

**FINAL
KNIK ARM CROSSING
ECONOMIC EFFECTS OF HIGHWAY IMPROVEMENT**

*Agreement No. P 42070
Federal No. ACSTP-0001(277)
AKSAS No. 56047*

Prepared for:

**Knik Arm Bridge and
Toll Authority
550 W. 7th Ave., Suite 1850
Anchorage, AK 99501**

**Alaska Department of
Transportation & Public Facilities
P.O. Box 196900
Anchorage, AK 99519-6900**

**Federal Highway Administration
P.O. Box 21648
Juneau, AK 99802**

Prepared by:

**Northern Economics, Inc
880 H Street, Suite 210
Anchorage, AK 99515**

At the request of:

**HDR Alaska, Inc
2525 C Street, Suite 305
Anchorage, AK 99503**

January 2006

Table of Contents

1.0	Economic Effects	1-4
1.1	Access and Transportation Costs Effects	1-4
1.2	Land Prices and Rents Effects	1-5
1.2.1	Changes in accessibility	1-5
1.2.2	Changes in safety	1-6
1.2.3	Changes in noise	1-6
1.2.4	Changes in visual quality	1-6
1.2.5	Changes in community cohesion	1-6
1.2.6	Changes in business productivity	1-7
1.3	Impacts on Employment, Income and Business Growth.....	1-9
2.0	Distributive Effects	2-12
3.0	References.....	3-13

List of Tables

Table 1-1.	Summary of regression studies of property-value effects	1-9
Table 1-2.	Economic Development Impacts.....	1-11

Abbreviations and Acronyms

ADHS	Appalachian Development Highway System
ARC	Appalachian Regional Commission

1.0 Economic Effects

The relative importance of transport compared to non-transport factors depends on the level of analysis—national, regional or local. Transportation costs make up a relatively small proportion (usually 5–7 percent) of total business costs, although this varies by industry (CBI, 1985; Diamond and Spence, 1989). The evidence generally suggests that transportation is a necessary but not sufficient condition for influencing business location, especially in developed countries where transport infrastructure is generally ubiquitous. Other factors such as access to skilled labor, market changes, tax structures etc., are generally more significant.

Transport is likely to be more important in influencing a businesses' choice of location within a local area, rather than its choice between regions (e.g., transport changes may influence a business' choice as to which part of town to locate, but may be irrelevant as to which region of a county it goes to). [McQuaid, 2004]. Local redistribution of businesses may have little or no effect on the growth of the regional or national economy as a whole, so it is important to distinguish transport investment that simply helps move businesses around a region from investment that leads to regional or national growth [McQuaid, 2004].

1.1 Access and Transportation Costs Effects

Highway projects can affect overall transportation system efficiency, localized traffic activity (levels and performance) and access (travel times between certain origins and destinations). All three types of transportation impacts can affect the spatial distribution pattern of economic development. Specifically, any such transportation changes can affect the *spatial distribution* of businesses and population as a consequence of three types of travel-related impacts, which vary over locations [Economic, 2001]:

- Impacts of a highway project on *directly* improving travel efficiency (reducing costs) for existing personal and business users on their already-existing trips;
- Impacts of a highway project on *indirectly* reducing the cost of personal and business activities by allowing those activities to redistribute in more efficient ways; and
- Impacts of a highway project on *induced* travel and business demand associated with bringing people access to a greater selection of job, shopping and recreational opportunities (available within a given travel time).

Businesses adjacent to a transportation improvement that benefit from pass-by traffic, e.g. retail stores and restaurants, are likely to realize income increases, and businesses near an improvement may find they are better able to grow and realize productivity benefits from expanded access to labor markets, customer markets and/or supplier markets. Businesses more distant from an improvement or businesses whose workers or suppliers or customers use it may also experience reduced travel costs and income gains or could experience losses because of increased competition for local customers and labor from other markets. [Economic, 2001b.]

Studies that seek to evaluate the net effects of specific transportation projects on a local economy typically attempt to measure its impacts on land prices, employment and income. The sections below summarize the findings of some of these studies.

1.2 Land Prices and Rents Effects

Despite the ambiguity of some of the theoretical results, most models of the impacts of transportation projects predict a link between improvements in transportation access and increases in land prices and development densities nearby. A fundamental empirical question, then, is whether transportation access influences land prices and development densities in the way that theory predicts. Some studies have examined whether land near highways sells for a higher price which reflects, at least in part, the value of the transportation access provided by the highway. Other studies have examined how highways influence population and employment growth patterns within urban areas. Both groups of studies are often intrametropolitan in their geographical focus [Boarnet, 2000].

A transportation project may lead to, or contribute to, changes in the value of surrounding property (both land and buildings) and the use of surrounding land. Thus, residents and businesses located in areas near proposed transportation facilities are often concerned about whether the project would lead to changes in the nature of the area's neighborhoods (i.e., affecting their desirability as places to live, work, and conduct business) or to changes in the value of their property (i.e., affecting personal wealth). If a place becomes more desirable as a place to live or do business, then demand for that location increases as more people or businesses attempt to locate there, and property values are driven up. Changes in property values are a direct measure of shifts in demand for a location, and thus they represent a leading indicator of subsequent changes in the intensity of land use.

It is important to note that changes in property values are driven by, and hence mirror, the value associated with local changes in accessibility, safety, noise, visual amenity, community cohesion, and business productivity. In general, a transportation project would only lead to changes in property values (and in subsequent land use) if it caused a positive net change in the entire set of local factors that affect the desirability of a location. [Forkenbrook, 2001].

Transportation projects affect property values and land use as a result of their direct effects on other social and economic factors. This is illustrated through the following examples that are expressed in terms of effects on property values (although they also apply for subsequent changes in the intensity of development for land that is not already built up). [Forkenbrook, 2001].

1.2.1 Changes in accessibility

Improved accessibility can increase property values. Proximity to highway off-ramps or transit stations often makes locations more convenient and desirable as places to live and do business, thus increasing property values. Conversely, projects that eliminate direct driveway access from an arterial to a commercial property or that create a barrier to its pedestrian access may reduce property values for the affected locations. Often, changes in accessibility also lead to distributive

effects in terms of property values—shifting demand for property to the area with improved access and increasing rents there, while other areas experience reduced demand and, therefore, lower rents. Access improvements also can make it easier for local residents to travel to more distant businesses instead of patronizing local businesses, so, in some cases, access improvements could actually lead to reductions in economic viability and, hence, in local property values.

1.2.2 Changes in safety

Improved safety can increase property values. Improvements such as traffic controls or separated pedestrian and bicycle routes can make nearby areas safer for children and other residents, thus increasing both the areas' attractiveness and property values. Conversely, greater traffic levels on neighborhood streets can make them more dangerous locations for pedestrians and children, and reduce property values.

1.2.3 Changes in noise

Increased noise can reduce residential property values, even though roadway projects that increase noise may improve accessibility increasing property values for other land uses. New highways, rail lines, bus transfer stations, and airports can increase ambient noise levels and decrease the attractiveness of adjacent residential locations, thus diminishing property values (and possibly discouraging new residential development). On the other hand, bypass highways or roads that divert traffic away from some existing arterials may reduce noise levels in some neighborhoods, and increase residential property values.

1.2.4 Changes in visual quality

Blocked views, visually unattractive scenes, or loss of privacy can reduce property values. For example, transit stations, bus terminals, parking structures, and elevated rights of way can potentially block views of scenery or be perceived as visually incompatible with existing adjacent park or residential properties, thus reducing residential property values. On the other hand, such facilities could also fill problematic vacant land, , provide better visual continuity of a streetscape, and increase commercial property values.

1.2.5 Changes in community cohesion

Projects that run through neighborhoods and cut off internal pedestrian access within them can affect the functioning of neighborhood activity centers and diminish residential property values. Highways, rail lines, or other forms of right-of-way can potentially split a neighborhood and cut off (or create roundabout routes for) access to schools, houses of worship, or neighborhood centers. Such effects would reduce residential property values in the affected areas. On the other hand, projects that create new pedestrian routes, divert heavy traffic that previously divided a neighborhood, or fill vacant parcels with desirable activity centers can potentially enhance community cohesion and increase property values.

1.2.6 Changes in business productivity

Commercial and industrial property values typically reflect the revenue-generating potential of the location. New transit services or highways that increase market accessibility to a specific commercial or industrial area can increase the potential customer market that can be served by businesses there. They can also increase the potential labor market from which businesses can draw. Such effects allow businesses to grow and to achieve greater productivity through economies of scale. The resulting potential for additional revenue and profitability are reflected in increased property values for commercial and industrial land and buildings. On the other hand, right-of-way acquisitions may leave odd-shaped pieces of land with few practical uses, thus reducing their economic productivity and property value. Highways, rail lines, or busways that bisect a farm or a business center's parking area may reduce the productivity of the remaining property.

The property value effects of an individual transportation project are often positive in some areas and negative in other areas. The variability of these effects results from differences in the individual factors: some effects, such as accessibility, can occur over a wide area, while other effects, such as noise, often involve a much smaller area. A new highway may reduce property values adjacent to the route between off-ramps due to the greater noise and reduced view, but increase property values near off-ramps due to the improved accessibility and potential business productivity. Therefore, any analysis of property tax effects must take into account the differential size of areas associated with accessibility, safety, noise, visual amenity, community cohesion, and business productivity. [Forkenbrook, 2001].

The property value effects of an individual transportation project can differ for residential and commercial land. Widening an arterial can have short-term economic development effects that then have long-term ramifications in terms of property values. Specifically, the arterial may increase the value of parcels zoned for commercial uses due to the increased customer access and pass-by traffic, but reduce values of parcels zoned for residential use due to the effects on noise and view. [Forkenbrook, 2001].

A transportation project can also sometimes influence a parcel's market category. A road improvement may make what was previously considered marginal farmland suitable for commercial real estate or suburban residential development. Such shifts from one land use to another can have significant effects on land values, but such changes are typically limited to fringe locations where the affected land is not already built up or to urbanized areas where it has been underutilized. Conversely, negative effects on customer access to a property can make it unsuitable for its previous uses (such as retail), leading to its redevelopment for other uses (such as office space) that are less dependent on convenient access to pass-by traffic. Such changes in use for already built land are typically limited to special cases in which local accessibility has been substantially reduced or in which the property has been effectively cut off from adjoining activities. [Forkenbrook, 2001].

Giuliano (1989) reviewed the literature on land use and transportation and Huang (1994) reviewed the narrower literature on land prices and transportation infrastructure. Both agree that studies of land prices and highways yield results that vary depending on when the study was

conducted. The early studies, from the 1950s and 1960s, usually showed large land price increases near major highway projects. The later studies, from the 1970s and (less often) the 1980s, typically showed smaller and often statistically insignificant land price effects from highway projects. The early studies typically examined the first limited access or interstate highway built in an urban area. Giuliano (1989) and Huang (1994) both **argue that the first link in a metropolitan highway system is likely to bring large improvements in transportation access and thus large increases in land prices near the project**. As more highways are built, and the metropolitan highway network matures, the incremental effect on accessibility from new or improved highways decreases, thus accounting for a smaller change in land prices due to any access premium [Boarnet, 2000].

New evidence suggests that metropolitan highway projects still influence land use in the way that theory predicts. The important difference between the new evidence and earlier studies is that **the geographic scale of the land use effect appears to be somewhat smaller**. A new highway or improvement might importantly reduce travel times in the immediate vicinity of the project, even if the resulting changes in metropolitan-wide transportation accessibility are small. Hence, the land use effects of modern highway projects likely operate over a very fine geographic scale, rather close to the project [Boarnet, 2000].

Voith (1993), in a study of the determinants of house sales prices in Montgomery County, Pa. (a suburb of Philadelphia) from 1970 to 1988, found that homes in locations with lower highway travel time to the Philadelphia central business district had higher sales prices, other things being equal. The study further found that the value of highway access increased during the 1980s. Ryan (1997), in a study of office and industrial property rents in San Diego, found that better highway access, measured by distance from a property to the nearest freeway on-ramp, is consistently associated with higher office rents, controlling for other characteristics of the property. Both of these analyses used site-specific information that provides substantially more geographic detail than many earlier studies [Boarnet, 2000].

Table 1-1, which is taken from Forkenbrock (2001), summarizes the estimated impacts of transportation access on property values or rents from 6 studies of residential properties and 4 studies of commercial properties. The results show a consistently positive impact on property values for commercial uses and a mix of impacts on residential properties.

Table 1-1. Summary of regression studies of property-value effects

Study	Transportation factor	Observed effect
Residential property values (observed effects after project completion)		
Grand Rapids, MI (Bagby, 1980)	Change in traffic volume in a residential neighborhood	Property values decreased roughly 2% per additional 100 vehicles per day on residential streets.
Baton Rouge, LA (Hughes and Sirmans, 1992)	Difference in traffic volume on a street	On high-traffic streets, each additional 1,000 vehicles per day reduced property values by 1% in urban areas and 0.5% in suburban areas.
Brisbane, Australia (Williams, 1993)	Proximity to a freeway	Property values increased \$1.78 per meter closer to an on-ramp, but decreased \$4.48 per meter closer to the freeway (where there was no on-ramp).
Washington State (Palmquist, 1982)	Proximity to a newly constructed highway	Property values increased 15–17% where there was highway access, but properties located nearby decrease 0.2–1.2% per dBA of traffic noise.
San Francisco, CA (Bernick and Carroll, 1991)	Proximity to a rail transit station	Rents increased \$0.05 per sq.ft. for each mile closer to a station.
Toronto, Canada (Bajic, 1983)	Proximity to a rail transit station	\$5,370 premium for homes close to a station.
Commercial/Office rents (observed effects after project completion)		
Santa Clara, CA (Weinberger, 2000)	Proximity to a light-rail transit station	Rent values increased 3–6% for sites within a mile of a light-rail station.
Atlanta, GA (Bollinger et al., 1996)	Distance from a heavy-rail transit station	Rents increase 4% for sites close to a station.
San Francisco, CA (Landis and Loutzenheiser, 1995)	Distance from a heavy-rail transit station	No effect in San Francisco or Oakland; elsewhere rents increased 16% for sites up to 3/8 mile from a station.
Washington, DC (Rybeck, 1981)	Distance from a heavy-rail station	9–14% premium for sites close to a station.

Source: [Forkenbrook, 2001].

Changes in access, transport costs, and property values will influence the future mix of local economic activity, including jobs and incomes. Studies that have attempted to measure the impact of transportation improvements on local employment and income are discussed in the following section.

1.3 Impacts on Employment, Income and Business Growth

Aggregate multi-county studies of the Interstate Highway System, Appalachian Development Highway System (ADHS), and Mississippi Delta program have found higher employment and earnings growth rates in counties served by the highways than those not served. While quantitative methods have only shown correlation and not causation between transportation and

economic growth, qualitative evidence from some studies suggests that transportation has helped to facilitate the observed growth. [Economic, 2001]

The ADHS is a 3,090-mile road system authorized in 1965 to overcome the region's isolation. Because of the high cost of building roads through Appalachia's mountainous terrain, adequate roads had not been built in much of the region and when the interstate system was built, large areas of Appalachia were simply bypassed. The ADHS is designed to link Appalachia with the US interstate system.

In 1998, the Appalachian Regional Commission (ARC) completed a study to measure the extent that completed portions of the ADHS had contributed to the region's economy. The study focused on 12 of the 26 ADHS highway corridors that were already built and open to traffic. The 12 study corridors serve 165 of the 399 counties in the Appalachian Region. Economic benefits and costs were analyzed based primarily upon the travel efficiencies created from the improved highways. The travel efficiencies were based upon estimates of reduced travel time, reduced vehicle operating costs, and a reduced number of accidents.

The effectiveness of the ADHS in creating economic opportunity was estimated for 56-year time frame (1968 to 2024) using a regional economic model (the REMI model¹). Travel efficiency benefits (shorter travel times and reduced vehicle operating costs) were inputs into the model which generated the economic development impact estimates, as measured by jobs, wages and value-added. [Wilbur Smith, 1998]

The ADHS corridors were evaluated from both a travel efficiency perspective and a regional economic development perspective. The study found that:

- The net present value created from the travel efficiencies was \$755 million over the course of the study time frame
- The constant dollar economic return was 7.87 percent
- The life cycle economic travel efficiency benefits exceed the costs (benefit/cost is \$1.18)
- The corridors as a whole seemed to have been reasonable investments from a travel efficiency perspective [Wilbur Smith, 1998]

Estimates of regional economic development impacts of the ADHS for the years 1975 and 1995 and projections for 2015 are shown in Table 1-2. The study estimated that by 1995 the ADHS had generated a net increase of 16,000 jobs with annual wages of \$426 million and more than \$1 billion of value added within the region. By 2015, the ADHS was projected to account for a net increase 42,000 jobs with annual wages of \$1.2 billion and \$3.0 billion of value added. [Wilbur Smith, 1998]

¹ The REMI model is a comprehensive economic forecasting and simulation model that has been employed in the evaluation of a wide array of issues, including investments in infrastructure.

Table 1-2. Economic Development Impacts

Increases Due to ADHS	<u>1975</u>	<u>1995</u>	<u>2015</u>
Jobs	6,100	16,270	42,190
Population	14,690	30,420	84,480
Wages (\$ million)	\$68	\$426	\$1,178
Value Added (\$million)	\$271	\$1,002	\$2,975

Source [Wilbur Smith, 1998]

In the 2003 North Country Transportation Study, researchers used a combination of local interviews and surveys, state business attraction and retention trend analysis, and a specially designed business attraction model to quantify the impact of transportation improvements in a relatively rural and isolated region of northern New York. [Hodge, 2003]

The study measured the value to the regional economy of efficiency gains to travelers and analyzed how an expanded highway could spur business attraction. The model used to quantify the business attraction impacts of highway improvements was a revised version of one developed for the ARC. Key components of the model include:

- Comparative employment data for industry mix and industry trends
- Competitive cost factors such as manufacturing labor wages and utility costs
- Industry-specific highway, rail, air, water transportation usage
- Accessibility impacts to labor, customer, tourism, product delivery markets and intermodal facilities [Hodge, 2003]

The business attraction analysis identified industries that were dependent on highway access, and had the greatest potential for attraction to the study area based on the potential highway benefits. Industries with substantial projected increases in employment opportunities due to highway improvements included:

- Primary metals
- Electric equipment
- Paper and Printing
- Eating and drinking establishments
- Retail trade
- Business and professional services
- Medical care services [Hodge, 2003]

Local interviews with individuals from key industries in the region, such as universities, aluminum companies, and paper mills, helped to verify and quantify the current detrimental impact of transportation access limitations and the potential for improved economic conditions given improved transportation facilities. Because of the uncertainty regarding the business attraction analysis, two sets of assumptions were generated, one with full business attraction impacts and the second with impacts at 50 percent of the total. The full impacts estimate was assumed to represent an upper bound on the potential for business attraction. Estimates of economic impacts ranged from roughly 750 new jobs to 4,000 depending on the alignment and highway design. [Hodge, 2003]

Positive relationships between transportation and economic development, which have been found in large, multi-county studies, have also been found in studies of much smaller areas. Studies of the determinants of population and employment changes in census tracts or similarly small geographic units within metropolitan areas have shown a relationship between population and employment change and highway location. Highway access positively influenced tract or municipal employment levels in the northern half of New Jersey (Boarnet 1994a and 1994b), Orange County, California (Boarnet, 1996; Geho, 1998), the Atlanta metropolitan area (Bollinger and Ihlanfeldt, 1997), South Carolina and parts of North Carolina and Georgia (Henry, et. al., 1997), and strictly within South Carolina (Singletary, et. al., 1995) [Boarnet, 2000].

While census tract level studies suggest that highway access is an important determinant of geographic variation in intrametropolitan growth patterns, other studies suggest that, in part, this is growth that is redistributed from other parts of the metropolitan area.

2.0 Distributive Effects

Boarnet [2000] cites two studies by Haughwout that show increases in state highway stocks reduce house values in both the city and suburbs of large metropolitan areas. Because the majority of an urban area's housing units are located in its most densely developed areas, Boarnet suggests that new highways tend to reduce the accessibility premium that central locations enjoy and foster the decentralization of employment growth from dense to less dense counties; that highways influence land prices, population, and employment changes near a project; and that the land use effects are likely at the expense of losses elsewhere. [Boarnet, 2000].

Transportation economists have traditionally argued that public assessment of the benefits of highway programs should be restricted to road user benefits—the value of travel time savings, safety improvements, and other reductions in the cost of travel (e.g. Forkenbrock and Foster, 1990; Mohring, 1976). The argument is that other benefits, such as reductions in consumer prices that result from cheaper transport costs or increases in land value that result from improved accessibility, are simply transfers of road user benefits to other persons. Thus, to count both road user and transfer benefits would “double count” benefits (Mohring, 1961, 1976, 1993, Mohring and Harwitz, 1962). That point is well taken, but the transfer benefits, even if they flow directly from road user benefits, are often highly visible, and some discussion of the

transfer benefits is important, if for no other reason than that such benefits are often drawn into the policy debate. Even more important, ignoring transfer benefits obscures some of the more important and obvious location-specific impacts of highway programs [Boarnet, 2000].

It turns out that there are substantial and growing reasons to believe that the spatial distribution of activity is an important determinant of total growth. In a series of papers, Voith (1992, 1993, 1998) has uncovered evidence of strong and increasing connections between city and suburban growth. Other authors have confirmed this general finding, and Brooks and Summers (1997) show that the direction of causality in the relationship runs from central city to suburb. That is, when the city's growth is robust, the entire region is more prosperous than it would be without strong city growth. This finding leads to the possibility that highways, by influencing the spatial character of metropolitan development, influence growth and social welfare in ways that are not readily apparent [Boarnet, 2000].

The literature on the productivity benefits of agglomeration (e.g. Ciccone and Hall, 1996; Ihlanfeldt, 1995) implies that the spatial concentration of producers leads to higher productivity and higher incomes to owners of land, labor and capital. For any particular firm, the incentive to locate in a dense agglomeration of activities will presumably decline with transportation cost; improved accessibility reduces the value of central locations, since employees and inputs may be drawn from a greater distance. The firm considers only its private costs and benefits, and ignores the effects of its decision on other businesses. A decentralizing firm loses the benefits of agglomeration, but this is only part of the cost to society since other firms lose the benefit of proximity to the moving firm. That is, a firm's location decision process ignores the fact that its presence in a dense agglomeration is beneficial to other firms [Boarnet, 2000].

3.0 References

Boarnet, M.G., and I. A. F. Haughwout. Do Highways Matter? Evidence and Policy Implications of Highway's Influence on Metropolitan Development. Paper Prepared for The Brookings Institution Center on Urban and Metropolitan Policy. August 2000

The Brandow Company and Economic Development Research Group. Evaluation of the Appalachian Regional Commission's Infrastructure and Public Works Program Projects. Prepared For: Appalachian Regional Commission (ARC). June 2000

Economic Development Research Group, Inc. and Cambridge Systematics, Inc. Using Empirical Information to Measure the Economic Impact of Highway Investments Volume 1: Review of Literature, Data Sources, and Agency Needs. Prepared for: Federal Highway Administration. April 2001.

Economic Development Research Group, Inc. and Cambridge Systematics, Inc. Using Empirical Information to Measure the Economic Impact of Highway Investments Volume 2: Guidelines for Data Collection and Analysis. Prepared for: Federal Highway Administration. April 2001.

Forkenbrock, David J. and Glen E. Weisbrod. Guidebook for Assessing the Social and Economic Effects of Transportation Projects. NCHRP Report 456. 2001.

Hodge, Daniel J., et al. Do New Highways Attract Businesses? The North Country (NY) Case Study. Prepared for: Transportation Research Board, Annual Meeting. January 2003.

McQuaid , Ronald W., et al. The Importance of Transport in Business' Location Decisions. Napier University–Scoping Study. Prepared for: United Kingdom Department for Transport. January 2004

Rutgers University, Center for Urban Policy Research. Public Works Program Performance Evaluation. Prepared for: U.S. Department of Commerce, Economic Development Administration, Office of Program Research and Evaluation (EDA Project No. 99-06-07415). May 1997.

US Department of Transportation, Federal Highway Administration Office of Asset Management. Economic Analysis Primer. August 2003

Wilbur Smith Associates. Appalachian Development Highways Economic Impact Studies. Prepared for: The Appalachian Regional Commission. July 1998.