

Invisible Costs

The \$122 Million Price Tag for The Naval Air Station Whidbey Island

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Executive Summary

A 2013 report by the Island County Economic Development Council lauds the Naval Air Station Whidbey Island in Washington State as “four times the size of the next nearest employer” in the region. It argues that the Navy’s contributions to the local economy include \$726 million in annual payroll, \$44 million in retirement and disability payments, and \$18 million in health care payments. Another study for the Washington Economic Development Commission found that in FY 2009 the Navy gave Island County companies \$130 million in contracts. All these studies, however, are outdated and incomplete. They highlight the benefits of Naval operations but say nothing about the costs. This study examines the myriad costs that thus far have been invisible for public scrutiny and action. Among the biggest:

- *Public Costs* – Navy personnel and their families use the same services as other businesses on Island County, but if they live or shop on the base they are exempt from local taxation. That means that other residents wind up underwriting a significant part of the Navy’s presence. For example, the County is losing \$5.7 million per year in sales and property taxes that it would otherwise collect from employees of an equivalently sized private industry.
- *Opportunity Costs* – Compared to private sector jobs, Navy jobs yield relatively small economic impact. The conversion of existing Navy jobs to civilian jobs would create 3,909 additional jobs (beyond the converted jobs), expand the economy by \$503 million, and generate \$153 million more in taxes (mostly to state and local government). The loss of military benefits would bring down net labor income by \$78 million, but this is more than compensated for through expanded proprietor income, rents, and tax revenues.
- *External Costs* – The Naval Air Station’s largest program—training pilots to fly “Growler” aircraft—has exposed more than 11,000 residents to harmful levels of noise. An economic assessment model used to assess every high-noise project in the United Kingdom suggests that the health costs to Island County residents are currently \$2.8 million per year, and will grow to \$3.3 million if the Growler program expands as planned. Additionally, the program has depressed property values by \$9.8 million thus far, and this damage will almost certainly grow as that program expands as planned.

Altogether, over the period 2010 and 2021, these invisible costs to Island County will be about \$122 million. While the Navy understandably wants to discount or dismiss these costs, state and local decision-makers would be remiss not to give them serious consideration. Public officials should seek to minimize them by pressing the Navy: to begin serious conversion planning; to pay the County at least \$5.7 million per year in “payments in lieu of taxes” (PILOT); to increase the Navy’s level of local contracting; to modify the Growler program (perhaps by moving its training to a less populated area); and to compensate victims of adverse Growler noise or toxic chemicals impacts. Whatever the Navy does in the future, Island County also needs to refocus its economic development efforts on diversifying its economy and reducing its dependence on ultimately unreliable streams of federal spending.

Foreword

What makes an economy sustainable? The American Sustainable Business Council says it includes “economic approaches, investments, regulations, and research that accurately assess the total costs of projects, including social, economic, and environmental externalities.” They say nurturing a diversity of small and mid-sized local businesses is better than attracting a large, outside employer for making communities more resilient and generating more jobs for the investment made. Depending on a single large employer, they argue, “leaves the community vulnerable to ... externalities (pollution, etc.), and to sudden, widespread unemployment if the corporation decides to pull up stakes.”

Forty sustainability minded Whidbey citizens with civilian, military, non-profit, small business, and professional backgrounds came together in the Spring of 2016 to better understand how to assure a thriving, diverse, resilient local economy on Whidbey Island into the future. The economic foot print of the Naval Air Station Whidbey Island (NASWI) became a focus because economies dominated by a single employer look prosperous but are actually brittle, because they use non-local suppliers and often have a transient workforce. They also leave the community subject to decisions over which it has little control.

Dubbing themselves the Sustainable Economy Collaborative, these citizens pooled personal resources and hired a well-known national expert in sustainable local economies, Michael Shuman, to do an analysis of the invisible costs of our major employer, and to help plan for the possibility that NASWI could shrink as defense priorities change – or close entirely. The purpose of the SEC is to encourage a healthy economy by promoting long term planning for a sustainable economy with an ecosystem of thriving small and mid-sized businesses that take advantage of our natural assets - beauty, tourism, agriculture, history, high speed internet, strong arts and culture, and strong spirit of community service. The SEC seeks to find ways to assure ourselves and workers in our community that we'll have equal or better jobs should the Navy as a major employer leave. The SEC does not seek the closure of NASWI; we only seek alternatives to a brittle, Navy dependent economy, including to insulate our current and future businesses from loss of revenue due to the expanding Growler training program; we seek to retain and grow a diversity of local businesses and mitigate any losses in the best way possible.

The SEC tasked Michael Shuman with researching the following questions about how the Navy currently operates in Island County:

- What are the hidden costs of NASWI to Island County and its residents?
- How much does the Navy contribute to property and sales tax, on which the county depends?
- What taxpayer-funded infrastructure and services do the Navy use that is not fully

compensated through taxes?

- How might our revenues from our parks and tourist attractions be impacted from NASWI planned programs?
- How do the Navy's economic impacts, such as its purchasing from local merchants, compare with those of other private businesses?
- What are the external costs of the currently proposed expansion of the Navy's Growler training program?
- How might Island County begin to think more seriously about the possibility of the NASWI closing in the future and "military conversion"?

The SEC proudly presents Michael Shuman's findings

The Sustainable Economy Collaborative
Island County, Washington
February, 2017

Introduction

Island County encompasses two large islands, Whidbey and Camano, and seven smaller islands. It currently is home to an estimated 80,600 residents. About half the population is concentrated in three communities: Oak Harbor (roughly 22,000 population), Langley (5,000 population), and Coupeville (2,000 population). The rest of the population is lightly dispersed over 208 square miles. Compared to Washington State, the residents of Island County are whiter and older, with many retirees who once worked for the largest employer on Whidbey Island – the U.S. Navy.

A 2013 report by the Island County Economic Development Council (EDC) touts the Naval Air Station Whidbey Island as having about 10,000 employees and being “four times the size of the next nearest employer” in Island and three other neighboring counties.¹ It argues that the Navy’s contributions to the Island County include \$726 million in annual payroll, \$44 million in retirement and disability payments (because of the high density of Navy retirees), and \$18 million in health care payments. Additionally, the report notes that the Navy benefits the economy through local contracts, charitable contributions, natural habitat improvements, and employee expenditures. Another study led by Bonnie Berk and Michael Hodgins for the Washington Economic Development Commission found that in FY 2009 the Navy gave Island County companies \$130 million in contracts.²

All these studies of the Navy’s economic impacts, however, are incomplete. Alongside the benefits of the Naval Air Station must be a careful evaluation of its costs. To count the benefits of any activity while ignoring the costs leads to poor decision-making. To improve state and local decision-making, this study attempts to highlight the missing piece—the invisible costs of the Navy’s presence in Island County. We call these costs “invisible” because policymakers have largely proceeded from the assumption that they do not exist.

Three invisible costs in particular are tallied:

- The special costs that the Navy imposes on the public sector, compared to a more typical, private-sector industry, because its personnel and veterans do not pay many state and local taxes;
- The opportunity costs of the Navy’s presence, including all the possible futures for the Island County that might be foreclosed or limited by focusing economic development on just one outsider-controlled industry; and,

¹ Island County Economic Development Council, “Naval Air Station Whidbey Island: Economic Impact to Island and Skagit Counties,” monograph, 4 December 2013, p. 3.

² Bonnie Berk and Michael Hodgins, “Washington State’s Defense Economy: Measuring and Growing Its Impact,” Prepared for the Washington Economic Development Commission, September 2010, p. ii.

- The external costs of the Navy’s activities, particularly the costs of the Growler program on human health and property values.

This study aims to bring common sense back into public policy concerning the Naval Air Station Whidbey Island. It urges state and local decision-makers to balance their enthusiasm for the Navy’s economic benefits with a sober assessment of its costs. The purpose is not to encourage the Navy to depart, but rather to suggest reasonable changes in Navy policies and activities that could minimize these costs and make the Navy a better neighbor. These recommendations, elaborated at the end of this paper, include beginning serious economic development planning around diversifying the Island County economy away from its current dependence on one federally funded industry. Additionally, the Navy should be pressed to do the following:

- Pay at least \$5.7 million per year to county and local government as “payments in lieu of taxes” (PILOT);
- Increase levels of local contracting;
- Modify the Growler program, perhaps by moving its training flights to a less populated area; and
- Compensate victims of adverse Growler noise and related impacts.

About the Methodology

Putting a dollar value on all the impacts associated with a given activity is inherently controversial. Economists and policymakers have spent generations debating “cost-benefit analysis.” What costs and benefits should be counted? How should they be counted? How, for example, can one count the loss of habitats for important or endangered species? What’s the cost of a human life? How should future damage be discounted for the present? There are no simple answers to these questions. Human judgment is required.

But human judgment also underscores that, whatever the challenges posed by cost-benefit analysis, it needs to be done. The prevailing practice by state and local decision-makers in Island County, such as in the EDC study cited above, is to count and glorify the benefits of the Naval Air Station Whidbey Island while ignoring the costs altogether. Even if methodologies to estimate costs are imperfect, assigning costs a value of zero is indefensible.

It’s worth noting, moreover, that the exact same kinds of methodological problems beset the estimation of benefits that are now widely used and accepted. The recitation of the number of jobs that the Navy provides, for example, often comes with an implicit assumption that without the Navy, these jobs would never materialize and these workers would be unemployed. In fact, as this study shows, the same federal dollars could be spent on myriad other nonmilitary activities and create even more employment. Similar benefits might accrue if local land, labor, and capital were freed up for private business development. As has been the case in many communities that once were highly dependent on military jobs, the withdrawal of the military creates short-term challenges but long-term opportunities.

This study focuses on the cost side of the equation but proceeds with two conservatisms, which means that our ultimate estimate of the cost of the Naval Air Station Whidbey Island is probably too low.

- First we rely on the best methodologies available for counting costs. Thus, for example, we use the methodology currently required by government decision-makers in the United Kingdom to evaluate the health impacts of noise.
- Second, we only evaluate those costs that are clearly quantifiable and not speculative. At the end of the report, we note several potential costs from the Navy that could be enormously costly, such as the contamination of drinking water supplies in parts of the Island County. But because the evidence on these problems is still unclear, we do not count them.

A final note: We keep all counts in current dollars but note the years of our sources. No discounting of costs or benefits is done, because it is a controversial practice and it would make no difference in the conclusions offered.

I. Public Sector Costs

The first type of economic cost the Navy imposes on Island County is its burden on public services. Because of federal supremacy under the Constitution, many federal activities are exempt from state and local taxation. Consequently, Navy personnel enjoy the same public services of Island County as other residents do— schools, police, social services, roads, trash collection, and so forth – but pay only a fraction of the cost. The rest of the bill is covered by other residents.

As a state without an income tax, Washington State and its sub-jurisdictions rely especially heavily on sales and property taxes. Island County loses out on both because of the significant presence of the Navy.

Regarding sales tax, Navy personnel do much of their shopping at the NEX and Commissary stores where all purchases are exempt from state and local taxation. The resulting loss of local revenue is significant. Of 39 counties in the state, according to the most recent state data available (for 2015), Island County ranks 34th in the yield of just *county and local* sales taxes per capita.³ Three of the five counties with lower yields have tiny populations (<12,000) where the population readily can shop nonlocally. In Island County, in contrast, nonlocal shopping requires significant effort—a ferry ride—which means that its low tax collections largely reflect extensive tax-exempt purchasing. Overall, county and local governments in the state generated \$687 million in sales tax collections—or \$97.22 per capita. Island County receives \$53.27 per capita. Were the County to receive just the *average* state yield per capita, the County would receive \$3.5 million more in revenue per year.

Regarding property taxes, Navy-owned land is exempt. As shown in Chart 1, the federal government owns 59 parcels of property across Whidbey Island that are exempt from taxation.⁴ Their assessed valuation is approximately \$216 million. Were the Navy paying the average property tax rate of 0.68% per dollar of valuation, the County would receive another \$1.5 million per year.

Additionally, there are property taxes that might be paid by base personnel. Most personnel live off base and do pay property taxes directly through mortgages or indirectly through rents. However, the most recent statistics available from the Navy show that 1,518 family units are living on the base and paying no property taxes.⁵ According to the US Census Bureau in 2010, Island County had 40,234 housing units, so roughly 3.8% of these units were on base and paying no property taxes. The total property tax collections for 2016 was \$17,282,259. If on-base families were occupying households on the tax

³ Washington State Department of Revenue, *Tax Statistics 2015*, Table 17, p. 28.

⁴ See the web site of the Island County Assessor and Treasurer: <http://assessor.islandcountywa.gov>

⁵ U.S. Department of the Navy, “Draft Environmental Impact Statement for EA-18G ‘Growler’ Airfield Operations at Naval Air Station Whidbey Island Complex,” (hereinafter, *DEIS*), November 2016, p. 3-155.

rolls and paying an average level of tax per household, they would be paying the County another \$678,000 per year.

Adding these three items together yields about \$5.7 million per year.

Another big tax loss is impossible to calculate. Were federal land made available for private industry or housing, substantially new tax dollars could be generated. The next section of this study, however, explores some of these “opportunity costs.”

Chart 1
Properties in Island County Owned by the U.S. Government

Property ID	Geographic ID	Appraised Value	Property ID	Geographic ID	Appraised Value
1205	R03225-200-0650	\$10	36071	R13324-237-1370	\$123,034
1447	R13101-046-0360	\$90,000	36650	R13325-330-0880	\$706,750
2044	R13102-038-4960	\$90,000	37524	R13326-329-4620	\$550,000
2197	R13102-246-4470	\$1,450,000	38444	R13327-428-3630	\$240,667
2295	R13102-336-3100	\$200,000	39005	R13328-264-1320	\$13,159,920
6736	R13109-317-0470	\$100,000	43303	R13336-080-1500	\$2,792,700
8299	R13111-515-5140	\$135,000	43358	R13336-120-2770	\$2,790,000
8315	R13112-015-2810	\$75,000	48086	R22906-345-2070	\$350,000
8324	R13112-036-1990	\$600,000	59395	R23005-198-1070	\$1,000,000
8360	R13112-167-1320	\$1,610,000	59527	R23006-288-4590	\$4,890,790
8529	R13112-421-1660	\$1,180,000	59876	R23007-489-1660	\$1,587,372
8887	R13113-343-3420	\$685,000	60490	R23008-467-0800	\$700,000
10197	R13122-202-2000	\$11,050,906	82010	R23118-181-0080	\$75,000
10240	R13122-310-2600	\$600,000	89647	R23204-040-3570	\$3,641,280
10311	R13122-420-3300	\$10	89790	R23204-330-3530	\$500,000
10721	R13201-093-2050	\$4,393,500	89816	R23204-350-1800	\$4,248,078
10776	R13201-418-1950	\$13,443,500	89969	R23206-024-5240	\$1,484,802
19045	R13212-140-1330	\$30,783,542	107672	R23331-240-4370	\$12,231,845
30344	R13235-479-2040	\$5,000	107681	R23331-345-0240	\$6,624,250
33056	R13310-264-3960	\$15,728,123	107930	R23332-240-2810	\$8,183,225
33252	R13311-107-0480	\$400,000	108369	R23333-166-2260	\$2,546,715
34000	R13312-020-2610	\$230,000	286915	S7270-00-0000A-2	\$1,050
35358	R13313-407-2500	\$1,059,760	286942	S7270-00-00003-0	\$25,000
35376	R13314-264-2640	\$7,438,750	286960	S7270-00-00008-0	\$25,000
35394	R13316-056-4830	\$2,657,008	550834	R03226-005-4810	\$400,348
35401	R13321-198-3300	\$16,222,236	550852	R13329-205-4880	\$9,388,453
35429	R13322-264-2640	\$5,742,935	572589	R13122-104-0740	\$80,000
35571	R13323-270-2730	\$20,444,760	623169	R23112-495-2300	\$200,000
35740	R13324-108-1000	\$700,000	803834	R13108-364-4680	\$273,617
35786	R13324-131-1520	\$450		Subtotal	\$78,819,896
	Subtotal	\$137,115,490			
				Total Assessed Value	\$215,935,386

To put this in perspective, the total 2016 budget for the Island County government is about \$83 million.⁶ Collecting appropriate sales and property taxes from military personnel would allow the budget to be expanded by almost 7%. Put another way, *nonmilitary residents of the County are significantly underwriting the public expenses imposed by military residents.*

The mismatch between taxes and services is especially apparent in public education. According to the Navy, half of the 5,500 students in the Oak Harbor school district are “federally connected” and school overcrowding, already a problem, is likely to get worse.”⁷ In 2012-13, total costs of the school district were just over \$46 million and expenditures per student were \$8,973. Mindful of this problem with military bases across the United States, the federal government has historically given school districts in militarily dependent communities additional aid. Oak Harbor received \$4.6 million in 2012-13, which covered approximately 20% of the costs of educating “federally connected” students. The other 80% came from the county and local taxes, which are paid largely by nonmilitary families. This unequal allocation of burdens is likely to get worse. Federal aid to schools in 2016, according to the Navy, will be 60% the level in 2008, and may well decline further in the future.

Numerous other instances reveal a mismatch between the Navy’s demands on public services and its contributions of dollars.

- Food insecurity runs high among low-ranking military enlistees, so much so that they spent \$103 million in food stamps at military commissary stores in 2013.⁸ While SNAP is a federal program, food insecurity also places burdens on local resources through school lunch programs and food pantries.
- The expansion of the Navy’s personnel in recent years has meant that more people on Whidbey Island are looking for housing. As the Navy concedes, Island County vacancy rates are already running low—in 2013 they were 2.4% for home owners and 5.6% for rentals.⁹ In the short term, more residents chasing a fixed supply of housing means higher housing costs for everyone in Island County. It also means more homelessness.¹⁰ A recent editorial in the *South Whidbey Record* concluded, “The affordable housing

⁶ See “Island County 2016 Budget Summary,” available at <https://www.islandcountywa.gov/Commissioners/Budget/2016ADOPTEDBUDGETSUMMARY12-07-2015.pdf>.

⁷ *DEIS*, pp. 3-158-60.

⁸ Becket Adams, “See the Eye-Popping Chart about Food Stamps and the Military,” *The Blaze*, 17 February 2014.

⁹ *DEIS*, pp. 3-156.

¹⁰ The rate of homelessness in Island County has recently doubled. See Patricia Guthrie, “More Islanders on Edge of Homelessness Than Previously Thought,” *Whidbey News-Times*, 20 December 2016.

problem on Whidbey Island, particularly the north end of the island, is reaching a crisis point...”¹¹

- To the extent that the affordable housing shortage pushes military families to live outside Island County, their commutes are exacerbating local traffic problems, which means more long waits for the ferries and more traffic accidents, all of which impose additional costs on existing residents.

The analysis above focuses on current budget expenses by Island County and local governments. What’s not included, however, are additional *capital budget* expenses. For example, the expanding number of students in the Oak Harbor school district may require additional schools, buses, and other capital expenditures—all of which will be the responsibility of residential taxpayers.

Another example is the Oak Harbor water treatment system. For several years, Oak Harbor struggled to get the Navy to contribute to the \$122 million upgrade and expansion of its sewage system.¹² The Navy ultimately declined to participate and, instead, chose to continue to dispose of its sewage in a rickety system of lagoons. That system is inadequate now – raw sewage is already spilling occasionally into the Oak Harbor Bay – and sooner or later either the Navy or the city will have to undertake a multimillion-dollar capital project to remedy the problem.

The anticipated expansion of the Growler program means that all these inequities will likely get worse in the years ahead. In its *Draft Environmental Impact Statement (DEIS)* published in November 2016, the Navy suggests that various alternatives will grow military personnel over the next five years by between 371 and 664, and military dependents between 509 and 910.¹³ But it’s unclear what exactly the Navy’s baseline is for these estimates, because there was substantial growth in personnel in 2015 and 2016. A clearer picture of what’s happening is available from the Island County’s Economic Development Council, as shown in Chart 2. Between 2015 and 2019, the total population of dependents and active duty officers will grow by 5,184—an increase of 22%.¹⁴

¹¹ “Whidbey Leaders Have Big Job Ahead in Addressing Affordable Housing,” *South Whidbey Record*, 17 September 2016.

¹² See Agenda Bill (at http://www.oakharborcleanwater.org/content/documents/agendas/2014-01-21_Resolution14-05-USNavyParticipation.pdf) and related video (<http://www.oakharbor.org/video-view.cfm?keyword=wwtp&id=746>).

¹³ *DEIS*, p. 4-228.

¹⁴ Personal Correspondence between Ron Nelson (Director of the Island County EDC) and Larry Morrell, 14 November 2016. See also Jessie Stensland, “Island County, Oak Harbor Team Up To Tackle Low-Income Housing,” *South Whidbey Record*, 14 September 2016.

Chart 2
Estimates of Military-Related Population Changes on Island County
As Estimated by the Island County EDC

Year	Active Duty	Dependents & Active Duty
2007	8,150	26,406
2008	7,700	24,948
2009	7,650	24,786
2010	7,550	24,462
2011	7,250	23,490
2012	7,000	22,680
2013	6,950	22,518
2014	6,975	22,599
2015	7,200	23,328
2016	8,000	25,920
2017	8,600	27,864
2018	8,800	28,512
2019	8,800	28,512
2020	8,150	26,406

II. Opportunity Costs

Another important cost economists often weigh is the “opportunity cost.” What options are being foreclosed by today’s choices? If the growth of the Whidbey Naval Air Station’s activities crowds out economic activities that could generate still more wealth for Island County, then there are important opportunity costs.

While it’s possible for the region to enjoy economic growth in both military and nonmilitary sectors, the two universes necessarily compete for scarce resources. For example, land used by the military cannot be used simultaneously by the private sector. Investment dollars focused on businesses linked to the military are unavailable for civilian businesses. If housing expansion is limited by strict zoning laws, as is the case on Whidbey Island, the growth of military housing precludes the growth of nonmilitary housing (in fact, private companies on Whidbey Island are having difficulty finding affordable housing for new hires¹⁵).

But even more fundamentally, economic development is about how a community can shape and realize a vision of the future. Residents of Island County can fairly ask: Do you prefer an economy over the next generation with a continued high degree of dependence on the Navy? Or do you prefer a diversified civilian economy? What are the relative costs of pursuing one instead of the other? And what economic-development priorities should flow from these choices?

One reason these questions matter is that a growing body of evidence suggests that military base spending, compared to spending by the private sector, has a relatively weak impact on the local economy. This is partially because low tax payments and low levels of local retail purchasing by military personnel, discussed in the previous section. But equally important is that the Naval Air Station purchases most of its food, equipment, fuel, and so forth from its own, nonlocal supply chain, as dictated by Pentagon rules and suppliers. When a dollar is expended like this outside of a local economy, it constitutes an economic “leakage” that adds little economic benefit locally.

As summarized in Appendix I, a growing body of evidence suggests that economic development is most successful when it identifies dollar leakages like these and systematically plugs them through an expanding universe of locally owned businesses. In this section, we will show the potential benefits of Island County shifting its economic development priorities to these businesses.

Diversification is important for any economy, but especially for a small economy dependent on a single industry.¹⁶ Because the Island County economy is dominated by

¹⁵ Kyle Jenson, "Slim Rental Market Worrying Officials," *Whidbey News-Times*, 13 September 2016.

¹⁶ To elaborate: Dependence on a single industry leaves an economy vulnerable to changes in global markets over which the community has little or no control. In the case of dependence on military spending,

one non-locally owned industry (namely the Navy), it is missing out on the economic benefits that might come from a diversity of local businesses. Unlike the Navy, local businesses tend to spend more of their money locally, which pumps up the local economic multiplier and increases local income, wealth, and jobs. (The empirical case for these arguments is summarized in Appendix I.)

Our analysis begins by detailing the key characteristics of the Island County economy. It then presents data that show the relatively poor economic-development impact that flows from a military dollar generally. Finally, it analyzes the potential benefits of Island County replacing Navy jobs with leak-plugging private businesses.

(1) The Existing Economy in Island County

Chart 3 provides a snapshot of the Island County economy using data of an input-output model called IMPLAN. Across the United States, economic-development agencies use IMPLAN to calculate the benefits and costs of various decisions. One of the virtues of IMPLAN over the use of, say, U.S. Census data, is that it integrates a number of disparate federal and private data bases. The year of the data – the most recent one available – is 2014. The inputs in the model, drawn from federal and state data, assume that 79,275 County residents live in 32,835 households, with an average household income of \$106,949. Note that *household* income represents more than one income earner. Also, the relatively high average reflects a small number of higher income earners averaged against a much larger number of lower income earners.¹⁷

**Chart 3
Overview of the Island County Economy (2014)**

Gross Regional Product	\$2,562,300,743
Total Personal Income	\$3,511,647,000
Total Employment	33,495
Population	79,275
Total Households	32,835
Average Household Income	\$106,949

Chart 4 shows the supply and demand of the Island County economy. IMPLAN is constructed like an accountant’s balance sheet, so the two sides, production and

a change in defense spending by the President, Congress, or the Joint Chiefs could lead to huge and sudden disruptions in the local economy.

¹⁷ IMPLAN’s household income number is higher than that reported in the Census (which reported a median household income in 2015 of \$58,815) for two reasons. IMPLAN looks at average income, while Census looks at the 50th percentile. IMPLAN also includes non-wage sources of personal income, including self-employment income, rents, dividends, interest, income supplements, retirement, and transfer payments. For further explanation, *see*: http://support.implan.com/index.php?option=com_content&view=article&id=383#qualitative-differences .

consumption, always equal one another. The size of each side—and the size of the Island County economy—is roughly \$2.6 billion per year.

There are two important points in Chart 4 to highlight: Because of the Navy’s huge role in the Island County economy, federal demand is about two-thirds the size of all households combined. This is an unusually high level of dependence of a local economy on a single industry. Also, imports are more than \$3.6 billion greater than exports. *This means that the County is running a serious annual trade deficit which, if not remedied over time, will steadily impoverish the economy.*¹⁸

Chart 4
Supply and Demand in the Island County Economy (2014)

Supply (Value Added)		Final Demand	
Employee Compensation	\$1,348,595,843	Households	\$3,299,544,862
Proprietor Income	\$164,624,227	Local/State Government	\$331,468,311
Other Property Type Income	\$859,557,080	Federal Government	\$2,161,193,223
Tax on Production and Imports	\$189,523,592	Capital	\$464,058,305
Total Value Added	\$2,562,300,742	Exports	\$642,105,277
		Imports	-\$4,229,570,932
		Institutional Sales	-\$106,498,252
		Total Final Demand	\$2,562,300,795

Chart 5 shows the breakdown of jobs in the *private* sector in the County, compared with that of the United States. The relatively high percentage of jobs in retail, arts, and accommodation is not surprising for a tourism-dependent economy like Island County, but these are also sectors with relatively low wages. The relatively smaller presence of manufacturing, wholesale, professional services, and administrative services, which typically have higher wages, further depresses incomes. The relatively high levels of construction and health care underscore the relatively high number of retirees.

The data in Chart 5 above are drawn from the U.S. Census Bureau. It presents jobs organized into what’s called North American Industrial Classification Scheme (NAICS), an inventory of about 1,100 sectors which currently excludes public employees, self-employees, and farmers.¹⁹ In other words, the Navy is not included.

Chart 6, drawn from IMPLAN, presents a more comprehensive breakdown of the jobs, wages, and output in Island County economy. It fixes the deficiencies of NAICS, and includes public employees, self-employees, and farmers. It shows that the single largest

¹⁸ Unlike a national economy, which can lower the value of its currency to “adjust” to a trade deficit (by making exports cheaper and imports more expensive), a local economy cannot influence the value of its currency.

¹⁹ Even though farmers and ranchers are excluded from NAICS, agricultural services are not. Additionally, companies in NAICS Code “11---“ include logging, hunting, and horticulture.

employment category is government services, which provides almost a third of all the jobs. The Navy, according to the model, was employing 6,170 people in 2014.

Chart 5
NAICS Composition of Private Sector Jobs on Island County (2014)²⁰

NAICS Code	Sector Description	U.S.	Island County
11----	Agriculture, Forestry, Fishing and Hunting	0%	na
21----	Mining, Quarrying, and Oil and Gas Extraction	1%	na
22----	Utilities	1%	1%
23----	Construction	5%	7%
31----	Manufacturing	9%	6%
42----	Wholesale Trade	5%	1%
44----	Retail Trade	13%	19%
48----	Transportation and Warehousing	4%	1%
51----	Information	3%	na
52----	Finance and Insurance	5%	4%
53----	Real Estate and Rental and Leasing	2%	2%
54----	Professional, Scientific, and Technical Services	7%	5%
55----	Management of Companies and Enterprises	3%	na
56----	Administrative, Support and Waste Management	9%	4%
61----	Educational Services	3%	2%
62----	Health Care and Social Assistance	16%	22%
71----	Arts, Entertainment, and Recreation	2%	3%
72----	Accommodation and Food Services	11%	14%
81----	Other Services (except Public Administration)	4%	7%

²⁰ The initials “na” mean that the data are not available from the Census Bureau, because there are a small number of firms and revealing data would compromise confidentiality.

Chart 6
IMPLANS Picture of Jobs, Output, and Wages on Island County Sectors (2014)

IMPLAN Sector	Employment	Output	Employee Compensation	Proprietor Income	Other Property Type Income	Indirect Business Tax
Farming, Ranching, & Forestry	716	\$42,920,394	\$7,126,931	\$9,336,480	\$8,899,309	\$1,992,611
Mining, Oil, and Gas	94	\$17,301,764	\$881,483	\$350,024	\$2,748,966	\$148,302
Energy & Utilities	67	\$31,198,814	\$3,605,406	\$280,059	\$6,526,528	\$5,638,964
Construction	1,645	\$259,945,096	\$28,629,000	\$31,672,855	\$12,955,828	\$4,196,633
Manufacturing						
* <i>Food, Beverages, & Tobacco</i>	188	\$90,697,225	\$6,143,207	\$525,968	\$5,297,790	\$2,205,055
* <i>Fibers, Textiles, & Clothing</i>	61	\$12,581,928	\$1,888,753	\$47,587	\$337,337	\$141,743
* <i>Wood and Wood Products</i>	17	\$3,802,092	\$615,628	\$30,868	\$320,000	\$28,549
* <i>Paper, Paper Products, & Printing</i>	76	\$26,175,853	\$4,112,117	\$88,200	\$1,802,882	\$134,732
* <i>Petroleum-Based Products</i>	40	\$55,150,075	\$3,919,429	\$1,343,281	\$7,857,888	\$590,616
* <i>Rubber, Glass, Stone, & Concrete Products</i>	29	\$9,758,327	\$1,625,903	\$10,667	\$1,032,862	\$112,393
* <i>Metals</i>	38	\$22,153,747	\$2,453,601	\$18,569	\$3,028,852	\$132,140
* <i>Metal Products</i>	51	\$13,341,849	\$2,722,197	\$33,891	\$1,646,360	\$137,272
* <i>Machinery & Equipment</i>	84	\$21,878,828	\$4,275,045	\$35,178	\$1,703,656	\$136,850
* <i>Computers, Electronics, & Appliances</i>	184	\$58,244,601	\$9,088,373	\$6,974	\$2,549,089	\$472,629
* <i>Vehicles, Boats, & Planes</i>	357	\$230,294,332	\$28,188,118	\$1,568,200	\$30,560,281	\$1,300,576
* <i>Furniture</i>	17	\$2,977,586	\$672,588	\$6,371	\$222,185	\$16,066
* <i>Health Equipment</i>	15	\$3,943,495	\$443,955	\$4,335	\$286,242	\$39,574
* <i>All Other Manufacturing</i>	50	\$8,922,592	\$859,773	\$42,075	\$236,046	\$257,129
Wholesale Trade	302	\$61,565,277	\$14,170,474	\$2,101,381	\$7,074,438	\$12,250,274
Retail	3,406	\$249,239,517	\$67,524,534	\$22,587,807	\$10,153,188	\$52,776,497
Transportation	420	\$51,487,398	\$12,182,897	\$2,766,983	\$4,027,376	\$1,407,569
Warehousing & Storage	9	\$1,103,471	\$459,799	\$118,160	\$122,459	\$8,785
Services						
* <i>Information Businesses</i>	280	\$94,788,393	\$15,782,669	\$1,066,305	\$7,224,029	\$3,163,776
* <i>Banking & Finance</i>	893	\$116,786,126	\$16,497,292	\$2,784,276	\$15,393,410	\$3,428,606
* <i>Real Estate & Leasing</i>	1,778	\$611,839,532	\$8,671,047	\$10,250,999	\$279,177,891	\$65,745,955
* <i>Professional Services</i>	4,322	\$355,994,788	\$92,723,822	\$31,987,196	\$28,999,451	\$14,526,731
* <i>Private Education</i>	462	\$24,764,838	\$8,938,017	\$3,469,199	\$153,486	\$968,407
* <i>Health & Human Services</i>	2,664	\$152,613,296	\$59,438,516	\$14,341,141	\$6,337,556	\$2,648,174
* <i>Entertainment, Tourism, & Food Services</i>	3,342	\$178,096,489	\$48,887,283	\$7,068,933	\$19,307,954	\$19,457,776
* <i>Personal Services</i>	854	\$57,251,354	\$13,359,872	\$22,605,680	\$645,676	\$6,714,043
* <i>Churches, Nonprofits, & Unions</i>	220	\$19,378,548	\$4,647,283	\$303,307	\$7,017,851	\$1,504,273
* <i>Household Operations</i>	208	\$1,822,832	\$1,822,832	\$0	\$0	\$0
* <i>Government Services</i>	10,913	\$1,432,134,823	\$899,958,646	\$0	\$410,032,926	-\$10,752,975
	33,803	\$4,320,155,276	\$1,372,316,491	\$166,852,949	\$883,679,793	\$191,529,723

(2) The Relative Impact of Military Jobs

As noted at the beginning of this study, state and local economic-development agencies tend to see the large presence of the Navy in Island County strictly in terms of its benefits. And unquestionably every military dollar spent in Island County does generate some jobs, wages, local contracts, and tax revenues. What is not discussed, however, is that a military dollar tends to generate all these economic benefits at a substantially lower rate than a nonmilitary dollar, because the military dollar is not re-spent locally.

University of Massachusetts economists Robert Pollin and Heidi Garrett-Peltier recently compared the job impacts of \$1 billion invested in the military versus \$1 billion invested in clean energy, health care, and education.²¹ They also compared the impacts of a \$1 billion tax cut. The military investment wound up generating the smallest employment impact—11,200 jobs. Clean energy yielded 16,800 jobs, health care 17,200 jobs, and education 26,700 jobs. Even tax cuts generated more jobs than did military spending.

Using IMPLAN (which is also the tool Pollin and Garrett-Peltier use), we perform a similar exercise for Island County. Chart 7 shows the impact of creating 1,000 new jobs in the military versus 1,000 new jobs in ten other exemplary sectors: farming, construction, manufacturing, information services, financial services, professional services, health services, and tourism. Note that the total new wages include both direct pay and benefits.

Chart 7
Impact of 1,000 New Jobs in Military vs. Other Sectors

IMPLAN Sector	IMPLAN Sector Description	Total New Jobs	Total New Wages	Total New Taxes
4	Fruit Farming	1,179	\$24,914,876	\$1,448,400
61	Residential Construction	2,541	\$71,999,276	\$20,767,246
94	Bread & Baker Products	1,258	\$38,256,560	\$10,954,872
357	Aircraft Manufacturing	1,812	\$117,314,855	\$9,938,568
398	Electronics and Appliance Stores	1,335	\$69,407,217	\$15,202,382
423	Motion Picture & Video Industries	1,955	\$32,306,931	\$10,627,114
439	Funds & Trusts	2,173	\$84,546,664	\$7,964,736
449	Architectural, Engineering Services	1,624	\$44,838,599	\$4,761,540
482	Hospitals	1,600	\$108,606,962	\$6,147,386
499	Hotels and Motels	1,295	\$32,731,723	\$29,020,043
536	Military	1,327	\$108,805,055	\$3,299,928

²¹ Robert Pollin & Heidi Garrett-Peltier, “The U.S. Employment Effects of Military and Domestic Spending Priorities: 2011 Update,” monograph, Political Economy Research Institute, University of Massachusetts-Amherst, December 2011.

Interpreting the results in Chart 7 requires an appreciation that each total (for jobs, wages, and taxes) includes direct effects, indirect effects, and induced effects. The direct effects are the 1,000 jobs hypothetically created, which then generate increased wages and taxes. Indirect effects are what happens when expanded local industries buy more local inputs. And induced effects are what happens when the employees of the expanded local industries purchase more local goods and services. Subtracting the 1,000 direct jobs, we can see that in the eleven exemplary sectors, the military is the fourth poorest generator of indirect and induced jobs.

Because the benefits of Navy personnel are relatively high, military jobs have the second highest impact on total wages. But because so much of this income is spent in tax-exempt ways, military jobs nevertheless are the second poorest generator of tax revenue. Only fruit farming generates less tax revenue, because farmer incomes are low.

Thus, while military jobs come with good benefits, they ultimately have relatively small impact on local economic development. This underscores why it's imperative for Island County to focus its small economic-development team and budget on diversifying the local economy and growing other, nonmilitary industries.

(3) Leakage in Island County

Just how leaky is the Island County economy? That is, to what extent are residents buying goods and services from outside the County? IMPLAN can be used to answer these questions. Chart 8 summarizes the bottom line. *Overall, for every dollar spent by Island County residents, 59 cents leak out. Compared to similar counties, this is an unusually high level of leakage.*²² This suggests a huge opportunity for diversifying the Island County economy through greater local production for local needs—what economists call import replacement. Every cost-effective local substitution means fewer purchasing dollars leaking out, a higher local economic multiplier, and more income, wealth, and jobs.

Chart 8
Leakage in the Island County Economy

Current Spending on Local Production	\$2,992,662,152
Additional Production for Self-Reliance	\$4,370,768,905
Total Demand for Local Production	\$7,363,431,057
Rough Level of Leakage	59%

²² The author has performed leakage analyses over the past decade for about two dozen counties and regions.

Chart 9 reinforces this point by showing how many IMPLAN sectors lack self-reliance. IMPLAN combines the 1,100 NAICS sectors in 539 sectors. Island County is self-reliant in only 4% of these sectors. About 78% of the sectors are less than 20% self-reliant, and two thirds of the sectors have almost zero activity in them. Appendix II presents a comprehensive list of the degree of the County’s self-reliance in every one of the 539 IMPLAN sectors.

Chart 9
Leakiness of IMPLAN’s 539 Sectors in Island County

	Number of	Percent of
	Sectors	Sectors
Total IMPLAN Sectors	539	100%
>99% Self-Reliant Sectors	22	4%
<50% Self-Reliant Sectors	453	84%
<20% Self-Reliant Sectors	418	78%
<1% Self-Reliant Sectors	361	67%

As Appendix I details, economic development works is most effective when new jobs are created in businesses that are locally owned and meet (initially at least) local demand. What would happen if, with a magic wand, the 6,170 Navy jobs could be converted into civilian economy jobs? And better still, what if those jobs could be redistributed to other sectors of the economy in a way that would have the greatest impact on reducing leakage and increasing local self-reliance? IMPLAN enables us to model the impacts of this hypothetical shift.

Before sharing our results, we should explain that we only redistributed the 6,170 Navy jobs into sectors that were plausible and preferable.

- Among the sectors we deemed implausible were those where natural resources or policies were already precluding any economic activity, such as certain kinds of farming (e.g., cotton and sugar cane), commercial logging, and mining.
- Among the sectors we deemed not preferable were tobacco and fossil fuel burning for energy.
- Additionally, we did not assume any changes in government employment except in the military.

Chart 10 shows the results. As would be expected, the conversion of 6,170 jobs from the Navy to private industry has very little effect on direct employment. But the induced effects, as local industries start purchasing from other industries, are huge. Overall, conversion of 6,170 Navy jobs to 6,170 nonmilitary jobs creates 3,909 *additional* jobs

(beyond those converted), expands the economy by \$503 million, and generates \$153 million more in taxes. Of these taxes, about \$142 million come into the coffers of state and local government.

Chart 10
Impact from Converting All Navy Jobs to Private Sector Jobs

Impact Type	Jobs	Labor Income	Value Added	Business Taxes
Direct Effect	62	(\$185,102,853)	\$332,308,420	\$127,221,866
Indirect Effect	4,074	\$113,174,104	\$185,183,318	\$28,133,139
Induced Effect	(227)	(\$6,172,330)	(\$14,154,501)	(\$2,335,805)
Total Effect	3,909	(\$78,101,079)	\$503,337,238	\$153,019,200

The one negative effect is a reduction of labor income by \$78 million, largely reflecting the disappearance of generous benefits paid to Navy personnel. How, then, can wages go down but the economy still expand? Because counterbalancing the loss of wages are a significant growth in proprietor income, rents, and tax revenues, all of which generate multiplier effects on the local economy.

Again, the point of this exercise is not to argue for elimination of Navy jobs, but rather to highlight their relatively weak impact on the local economy. It underscores why economic development ultimately needs to diversify the economy by plugging leaks through expansion of private industries. Given that the Navy's presence could disappear overnight with an act of Congress, it would be prudent for Island County plan seriously to reduce its dependence on military spending.

III. External Costs

The third type of cost the Navy imposes on Island County is the “external” cost—that is, the cost borne by the general public and not compensated by the Navy. Economists have long recognized that “internalizing” external costs leads to more efficient and fair outcomes. If for example a factory emits air pollution, forcing the factory to pay for the damage it causes downwind motivates it to install scrubbers that reduce its pollution. Failing to internalize the externality removes any incentive for the factory to manage its own pollution.

The Naval Air Station Whidbey Island Complex currently generates myriad external costs and has little incentive to internalize them. Those imposed by just one of its many programs—the deployment and training of pilots for its EA-18G “Growler” aircraft—are extensively reviewed in the 1,000+ page *Draft Environmental Impact Statement (DEIS)* published in November 2016. The report presents dozens of potential problems with the program and then largely discounts or dismisses all them. *In no instance does it actually attempt to assess the dollar cost of any of these externalities.*

While it is beyond the scope of this study to place a dollar value on all these costs—many are speculative and require probabilistic analysis—two of the costs discussed in the *DEIS* are especially high, clearly visible, and susceptible to empirical measurement: the human health impacts of Growler noise, and the reduced value of private property resulting from Growler noise. We analyze both below, and then discuss briefly other more speculative—but potentially costly—impacts from the Naval Air Station.

(1) The Costs of Noise

The most significant public concerns about the operations from the Naval Air Station surround the noise emanating from its Growler aircraft. The nickname “Growler” comes from the plane’s unusual loudness, and consequently the *DEIS* devotes more space and analysis to this one issue than any other. As shown in Chart 11, the *DEIS* estimates that the current level of the program (called “No Action”) is adversely effecting more than 11,000 residents. The metric the Navy uses is a weighted average of loud and quiet periods called the Day Night Average Sound Level (DNL). The Navy focuses on three concentric areas of DNL impact: those exposed to average noise levels between 65 and 70 decibels (dB), those exposed to between 70 and 75 dB, and those exposed to above 75 dB.

The use of the DNL metric is controversial, because it averages very high levels of sound on a few days with a large number of quiet days.²³ Careful measurement on the ground of Growler noises by the National Park Service in 2015 found “acoustic events” from

²³23 “DNL is...a ‘noise averaging method’ that has been criticized because it does not address annoyance. Annoyance can therefore be understated by averaging.” Randall Bell, “The Impact of Airport Noise on Residential Real Estate,” *The Appraisal Journal*, July 2001, p. 320.

Growler overflights as high as 113 dBA.²⁴ This study also points out that human blood pressure and heart rates increase at 35 dB, that the World Health Organization recommends that the maximum noise level inside a bedroom be 45 dB, and that normal conversations are interrupted by sound above 60 dB.²⁵ (Note that decibels are measured on a logarithmic scale, which means that a 60 dB noise exerts ten times the sound pressure as a 50 dB noise.) The sidewalks of a busy street are about 80 dB, a jackhammer is 100 dB, and a train horn close up is 120 dB.²⁶ In plain language, metrics that present periodic bursts of jackhammer noise as being just like the humming of traffic on average is very misleading. In submitted commentary on the DEIS, Dr. Sanford Fidell, a noted sound engineer, argues that this kind of analysis is obsolete and is likely to cause an underestimation of the ultimate impact and the population effected.²⁷

Chart 10
Island County Residents Impacted at Different Noise Levels

	65-<70 dB	70-<75 dB	>75 dB	Total
No Action	3,875	3,165	3,993	11,033
Alternative 1				
- Scenario A	4,355	2,958	5,734	13,047
- Scenario B	4,359	3,505	5,646	13,510
- Scenario C	5,183	3,400	5,223	13,806
Alternative 2				
- Scenario A	4,264	2,985	5,554	12,803
- Scenario B	4,355	3,547	5,545	13,447
- Scenario C	5,055	3,454	5,056	13,565
Alternative 3				
- Scenario A	4,348	2,970	5,675	12,993
- Scenario B	4,363	3,505	5,633	13,501
- Scenario	5,024	3,443	5,010	13,477

The *DEIS* reviews nine different alternatives that would raise the exposed population to almost 14,000. It makes no effort to quantify the health costs of a DNL above 65 dB, because at these DNL levels “no studies have shown a definite causal and significant relationship between aircraft noise and health.”²⁸

²⁴ National Park Service, Ebey’s Landing National Historical Reserve Acoustical Monitoring Report, Natural Resource Report NPS/ELBA/NRR-2016/1299, p. vi.

²⁵ *Ibid.*, p. viii.

²⁶ *Ibid.*, p. 10.

²⁷ Personal Communication, 4 January 2017.

²⁸ *DEIS*, p. 3-22.

In fact, the Department for Environment, Food, and Rural Affairs for the United Kingdom (UK), examining the same evidence, has come to the opposite conclusion: “Noise can have an effect on health, wellbeing, productivity, and the natural environment.”²⁹ While the Department concedes that measurement of ill effects on productivity and environmental damage from noise is difficult, it argues that there is convincing evidence connecting loud noise exposure to measurable impacts like heart attacks, hypertension, strokes, and dementia. To help guide decision-makers evaluating projects with significant noise impacts, they have produced two tables that summarize their best estimates of the associated economic costs. One table estimates the health costs of noise, and the other estimates the amenity costs of sleep disturbance. We use these tables to estimate the total health costs of the Growler program.

Chart 12 applies the midpoints of the two sound-impact areas identified in the *DEIS*—67.5 dB and 72.5 dB—to the two UK charts.³⁰ For the highest sound-impact area—75 dB plus—we use 80 dB as a reasonable single point. The Chart shows that at the three sound levels, the annual costs per affected person are between \$229 and \$275.

Chart 12
UK Estimates of Damages Per Affected Person
(1 Pound = \$1.25)

	67.5 dB	72.5 dB	80 dB
Health Cost	\$110.41	\$132.30	\$155.89
Sleep Disturbance Cost	\$118.99	\$118.99	\$118.99
Total Cost	\$229.40	\$251.29	\$274.88

Chart 13 applies these data to the population areas identified in the *DEIS*. If the Growler program remained at its current level, its cost would continue to be \$2.8 million per year. If it is expanded, as the *DEIS* advocates, annual costs could grow to as high as \$3.5 million.

The Growlers fully replaced the predecessor planes, called the Prowlers, in 2010. Thus, in the seven years between 2010 and 2017, the cost of just the Growler program to public health on Island County thus far has been \$18.9 million.

²⁹ Department for Environment, Food and Rural Affairs, “Noise Pollution: Economic Analysis,” 9 April 2013 (updated 19 December 2014), “Overview,” at www.gov.uk/guidance/noise-pollution-economic-analysis.

³⁰ The UK charts are calibrated in “change in noise metric.” The “change” is effectively the level of the Growler DNL, however, because the scale is logarithmic. A 60 dB DNL generates a thousand times more sound pressure than 30 dB DNL, the level of the quiet enjoyed by a Whidbey Island resident without the Growlers. Because the change from 1 to 1,000 is 999, the Growler DNLs give the proper indication of which points to choose on the UK charts. Hilary Notley, Senior Acoustic Analyst for the UK Department of Environment, Food, and Rural Affairs, Personal Communication, 25 January 2017.

Chart 13
UK Estimates of Damages Applied to DEIS Population Envelopes

	65-<70 dB	70-<75 dB	>75 dB	Total
No Action	\$888,925	\$795,325	\$1,097,576	\$2,781,826
Alternative 1				
- Scenario A	\$999,037	\$743,308	\$1,576,133	\$3,318,479
- Scenario B	\$999,955	\$880,763	\$1,551,944	\$3,432,662
- Scenario C	\$1,188,980	\$854,378	\$1,435,672	\$3,479,030
Alternative 2				
- Scenario A	\$978,162	\$750,093	\$1,526,656	\$3,254,911
- Scenario B	\$999,037	\$891,317	\$1,524,182	\$3,414,536
- Scenario C	\$1,159,617	\$867,947	\$1,389,768	\$3,417,332
Alternative 3				
- Scenario A	\$997,431	\$746,324	\$1,559,916	\$3,303,671
- Scenario B	\$1,000,872	\$880,763	\$1,548,371	\$3,430,006
- Scenario C	\$1,152,506	\$865,183	\$1,377,124	\$3,394,812

These estimates of health costs are arguably too conservative for four reasons:

- First, as noted, the Navy’s use of DNL averages understates the problem, because it masks the bursts of high and extremely damaging sounds. Compared to the previous generation of Navy planes being flown in Island County, the Prowlers, the Growlers emit very high intensities of low frequencies that have an intense effect on humans.³¹ Were appropriate adjustments made, many more residents would be listed in the concentric areas marking the Navy’s exposure categories, and higher exposure categories (not just “>75 dB”) would be identified—all of which would increase the consequent costs.
- The value of the British pound collapsed after the June 2016 “Brexit” vote, and now is at its lowest point against the U.S. dollar in thirty years. At the time the UK study was written, the conversion rate was over \$1.6 dollars per pound, which would increase the damage numbers here by a third.
- Underlying the British calculations are assumptions about medical care for noise-induced problems and about the value of human life. In fact, medical expenses per capita in the United States are significantly greater than they are in the United Kingdom (UK medical costs are tightly controlled by its single-

³¹ Larry Morrell, Comments on the *DEIS*, “Calculating Sound Averages That More Accurately Describe Environmental Impact,” Forthcoming.

payer system). And the value of human life assumed in the UK model—a\$36,600 to \$97,600, depending on demographics—is significantly lower than what U.S. lawsuits routinely award.

- Adjusting for the demographics of Whidbey Island would further increase the total level of damage. Older people, for example, are more vulnerable to heart attacks from all causes, including noise, and Island County’s population is significantly older than that of the United States or the United Kingdom.³²
- Finally, the UK cost estimates do not include lost productivity. But consider one glaring example of this uncounted cost in Whidbey Island: According to the *DEIS*, classrooms at the Oak Harbor High School and Crescent Harbor Elementary School are already being interrupted 4-5 times per hour for multiple school-time hours every week, and the rate and intensity of these interruptions will grow as the Growler program expands.³³ Teaching with significant interruptions every 10-12 minutes is exceedingly difficult. What are the costs of lost school time? Lost education? Student well being?

In sum, the \$18.9 million estimate of costs imposed on the health of Island County residents between 2010 and the present is probably too low.

(2) The Costs of Reduced Property Values

A second important external cost is reduced property values. The *DEIS* cites general studies on the topic, most of them 20-40 years out of date, and concedes that “[e]nough data are available to conclude that aircraft noise has a real effect on property values.”³⁴ But it then chooses not to count the actual property damages on Island County. “Real property values,” the *DEIS* explains, “are dynamic and influenced by a combination of factors, including market conditions, neighborhood characteristics, and individual real property characteristics (e.g., the age of the property, its size, and amenities).”³⁵ In fact, enough data are available to make this analysis for Island County.

Chart 14 compares the total assessed valuation of property in Island County with that of neighboring counties and Washington State generally.³⁶ Contrasting property values in

³² See, e.g., Bel Marra, “Noise Pollution Health Risks in Seniors: Heart Disease, Stroke, and Hearing Loss,” *Hearing Health*, 9 October 2015. According to the U.S. Census Bureau, 23.2% of Island County residents are above 65, while only 14.5% of all Americans are in that age bracket. The comparable number for the United Kingdom is 17.8%. See <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates> .

³³ *DEIS*, p. 4-38.

³⁴ *Ibid.*, p. 4-232.

³⁵ *Ibid.*, pp. 4-232-33.

³⁶ Washington State Department of Revenue, Property Tax Statistics 2015, monograph, available at http://dor.wa.gov/content/aboutus/statisticsandreports/stats_proptaxstats_report.aspx .

2007 (pre-financial crisis) with those of 2015 (the most recent data), we can see that Island County's property values have shrunk more than all the surrounding counties except Kitsap (another Navy-dependent economy). While property values in Washington State generally rose by about 10% during this period, those on Island County fell by almost 13%. Why?

A second comparison of interest is between 2010 (when the Growler flight tests became fully engaged) and 2015. Here, Island County performed better than surrounding counties, losing only about 3% of its assessed property value. In Washington State generally during this period property values rose by 1.5%, but surrounding counties lost 7-24% of their assessed valuation. This has led to a general impression that the Island County economy is booming and that the Growlers have had no negative impact on property values.

A more complex picture emerges, however, if the focus shifts to the 27 subdivisions that are currently most directly under the flight path of the Growlers.³⁷ In many of these subdivisions, large numbers of "For Sale" signs can be seen as residents now seek to flee the loss of peace and quiet in their homes. Over 2010 to 2015, the collective assessed property valuation in these subdivisions, as shown in Chart 15, has plummeted 6.64%, or 3.35% more than the Island overall. That amounts to a total property value loss in these subdivisions of about \$9.8 million.

³⁷ These data were made available by special request from the Island County Assessor's Office. There are 28 subdivisions under the flight path, but one, On Frosted Pond, saw considerable housing construction during this period, so changes in property valuation are not comparable.

Chart 14
Changes in Assessed Property Values between 2007 and 2015
Island County, Surrounding Counties, and Washington State

Year	Island	Jefferson	Kitsap	Snohomish	Skagit	San Juan	State
2007	\$13,966,045,784	\$4,618,248,685	\$31,903,513,049	\$95,519,249,655	\$15,038,859,402	\$6,974,272,646	\$800,949,389,329
2008	\$14,729,387,220	\$5,056,667,107	\$31,901,494,279	\$97,810,393,346	\$15,706,785,645	\$7,904,618,853	\$875,941,275,493
2009	\$14,452,006,504	\$5,311,207,280	\$29,021,620,917	\$90,197,192,681	\$14,964,746,348	\$8,064,934,225	\$818,067,274,838
2010	\$12,546,359,697	\$5,327,550,880	\$27,716,265,936	\$81,763,046,539	\$14,227,276,096	\$8,024,385,667	\$780,116,556,730
2011	\$12,552,367,094	\$4,830,828,030	\$26,461,497,915	\$72,601,537,469	\$13,577,446,902	\$7,919,989,258	\$747,277,392,378
2012	\$12,052,722,301	\$4,549,745,475	\$25,444,024,968	\$68,642,718,641	\$13,244,632,127	\$6,209,389,933	\$720,274,017,942
2013	\$11,864,504,769	\$4,316,339,253	\$25,208,432,971	\$75,289,712,921	\$13,387,944,549	\$6,147,487,805	\$760,198,391,066
2014	\$11,959,902,648	\$4,508,093,057	\$25,140,607,793	\$84,038,078,352	\$13,616,166,938	\$6,124,904,836	\$830,215,285,152
2015	\$12,170,669,944	\$4,587,247,864	\$27,160,214,037	\$88,260,207,637	\$14,670,422,177	\$6,217,488,278	\$883,968,552,219
From 07 to 15	-12.86%	-0.67%	-14.87%	-7.60%	-2.45%	-10.85%	10.37%
From 10 to 15	-2.99%	-15.12%	-13.37%	-6.83%	-9.01%	-24.06%	1.48%

Chart 15
Changes in Assessed Property Values
In Island County Subdivisions Directly Under the Growler Flight Path

Assessor Code	Subdivision	Number of Properties	Value 2010	Value 2015	% Change
6010-02	Admirals Cove - 2	19	\$4,200,009	\$4,072,276	-3.04%
6010-03	Admirals Cove - 3	75	\$19,891,641	\$19,640,732	-1.26%
6010-04	Admirals Cove - 4	29	\$6,825,994	\$7,051,534	3.30%
6010-05	Admirals Cove - 5	67	\$12,838,433	\$13,014,412	1.37%
6010-06	Admirals Cove - 6	88	\$19,419,377	\$19,004,624	-2.14%
6010-07	Admirals Cove - 7	42	\$8,667,935	\$8,508,149	-1.84%
6430	Crescent Acres	27	\$6,344,281	\$5,588,221	-11.92%
6515	Dugualla Bay Heights - 1	35	\$11,927,025	\$9,971,598	-16.39%
6515-02	Dugualla Bay Heights - 2	20	\$5,684,650	\$5,741,310	1.00%
6515-03	Dugualla Bay Heights - 3	36	\$10,685,110	\$10,947,040	2.45%
6515-04	Dugualla Bay Heights - 4	21	\$8,229,754	\$7,595,405	-7.71%
6515-05	Dugualla Bay Heights - 5	11	\$4,096,452	\$4,052,168	-1.08%
6515-06	Dugualla Bay Heights - 6	5	\$1,616,735	\$1,534,694	-5.07%
6515-07	Dugualla Bay Heights - 7	11	\$5,309,863	\$4,830,290	-9.03%
6515-08	Dugualla Bay Heights - 8	19	\$7,192,801	\$6,727,185	-6.47%
6515-09	Dugualla Bay Heights - 9	47	\$14,019,000	\$13,812,591	-1.47%
7020	Goldie Road Acres	2	\$250,916	\$193,454	-22.90%
7355-02	Ledgewood Beach - 2	4	\$1,490,031	\$384,139	-74.22%
7355-03	Ledgewood Beach - 3	45	\$14,978,744	\$14,807,483	-1.14%
7575	Northgate Terrace	243	\$33,824,464	\$27,214,053	-19.54%
7585	Oak Harbor	26	\$6,451,397	\$6,089,457	-5.61%
7755	Polnell Shores	95	\$27,840,559	\$26,404,337	-5.16%
8250	Sunrise Beach	5	\$3,180,582	\$2,538,763	-20.18%
8255	Sunrise Hills - 1	30	\$9,898,490	\$8,616,936	-12.95%
8255-02	Sunrise Hills - 2	24	\$7,985,274	\$7,044,873	-11.78%
8255-03	Sunrise Hills - 3	30	\$12,535,972	\$12,118,785	-3.33%
8542	Frostad Road - Assessor's P	11	\$1,862,646	\$1,985,336	6.59%
Total			\$267,248,135	\$249,489,845	-6.64%

A reasonable estimate of lost property value almost certainly will rise in the coming years, for four reasons:

- First, many home buyers are still unaware of the severity of the problem of jet noise when they move in. Real estate brokers have a strong incentive to understate the problem, and the legal requirements for disclosure are loose. In other words, the market has yet to fully absorb information about the problem. As it does, better information will likely depress prices further.
- Second, assessed valuation is almost always a lagging indicator of the real property value by several years. The financial crisis that hit housing prices across America especially hard technically struck in 2008. But as Chart 13 shows, the impacts on assessed valuation across the state did not register until 2010-12 (depending on the county).
- Third, as the *DEIS* explains, the number of Growler tests and their flight footprint will expand over the next five years. This will increase the number of properties adversely affected.
- Fourth, the Navy will issue an Air Installations Compatible Use Zones Report (AICUZ) after the final *Environmental Impact Statement* is issued to define an “Accident Potential Zone” (APZ) that would prohibit further development. This could further reduce property values by diminishing landowners’ ability to build houses and by increasing insurance rates.

(3) Other Major External Costs

As noted at the outset, this study is limited to those costs that are visible and measurable. There are, however, several costs that could dwarf the costs mentioned so far, but are speculative. Three in particular are worth mentioning.

First is the potential cost of a catastrophic accident. The Navy’s policy is generally not to conduct training flights in populated areas like Whidbey Island, because the area underneath is an “Accident Potential Zone” (APZ). As noted, the Navy may recommend a prohibition on *additional* development on these properties after the EIS is finalized. But even with the existing level of development, the dangers of a major accident are potentially huge. A plane accidentally crashing into a public school or a fuel storage facility, for example, could conceivably lead to hundreds of deaths and hundreds of millions of dollars of liability. The Growlers, moreover, have a significant rate of accidents and mishaps that make these worries not just abstract.³⁸

³⁸ Robert Wilbur, Maryon Attwood, Neal Sims, and Mark Harmon, “Outlying Field Coupeville: Its Time Has Passed,” monograph, October 2016, pp. 40-44, 79-84. The authors make the points that military jets are 67 times more likely to crash than passenger jets, and that the F-18 frame (which the Growler uses) has had an accident rate 5.5 times greater than the predecessor Prowler. The report contains appendices with comprehensive lists of worrisome Prowler and Growler mishaps.

Second is the potential cost of toxic releases. The Navy has recently found a number of wells mid-island with water that may be contaminated by a very toxic class of chemicals called PFASs that are used in its fire-retardant foams.³⁹ A scientific paper on the subject in 2016 concludes that “PFAS contamination is poorly reversible and...*the societal costs of cleanup will be high.*”⁴⁰ In July 2015, after modest levels of PFAS were found in public drinking water just north of Philadelphia, the Navy agreed to pay \$8.8 million for cleanup of wells in the Horsham Water and Sewer Authority and \$4 million for cleanup of the neighboring Warminster Municipal Authority.⁴¹ In October 2015, a jury awarded a woman suing DuPont for kidney cancer caused by PFAS contamination \$1.6 million, and now the law firm of Weitz & Luxenberg is seeking a multi-million dollar settlement for PFAS damages caused by the Willow Grove Naval Air Station.⁴² The New York State Department of Environmental Conservation and Department of Health recently sent a letter to the federal Environmental Protection Agency seeking reimbursement for the roughly \$25 million the state has already spend cleaning up PFAS contamination in drinking water—and for another \$50 million of anticipated future costs.⁴³

Third is the potential cost to the local tourism economy. Tourists are directly spending \$180 million per year in Island County—a significant part of the overall economy.⁴⁴ There is already anecdotal evidence that campers are demanding refunds when they experience a night a jet noise.⁴⁵ Should word of the noise problems spread, not to mention more reports of PFAS contamination of local water supplies, this could ultimately shave tens of millions of dollars of activity from the Whidbey Island economy. Unfortunately for Island County, campers, hikers, and nature lovers have many quiet and clean-water alternatives elsewhere in the Pacific Northwest.

Risk has long been understood to equal the probability of an adverse event multiplied by the probability of its occurrence. All three of the costs mentioned here are potentially enormous, but the probabilities are unclear. The Navy and public officials alike must

³⁹ Jessie Stensland, *Whidbey News-Times*, 29 October 2016. See also, Mitch Pittman, “Navy Testing Wells on Whidbey Island for Possible Contamination,” 11 November 2016. <http://komonews.com/news/local/navy-testing-wells-on-whidbey-island-for-possible-contamination>

⁴⁰ Emphasis added. IT Cousins et al., “The Precautionary Principle and Chemicals Management: The Example of Perfluoroalkyl Acids in the Groundwater,” *Environ. Int.*, September 2016, pp. 331-40.

⁴¹ Sharon Lerner, “Poisoning the Well: Toxic Firefighting Foam has Contaminated U.S. Drinking Water,” *The Intercept*, 16 December 2015. (*The Intercept* is an online, investigative-journalism site.)

⁴² Associated Press, “Residents Near Former Willow Grove Base Sue Over Contaminated Drinking Water,” *The Morning Call*, 16 September 2016.

⁴³ Michael Goot, “State Asks Feds for PFOA Cleanup Reimbursement,” *The Post Star*, 30 August 2016.

⁴⁴ Dean Runyan Associates, Washington State County Travel Impacts & Visitor Volume, 1991-2014, Prepared for the Washington Tourism Alliance, April 2015, p. 57.

⁴⁵ Hal Bernton, “Jets, Helicopters, Rockets: Military Plans More Uses of Northwest Public Lands,” *Seattle Times*, 4 April 2016.

assess the risks of these scenarios carefully, and monitor for early warning signs that they are coming to fruition.

IV. Conclusions and Recommendations

Whatever the benefits of the Naval Air Station Whidbey Island, its activities are clearly imposing significant costs on Island County. This study underscores that these costs include:

- The non-collection of \$5.7 million in sales and property taxes each year, which at a minimum makes it more difficult for public agencies to provide needed infrastructure and services to everyone living in Island County;
- The opportunity costs of embracing a military-dependent economy, which, if the military jobs were converted to civilian jobs, could mean 5,512 new jobs, \$608 million in additional wages, and \$154 million more in state and local taxes;
- At least \$2.8 million in costs per year in the form of adverse health effects and sleep disturbances; and
- The loss (between 2010 and 2015) of \$9.8 million in private property value.

Chart 16 combines the public sector costs and external costs over twelve years, beginning in 2010 (when the Growler program was first introduced) and continuing until 2021 (which the *DEIS* chose as a reasonable cutoff date for estimating the impacts of the Growler program). Because some of these numbers are annual while others are one-time costs, and because all of them will change as if the Growler program grows as planned, the following adjustments have been made:

- Earlier we noted that Island County EDC foresees the total population of active duty personnel and their dependents growing by 22% between 2015 and 2019. We therefore increase the anticipated tax losses by 22% evenly between 2015 and 2019, and then hold them constant. We also assume that the baseline calculation of \$5.7 million of tax loss remains constant before the spike of personnel growth.⁴⁶
- The health effects are annual and will grow if the Growler program expands. As a conservatism, the *DEIS* alternative with the lowest projected additional health costs (\$3.3 million per year) is assumed.
- The property value losses between 2010 and 2016 are spread out evenly at \$1.4 million per year. A reasonable assumption is that if the Growler sound footprint of >65 dB expands from about 11,000 to 13,000 residents (an 18% increase), properties overall will experience 18% more damage—from \$9.8

⁴⁶ Another development that could displace the need for Growler practice is the so-called “magic carpet” technology which greatly reduces the demands on pilots landing on aircraft carriers.

million to \$11.6 million. Spread over 2017 to 2021, the additional annual damage (\$1.8 million divided over five years) is \$360,000 per year.

As shown in Chart 16, the total adverse economic impact over this period is nearly \$122 million.

**Chart 16
Total Public Costs of Naval Operations 2010-2021**

	Health Effects	Property Losses	Tax Losses	Annual Losses
2010	\$2,800,000	\$1,400,000	\$5,700,000	\$9,900,000
2011	\$2,800,000	\$1,400,000	\$5,700,000	\$9,900,000
2012	\$2,800,000	\$1,400,000	\$5,700,000	\$9,900,000
2013	\$2,800,000	\$1,400,000	\$5,700,000	\$9,900,000
2014	\$2,800,000	\$1,400,000	\$5,700,000	\$9,900,000
2015	\$2,800,000	\$1,400,000	\$5,700,000	\$9,900,000
2016	\$2,800,000	\$1,400,000	\$6,025,000	\$10,225,000
2017	\$3,300,000	\$360,000	\$6,350,000	\$10,010,000
2018	\$3,300,000	\$360,000	\$6,675,000	\$10,335,000
2019	\$3,300,000	\$360,000	\$7,000,000	\$10,660,000
2020	\$3,300,000	\$360,000	\$7,000,000	\$10,660,000
2021	\$3,300,000	\$360,000	\$7,000,000	\$10,660,000
	\$36,100,000	\$11,600,000	\$74,250,000	\$121,950,000

To reiterate a point made at the outset of this study, the identification of costs should not be interpreted to mean that the appropriate recourse is to shut down naval operations. Rather, *the goal for decision makers should be to shift total costs of operations from the community to the Navy, and help the Navy maximize benefits and minimize costs over the long term.* Hence the following five recommendations:

(1) Begin Conversion Planning

Ever since the Cold War ended in the 1990s, hundreds of military-dependent communities have learned that assuming a local military base will remain open forever is unwise. In a rapidly changing world like today’s, foreign policies and military commitments are in constant flux. While most observers believe that the Whidbey Naval Air Station will likely remain relevant in the short-term, Island County officials would be smart to start thinking about a plan for what happens if or when the military downscales or leaves.

The rapid advancement of technology may already be making the principal program of the Naval Air Station obsolete. The Growler's mission of jamming communications could be performed by UAVs at a small fraction of the operational costs of the Growler. In July 2016, the Navy launched a "swarm of drones" to demonstrate autonomous drone-

to-drone communication and cooperation. Compared to the \$8 million per year⁴⁷ just to operate an \$81 million Growler, the Office of Naval Research recently demonstrated the comparable efficacy of 30 Raytheon-built Coyote UAVs that cost only \$15,000 per unit. Vice Admiral Rick Breckenridge, Deputy Commander of U.S. Fleet Forces Command, said, "This is going to change some of the calculus of how we operate." The swarm can conduct such tasks as intelligence-gathering or jamming communications that might otherwise be accomplished with manned aircraft.⁴⁸ If UAV costs drop, as expected, to \$10,000 in large-scale production, 800 UAVs could be purchased for less than the cost of just operating a single Growler for a year. These economic realities place the future of the Growler program and the current mission of the Naval Air Station in serious question.⁴⁹

Whatever the Navy decides to do, Island County urgently needs to focus its economic development on diversification. The current economy is remarkably brittle and leaky. And as the analysis here underscores, every new civilian job will generate significantly greater economic-development benefits than retention of an existing military job. Economic development priorities needs to be reset accordingly.

(2) Demand a PILOT Agreement with the Navy

To address current tax inequities, state and local decision-makers should negotiate an agreement for "payment in lieu of taxes." PILOT programs are common where federal agencies impose burdens on state and local authorities, and this study suggests that an appropriate PILOT right now just with Island County should be at least \$5.7 million per year. If compensation for victims of Growler noise is included, this amount should be closer to \$9 million per year. Inclusion of lost property value would raise the further. One priority for this compensation should be the Oak Harbor school district, which now must expand to accommodate federally connected students. Currently, federal agencies give Island County a PILOT of about \$2,000 per year, of which the Navy currently contributes \$155.

(3) Increase Local Contracting by the Navy

One way the Navy has sought to be a good neighbor with other jurisdictions is by increasing the level of local contracting. There is already some local contracting, as outlined in the 2013 report by the Island County EDC, but it can and should be expanded substantially. Every dollar that the Navy puts back into the Island County economy

⁴⁷ Selected Acquisition Report, RCS: DD-A&T (Q&A)823-378, 18 March 2015, gives Average Annual Cost Per Aircraft (EA-18G) of \$8.123 million.

⁴⁸ Hope Hodge Seck, "Navy to Demo Swarming Drones at Sea in July," *Military.com Daily News*, 24 June 2016.

⁴⁹ Another "game changer" could be the "MAGIC CARPET" software, which will greatly reduce the burdens on and training requirements for Growler pilots. See, e.g., Meghann Myers, "Navy Fighters Are One Upgrade Away from Changing Carrier Aviation Forever," *Navy Times*, 3 July 2016.

creates more income, wealth, and jobs. Moreover, it has the further benefit of diversifying the local economy, which supports the needed strategy of locally-owned import substitution (LOIS). By developing businesses that can thrive locally by supplying goods and services both to the Navy and the local civilian customers, economic planners can create a more robust local economy.

(4) Reduce the Economic Cost of the Growler Program

This study suggests that the biggest external costs from the Naval Whidbey Air Station come not from Naval operations generally but from one program. The problem is obvious: *The Navy is training pilots to fly an exceptionally loud plane over a populated area and instead should do so over a less populated area.*

In the *DEIS* and elsewhere, the Navy has dismissed a variety of alternatives for its current training program. These include:

- Making technical modifications to the Growler engines to lower their noise (the Navy assessment is that this is technologically infeasible);
- Changing flight paths to reduce exposure to the population (the Navy claims this will lessen the value of the landing practices);
- Moving the testing program to less populated areas while maintaining the planes and crews at Naval Whidbey Air Station, all of which could require a few minutes of additional flying time from existing takeoff points (the Navy claims no alternative areas exist);
- Moving the testing program to a less populated area, such as China Lake, and then flying pilots by helicopter or plane from Whidbey Island for a day of testing (again, the Navy claims these areas do not exist); and
- Moving the entire program to another less populated area (the Navy claims this is too expensive).

Ultimately, a key factor governing some of the Navy's positions is cost. By assuming public costs near zero, the Navy easily can dismiss *any* alternatives. With this study, state and local decision-makers now know this is untrue. It's their role to prevail upon the Navy to revisit and reweigh the very real costs to the community of the status quo against costs of the alternatives.

(5) Compensate Victims of the Growler Noise

Short of changing or moving the Growler program, public decision-makers also might seek to internalize some of these costs by asking the Navy to compensate financially residents who have experienced adverse health effects and diminished property values.

Settlements between federal agencies creating noise and property owners adversely effected by the noise are common.⁵⁰

While the analogy is imperfect, it's worth concluding by noting the disturbing similarity to the recent contamination of water systems in Flint, Michigan. There, public officials steadily dismissed complaints from thousands of residents about discolored and foul tasting water, until the facts became undeniable. Now, many of these same officials are being carted off to jail for dereliction of their duties. Here, thousands of residents under the flight paths – in Island, San Juan, Skagit and Jefferson counties - are complaining about toxic levels of noise that making healthy living, sleeping, and learning all but impossible. Public officials who ignore these complaints do so not only at the public's peril but at their own.

⁵⁰ See, e.g., <http://www.nonoise.org/news/law.htm> .

Appendix I

The Case for LOIS Economic Development

A growing body of evidence suggests that the promising approach to economic development is to focus, laser-like, on locally owned, import-substituting (LOIS) businesses. Local ownership means that working control of a company is held within a small geographic area. Import-substituting means that the company is focused first and foremost (though not exclusively) on cost-effective production for local markets. While the vast majority of LOIS businesses are small, some actually grow to be quite large and powerful.

Numerous studies in recent years suggest that local ownership –the LO in LOIS—enables businesses to contribute more to economic development than do most global businesses attracted through expensive incentive schemes. Local ownership matters in at least five ways:⁵¹

- *Higher Multipliers* – Locally owned businesses generally contribute more to the “economic multiplier.” More than two dozen studies over the past decade have compared the economic impacts of locally owned businesses with their nonlocal equivalents, and they consistently show that local businesses generate two to four times the multiplier benefits.⁵² That means that every dollar that moves from a nonlocal to a local business in a community generates two to four times the income boost, two to four times the jobs, two to four times the local taxes, and two to four times the charitable contributions.
- *More Reliable* – While absentee-owned businesses increasingly consider moving to Mexico, China, or low-wage U.S. states, with only secondary concern for throwing the community into an economic tailspin, businesses anchored locally produce wealth more reliably for many years, often for many generations. This means that economic-development investments in local business have greater payoffs.
- *Higher Standards* – Because local businesses tend to stay put, a community with primarily local businesses can raise labor and environmental standards with confidence that its businesses will adapt rather than flee.

⁵¹ Extensive documentation of these points can be found in Michael H. Shuman, *The Small-Mart Revolution: How Local Businesses Are Beating the Global Competition* (San Francisco: Berrett-Koehler, 2006), Chapter 2.

⁵² See, for example, Michael H. Shuman, *Local Dollars, Local Sense: How to Shift Your Money from Wall Street to Main Street and Achieve Real Prosperity* (White River Junction, VT: Chelsea Green, 2012), 17–25. Also see Stacy Mitchell, *The Big Box Swindle: The True Cost of Mega-Retailers and the Fight for America’s Independent Businesses* (Boston: Beacon Press, 2006).

- *More Dynamic* – A community made up of smaller, locally owned businesses is better equipped to promote smart growth and walkable communities, draw tourists through unique stores and attractions, retain talented young people who seek entrepreneurial opportunities and a distinct sense of place, and reduce the noise, fumes, and risks of traffic.
- *Better Social Impacts* – Compared to economies dependent on absentee-owned enterprises, local-business economies tend to have more social stability, lower levels of welfare, and greater political participation.

The case for promoting local ownership has been deepened by empirical evidence that regions with higher densities of local business have superior economic performance. For example:

- A 2010 study appeared in the *Harvard Business Review* under the headline “More Small Firms Means More Jobs.”⁵³ The authors wrote, “Our research shows that regional economic growth is highly correlated with the presence of many small, entrepreneurial employers—not a few big ones.” The authors further argued that the major preoccupation of economic developers – how to attract global companies – is fundamentally wrong-headed. “Politicians enjoy announcing a big company’s arrival because people tend to think that will mean lots of job openings. But in a rapidly evolving economy, politicians are all too likely to guess wrong about which industries are worth attracting. What’s more, large corporations often generate little employment growth even if they are doing well.”
- Another study published shortly thereafter in the *Economic Development Quarterly*, a journal long supportive of business attraction practices, similarly finds: “Economic growth models that control for other relevant factors reveal a positive relationship between density of locally owned firms and per capita income growth, but only for small (10-99 employees) firms, whereas the density of large (more than 500 workers) firms not owned locally has a negative effect.”⁵⁴
- A paper published in 2013 by the Federal Reserve in Atlanta, which performed a regression analysis of counties across the United States, found statistically significant “evidence that local entrepreneurship matters for local economic performance . . . [T]he percent of employment provided by resident, or locally-owned, business establishments has a significant positive effect on

⁵³ Edward L. Glaeser and William R. Kerr, “The Secret to Job Growth: Think Small,” *Harvard Business Review*, July-August 2010.

⁵⁴ David A. Fleming and Stephan J. Goetz, “Does Local Firm Ownership Matter?,” *Economic Development Quarterly*, 2011.

county income and employment growth and a significant and negative effect on poverty....”⁵⁵

The second part of LOIS, the IS, stands for import substitution—the consumption of goods and services produced in close proximity to the producer. Every time a community imports a good or service that it might have cost-effectively produced for itself, it “leaks” dollars and loses the critically important multipliers associated with them. Moreover, import dependencies – on petroleum, for example –subject a community to risks of price hikes and disruptions far beyond local control. They also deny a community a diversified base of businesses and skills needed to take advantage of unknown (and unknowable) future opportunities in the global economy.

Three examples help to illustrate the potential benefits of import substitution:

- Twenty years ago, Güssing was a dying rural community of 4,000 in Austria.⁵⁶ Its old industries of logging and farming had been demolished by global competition. Many of today's economic developers would have given up and encouraged the residents to move elsewhere. But the mayor of Güssing decided that the key to prosperity was to plug energy "leaks." He built a small district heating system, fueled with local wood. The local money saved by importing less energy was then reinvested in expanding the district heating system and in new energy businesses. Since then, 50 new firms have opened, creating 1,000 new jobs. And most remarkably, the town estimates that this economic expansion actually will result in a *reduction* of its carbon footprint by 90 percent.
- In autumn of 2008 Marian Burros of the *New York Times* wrote a piece about how the 3000-person community of Hardwick, Vermont, prospered by creating a new "economic cluster" around local food.⁵⁷ Cutting-edge restaurants, artisan cheese makers, and organic orchardists were just some of the new businesses that had added an estimated 75-100 jobs to the area at a time when most rural communities were losing jobs. A new Vermont Food Venture Center also was put in place to continue the creation of local food enterprises.
- Even a single, visionary business can lead a community-wide effort at import substitution. Take Zingerman's in Ann Arbor, Michigan. On its first day of business in a college town known globally more for its radicalism than for its food, Zingerman's Deli sold about \$100 worth of sandwiches. That was 1982.

⁵⁵ Anil Rupesingha, “Locally Owned: Do Local Business Ownership and Size Matter for Local Economic Well-Being?,” monograph, August 2013.

⁵⁶ Jonathan Tirone, “‘Dead-End’ Austrian Town Blossoms with Green Energy,” *International Herald-Tribune*, 28 August 2007.

⁵⁷ Marian Burros, “Uniting Around Food to Save an Ailing Town,” *New York Times*, 7 October 2008.

It has since grown into a community of ten businesses, each independent but linked through overlapping partnerships that collectively employ 650 people and achieve annual sales of over \$50 million. Over that period the proprietors conscientiously built a food cluster from scratch. They carefully assessed the items going into the deli – bread, coffee, cheeses – and captured profitable opportunities for creating a bakery, a coffee roaster, and a creamery. They looked at the products being sold at the deli – fabulous coffee cakes and high-quality meats – and built new, value-adding businesses with these products, including a mail-order company and a restaurant called the Roadhouse.

These three case examples suggest the importance of a region looking past *existing* clusters of export-oriented business. A smarter approach is to create new clusters based, initially at least, on local demand.

Many economic developers believe that the only way an economy can grow is by exporting, because, the argument goes, this is the only way to bring new money into the economy. This in turn leads to a focus on larger, nonlocal, “trading sector” businesses. The argument is incorrect, however, because what matters is not exports per se but the local trade balance. Greater exports can improve the trade balance, but so can fewer imports.

As the great regional economist Jane Jacobs argued, import substitution is arguably more important than export-led development, because it facilitates long-term growth through diversification and long-term stability through self-reliance. Moreover, it tends to be easier to grow local businesses around local markets (which are well understood) than global markets (which are more unpredictable). Most importantly, Jacobs argued, it turns out that the best way of growing exporting businesses is to nurture them first through local markets, and then they naturally expand into regional, national, and global markets.

Implementation of LOIS requires creating a strong entrepreneurship ecosystem. Doing so requires answering key questions around six key concepts, each beginning with the letter P:

- *Planning* – How can significant dollar “leaks” caused by imports be identified, and which leaks can best be plugged with competitive LOIS enterprises?
- *People* – How can a new generation of LOIS entrepreneurs be nurtured and trained?
- *Partners* – How can existing LOIS businesses work together (through, for example, joint purchasing or marketing cooperatives) to improve their competitiveness?
- *Purse* – How can local savings, whether in banks or pension funds, be tapped to support new or expanded LOIS businesses?

- *Purchasing* – How can LOIS businesses achieve greater success through “Local First” purchasing by consumers, businesses, and government agencies?
- *Public Policymaking* – How can biases that currently exist against LOIS be eliminated so that local businesses can compete?

Appendix II

The Degree of Self-Reliance on Island County (In IMPLAN's Private Enterprise Sectors)

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Farming, Ranching, and Forestry	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Oilseed farming	\$0	\$2,844,960	\$2,844,960	0%
Grain farming	\$1,889	\$3,865,571	\$3,867,461	0%
Vegetable and melon farming	\$905,192	\$4,781,724	\$5,686,916	16%
Fruit farming	\$132,560	\$16,148,628	\$16,281,188	1%
Tree nut farming	\$3,300	\$1,470,505	\$1,473,806	0%
Greenhouse, nursery, and floriculture production	\$143,923	\$3,501,023	\$3,644,946	4%
Tobacco farming	\$0	\$296	\$296	0%
Cotton farming	\$0	\$481,695	\$481,695	0%
Sugarcane and sugar beet farming	\$0	\$389,594	\$389,594	0%
All other crop farming	\$24,381	\$598,352	\$622,733	4%
Beef cattle ranching and farming, including feedlots	\$103,513	\$575,303	\$678,815	15%
Dairy cattle and milk production	\$35,590	\$1,453,691	\$1,489,280	2%
Poultry and egg production	\$12,977	\$2,429,840	\$2,442,817	1%
Animal production, except cattle and poultry and eggs	\$1,239,512	\$1,110,677	\$2,350,189	53%
Forestry, forest products, and timber tract production	\$4	\$123,128	\$123,132	0%
Commercial logging	\$0	\$488,373	\$488,373	0%
Commercial fishing	\$20,507	\$2,211,403	\$2,231,910	1%
Commercial hunting and trapping	\$0	\$382,430	\$382,430	0%
Support activities for agriculture and forestry	\$214,905	\$485,077	\$699,982	31%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Mining, Oil, and Gas	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Extraction of natural gas and crude petroleum	\$19,883	\$14,220,255	\$14,240,138	0%
Extraction of natural gas liquids	\$0	\$0	\$0	0%
Coal mining	\$0	\$999,005	\$999,005	0%
Iron ore mining	\$0	\$72,884	\$72,884	0%
Gold ore mining	\$0	\$509,837	\$509,837	0%
Silver ore mining	\$0	\$29,364	\$29,364	0%
Lead and zinc ore mining	\$0	\$160,547	\$160,547	0%
Copper ore mining	\$0	\$617,202	\$617,202	0%
Uranium-radium-vanadium ore mining	\$0	\$100,622	\$100,622	0%
Other metal ore mining	\$0	\$350,674	\$350,674	0%
Stone mining and quarrying	\$10,237	\$166,930	\$177,167	6%
Sand and gravel mining	\$137,684	\$206,610	\$344,294	40%
Other clay, ceramic, refractory minerals mining	\$0	\$50,718	\$50,718	0%
Potash, soda, and borate mineral mining	\$0	\$213,023	\$213,023	0%
Phosphate rock mining	\$0	\$195,443	\$195,443	0%
Other chemical and fertilizer mineral mining	\$0	\$76,872	\$76,872	0%
Other nonmetallic minerals	\$0	\$174,919	\$174,919	0%
Drilling oil and gas wells	\$1,064,087	\$14,267,825	\$15,331,912	7%
Support activities for oil and gas operations	\$15,757	\$4,224,235	\$4,239,991	0%
Metal mining services	\$15,050	\$241	\$15,291	98%
Other nonmetallic minerals services	\$0	\$201,215	\$201,215	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Energy and Utilities	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Electric power generation - Hydroelectric	\$0	\$4,281,489	\$4,281,489	0%
Electric power generation - Fossil fuel	\$0	\$0	\$0	0%
Electric power generation - Nuclear	\$0	\$0	\$0	0%
Electric power generation - Solar	\$0	\$0	\$0	0%
Electric power generation - Wind	\$0	\$0	\$0	0%
Electric power generation - Geothermal	\$0	\$0	\$0	0%
Electric power generation - Biomass	\$0	\$0	\$0	0%
Electric power generation - All other	\$0	\$0	\$0	0%
Electric power transmission and distribution	\$6,861,505	\$71,119,092	\$77,980,597	9%
Natural gas distribution	\$0	\$12,167,153	\$12,167,153	0%
Water, sewage and other systems	\$6,859,501	\$484,111	\$7,343,612	93%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Construction	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Construction of new health care structures	\$8,035,455	\$617,813	\$8,653,267	93%
Construction of new manufacturing structures	\$6,188,086	\$48,377	\$6,236,462	99%
Construction of new power and communication structures	\$14,908,030	\$92,823	\$15,000,853	99%
Construction of new educational and vocational structures	\$13,399,953	\$173,981	\$13,573,934	99%
Construction of new highways and streets	\$14,673,882	\$72,150	\$14,746,032	100%
Construction of new commercial structures, including farms	\$10,158,979	\$462,315	\$10,621,294	96%
Construction of other new nonresidential structures	\$33,776,241	\$1,395,208	\$35,171,450	96%
Construction of new single-family residential structures	25,387,175	4,557	\$25,391,732	100%
Construction of new multifamily residential structures	6,196,633	2,605	\$6,199,238	100%
Construction of other new residential structures	71,259,102	45,972	\$71,305,074	100%
Maintenance and repair construction of nonres. structures	7,116,305	15,302,826	\$22,419,130	32%
Maintenance and repair construction of res. structures	790,979	14,765,275	\$15,556,254	5%
Maintenance and repair construction of infrastructure	9,294,402	15,677,637	\$24,972,039	37%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Food, Beverages, and Tobacco)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Dog and cat food manufacturing	0	8,601,316	\$8,601,316	0%
Other animal food manufacturing	0	4,571,757	\$4,571,757	0%
Flour milling	283	1,959,230	\$1,959,513	0%
Rice milling	449	501,584	\$502,033	0%
Malt manufacturing	0	248,936	\$248,936	0%
Wet corn milling	0	1,727,689	\$1,727,689	0%
Soybean and other oilseed processing	0	3,673,733	\$3,673,733	0%
Fats and oils refining and blending	7	1,922,291	\$1,922,297	0%
Breakfast cereal manufacturing	602	3,176,922	\$3,177,525	0%
Beet sugar manufacturing	0	1,001,165	\$1,001,165	0%
Sugar cane mills and refining	0	1,247,940	\$1,247,940	0%
Nonchocolate confectionery manufacturing	1	2,517,522	\$2,517,522	0%
Chocolate and confectionery manufacturing from cacao bean	1,625	807,809	\$809,433	0%
Confectionery manufacturing from purchased chocolate	13	3,636,929	\$3,636,942	0%
Frozen fruits, juices and vegetables manufacturing	25	3,159,576	\$3,159,601	0%
Frozen specialties manufacturing	2,585	5,385,135	\$5,387,720	0%
Canned fruits and vegetables manufacturing	74	5,040,393	\$5,040,467	0%
Canned specialties	1,809	6,261,092	\$6,262,901	0%
Dehydrated food products manufacturing	145	890,551	\$890,697	0%
Fluid milk manufacturing	130,724	8,769,581	\$8,900,305	1%
Creamery butter manufacturing	36,631	615,919	\$652,549	6%
Cheese manufacturing	6,310	7,339,967	\$7,346,277	0%
Dry, condensed, and evaporated dairy product manufacturing	31,065	3,993,089	\$4,024,154	1%
Ice cream and frozen dessert manufacturing	36,657	1,765,736	\$1,802,392	2%
Animal, except poultry, slaughtering	1,355	13,043,548	\$13,044,904	0%
Meat processed from carcasses	1,794	15,230,699	\$15,232,493	0%
Rendering and meat byproduct processing	7	899,427	\$899,434	0%
Poultry processing	9	13,432,893	\$13,432,902	0%
Seafood product preparation and packaging	19	3,149,973	\$3,149,992	0%
Bread and bakery product, except frozen, manufacturing	133,105	13,311,262	\$13,444,367	1%
Frozen cakes and other pastries manufacturing	2,681	1,199,723	\$1,202,404	0%
Cookie and cracker manufacturing	3,225	3,270,984	\$3,274,209	0%
Dry pasta, mixes, and dough manufacturing	1,433	3,343,659	\$3,345,091	0%
Tortilla manufacturing	111	950,688	\$950,799	0%
Roasted nuts and peanut butter manufacturing	195	2,286,601	\$2,286,796	0%
Other snack food manufacturing	1,436	7,727,701	\$7,729,137	0%
Coffee and tea manufacturing	108,432	3,326,634	\$3,435,065	3%
Flavoring syrup and concentrate manufacturing	215	1,539,051	\$1,539,266	0%
Mayonnaise, dressing, and sauce manufacturing	279	2,068,032	\$2,068,310	0%
Spice and extract manufacturing	286	2,973,300	\$2,973,587	0%
All other food manufacturing	14,449	6,719,673	\$6,734,122	0%
Bottled and canned soft drinks & water	47,648	17,969,794	\$18,017,442	0%
Manufactured ice	0	338,485	\$338,485	0%
Breweries	0	10,335,949	\$10,335,949	0%
Wineries	62,704	5,142,380	\$5,205,084	1%
Distilleries	953	4,473,320	\$4,474,273	0%
Tobacco product manufacturing	0	12,237,155	\$12,237,155	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Fibers, Textiles, and Clothing)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Fiber, yarn, and thread mills	7,586	676,036	\$683,622	1%
Broadwoven fabric mills	5,035	838,620	\$843,655	1%
Narrow fabric mills and schiffli machine embroidery	0	202,314	\$202,314	0%
Nonwoven fabric mills	1,757	511,754	\$513,511	0%
Knit fabric mills	46	124,696	\$124,742	0%
Textile and fabric finishing mills	70	1,333,446	\$1,333,516	0%
Fabric coating mills	167	254,314	\$254,481	0%
Carpet and rug mills	2,058	3,437,346	\$3,439,404	0%
Curtain and linen mills	1,628	4,489,059	\$4,490,687	0%
Textile bag and canvas mills	1,052	1,475,025	\$1,476,077	0%
Rope, cordage, twine, tire cord and tire fabric mills	269	1,224,592	\$1,224,861	0%
Other textile product mills	3,152	1,784,675	\$1,787,826	0%
Hosiery and sock mills	0	1,121,200	\$1,121,200	0%
Other apparel knitting mills	6	0	\$6	100%
Cut and sew apparel contractors	0	821,397	\$821,397	0%
Mens and boys cut and sew apparel manufacturing	102	6,967,969	\$6,968,071	0%
Womens and girls cut and sew apparel manufacturing	16	12,843,561	\$12,843,577	0%
Other cut and sew apparel manufacturing	0	1,255,611	\$1,255,611	0%
Apparel accessories and other apparel manufacturing	56	2,246,205	\$2,246,261	0%
Leather and hide tanning and finishing	3	176,111	\$176,113	0%
Footwear manufacturing	972	5,140,387	\$5,141,359	0%
Other leather and allied product manufacturing	71	3,578,316	\$3,578,387	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Wood and Wood Products)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Sawmills	0	3,544,511	\$3,544,511	0%
Wood preservation	0	675,248	\$675,248	0%
Veneer and plywood manufacturing	0	1,578,562	\$1,578,562	0%
Engineered wood member and truss manufacturing	227	1,071,322	\$1,071,549	0%
Reconstituted wood product manufacturing	83	1,203,203	\$1,203,286	0%
Wood windows and door manufacturing	2	2,235,190	\$2,235,191	0%
Cut stock, resawing lumber, and planing	0	302,637	\$302,637	0%
Other millwork, including flooring	0	1,867,941	\$1,867,941	0%
Wood container and pallet manufacturing	0	1,527,662	\$1,527,662	0%
Manufactured home (mobile home) manufacturing	7,233	675,115	\$682,347	1%
Prefabricated wood building manufacturing	43,375	38,342	\$81,717	53%
All other miscellaneous wood product manufacturing	12	1,274,779	\$1,274,791	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Paper, Paper Products, and Printing)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Pulp mills	0	437,498	\$437,498	0%
Paper mills	6	9,890,651	\$9,890,657	0%
Paperboard mills	0	4,301,183	\$4,301,183	0%
Paperboard container manufacturing	5	6,561,021	\$6,561,026	0%
Paper bag and coated and treated paper manufacturing	471	3,121,350	\$3,121,821	0%
Stationery product manufacturing	360,134	729,427	\$1,089,561	33%
Sanitary paper product manufacturing	0	3,308,152	\$3,308,152	0%
All other converted paper product manufacturing	47	729,585	\$729,632	0%
Printing	72,562	8,310,729	\$8,383,291	1%
Support activities for printing	657	296,240	\$296,897	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Petroleum-based Products)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Petroleum refineries	316,234	157,056,312	\$157,372,547	0%
Asphalt paving mixture and block manufacturing	8,936	2,533,578	\$2,542,515	0%
Asphalt shingle and coating materials manufacturing	92	2,277,115	\$2,277,207	0%
Petroleum lubricating oil and grease manufacturing	5,219	3,121,366	\$3,126,585	0%
All other petroleum and coal products manufacturing	666	886,606	\$887,272	0%
Petrochemical manufacturing	2,005	8,680,355	\$8,682,360	0%
Industrial gas manufacturing	11	1,442,716	\$1,442,726	0%
Synthetic dye and pigment manufacturing	32	730,880	\$730,912	0%
Other basic inorganic chemical manufacturing	998	3,965,794	\$3,966,792	0%
Other basic organic chemical manufacturing	43	7,208,679	\$7,208,722	0%
Plastics material and resin manufacturing	44	2,855,433	\$2,855,477	0%
Synthetic rubber manufacturing	98	614,304	\$614,401	0%
Artificial and synthetic fibers and filaments manufacturing	0	3,863,583	\$3,863,583	0%
Nitrogenous fertilizer manufacturing	0	2,366,662	\$2,366,662	0%
Phosphatic fertilizer manufacturing	74	2,302,902	\$2,302,976	0%
Fertilizer mixing	5	0	\$5	100%
Pesticide and other agricultural chemical manufacturing	0	2,847,492	\$2,847,492	0%
Medicinal and botanical manufacturing	18	206,787	\$206,805	0%
Pharmaceutical preparation manufacturing	1,051	80,892,152	\$80,893,204	0%
In-vitro diagnostic substance manufacturing	0	102,599	\$102,599	0%
Biological product (except diagnostic) manufacturing	54	1,478,831	\$1,478,885	0%
Paint and coating manufacturing	0	3,206,412	\$3,206,412	0%
Adhesive manufacturing	0	1,610,061	\$1,610,061	0%
Soap and other detergent manufacturing	39,372	5,455,228	\$5,494,600	1%
Polish and other sanitation good manufacturing	4,609	3,750,259	\$3,754,868	0%
Surface active agent manufacturing	191	1,133,024	\$1,133,215	0%
Toilet preparation manufacturing	1,166	11,499,736	\$11,500,902	0%
Printing ink manufacturing	0	583,939	\$583,939	0%
Explosives manufacturing	0	261,709	\$261,709	0%
Custom compounding of purchased resins	22	1,390,086	\$1,390,108	0%
Photographic film and chemical manufacturing	0	1,377,093	\$1,377,093	0%
Other miscellaneous chemical product manufacturing	2,891	3,325,185	\$3,328,076	0%
Plastics packaging materials and unlaminated film and sheet	7	4,265,268	\$4,265,275	0%
Unlaminated plastics profile shape manufacturing	11	972,365	\$972,376	0%
Plastics pipe and pipe fitting manufacturing	5	1,956,104	\$1,956,109	0%
Laminated plastics plate, sheet (except packaging), and shape	5	365,671	\$365,676	0%
Polystyrene foam product manufacturing	435	1,467,351	\$1,467,786	0%
Urethane and other foam product (except polystyrene)	236	1,470,545	\$1,470,780	0%
Plastics bottle manufacturing	2	1,006,953	\$1,006,955	0%
Other plastics product manufacturing	87	15,557,064	\$15,557,151	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Rubber, Glass, Stone, and Concrete)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Tire manufacturing	0	6,477,172	\$6,477,172	0%
Rubber and plastics hoses and belting manufacturing	2	540,802	\$540,804	0%
Other rubber product manufacturing	121	3,221,105	\$3,221,226	0%
Pottery, ceramics, and plumbing fixture manufacturing	477	889,315	\$889,793	0%
Brick, tile, and other structural clay product manufacturing	0	1,321,764	\$1,321,764	0%
Flat glass manufacturing	0	201,870	\$201,870	0%
Other pressed and blown glass and glassware manufacturing	456	1,193,030	\$1,193,486	0%
Glass container manufacturing	0	1,013,150	\$1,013,150	0%
Glass product manufacturing made of purchased glass	159	730,119	\$730,277	0%
Cement manufacturing	0	957,847	\$957,847	0%
Ready-mix concrete manufacturing	8	3,256,487	\$3,256,495	0%
Concrete block and brick manufacturing	3	906,072	\$906,075	0%
Concrete pipe manufacturing	9	328,613	\$328,622	0%
Other concrete product manufacturing	105	1,832,725	\$1,832,830	0%
Lime manufacturing	118	212,891	\$213,009	0%
Gypsum product manufacturing	0	1,244,003	\$1,244,003	0%
Abrasive product manufacturing	414	547,795	\$548,209	0%
Cut stone and stone product manufacturing	43,207	1,717,256	\$1,760,463	2%
Ground or treated mineral and earth manufacturing	112	400,107	\$400,219	0%
Mineral wool manufacturing	0	1,376,076	\$1,376,076	0%
Miscellaneous nonmetallic mineral products manufacturing	10	591,572	\$591,582	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Metals)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Iron and steel mills and ferroalloy manufacturing	0	14,596,526	\$14,596,526	0%
Iron, steel pipe and tube manufacturing from purchased steel	4	0	\$4	100%
Rolled steel shape manufacturing	0	0	\$0	#DIV/0!
Steel wire drawing	3	575,869	\$575,872	0%
Alumina refining and primary aluminum production	16	2,963,006	\$2,963,022	0%
Secondary smelting and alloying of aluminum	0	0	\$0	#DIV/0!
Aluminum sheet, plate, and foil manufacturing	31	1,753,127	\$1,753,158	0%
Other aluminum rolling, drawing and extruding	7	250,625	\$250,632	0%
Nonferrous metal (exc aluminum) smelting and refining	0	2,081,086	\$2,081,086	0%
Copper rolling, drawing, extruding and alloying	0	2,031,608	\$2,031,608	0%
Nonferrous metal, except copper and aluminum, shaping	1	2,721,091	\$2,721,091	0%
Secondary processing of other nonferrous metals	3	1,100,652	\$1,100,655	0%
Ferrous metal foundries	0	805,983	\$805,983	0%
Nonferrous metal foundries	3	653,264	\$653,267	0%
Iron and steel forging	26	1,070,321	\$1,070,347	0%
Nonferrous forging	245	229,113	\$229,359	0%
Custom roll forming	1	153,732	\$153,733	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Metal Products)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Crown and closure manufacturing and metal stamping	8	1,342,751	\$1,342,760	0%
Cutlery, utensil, pot, and pan manufacturing	4	2,080,857	\$2,080,861	0%
Handtool manufacturing	0	2,615,288	\$2,615,288	0%
Prefabricated metal buildings and components manufacturing	2,743	1,139,872	\$1,142,615	0%
Fabricated structural metal manufacturing	10	3,765,549	\$3,765,559	0%
Plate work manufacturing	7	1,036,060	\$1,036,067	0%
Metal window and door manufacturing	28	2,333,427	\$2,333,455	0%
Sheet metal work manufacturing	28	2,992,376	\$2,992,404	0%
Ornamental and architectural metal work manufacturing	186	1,381,848	\$1,382,034	0%
Power boiler and heat exchanger manufacturing	3	1,061,215	\$1,061,218	0%
Metal tank (heavy gauge) manufacturing	1	1,576,922	\$1,576,923	0%
Metal cans manufacturing	75	1,430,733	\$1,430,809	0%
Metal barrels, drums and pails manufacturing	1	309,662	\$309,663	0%
Hardware manufacturing	1,470	2,694,026	\$2,695,497	0%
Spring and wire product manufacturing	18	2,660,254	\$2,660,271	0%
Machine shops	1,333	4,242,391	\$4,243,724	0%
Turned product and screw, nut, and bolt manufacturing	12	1,906,782	\$1,906,794	0%
Metal heat treating	3	562,717	\$562,721	0%
Metal coating and nonprecious engraving	17	1,193,857	\$1,193,873	0%
Electroplating, anodizing, and coloring metal	0	826,324	\$826,324	0%
Valve and fittings, other than plumbing, manufacturing	111	6,768,672	\$6,768,784	0%
Plumbing fixture fitting and trim manufacturing	2	1,288,971	\$1,288,973	0%
Ball and roller bearing manufacturing	0	1,464,055	\$1,464,055	0%
Small arms ammunition manufacturing	0	3,048,246	\$3,048,247	0%
Ammunition, except for small arms, manufacturing	21	3,441,631	\$3,441,652	0%
Small arms, ordnance, and accessories manufacturing	102	5,158,425	\$5,158,527	0%
Fabricated pipe and pipe fitting manufacturing	0	1,774,297	\$1,774,297	0%
Other fabricated metal manufacturing	2	3,414,527	\$3,414,529	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Machinery and Equipment)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Farm machinery and equipment manufacturing	23,820	5,402,775	\$5,426,595	0%
Lawn and garden equipment manufacturing	14,873	1,436,288	\$1,451,161	1%
Construction machinery manufacturing	6,386	6,714,371	\$6,720,757	0%
Mining machinery and equipment manufacturing	130	319,735	\$319,865	0%
Oil and gas field machinery and equipment manufacturing	4	3,649,619	\$3,649,623	0%
Food product machinery manufacturing	0	624,228	\$624,228	0%
Semiconductor machinery manufacturing	0	1,383,961	\$1,383,961	0%
Sawmill, woodworking, and paper machinery	0	206,310	\$206,310	0%
Printing machinery and equipment manufacturing	5	338,184	\$338,189	0%
All other industrial machinery manufacturing	2	2,430,982	\$2,430,984	0%
Optical instrument and lens manufacturing	69	1,947,806	\$1,947,875	0%
Photographic and photocopying equipment manufacturing	30	475,966	\$475,996	0%
Other commercial service industry machinery manufacturing	5	2,971,182	\$2,971,187	0%
Air purification and ventilation equipment manufacturing	0	1,307,252	\$1,307,252	0%
Heating equipment (except warm air furnaces) manufacturing	0	990,577	\$990,577	0%
Air conditioning, refrigeration, and warm air heating equipment	1	5,977,414	\$5,977,415	0%
Industrial mold manufacturing	11,548	1,135,764	\$1,147,312	1%
Special tool, die, jig, and fixture manufacturing	131	1,772,658	\$1,772,789	0%
Cutting tool and machine tool accessory manufacturing	1	546,228	\$546,229	0%
Machine tool manufacturing	4	1,638,727	\$1,638,732	0%
Rolling mill and other metalworking machinery manufacturing	4	273,868	\$273,872	0%
Turbine and turbine generator set units manufacturing	0	1,339,288	\$1,339,288	0%
Speed changer, industrial high-speed drive, and gears	0	389,471	\$389,471	0%
Mechanical power transmission equipment manufacturing	0	783,721	\$783,721	0%
Other engine equipment manufacturing	34	3,521,462	\$3,521,496	0%
Pump and pumping equipment manufacturing	0	2,729,931	\$2,729,931	0%
Air and gas compressor manufacturing	0	1,402,597	\$1,402,597	0%
Measuring and dispensing pump manufacturing	2	133,276	\$133,278	0%
Elevator and moving stairway manufacturing	0	496,733	\$496,733	0%
Conveyor and conveying equipment manufacturing	47	1,182,860	\$1,182,907	0%
Overhead cranes, hoists, and monorail systems manufacturing	159	943,340	\$943,499	0%
Industrial truck, trailer, and stacker manufacturing	16	1,395,446	\$1,395,463	0%
Power-driven handtool manufacturing	111	1,064,864	\$1,064,974	0%
Welding and soldering equipment manufacturing	37	649,520	\$649,557	0%
Packaging machinery manufacturing	2	1,330,382	\$1,330,384	0%
Industrial process furnace and oven manufacturing	0	326,825	\$326,825	0%
Fluid power cylinder and actuator manufacturing	124	1,251,156	\$1,251,281	0%
Fluid power pump and motor manufacturing	8	1,630,113	\$1,630,122	0%
Scales, balances, and misc. general purpose machinery	4	2,234,669	\$2,234,672	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Computers, Electronics, and Appliances)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Electronic computer manufacturing	0	25,734,868	\$25,734,868	0%
Computer storage device manufacturing	0	2,970,006	\$2,970,006	0%
Computer terminals and other computer peripheral equipment	0	4,935,454	\$4,935,454	0%
Telephone apparatus manufacturing	0	3,420,393	\$3,420,393	0%
Broadcast and wireless communications equipment	2,648	34,962,785	\$34,965,433	0%
Other communications equipment manufacturing	6	962,822	\$962,828	0%
Audio and video equipment manufacturing	0	9,564,302	\$9,564,302	0%
Bare printed circuit board manufacturing	0	1,016,812	\$1,016,812	0%
Semiconductor and related device manufacturing	157	33,642,570	\$33,642,728	0%
Capacitor, resistor, coil, transformer, and other inductors	57	1,133,284	\$1,133,341	0%
Electronic connector manufacturing	3	1,065,483	\$1,065,486	0%
Printed circuit assembly (electronic assembly) manufacturing	927	6,104,433	\$6,105,360	0%
Other electronic component manufacturing	58	5,662,819	\$5,662,877	0%
Electromedical and electrotherapeutic apparatus	3	5,285,020	\$5,285,023	0%
Search, detection, and navigation instruments manufacturing	6,402	65,484,893	\$65,491,295	0%
Automatic environmental control manufacturing	1	917,964	\$917,965	0%
Industrial process variable instruments manufacturing	15	1,632,483	\$1,632,498	0%
Totalizing fluid meter and counting device manufacturing	1,218	740,506	\$741,724	0%
Electricity and signal testing instruments manufacturing	0	4,144,844	\$4,144,844	0%
Analytical laboratory instrument manufacturing	0	1,775,716	\$1,775,716	0%
Irradiation apparatus manufacturing	0	1,469,367	\$1,469,367	0%
Watch, clock, and other measuring and controlling devices	116	4,080,912	\$4,081,028	0%
Blank magnetic and optical recording media manufacturing	0	598,848	\$598,848	0%
Software and other prerecorded and record reproducing	0	420,613	\$420,613	0%
Electric lamp bulb and part manufacturing	0	682,279	\$682,279	0%
Lighting fixture manufacturing	0	3,846,299	\$3,846,299	0%
Small electrical appliance manufacturing	4	3,199,851	\$3,199,855	0%
Household cooking appliance manufacturing	0	2,445,413	\$2,445,413	0%
Household refrigerator and home freezer manufacturing	0	2,534,310	\$2,534,310	0%
Household laundry equipment manufacturing	0	2,191,235	\$2,191,235	0%
Other major household appliance manufacturing	0	1,386,782	\$1,386,782	0%
Power, distribution, and specialty transformer manufacturing	11	1,629,284	\$1,629,295	0%
Motor and generator manufacturing	22	2,343,892	\$2,343,914	0%
Switchgear and switchboard apparatus manufacturing	10	3,778,753	\$3,778,764	0%
Relay and industrial control manufacturing	888	2,113,882	\$2,114,770	0%
Storage battery manufacturing	0	1,193,958	\$1,193,958	0%
Primary battery manufacturing	0	1,259,455	\$1,259,455	0%
Fiber optic cable manufacturing	15	598,186	\$598,201	0%
Other communication and energy wire manufacturing	1	2,516,328	\$2,516,329	0%
Wiring device manufacturing	48	4,127,569	\$4,127,617	0%
Carbon and graphite product manufacturing	0	569,568	\$569,568	0%
All other miscellaneous electrical equipment and components	52,546	2,597,081	\$2,649,626	2%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Vehicles, Boats, and Planes)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Automobile manufacturing	0	47,372,192	\$47,372,192	0%
Light truck and utility vehicle manufacturing	0	46,053,099	\$46,053,099	0%
Heavy duty truck manufacturing	0	5,847,205	\$5,847,205	0%
Motor vehicle body manufacturing	0	437,232	\$437,232	0%
Truck trailer manufacturing	0	1,697,154	\$1,697,154	0%
Motor home manufacturing	0	1,669,767	\$1,669,767	0%
Travel trailer and camper manufacturing	0	2,214,475	\$2,214,475	0%
Motor vehicle gasoline engine and engine parts	0	3,169,434	\$3,169,434	0%
Motor vehicle electrical and electronic equipment	11	7,754,639	\$7,754,650	0%
Motor vehicle steering, suspension, and brake systems	0	3,451,146	\$3,451,146	0%
Motor vehicle transmission and power train parts	8	5,743,750	\$5,743,758	0%
Motor vehicle seating and interior trim manufacturing	0	1,266,208	\$1,266,208	0%
Motor vehicle metal stamping	19	389,364	\$389,383	0%
Other motor vehicle parts manufacturing	0	10,470,951	\$10,470,951	0%
Aircraft manufacturing	10,694,821	77,768,002	\$88,462,824	12%
Aircraft engine and engine parts manufacturing	3,374	35,012,354	\$35,015,728	0%
Other aircraft parts and auxiliary equipment manufacturing	20,976	35,021,289	\$35,042,265	0%
Guided missile and space vehicle manufacturing	98,374	14,318,073	\$14,416,447	1%
Propulsion units and parts for space vehicles and missiles	43,589	3,115,258	\$3,158,848	1%
Railroad rolling stock manufacturing	0	2,173,258	\$2,173,258	0%
Ship building and repairing	16,264,131	12,669,277	\$28,933,408	56%
Boat building	106,665	2,733,031	\$2,839,696	4%
Motorcycle, bicycle, and parts manufacturing	4	2,449,190	\$2,449,194	0%
Military armored vehicle, tank, and tank component	1,045	3,843,404	\$3,844,449	0%
All other transportation equipment manufacturing	883	2,889,034	\$2,889,917	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Furniture)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Wood kitchen cabinet and countertop manufacturing	98	3,527,809	\$3,527,907	0%
Upholstered household furniture manufacturing	540	3,595,124	\$3,595,663	0%
Nonupholstered wood household furniture manufacturing	4,582	4,423,197	\$4,427,780	0%
Other household nonupholstered furniture manufacturing	1,531	1,666,610	\$1,668,141	0%
Institutional furniture manufacturing	1,164	983,546	\$984,710	0%
Wood office furniture manufacturing	116	651,203	\$651,320	0%
Custom architectural woodwork and millwork	242	583,724	\$583,966	0%
Office furniture, except wood, manufacturing	2,539	1,525,636	\$1,528,176	0%
Showcase, partition, shelving, and locker manufacturing	2,984	2,092,618	\$2,095,602	0%
Mattress manufacturing	58	2,424,010	\$2,424,068	0%
Blind and shade manufacturing	2,851	688,771	\$691,622	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Health Equipment)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Surgical and medical instrument manufacturing	89	4,964,976	\$4,965,065	0%
Surgical appliance and supplies manufacturing	3,886	7,793,187	\$7,797,073	0%
Dental equipment and supplies manufacturing	5	1,092,354	\$1,092,358	0%
Ophthalmic goods manufacturing	6	2,254,934	\$2,254,939	0%
Dental laboratories	0	943,416	\$943,416	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (All Other Manufacturing)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Jewelry and silverware manufacturing	0	5,093,974	\$5,093,974	0%
Sporting and athletic goods manufacturing	31,950	5,830,281	\$5,862,231	1%
Doll, toy, and game manufacturing	1	6,494,375	\$6,494,376	0%
Office supplies (except paper) manufacturing	24	1,068,922	\$1,068,946	0%
Sign manufacturing	6,857	1,173,056	\$1,179,913	1%
Gasket, packing, and sealing device manufacturing	14	1,160,539	\$1,160,553	0%
Musical instrument manufacturing	0	426,446	\$426,446	0%
Fasteners, buttons, needles, and pins manufacturing	27	392,409	\$392,436	0%
Broom, brush, and mop manufacturing	22	787,457	\$787,479	0%
Burial casket manufacturing	0	148,069	\$148,069	0%
All other miscellaneous manufacturing	3,449	3,693,746	\$3,697,195	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Wholesale Trade)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Wholesale trade	36,854,338	199,436,012	\$236,290,350	16%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Retail Trade)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Retail - Motor vehicle and parts dealers	13,058,948	27,452,293	\$40,511,240	32%
Retail - Furniture and home furnishings stores	6,940,418	5,082,965	\$12,023,383	58%
Retail - Electronics and appliance stores	3,714,136	3,432,538	\$7,146,674	52%
Retail - Building material and garden equipment and supplies	26,908,293	52,883	\$26,961,177	100%
Retail - Food and beverage stores	43,072,787	6,810,270	\$49,883,057	86%
Retail - Health and personal care stores	15,051,250	2,378,494	\$17,429,744	86%
Retail - Gasoline stores	5,720,922	7,978,727	\$13,699,649	42%
Retail - Clothing and clothing accessories stores	4,977,392	16,033,172	\$21,010,564	24%
Retail - Sporting goods, hobby, musical instrument and books	4,753,388	3,064,838	\$7,818,226	61%
Retail - General merchandise stores	21,539,969	30,473,339	\$52,013,308	41%
Retail - Miscellaneous store retailers	9,850,878	64,024	\$9,914,902	99%
Retail - Nonstore retailers	25,428,067	156,294	\$25,584,362	99%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Transportation)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Air transportation	983,157	53,672,633	\$54,655,790	2%
Rail transportation	719,049	5,413,279	\$6,132,327	12%
Water transportation	401,952	6,462,560	\$6,864,511	6%
Truck transportation	10,564,149	42,566,493	\$53,130,643	20%
Transit and ground passenger transportation	2,763,549	87,092	\$2,850,642	97%
Pipeline transportation	0	1,934,396	\$1,934,396	0%
Scenic and sightseeing transportation and support activities	2,378,876	245,824	\$2,624,700	91%
Couriers and messengers	99,611	6,390,564	\$6,490,175	2%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Manufacturing (Warehousing and Storage)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Warehousing and storage	89,760	10,583,778	\$10,673,537	1%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Information Businesses)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Newspaper publishers	17,341	1,889,159	\$1,906,500	1%
Periodical publishers	336,715	3,911,512	\$4,248,227	8%
Book publishers	27,632	8,342,082	\$8,369,714	0%
Directory, mailing list, and other publishers	54,249	5,414,554	\$5,468,804	1%
Greeting card publishing	915	430,877	\$431,791	0%
Software publishers	320,088	32,808,974	\$33,129,062	1%
Motion picture and video industries	1,677,596	25,812,744	\$27,490,340	6%
Sound recording industries	1,001,006	2,209,317	\$3,210,323	31%
Radio and television broadcasting	117,962	2,000,741	\$2,118,703	6%
Cable and other subscription programming	2,859,856	2,720,354	\$5,580,210	51%
Wired telecommunications carriers	41,051,896	24,724,258	\$65,776,155	62%
Wireless telecommunications carriers (except satellite)	287,426	73,372,153	\$73,659,579	0%
Satellite, telecommunications resellers, and other telecomm.	389,917	2,185,351	\$2,575,268	15%
Data processing, hosting, and related services	4,606,817	48,629,290	\$53,236,107	9%
News syndicates, libraries, archives and other information	148,048	11,424,997	\$11,573,045	1%
Internet publishing and broadcasting and web search portals	716,188	6,516,919	\$7,233,107	10%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Banking and Finance)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Monetary authorities and depository credit intermediation	19,373,862	64,647,694	\$84,021,556	23%
Nondepository credit intermediation and related activities	1,335,367	24,599,278	\$25,934,644	5%
Securities and commodity contracts intermediation and brokers	5,029,373	10,360,525	\$15,389,899	33%
Other financial investment activities	19,462,115	41,685,607	\$61,147,722	32%
Insurance carriers	5,641,742	106,788,467	\$112,430,208	5%
Insurance agencies, brokerages, and related activities	1,208	23,050,559	\$23,051,767	0%
Funds, trusts, and other financial vehicles	7,295,986	32,003,627	\$39,299,613	19%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Real Estate and Leasing)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Real estate	92,533,385	75,412,008	\$167,945,393	55%
Owner-occupied dwellings	376,712,061	0	\$376,712,061	100%
Automotive equipment rental and leasing	1,434,393	17,398,241	\$18,832,634	8%
General and consumer goods rental except video tapes	1,087,922	3,734,747	\$4,822,669	23%
Video tape and disc rental	906,293	98,357	\$1,004,650	90%
Commercial and industrial machinery and equipment rental	683,314	146,689	\$830,003	82%
Lessors of nonfinancial intangible assets	0	930,523	\$930,523	0%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Professional Services)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Legal services	11,249,042	34,962,892	\$46,211,934	24%
Accounting, tax preparation, bookkeeping, and payroll services	8,063,322	11,247,310	\$19,310,632	42%
Architectural, engineering, and related services	18,639,788	93,446,411	\$112,086,199	17%
Specialized design services	1,746,765	269,888	\$2,016,652	87%
Custom computer programming services	20,510,892	57,460,402	\$77,971,295	26%
Computer systems design services	7,080,665	50,192,381	\$57,273,045	12%
Other computer related services, including facilities man.	1,976,049	7,206,089	\$9,182,138	22%
Management consulting services	10,547,810	15,485,738	\$26,033,548	41%
Environmental and other technical consulting services	705,323	226,684	\$932,007	76%
Scientific research and development services	70,654,479	221,481,943	\$292,136,422	24%
Advertising, public relations, and related services	729,309	39,064,805	\$39,794,113	2%
Photographic services	0	2,955,812	\$2,955,812	0%
Veterinary services	7,955,285	925,092	\$8,880,378	90%
Marketing research and other miscellaneous professional servs.	3,807,839	3,607,541	\$7,415,380	51%
Management of companies and enterprises	0	39,949,617	\$39,949,617	0%
Office administrative services	882,627	16,104,036	\$16,986,663	5%
Facilities support services	7,560,656	93,677	\$7,654,332	99%
Employment services	513,501	30,504,517	\$31,018,018	2%
Business support services	4,084,955	2,617,888	\$6,702,843	61%
Travel arrangement and reservation services	1,486,139	11,241,956	\$12,728,095	12%
Investigation and security services	1,136,977	6,651,659	\$7,788,636	15%
Services to buildings	2,116,260	5,008,244	\$7,124,504	30%
Landscape and horticultural services	4,149,998	239,819	\$4,389,817	95%
Other support services	824,357	6,241,027	\$7,065,384	12%
Waste management and remediation services	5,164,789	5,311,845	\$10,476,633	49%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Private Education)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Elementary and secondary schools	4,839,900	10,768,039	\$15,607,939	31%
Junior colleges, colleges, universities, and prof. schools	9,975,217	37,629,509	\$47,604,727	21%
Other educational services	9,033,936	5,943,622	\$14,977,558	60%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Health and Human Services)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Offices of physicians	\$27,353,138	\$85,587,722	\$112,940,860	24%
Offices of dentists	\$21,375,723	\$13,818,551	\$35,194,274	61%
Offices of other health practitioners	\$22,762,316	\$7,710,070	\$30,472,385	75%
Outpatient care centers	\$12,178,065	\$26,097,883	\$38,275,949	32%
Medical and diagnostic laboratories	\$0	\$8,011,294	\$8,011,294	0%
Home health care services	\$3,983,873	\$19,147,913	\$23,131,786	17%
Other ambulatory health care services	\$2,559,224	\$4,340,463	\$6,899,687	37%
Hospitals	\$942,338	\$230,037,883	\$230,980,222	0%
Nursing and community care facilities	\$23,958,322	\$23,019,404	\$46,977,725	51%
Residential mental retardation, mental health, substance abuse	\$0	\$9,787,896	\$9,787,896	0%
Individual and family services	\$17,922,228	\$4,917,740	\$22,839,968	78%
Community food, housing, and other relief services	\$12,186,245	\$246,304	\$12,432,549	98%
Child day care services	\$3,265,639	\$1,031,384	\$4,297,023	76%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Entertainment, Tourism, and Food Service)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Performing arts companies	\$4,605,549	\$4,153,775	\$8,759,324	53%
Commercial Sports Except Racing	\$44,827	\$5,367,397	\$5,412,223	1%
Racing and Track Operation	\$0	\$475,429	\$475,429	0%
Promoters of performing arts and sports and agents	\$1,371,544	\$4,080,668	\$5,452,213	25%
Independent artists, writers, and performers	\$3,768,840	\$37,846	\$3,806,686	99%
Museums, historical sites, zoos, and parks	\$1,361,691	\$2,349,871	\$3,711,562	37%
Amusement parks and arcades	\$0	\$2,568,961	\$2,568,961	0%
Gambling industries (except casino hotels)	\$6,001,535	\$13,957,777	\$19,959,312	30%
Other amusement and recreation industries	\$10,249,153	\$75,054	\$10,324,208	99%
Fitness and recreational sports centers	\$5,208,308	\$1,707,042	\$6,915,350	75%
Bowling centers	\$786,407	\$168,625	\$955,032	82%
Hotels and motels, including casino hotels	\$503,446	\$34,077,746	\$34,581,191	1%
Other accommodations	\$8,510	\$1,571,293	\$1,579,802	1%
Full-service restaurants	\$31,215,208	\$5,438,459	\$36,653,667	85%
Limited-service restaurants	\$58,703,428	\$40,246,795	\$98,950,223	59%
All other food and drinking places	\$17,969,041	\$5,657,942	\$23,626,983	76%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Personal Services)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Automotive repair and maintenance, except car washes	\$19,737,448	\$18,012,452	\$37,749,900	52%
Car washes	\$1,899,496	\$2,202,743	\$4,102,239	46%
Electronic and precision equipment repair and maintenance	\$769,172	\$5,396,840	\$6,166,012	12%
Commercial and industrial machinery and equipment repair	\$557,416	\$2,794,084	\$3,351,500	17%
Personal and household goods repair and maintenance	\$5,445,571	\$884,848	\$6,330,420	86%
Personal care services	\$6,699,485	\$10,842,918	\$17,542,404	38%
Death care services	\$698,146	\$3,454,181	\$4,152,326	17%
Dry-cleaning and laundry services	\$667,974	\$3,330,964	\$3,998,938	17%
Other personal services	\$9,523,906	\$1,150,124	\$10,674,029	89%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Churches, Nonprofits, and Unions)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Religious organizations	\$1,965,901	\$13,431,197	\$15,397,099	13%
Grantmaking, giving, and social advocacy organizations	\$8,296,821	\$9,486,826	\$17,783,647	47%
Business and professional associations	\$1,674,494	\$7,000,328	\$8,674,822	19%
Labor and civic organizations	\$5,934,595	\$8,072,440	\$14,007,035	42%

IMPLAN Sector	Current Spending	Additional Production	Total Demand	%
Services (Household Operations)	On Local Production	for Self-Reliance	For Local Production	Self-Reliant
Private households	\$1,822,118	\$3,555,511	\$5,377,629	34%

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Shuman has authored, coauthored, or edited nine books. His most recent book is *The Local Economy Solution: How Innovative, Self-Financing Pollinator Enterprises Can Grow Jobs and Prosperity* (Chelsea-Green, 2015). One of his previous books, *The Small Mart Revolution: How Local Businesses Are Beating the Global Competition* (Berrett-Koehler, 2006), received as bronze prize from the Independent Publishers Association for best business book of 2006.

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Shuman received an A.B. with distinction in economics and international relations from Stanford University in 1979 and a J.D. from Stanford Law School in 1982. Between 1987 and 1990 he was a W.K. Kellogg National Leadership Fellow. He is also a member of the State Bars of California and the District of Columbia.