

The Economic Impact of Department of Defense, Veterans and Military Retirees, and the Department of Veterans Affairs Activities in Colorado

By

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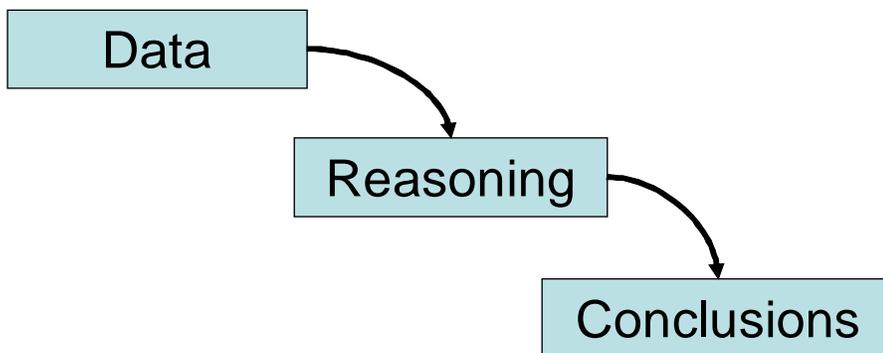


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COLORADO
Gov. John Hickenlooper



May 8, 2018

Greetings:

We have long championed our vibrant military and veterans community in the Centennial State. Over the course of my time as the Governor of Colorado, I've shared in the joy of welcoming units home from deployment and the sorrow of laying to rest American heroes who were killed in the line of duty. Never far from my mind is the daily service and sacrifice that servicemen and women, as well as their families, render for all of us.

An important part in recognizing these contributions is to understand the full scope of economic impact that our military and veterans community make in Colorado. Each job created or retained represents a daily effort that drives our state's impressive economic growth and success. With this in mind, I was pleased to sign into law SB 14-157 concerning the Colorado Department of Military and Veterans Affairs (DMVA) commissioning of the reported value of U.S. Military activities in Colorado. The bill allows the DMVA to take a holistic look at the impacts of Department of Defense activities across our entire state.

In addition to determining that our defense industry was tied with agriculture for the third largest in Colorado, we measured the economic impact of the defense industry to be \$27 billion in 2015. This figure is substantial and reflects positive impacts for every Coloradan. In light of this previous finding, we were pleased to learn that several communities had partnered to follow up on the economic portion of the 2015 study.

We think you will agree that the data contained in this report is impressive in scope and highlights the win-win nature of our role as a major center for national defense. We are fortunate to host several key missions that are critical to the daily security that we enjoy as Americans. Whether it is the sentinels of the North American Aerospace Defense Command or the member of the Colorado National Guard responding at a moment's notice to a wildfire, Colorado is a community that truly supports our military.

Sincerely,

John W. Hickenlooper
Governor



STATE OF COLORADO

DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

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John W. Hickenlooper
Governor

Major General
Michael A. Loh
The Adjutant General

May 4, 2018

Fellow Coloradans,

The Colorado Department of Military and Veterans Affairs is a vital supporter of the efforts of our military across all branches and components. We proactively assist our active duty installations and missions to ensure the sustainment and development of our National Security. As most of you know, there is no better place for our military to train, have access to cutting edge technology and innovation, and to raise their children.

One of the landmark efforts in ensuring that both the Department of Defense and the citizens of the Centennial State understand the full depth and breadth of the military missions in Colorado and the jobs and enterprise they create was the 2015 *Report on the Comprehensive Military Value and Economic Impact of Department of Defense Activities in Colorado*. This report was a grass-roots concept championed by several communities. The report was funded by the Colorado General Assembly and conducted by the Colorado Department of Military and Veterans Affairs. The report marked the first time that we, as a state, had looked closely out how we benefit the Department of Defense and how their activities benefit every Coloradan.

I'm pleased that several of the same communities that helped generate the political will for the first study have come together to fund a continuation, and ultimately an expansion of the economic impact study contained in the 2015 report. It is important for every Coloradan to understand that the economic benefits of the Department of Defense are not confined to military installations, but rather span a broad range of universities, research centers, and corporations. The military members and their families that live and work in Colorado are a big part of the economic engine in our state.

While the first report was limited to Department of Defense-specific activities, this report includes Department of Veterans Affairs expenditures and other ancillary spending that is connected to the military presence in Colorado. I hope that the reader recognizes that this sector represents a significant driver of our State's economy and benefits every citizen either directly or indirectly.

In closing, I would like to thank the community partners that put this report together and hope our partners see fit to sustain this effort in the coming years. I would like to thank the reader for taking an interest in what your United States Armed Forces do every day to keep us safe. It is only through your support that we will have the resources to continue to be the best military force in the world.

Respectfully,

Major General Michael A. Loh
The Adjutant General of Colorado
Executive Director, Colorado Department of Military and Veterans Affairs

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SECTION 1

BACKGROUND AND INTRODUCTION

In 2015, the Colorado State Legislature funded, and then the Colorado Department of Military and Veterans Affairs commissioned a study to address the risks and opportunities for Colorado concerning the location of significant military installations within the state. This was done in response to the 2015 National Security Strategy and the 2014 Quadrennial Defense Review, to provide a strategic context for the Department's national defense objectives.

The 2015 report, titled the Report on the Comprehensive Military Value and Economic Impact of the Department of Defense Activities in Colorado was completed in April 2015. The report was funded by the General Assembly through the Colorado Department of Military and Veterans Affairs. The prime contractor for the report was Whitney, Bradley Brown (WBB), with the economic impact analysis developed by Summit Economics.

In the 2015 report a broad strategic context for the Department of Defense (DoD) was decomposed into ten non-prioritized strategic mission areas for which DoD must organize, train and equip. The degree to which Colorado military personnel, missions and installations facilitate the success of these ten mission areas is one vital measure of the state's collective value to supporting national defense. The ten mission areas are:

- Counter-terrorism and irregular warfare
- Deter and defeat aggression
- Project power despite anti-access/area denial challenges
- Counter weapons of mass destruction
- Operate effectively in cyberspace and space
- Maintain a safe, secure, and effective nuclear deterrent
- Defend the homeland and provide support to civil authorities
- Provide a stabilizing presence
- Conduct stability and counterinsurgency operations
- Conduct humanitarian, disaster relief, and other operations

The 2015 Report confirmed that Colorado Active and Reserve Component forces, DoD civilians and installations contribute significantly to all these mission areas.

The 2017 Report represents both an update to the 2015 study, **and** an expansion in scope of the economic analysis as it relates to the importance of the DoD and national defense to Colorado. The 2017 Report both updates the economic impact of the 2015 Report, but also adds the impact of the Veterans Administration, Military Veterans and Retirees, the Pueblo Chemical Depot, and other defense related activities in Colorado.

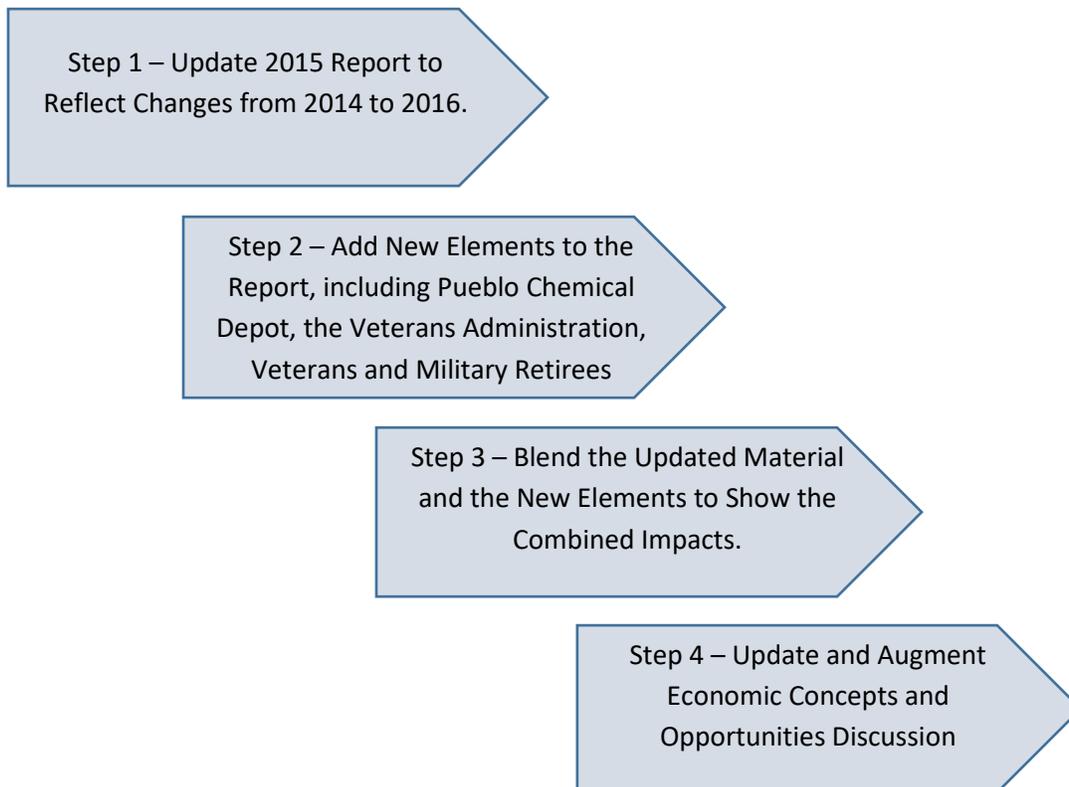
The 2017 study also adds additional observations as to the strengths of Colorado in terms of supporting the nation’s defense posture, as well as builds upon observations as to long term opportunities, vulnerabilities and considerations for Colorado elected officials, business leaders and industry to consider.

Additional information in the 2015 Report included the strengths of Colorado’s installations as well as its vulnerabilities and opportunities. The 2017 report does not address the state’s installations strengths and vulnerabilities, but does offer some general observations on its opportunities.

The 2017 Report has been designed so that the reader can see the essential elements of both the 2015 Report and the 2017 Report side-by-side in selected tables, while presenting explanatory and supporting data tables for just the 2017 Report.

The reader should note that while the titles of the two reports refer to 2015 and 2017, the data contained within the reports refer to 2014 and 2016.

Figure 1 – 2015 to 2017 Report Development Process



SECTION 2

The Economic Impact of the Department of Defense and the Department of Veterans Affairs on Colorado

The economic impact analysis is based on a complex set of inputs from a variety of sources. The data represent the most recent complete set of inputs that can be found, generally for calendar or fiscal year 2016. The analysis addresses the economic activity that has taken place in Colorado that can be attributed to the Department of Defense (DoD) and the Department of Veterans Affairs (VA). The analytical model is focused on three primary domains: 1) the activity that takes place on or in association with the eight assessed military installations in Colorado, 2) the contracts of the DoD and VA to both private contractors and recipients of DoD assistance awards, and; 3) the expenditures of the Veterans Administration and the incomes of military retirees and veterans.

The model examines the direct, indirect and induced effects of having DoD and VA activity located and performed in Colorado. Direct impacts are the first order impacts: the jobs and earnings that come directly from DoD or VA expenditures. Indirect impacts come from expenditures by an entity in the economy for its day to day operations, such as utilities, facility maintenance and support services, and induced impacts come from expenditures of earnings of the direct employees in the economy. The total impacts come primarily from:

- The presence of a combination of active duty military and civilian workforces at the military installations
- The expenditures of those installations for construction and operations
- A large network of recipients of DoD and VA contract and assistance award expenditures for work done in the state
- National Guard and Reserve forces located in the state
- Veteran and Military Retiree pensions and the Veterans Administration Expenditures

The drivers of this impact are the federal dollars that flow into the state as a result of Defense Sector activity. While the rest of the report is focused on how those inflows affect employment, earnings, tax revenues, and job demand by sector, a brief examination of the inflows provides a basis for what follows.

In FY2016, \$18.1 billion flowed into Colorado from the Department of Defense, including:

- Military Pay: \$3.7 billion
- Military Installation Operations: \$1.5 billion
- DoD Contracts and Assistance Awards/Grants: \$6.6 billion
- Veterans Administration, excluding veteran compensation: \$2.0 billion
- Veteran and Military Retiree Compensation/Pensions: \$3.2 billion
- Tricare not through military installations, National Guard, and Pueblo Chemical Depot: \$1.1 billion
- Federal Payments to the State for National Guard

Economic Impact Analysis Overview

The following series of tables presents an outline of the analysis activities used to derive the total economic impact of the Defense Sector on Colorado. Tables 1 through 4 and Figure 1 essentially present the findings at a statewide level.¹

The tables that then follow are organized in a building block fashion, first showing the economic impacts of the military installations and DoD contracts by county level. The five military installations of Fort Carson, Peterson Air Force Base, Schriever Air Force Base, the United States Air Force Academy and the Cheyenne Mountain Air Force Station are grouped into one analysis for El Paso County. Data for Peterson AFB and Cheyenne Mountain Air Force Station are usually found combined together so they are treated as one base for this analysis. Buckley Air Force Base is shown in the Arapahoe County analysis, the Pueblo Chemical Depot and the Demilitarization process at the facility led by Bechtel is shown in the Pueblo Analysis; and the Greeley Air National Guard Station is shown as the Weld County analysis. Impacts from other activities such as the High- altitude Army Aviation Training Site in Eagle County, National Guard facilities other than the Greeley Air National Guard Site in Weld County, the Pinon Canyon Maneuver Site in Las Animas County, and VA facilities throughout the state are included in the county impact tables.

This section of the report presents the summation of the economic impact analyses based upon IMPLAN and Summit Economic models.

Table 1 presents findings in terms of the employment, earnings, and tax revenues to the State of Colorado that can be attributed to the presence of the DoD, military retirees and veterans, and the VA. Table 1 also presents an estimate of the proportion of Colorado's economy and of its State tax collections that are attributable to them. In summary it can be said that the DoD and VA are responsible for around 8% of the State's total economy in terms of employment, earnings and State tax revenues.

- Total employment attributable to the Defense Sector in Colorado is just under 247,000 or 7.5% of the total state wage and salary employment. The 2015 Report Indicated a total of 169,000 jobs were attributable just to the DoD.
- Labor income associated with the employment impact is approximately \$16.4 billion, 7.4% of total statewide wage and salary labor income, reflecting the relatively higher wages and benefits within the aerospace and defense private sector industries. Labor income in the 2015 Report was about \$11.7 billion.
- Based on those earnings, and subsequent expenditures of the earnings, approximately 7.3% of total Colorado tax revenue is due to the presence of the DoD, veterans and retirees, and the VA in the state. The 2015 figure was 5.5%.

¹ The impacts are derived from IMPLAN and Summit Economics modeling. See methodology explanation in Section 5 of this report.

- Of the 247,000 jobs, all Front Range Counties represent about 94% of the total impact, and approximately 179,000 jobs (72%) are in the four counties that contain the major military installations.
- El Paso County represents about 49% of the total statewide impact.

In addition to fiscal impacts to the State of Colorado, local governments, school districts, and special districts also benefit from the presence of the DoD and the VA through property taxes on individual homes and businesses that are supported by DoD and VA dependent incomes, and local sales taxes generated from those incomes. Additionally, the installations themselves are customers of the local utility providers, contributing to the economies of scale of each utility. It is expected that the sum total of revenues significantly exceeds that of the revenue to the State.

Table 1 - Fiscal Impacts on the State of Colorado from Defense Sector Related Employment, Earnings and Expenditures. 2016

Total 2016 Colorado Employment	3,287,598
Total Employment from Defense Sector Expenditures	246,723
Ratio - Defense Sector to Total Labor	7.5%
Total State Labor Income (*)	\$ 220,906,483,477
Total Labor Income from Defense Sector Related Earnings	\$ 16,357,135,201
Ratio - Defense Sector to Total Employment	7.4%
Total Actual State Sales Tax Collections, 2016	\$ 2,596,355,335
Total State Sales, Use and Excise Tax Collections, 2016	\$ 3,971,573,409
Total State Sales Tax Collections from Defense Sector Related Expenditures, 2016	\$ 175,512,061
Total State Sales, Use and Excise Tax Collections from Defense Related Expenditures	\$ 268,475,976
Ratio - Estimated Sales Tax from Defense Sector Related Expenditures to Total Sales Tax	6.8%
Total State Personal Income Tax Collections	\$ 6,408,323,310
Total State Personal Income Tax Collections from Defense Related Expenditures, 2014	\$ 492,225,740
Ratio - Defense Sector to Total Income Tax	7.7%
Total State Corporate Income Tax Collections	\$ 626,109,654
Total State Corporate Income Tax Collections from Defense Related Expenditures, 2016	\$ 46,987,424
Ratio - Defense Sector to Total Labor	7.5%
Total State License, Motor Vehicle, Regulatory & Business, and Other Tax Collections	\$ 686,467,479
Total State "Other" Tax Collections from Defense Related Expenditures, 2016	\$ 51,517,076
Ratio - Defense Sector to Total Labor	7.5%
Total Revenue to the State of Colorado from Taxes Derived Directly or Indirectly from Defense Sector Related Activities, 2016	\$ 859,206,216
Total State Revenues from All Sources, 2016	\$ 11,819,158,006
Share of Total State Tax Revenues from Defense Sector Related Activities	7.3%

*Personal income equals labor income plus incomes from other sources such as pensions and proprietor income. Colorado total personal income exceeded \$288b in 2016.

Source: Summit Economics, LLC; Colorado Department of Revenue, 2016 Annual Report; BEA Table SA04

Impact Drivers

The total employment impact of the DoD and the VA in Colorado is derived from six different streams of expenditures. The total impact of 246,723 jobs is attributable to the drivers listed below.

- Military Installations – 96,402 (includes on-base National Guard/Reserves and Tricare)
- DoD Contracts and Awards - 54,898
- National Guard and Reserves – 2,449
- Veterans Administration – 38,009
- Veterans and Military Retirees - 29,181
- Non Installation Budget Tricare – 13,149
- Trade Flow Effects – 12,583

Tables 2 and 3 then separate out the employment impacts of these drivers by county and congressional district. The employment impacts include jobs created in one county due to the military installation, DoD contracting or VA expenditures in another, termed the *trade flow effect*. Jobs created in the counties without military installations can be attributed to the trade flow effect, DoD contracts and assistance, VA expenditures, veterans and military retirees or National Guard facilities.

Table 2 contains a column headed Total DoD Impact Comparable to 2014. That column only contains installations and drivers that were also included in the 2015 analysis. Next to that is a column for Total DoD Impact in 2014. That column contains the findings in the 2015 report. The difference between the two shows the change that has occurred in the intervening two years.

Table 2 - Total Defense Sector Related Employment in Colorado - 2016

Direct, Indirect and Induced Employment from Military Installation Operations, DoD Contracts & Assistance Awards, National Guard, the VA, Veteran and DoD Retiree Incomes in Each County. Includes Trade Flow Impacts

						Additions to 2015 Study				Total DoD Impact in 2014	
	Arapahoe County	El Paso County	Weld County	DoD Contracts	National Guard/Reserves (*)	Pueblo County Facility	Other Tricare, Non Mil Base	Veterans Administration Impacts (**)	Veteran and Retiree Impacts		Total 2016 Colorado Defense Impact
	Bases	Bases	Bases								
Adams	668	234	3	948	333	-	233	2,406	2,323	7,148	2,481
Alamosa	2	18	-	-	8	-	7	90	88	214	58
Arapahoe	17,359	1,674	2	20,866	-	-	1,745	3,118	2,736	47,499	37,772
Archuleta	0	3	-	-	6	-	13	83	110	216	35
Baca	0	3	-	-	2	-	1	14	30	51	13
Bent	2	5	-	17	3	-	5	72	52	156	27
Boulder	156	208	3	5,811	216	-	108	600	1,240	8,342	3,234
Broomfield	57	38	0	1,030	51	-	26	260	313	1,776	449
Chaffee	5	33	-	-	9	-	21	90	167	325	78
Cheyenne	1	4	-	-	-	-	1	10	11	27	5
Clear Creek	11	30	-	-	5	-	3	63	72	184	60
Conejos	1	5	-	-	4	-	3	55	44	113	27
Costilla	0	2	-	-	2	-	4	36	41	85	12
Crowley	0	1	-	-	-	1	3	31	36	73	1
Custer	1	9	-	-	2	-	11	40	61	123	19
Delta	2	3	-	-	16	-	31	325	274	650	83
Denver	1,591	1,284	3	1,128	525	-	231	9,035	2,702	16,498	6,025
Dolores	0	0	-	-	-	-	1	17	11	30	0
Douglas	650	1,579	-	57	159	-	340	1,275	1,582	5,642	2,801
Eagle	19	57	-	8	60	-	17	68	159	388	214
EL Paso	128	77,800	0	22,217	-	46	8,677	6,853	5,313	121,035	107,016
Elbert	57	25	-	2	12	-	29	113	200	438	136
Fremont	8	90	-	-	40	3	76	335	467	1,022	188
Garfield	18	17	-	1	30	-	19	217	251	554	182
Gilpin	1	3	-	-	3	-	3	33	45	87	18
Grand	8	15	-	-	7	-	9	52	110	202	57
Gunnison	2	14	-	-	8	-	7	48	70	148	53
Hinsdale	0	0	-	-	-	-	1	2	10	13	0
Huerfano	0	7	-	-	3	2	9	65	70	158	24
Jackson	1	1	-	-	-	-	1	5	12	19	1
Jefferson	412	375	-	591	298	-	379	3,370	3,378	8,802	2,769
Kiowa	1	1	-	-	-	-	1	2	6	11	2
Kit Carson	3	13	-	-	4	-	22	29	47	119	34
Lake	2	2	-	-	4	-	29	24	38	99	23
LaPlata	12	22	-	3	47	-	1	189	318	591	168
Larimer	81	64	1	219	185	-	246	1,711	1,853	4,359	1,173
Las Animas	1	50	-	11	-	-	16	125	106	308	27
Lincoln	3	5	-	-	2	-	4	26	34	74	19
Logan	7	5	-	-	10	-	7	84	144	258	61
Mesa	11	23	-	345	99	-	104	2,658	1,110	4,351	770
Mineral	0	1	-	-	-	-	1	3	8	12	1
Moffet	3	4	-	-	7	-	4	81	86	186	42
Montezuma	0	2	-	-	-	-	19	112	172	305	2
Montrose	3	19	-	-	41	-	37	372	292	765	126
Morgan	15	12	-	-	15	-	8	96	129	275	98
Otero	1	10	-	1	50	3	17	113	126	322	60
Ouray	0	1	-	-	2	-	4	22	41	70	13
Park	3	21	-	2	9	-	21	127	158	340	66
Philips	1	1	-	-	2	-	2	10	31	47	13
Pitkin	13	37	-	-	9	-	2	27	66	154	90
Prowers	1	6	-	-	6	-	5	61	82	162	38
Pueblo	24	542	-	1,553	107	2,212	231	1,590	825	7,084	1,404
RioBlanco	1	3	-	-	4	-	4	40	50	100	21
Rio Grande	1	9	-	-	6	-	9	62	74	161	40
Routt	11	28	-	-	12	-	10	45	114	220	95
Saguache	0	1	-	-	3	-	2	32	44	83	18
SanJuan	0	0	-	20	-	-	1	2	4	27	20
SanMiguel	1	10	-	-	-	-	1	15	35	62	10
Sedgwick	1	0	-	-	-	-	2	19	20	43	1
Summit	11	22	-	-	15	-	19	38	114	219	103
Teller	0	90	-	31	12	-	96	175	274	680	173
Washington	3	2	-	-	2	-	1	21	32	60	16
Weld	129	92	552	37	35	-	205	1,301	730	3,082	1,196
Yuma	5	3	-	-	5	-	4	14	45	76	33
Total	21,511	84,642	565	54,898	2,499	2,267	13,149	38,009	29,181	246,723	169,792

* National Guard includes both full time and part time positions. National Guard for Arapahoe, El Paso and Weld County are included in their respective Military Installation figures. The balance are shown at the location of the National guard facility.

** The impacts of VA operations and programs, VA Contracts, non- pension Veterans Benefits are combined.

Sources: Summit Economics, using Implan Models and data from USASpending.gov, BEA, and the Veterans Administration

Table 3 shows the employment impact from the Defense Sector in 2016 by county, sorted by Congressional District. By including the VA, military retirees, veterans and the Pueblo Chemical Depot, the employment by Congressional District increases significantly from 2014 to 2016.

Table 3 - Total DoD and VA Related Employment by Congressional District, 2016																
County	Employment by Congressional District by County							Employment by Congressional District by County								
	CD1	CD2	CD3	CD4	CD5	CD6	CD7	CD1	CD2	CD3	CD4	CD5	CD6	CD7		
Adams						500	6,648	Kit Carson						119		
Alamosa			214					Lake			99					
Arapahoe		475		475		46,549		LaPlata			591					
Archuleta			216					Larimer		4,359						
Baca				51				Las Animas			308					
Bent				156				Lincoln					74			
Boulder		8,176		167				Logan					258			
Broomfield		1,012					764	Mesa			4,351					
Chaffee					325			Mineral			12					
Cheyenne				27				Moffet			186					
Clear Creek		184						Montezuma			305					
Conejos			113					Montrose			765					
Costilla			85					Morgan					275			
Crowley				73				Otero					322			
Custer			123					Ouray			70					
Delta			650					Park						340		
Denver	15,838						660	Philips						47		
Dolores			30					Pitkin			154					
Douglas				5,642				Prowers					162			
Eagle			388					Pueblo			7,084					
EL Paso					121,035			RioBlanco			100					
Elbert				438				Rio Grande			161					
Fremont					1,022			Routt			220					
Garfield			554					Saguache			83					
Gilpin		87						SanJuan			27					
Grand		202						SanMiguel			62					
Gunnison			148					Sedgwick					43			
Hinsdale			13					Summit		219						
Huerfano			158					Teller						680		
Jackson			19					Washington						60		
Jefferson	88	528					8,186	Weld						3,082		
Kiowa				11				Yuma						76		
								Total by CD	15,926	15,242	17,290	11,557	123,401	47,050	16,257	
								Colorado Total	246,723							
								2014 Total	5,812	5,379	3,578	4,997	107,519	37,190	5,317	
								Colorado Total	169,792							

Source: Summit Economics, LLC

Figure 2, below, graphically shows the employment impacts across the state by county both in 2014 and 2016. The movement of most counties from few Defense Sector related jobs in 2014 to larger impacts in 2016 is attributable to the addition to the analysis of the impact of the VA, veterans and military retirees.

Figure 2: Distribution of Impacts by County, 2014 and 2016

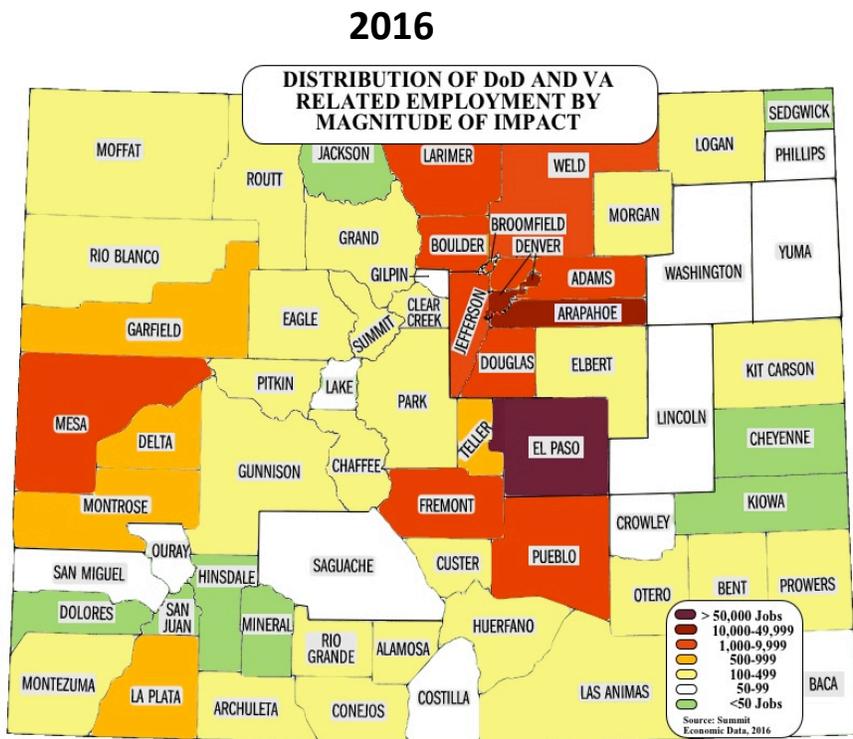
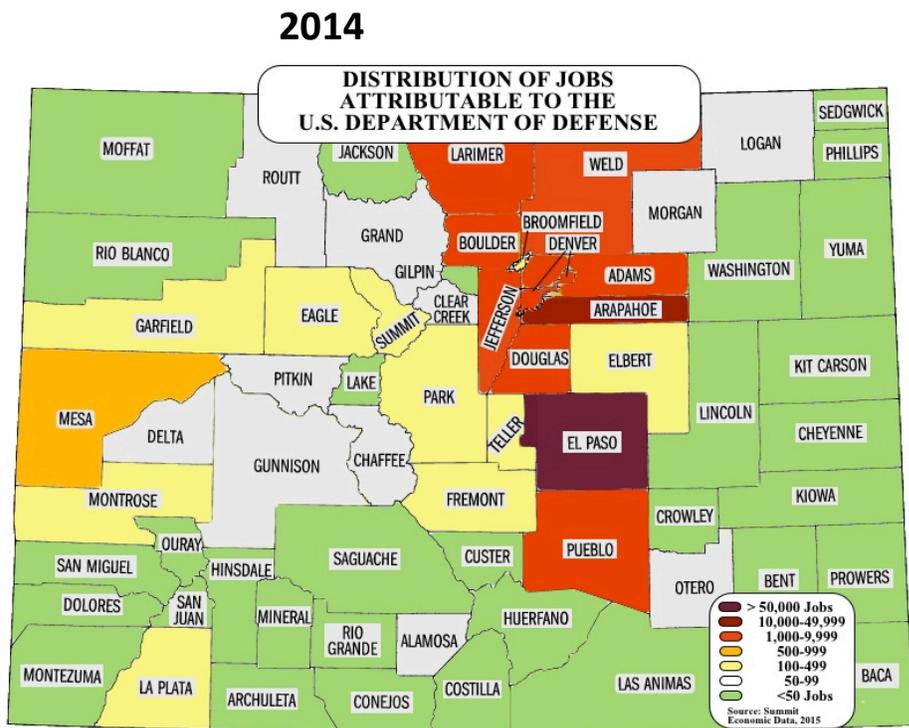


Table 4 breaks out earnings for the four counties with significant military installations, as well as the remainder of the state. The distribution of those earnings by county will be very similar to the employment impacts shown graphically in Figure 1.

Table 4 - Total DoD & VA Related Earnings, 2016			
	<u>Total Employment</u>		<u>Total Labor Income</u>
Arapahoe	47,499	\$	3,847,709,020
El Paso	121,035	\$	7,600,202,832
Pueblo	7,084	\$	295,323,861
Weld	3,082	\$	104,133,288
All Other Counties	68,023	\$	4,509,766,201
Total	246,723	\$	16,357,135,201
* Includes Direct, Indirect and Induced Earnings from Military Base Operations, DoD Contracts and Assistance, National Guard, Reserves, VA, Veterans and Military Retirees, plus trade flow effects			
Source: Summit Economics			

Military Installation County-Level Analysis

Table 5 shows the key military installation inputs into the economic impact model. The inputs are broken down into military and civilian personnel. It shows the number of those two categories of personnel by installation. The civilian category is further decomposed into professional and non-professional sub-categories. Contractors working on the military installations are shown, but not included in the installation impact figures, as the impact of those contractors is separately estimated in later steps when the impact of DoD contractors are analyzed.

The magnitude of the military presence in Colorado can be quickly seen from the presence of almost 75,000 military and civilian personnel at the military installations analyzed.

Data used to build Table 5 was provided by each military installation within the state. Adjustments for professional versus non-professional are based on conversations with installation personnel during the 2015 study. Additional classification of employment into specific North American Industry Classification System (NAICS) categories was required for the analysis phase.

Table 5 - Employment of Military Installations, 2016									
Military Installations	Peterson Air Force Base/ Cheyenne Mtn				Total El Paso County	Buckley - Arapahoe County	Greeley ANG - Weld County	Pueblo Chemical Depot & CSEPP	All Installations
	Ft Carson	Schriever Air Force Base	Air Force Academy						
Employment									
Military	25,514	5,632	2,026	6,113	39,285	7,925	305	400	47,915
Civilian									
Prof, excl contractors	3,264	3,223	506	1,387	8,380	3,577	12	58	12,026
Non Professional	3,264	1,074	169	491	4,998	226		58	5,281
Contractors		1,299	4,175	585	6,059	2,069		1,366	9,494
Total	32,041	11,228	6,876	8,576	58,721	13,796	317	1,881	74,715

Military employment includes active duty and national guard and reserves stationed on the installation.
Civilian employment separated into two categories: professional and non professional. Splits are approximate.
Contractor employment is provided separately by each installation and is limited to those on the installation, except for Pueblo Chemical Depot. Limited information provided on installation contractors.

Sources: Summit Economics, LLC and Reports/Briefings Provided by Each Installation

In addition to the employment impacts at the installations, each installation spends significant funds to operate. For those familiar with impact analysis, these sorts of expenditures are normally included in employment multipliers; however, for Federal operations they are not included in the IMPLAN model. As a consequence, certain expenditures must be separately estimated and their impacts analyzed. Expenditures for operations and construction at military installations are obligated using several different methods of funding. Many expenditures are performed by contract, while some are made using purchase cards and direct billing. No central reporting source was found that reported expenditures by these categories, so Table 6 presents an approximation of the split. The approximation is based on interviews with several military base budget or base operation managers.

The economic impact of the contract expenditures is then analyzed separately from the impacts of the direct expenditures not shown as DoD contract expenditures. For this analysis, half of all operations and maintenance expenditures, and all construction and “other” spending excluding health care, are assumed to be contract based. That means that their impact is estimated in a later step to be shown in Table 7. The remaining direct expenditures at the installations are added to the impacts resulting from the military installation personnel.

Table 6 - Expenditures at Military Installations, excluding DoD Contracts, 2016									
Military Installations	Peterson Air Force Base/ Cheyenne Mtn				Total El Paso County	Buckley - Arapahoe County	Greeley ANG - Weld County	Pueblo Chemical Depot & CSEPP	All Installations
	Ft Carson	Schriever Air Force Base	Air Force Academy						
Expenditures									
O&M	\$ 316,600,000	\$ 73,272,498	\$ 13,169,119	\$ 198,856,452	\$ 601,898,069	\$ 50,824,527	\$ 600,000		\$ 653,322,596
Military Construction	\$ 103,000,000	\$ 35,847,312	\$ 27,872,085	\$ 46,494,152	\$ 213,213,549	\$ 15,807,307	\$ 15,200,000	\$ 1,200,000	\$ 245,420,856
Other Expenditures	\$ -	\$ 394,235,200	\$ 669,224,000	\$ 35,203,000	\$ 1,098,662,200	\$ 68,489,669		\$ 136,000,000	\$ 1,303,151,869
Total Expenditures	\$ 419,600,000	\$ 503,355,010	\$ 710,265,204	\$ 280,553,604	\$ 1,913,773,818	\$ 135,121,503	\$ 15,800,000	\$ 137,200,000	\$ 2,201,895,321

Expenditures were allocated to various representative NAICS classifications in order to more accurately model the impacts.
DOD Contractor impact models. In general, only O&M contained expenditures that were not contract based. Pueblo Chemical Depot data based on phone conversations with the prime contractor Bechtel and examination of DoD Prime and Sub Contracts in USASpending.gov.

Source: Summit Economics, LLC

The non-contract operations and maintenance (O&M) expenditures shown in Table 6 were then broken down into different industry classifications or NAICS (National Industrial Classification System) codes. Each different NAICS code has a different economic impact. The NAICS codes and the distribution between NAICS codes were selected to create a representative look at how those expenditures might look if precise expenditure records were available. The non-contract expenditures at the military installations in El Paso County were combined. Generally, these expenditures were modeled as a combination of utilities, printing, educational services, transportation, social assistance, food services, furniture and other support activities.

Table 7 presents a summary of the largest DoD contract awards in El Paso and Arapahoe Counties by NAICS modeled in the analysis. Similar steps were taken to assess the impacts of DoD contracts in Weld and Pueblo counties, as well as other counties with large DoD contract totals.

DoD contract awards were obtained from the federal on-line database.² All contract awards given in 2016 were downloaded from the site, and then subjected to sorting and categorizing. The total number of contract actions awarded in all of Colorado exceeded 25,000. Any contract can have multiple actions in a given year. The contracts assessed included both prime and subcontract awards by place of performance. Assistance Awards and Grants were analyzed separately.

² www.USASpending.gov

Table 7 - Ten Largest DoD Contracts by NAICS, Arapahoe and El Paso Counties - 2016

Total DoD Contracts - Arapahoe County		% of Total
481212	Nonscheduled Chartered Freight Air Transportation	76.2%
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	10.0%
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	3.3%
336414	Guided Missile and Space Vehicle Manufacturing	2.8%
541330	Engineering Services	1.3%
611512	Flight Training	0.8%
236220	Commercial and Institutional Building Construction	0.7%
237310	Highway, Street, and Bridge Construction	0.5%
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	0.5%
511210	Software Publishers	0.4%
	All Others	3.5%
Total DoD Contracts - El Paso County		% of Total
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	25.7%
236220	Commercial and Institutional Building Construction	17.1%
541512	Computer Systems Design Services	14.0%
541330	Engineering Services	10.0%
561210	Facilities Support Services	6.7%
517919	All Other Telecommunications	3.3%
517110	Wired Telecommunications Carriers	2.1%
517410	Satellite Telecommunications	2.1%
237310	Highway, Street, and Bridge Construction	1.6%
541710	Research and Development in Biotechnology	1.3%
	All Others	16.0%

Source: Summit Economics, USASpending.gov

Outputs from the Economic Analysis

Once the data were collected, it was entered into economic impact models created using IMPLAN software. IMPLAN is a nationally recognized modeling system, widely used for private and public sector projects.³

Models were built for each county that contained a large military installation (El Paso, Arapahoe, Pueblo and Weld). The modeling was done in stages, with the first analysis of the impacts of the military and civilian personnel, followed by a second run of just the operation expenditures, followed by a third run with just the DoD Contract and Assistance expenditures. Each run was then combined. The combined impacts represented the first round of impacts within El Paso, Arapahoe and Weld counties. Additional runs were then performed to analyze the economic impact of veterans and military retiree pensions, while another set of runs were completed to analyze the impacts of VA expenditures, including VA contracts and awards.

³ IMPLAN is a product of IMPLAN Group, LLC. It has become an industry standard.

Because the analysis is concerned with the impact upon the entire state of Colorado, additional modeling efforts were then required. Another series of analyses were then performed to assess the trade flow impacts of expenditures in the four counties upon other counties in Colorado. The trade flow represents how economic activities in one county can impact the economies of other counties through the purchases made by the military installation, its personnel, firms that support the installation, and people who have jobs due to the presence of the installations when they spend their earnings throughout the state. By combining the trade flow effects with the impacts in the four military installation counties, a statewide total was created.

Table 8 shows the combined impact of all seven military installations in the four counties of El Paso, Arapahoe, Pueblo and Weld. In just these four counties, total employment in Colorado is more than 161,000 higher as a result of Defense Sector activities than it would be otherwise. The total labor income in the four counties created by Defense Sector activities is \$10.7 billion. Impacts occurring within other counties were shown earlier in Tables 2-4.

Table 8 - Combined El Paso, Arapahoe, Weld and Pueblo Impacts, FY2016

On Base Military and Non Contract Civilian Personnel				
This includes all Military and Civilian Employees. Excludes Contractors, O&M and MilCon				
	Employment	Labor Income	Value Added	Output
Direct	65,223	\$ 5,085,621,667	\$ 10,464,629,071	\$ 12,911,241,386
Indirect	4,598	\$ 236,880,088	\$ 387,627,627	\$ 608,983,128
Induced	20,143	\$ 879,421,021	\$ 1,642,829,975	\$ 2,633,703,182
	<u>89,964</u>	<u>\$ 6,201,922,776</u>	<u>\$ 12,495,086,673</u>	<u>\$ 16,153,927,696</u>
Military Base O&M. Excludes Contract O&M and MilCon.				
	Employment	Labor Income	Value Added	Output
Direct	3,071	\$ 155,023,333	\$ 175,181,346	\$ 304,674,434
Indirect	1,337	\$ 24,177,359	\$ 40,639,386	\$ 64,792,139
Induced	2,030	\$ 83,361,184	\$ 63,480,288	\$ 102,286,159
	<u>6,438</u>	<u>\$ 262,561,876</u>	<u>\$ 279,301,020</u>	<u>\$ 471,752,732</u>
Combined Military & Civilian Employees and Non Contract O&M.				
	Employment	Labor Income	Value Added	Output
Direct	68,294	\$ 5,240,645,000	\$ 10,639,810,417	\$ 13,215,915,820
Indirect	5,935	\$ 261,057,447	\$ 428,267,013	\$ 673,775,267
Induced	22,173	\$ 962,782,205	\$ 1,706,310,263	\$ 2,735,989,341
	<u>96,402</u>	<u>\$ 6,464,484,652</u>	<u>\$ 12,774,387,693</u>	<u>\$ 16,625,680,428</u>
DOD Contracts and Assistance, & Milcon				
	Employment	Labor Income	Value Added	Output
Direct	21,269	\$ 2,150,491,898	\$ 2,565,404,496	\$ 5,455,673,141
Indirect	12,167	\$ 714,387,755	\$ 1,017,933,311	\$ 1,576,865,641
Induced	11,237	\$ 529,440,493	\$ 950,193,547	\$ 1,503,455,680
	<u>44,673</u>	<u>\$ 3,394,320,145</u>	<u>\$ 4,533,531,354</u>	<u>\$ 8,535,994,462</u>
Combined Military & Civilian Employees, Non Contract O&M, and DOD Contracts and Assistance				
	Employment	Labor Income	Value Added	Output
Direct	89,563	\$ 7,391,136,898	\$ 13,205,214,913	\$ 18,671,588,961
Indirect	18,102	\$ 975,445,202	\$ 1,446,200,324	\$ 2,250,640,908
Induced	33,410	\$ 1,492,222,698	\$ 2,656,503,810	\$ 4,239,445,021
	<u>141,075</u>	<u>\$ 9,858,804,797</u>	<u>\$ 17,307,919,047</u>	<u>\$ 25,161,674,890</u>
Veterans Administration and VA Contracts for Services				
	Employment	Labor Income	Value Added	Output
Direct	8,056	\$ 356,149,909	\$ 385,506,834	\$ 647,143,556
Indirect	1,102	\$ 57,414,858	\$ 92,020,229	\$ 147,729,037
Induced	1,726	\$ 75,179,548	\$ 139,236,066	\$ 223,410,691
	<u>10,884</u>	<u>\$ 488,744,315</u>	<u>\$ 616,763,129</u>	<u>\$ 1,018,283,284</u>
Other Tricare				
	Employment	Labor Income	Value Added	Output
Direct	269	\$ 12,798,830	\$ 13,778,762	\$ 22,567,266
Indirect	40	\$ 2,117,931	\$ 3,427,772	\$ 5,435,697
Induced	64	\$ 2,772,738	\$ 5,157,973	\$ 8,160,902
	<u>373</u>	<u>\$ 17,689,499</u>	<u>\$ 22,364,507</u>	<u>\$ 36,163,865</u>
Veterans and Military Retirees				
	Employment	Labor Income	Value Added	Output
Direct	-	\$ -	\$ -	\$ -
Indirect	-	\$ -	\$ -	\$ -
Induced	9,289	\$ 411,484,252	\$ 781,129,142	\$ 1,188,123,743
	<u>9,289</u>	<u>\$ 411,484,252</u>	<u>\$ 781,129,142</u>	<u>\$ 1,188,123,743</u>
Grand Total DoD Impacts (Active Duty, Retirees, Veterans, Installation O&M, DoD Contracts)				
	Employment	Labor Income	Value Added	Output
Direct	97,888	\$ 7,760,085,637	\$ 13,604,500,509	\$ 19,341,299,783
Indirect	19,244	\$ 1,034,977,991	\$ 1,541,648,325	\$ 2,403,805,642
Induced	44,489	\$ 1,981,659,235	\$ 3,582,026,991	\$ 5,659,140,357
	<u>161,621</u>	<u>\$ 10,776,722,863</u>	<u>\$ 18,728,175,825</u>	<u>\$ 27,404,245,782</u>

Source: Summit Economics, LLC

Table 9 shows the economic impacts resulting just from the military and non-contractor civilians at the four El Paso County military installations (Fort Carson, Peterson AFB/Cheyenne Mountain AFS, Schriever AFB, and the US Air Force Academy). In summary, it shows the direct employment of 52,600 personnel creates an additional 19,400 indirect and induced jobs. The non-contract O&M (operations & Maintenance) expenditures then create about 5,800 more jobs, and finally the DoD contracts and expenditures create 22,200 jobs, for a grand total of 100,000 total direct, indirect and induced jobs. The direct employment figures for military and non-contractor civilians come from the military installations. The non-contract O&M from contracts and assistance awards are produced by IMPLAN, based on the dollar expenditures. Total labor income, which includes wages, benefits and proprietors income, exceeds \$6.5 billion, total value added (GRP) of \$12.1 billion and total economic output is increased by \$17.0 billion.

The economic impact of the operations of the VA, and of the pensions received by veterans and military retirees then adds to the installation and contractor impacts. Approximately 11,600 additional jobs are supported from VA expenditures and military retirees and veterans, along with \$510 million in labor earnings.

Table 9 - El Paso County Defense Sector Impacts, FY2016

On Base Military and Non Contract Civilian Personnel				
This includes all Military and Civilian Employees. Excludes Contractors, O&M and MilCon				
	Employment	Labor Income	Value Added	Output
Direct	52,662	\$ 3,975,277,243	\$ 8,281,269,537	\$ 10,520,386,168
Indirect	3,364	\$ 160,800,442	\$ 273,203,046	\$ 436,482,343
Induced	16,023	\$ 660,088,376	\$ 1,271,878,074	\$ 2,058,861,606
	<u>72,049</u>	<u>\$ 4,796,166,061</u>	<u>\$ 9,826,350,657</u>	<u>\$ 13,015,730,117</u>
Military Base O&M. Excludes Contract O&M and MilCon				
	Employment	Labor Income	Value Added	Output
Direct	2,612	\$ 135,502,359	\$ 151,210,572	\$ 264,847,002
Indirect	1,252	\$ 20,253,645	\$ 34,857,415	\$ 55,924,818
Induced	1,919	\$ 79,045,582	\$ 56,168,693	\$ 90,942,921
	<u>5,783</u>	<u>\$ 234,801,586</u>	<u>\$ 242,236,680</u>	<u>\$ 411,714,741</u>
Combined Military & Civilian Employees and Non Contract O&M				
	Employment	Labor Income	Value Added	Output
Direct	55,274	\$ 4,110,779,602	\$ 8,432,480,109	\$ 10,785,233,170
Indirect	4,616	\$ 181,054,087	\$ 308,060,461	\$ 492,407,161
Induced	17,942	\$ 739,133,958	\$ 1,328,046,767	\$ 2,149,804,527
	<u>77,832</u>	<u>\$ 5,030,967,647</u>	<u>\$ 10,068,587,337</u>	<u>\$ 13,427,444,858</u>
DOD Contracts and Assistance, & Milcon				
	Employment	Labor Income	Value Added	Output
Direct	12,241	\$ 1,017,647,021	\$ 1,227,619,636	\$ 2,260,453,652
Indirect	4,349	\$ 219,069,897	\$ 354,273,567	\$ 572,841,131
Induced	5,627	\$ 231,742,503	\$ 446,378,593	\$ 722,705,939
	<u>22,217</u>	<u>\$ 1,468,459,421</u>	<u>\$ 2,028,271,796</u>	<u>\$ 3,556,000,722</u>
Combined Military & Civilian Employees, Non Contract O&M, and DOD Contracts and Assistance				
	Empl	Labor Income	Value Added	Output
Direct	67,515	\$ 5,128,426,623	\$ 9,660,099,745	\$ 13,045,686,822
Indirect	8,965	\$ 400,123,984	\$ 662,334,028	\$ 1,065,248,292
Induced	23,569	\$ 970,876,461	\$ 1,774,425,360	\$ 2,872,510,466
	<u>100,049</u>	<u>\$ 6,499,427,068</u>	<u>\$ 12,096,859,133</u>	<u>\$ 16,983,445,580</u>
Veterans Administration and VA Contracts for Services				
	Employment	Labor Income	Value Added	Output
Direct	4,252	\$ 200,533,720	\$ 220,134,592	\$ 367,477,769
Indirect	647	\$ 32,563,288	\$ 54,613,075	\$ 88,929,622
Induced	1,062	\$ 43,749,651	\$ 84,292,545	\$ 136,453,903
	<u>5,961</u>	<u>\$ 276,846,659</u>	<u>\$ 359,040,212</u>	<u>\$ 592,861,294</u>
Other Tricare				
	Employment	Labor Income	Value Added	Output
Direct	212	10,240,234	10,958,491	17,914,267
Indirect	32	1,662,841	2,718,686	4,335,253
Induced	53	2,234,072	4,196,156	6,652,026
	<u>297</u>	<u>14,137,147</u>	<u>17,873,334</u>	<u>28,901,546</u>
Veterans and Military Retirees				
	Employment	Labor Income	Value Added	Output
Direct	-	\$ -	\$ -	\$ -
Indirect	-	\$ -	\$ -	\$ -
Induced	5,313	\$ 218,615,439	\$ 461,278,576	\$ 686,452,478
	<u>5,313</u>	<u>\$ 218,615,439</u>	<u>\$ 461,278,576</u>	<u>\$ 686,452,478</u>
Grand Total DoD Impacts (Active Duty, Retirees, Veterans, Installation O&M, DoD Contracts)				
	Employment	Labor Income	Value Added	Output
Direct	71,979	5,339,200,577	9,891,192,828	13,431,078,858
Indirect	9,644	434,350,113	719,665,789	1,158,513,167
Induced	29,997	1,235,475,623	2,324,192,637	3,702,068,873
	<u>111,620</u>	<u>\$ 7,009,026,313</u>	<u>\$ 12,935,051,254</u>	<u>\$ 18,291,660,898</u>

Source: Summit Economics, LLC

Table 10 shows the impacts of the military installation (Buckley Air Force Base), DoD contracts and assistance awards, the VA and veterans and retirees in Arapahoe County. In total, these expenditures are responsible for more than 43,000 jobs and \$3.5 billion in labor income in Arapahoe County alone. The Buckley figures include both published official personnel counts, as well as an estimate of off-budget personnel at the Aerospace Data Facility.

Table 11 shows the impacts in Weld County. In total, the expenditures are responsible for more than 2,400 jobs and \$79.6 million in labor income. Weld County is home to the Greeley Air National Guard Station. The majority of the impact is due to the presence of military veterans and retirees through both VA expenditures and expenditures of pensions and compensation by the veterans and retirees.

Table 12 shows the impacts in Pueblo County at the Pueblo Chemical Depot. Activities at the Depot are essentially focused on demilitarizing old chemical munitions. After many years of construction of a chemical weapons disposal facility (mostly mustard gas), actual disposal operations began in September 2016 through the Pueblo Chemical Agent – Pilot Destruction Program (PCAPP). In 2016, the construction and operations expenditures, as well as expenditures at the Chemical Storage Emergency Preparedness Plan offices in Pueblo, were responsible for more than 2,200 jobs and \$97.8 million in labor income. Additionally, the presence of the VA and of veterans and retirees created another 2,100 jobs in the county. The total employment impact is 4,360 jobs with earnings of \$181.8 million.

Table 10 - Arapahoe County Defense Sector Impacts, FY2016

On Base Military and Non Contract Civilian Personnel				
	Employment	Labor Income	Value Added	Output
Direct	11,726	\$ 1,074,703,977	\$ 2,072,542,714	\$ 2,265,001,150
Indirect	1,206	\$ 75,117,512	\$ 112,683,234	\$ 169,602,528
Induced	3,972	\$ 213,445,857	\$ 360,085,624	\$ 557,062,294
	<u>16,904</u>	<u>\$ 1,363,267,346</u>	<u>\$ 2,545,311,572</u>	<u>\$ 2,991,665,972</u>
Military Base O&M. Excludes Contract O&M and MilCon.				
	Employment	Labor Income	Value Added	Output
Direct	323	\$ 18,479,463	\$ 22,367,123	\$ 36,691,233
Indirect	56	\$ 3,672,581	\$ 5,392,449	\$ 8,198,301
Induced	76	\$ 4,084,635	\$ 6,892,217	\$ 10,661,075
	<u>455</u>	<u>\$ 26,236,679</u>	<u>\$ 34,651,789</u>	<u>\$ 55,550,609</u>
Combined Military & Civilian Employees and Non Contract O&M.				
	Employment	Labor Income	Value Added	Output
Direct	12,049	\$ 1,093,183,440	\$ 2,094,909,837	\$ 2,301,692,383
Indirect	1,262	\$ 78,790,093	\$ 118,075,683	\$ 177,800,829
Induced	4,048	\$ 217,530,492	\$ 366,977,841	\$ 567,723,369
	<u>17,359</u>	<u>\$ 1,389,504,025</u>	<u>\$ 2,579,963,361</u>	<u>\$ 3,047,216,581</u>
DOD Contracts and Assistance, & Milcon				
	Employment	Labor Income	Value Added	Output
Direct	7,887	\$ 1,081,261,011	\$ 1,266,119,378	\$ 3,071,824,385
Indirect	7,644	\$ 486,975,900	\$ 650,212,080	\$ 981,875,249
Induced	5,335	\$ 286,883,232	\$ 484,193,439	\$ 748,844,570
	<u>20,866</u>	<u>\$ 1,855,120,143</u>	<u>\$ 2,400,524,897</u>	<u>\$ 4,802,544,204</u>
Combined Military & Civilian Employees, Non Contract O&M, and DOD Contracts and Assistance				
	Employment	Labor Income	Value Added	Output
Direct	19,936	\$ 2,174,444,451	\$ 3,361,029,215	\$ 5,373,516,768
Indirect	8,906	\$ 565,765,993	\$ 768,287,763	\$ 1,159,676,078
Induced	9,383	\$ 504,413,724	\$ 851,171,280	\$ 1,316,567,939
	<u>38,225</u>	<u>\$ 3,244,624,168</u>	<u>\$ 4,980,488,258</u>	<u>\$ 7,849,760,785</u>
Veterans Administration and VA Contracts for Services				
	Employment	Labor Income	Value Added	Output
Direct	1,876	\$ 89,172,801	\$ 94,260,604	\$ 151,847,562
Indirect	272	\$ 17,480,139	\$ 26,108,975	\$ 39,540,767
Induced	365	\$ 19,642,315	\$ 33,144,700	\$ 51,267,964
	<u>2,514</u>	<u>\$ 126,295,255</u>	<u>\$ 153,514,279</u>	<u>\$ 242,656,293</u>
Other Tricare				
	Employment	Labor Income	Value Added	Output
Direct	45	2,007,113	2,206,743	3,636,654
Indirect	6	393,445	611,239	946,977
Induced	9	442,112	775,953	1,227,836
	<u>60</u>	<u>2,842,670</u>	<u>3,593,935</u>	<u>5,811,466</u>
Veterans and Military Retirees				
	Employment	Labor Income	Value Added	Output
Direct				
Indirect				
Induced	2,487	\$ 132,599,004	\$ 223,475,398	\$ 343,561,837
	<u>2,487</u>	<u>\$ 132,599,004</u>	<u>\$ 223,475,398</u>	<u>\$ 343,561,837</u>
Grand Total DoD Impacts (Active Duty, Retirees, Veterans, Installation O&M, DoD Contracts)				
	Employment	Labor Income	Value Added	Output
Direct	21,857	2,265,624,365	3,457,496,562	5,529,000,984
Indirect	9,184	583,639,577	795,007,977	1,200,163,822
Induced	12,244	657,097,155	1,108,567,331	1,712,625,576
	<u>43,286</u>	<u>\$ 3,506,361,097</u>	<u>\$ 5,361,071,870</u>	<u>\$ 8,441,790,382</u>

Source: Summit Economics, LLC

Table 11 - Weld County Defense Sector Impacts

On Base Military and Non Contract Civilian Personnel					
This includes all Military and Civilian Employees. Excludes Contractors, O&M and MilCon					
	Employment	Labor Income	Value Added	Output	
Direct	317	\$ 14,717,925	\$ 44,562,460	\$	48,753,941
Indirect	3	\$ 98,961	\$ 157,657	\$	272,142
Induced	51	\$ 1,960,193	\$ 3,744,848	\$	6,200,542
	<u>371</u>	<u>\$ 16,777,079</u>	<u>\$ 48,464,965</u>	<u>\$</u>	<u>55,226,625</u>
Military Base O&M. Excludes Contract O&M and MilCon.					
	Employment	Labor Income	Value Added	Output	
Direct	128	\$ 32,790	\$ 42,917	\$	91,963
Indirect	24	\$ 7,051	\$ 10,165	\$	17,629
Induced	29	\$ 5,272	\$ 10,075	\$	16,683
	<u>181</u>	<u>\$ 45,113</u>	<u>\$ 63,157</u>		
Combined Military & Civilian Employees and Non Contract O&M.					
	Employment	Labor Income	Value Added	Output	
Direct	445	\$ 14,750,715	\$ 44,605,377	\$	48,845,904
Indirect	27	\$ 106,012	\$ 167,822	\$	289,771
Induced	80	\$ 1,965,465	\$ 3,754,923	\$	6,217,225
	<u>552</u>	<u>\$ 16,822,192</u>	<u>\$ 48,528,122</u>	<u>\$</u>	<u>55,352,900</u>
DOD Contracts and Assistance, & Milcon					
	Employment	Labor Income	Value Added	Output	
Direct	19	\$ 132,519	\$ 155,232	\$	375,011
Indirect	10	\$ 22,382	\$ 32,450	\$	56,500
Induced	8	\$ 20,518	\$ 39,234	\$	64,988
	<u>37</u>	<u>\$ 175,419</u>	<u>\$ 226,916</u>	<u>\$</u>	<u>496,499</u>
Combined Military & Civilian Employees, Non Contract O&M, and DOD Contracts and Assistance					
	Employment	Labor Income	Value Added	Output	
Direct	464	\$ 14,883,234	\$ 44,760,609	\$	49,220,915
Indirect	37	\$ 128,394	\$ 200,272	\$	346,271
Induced	88	\$ 1,985,983	\$ 3,794,157	\$	6,282,213
	<u>589</u>	<u>\$ 16,997,611</u>	<u>\$ 48,755,038</u>	<u>\$</u>	<u>55,849,399</u>
Veterans Administration and VA Contracts for Services					
	Employment	Labor Income	Value Added	Output	
Direct	891	\$ 28,674,699	\$ 31,055,330	\$	57,694,714
Indirect	90	\$ 3,480,210	\$ 5,166,034	\$	9,013,580
Induced	113	\$ 4,255,638	\$ 8,132,705	\$	13,467,626
	<u>1,094</u>	<u>\$ 36,410,547</u>	<u>\$ 44,354,069</u>	<u>\$</u>	<u>80,175,920</u>
Other Tricare					
	Employment	Labor Income	Value Added	Output	
Direct	6	263,154	295,792		491,576
Indirect	1	31,939	49,205		76,798
Induced	1	39,055	77,461		114,748
	<u>7</u>	<u>334,148</u>	<u>422,458</u>		<u>683,123</u>
Veterans and Military Retirees					
	Employment	Labor Income	Value Added	Output	
Direct					
Indirect					
Induced	664	\$ 25,832,627	\$ 46,882,271	\$	77,760,447
	<u>664</u>	<u>\$ 25,832,627</u>	<u>\$ 46,882,271</u>	<u>\$</u>	<u>77,760,447</u>
Grand Total DoD Impacts (Active Duty, Retirees, Veterans, Installation O&M, DoD Contracts)					
	Employment	Labor Income	Value Added	Output	
Direct	1,361	43,821,087	76,111,731		107,407,205
Indirect	128	3,640,543	5,415,511		9,436,649
Induced	866	32,113,303	58,886,594		97,625,034
	<u>2,355</u>	<u>\$ 79,574,933</u>	<u>\$ 140,413,836</u>	<u>\$</u>	<u>214,468,888</u>

Source: Summit Economics, LLC

Table 12- Pueblo County Defense Sector Impacts, FY2016

On Base Military and Non Contract Civilian Personnel				
This includes all Military and Civilian Employees. Excludes Contractors, O&M and MilCon				
	Employment	Labor Income	Value Added	Output
Direct	518	\$ 20,922,522	\$ 66,254,360	\$ 77,100,127
Indirect	25	\$ 863,173	\$ 1,583,690	\$ 2,626,115
Induced	97	\$ 3,926,595	\$ 7,121,429	\$ 11,578,740
	640	\$ 25,712,290	\$ 74,959,479	\$ 91,304,982
Military Base O&M. Excludes Contract O&M and MilCon. *O&M IS ALL CONTRACTOR WORK				
	Employment	Labor Income	Value Added	Output
Direct	8	\$ 1,008,721	\$ 1,560,734	\$ 3,044,236
Indirect	5	\$ 244,082	\$ 379,357	\$ 651,391
Induced	6	\$ 225,695	\$ 409,303	\$ 665,480
	19	\$ 1,478,498	\$ 2,349,394	\$ 4,361,107
Combined Military & Civilian Employees and Non Contract O&M.				
	Employment	Labor Income	Value Added	Output
Direct	526	21,931,243	67,815,094	80,144,363
Indirect	30	1,107,255	1,963,047	3,277,506
Induced	103	4,152,290	7,530,732	12,244,220
	659	\$ 27,190,788	\$ 77,308,873	\$ 95,666,089
DOD Contracts and Assistance, & Milcon				
	Employment	Labor Income	Value Added	Output
Direct	1,122	\$ 51,451,347	\$ 71,510,250	\$ 123,020,093
Indirect	164	\$ 8,319,576	\$ 13,415,214	\$ 22,092,761
Induced	267	\$ 10,794,240	\$ 19,582,281	\$ 31,840,183
	1,553	\$ 70,565,162	\$ 104,507,745	\$ 176,953,037
Combined Military & Civilian Employees, Non Contract O&M, and DOD Contracts and Assistance				
	Employment	Labor Income	Value Added	Output
Direct	1,648	\$ 73,382,590	\$ 139,325,344	\$ 203,164,456
Indirect	194	\$ 9,426,831	\$ 15,378,261	\$ 25,370,267
Induced	370	\$ 14,946,530	\$ 27,113,013	\$ 44,084,403
	2,212	\$ 97,755,950	\$ 181,816,618	\$ 272,619,126
Veterans Administration and VA Contracts for Services				
	Employment	Labor Income	Value Added	Output
Direct	1,036	\$ 37,768,689	\$ 40,056,308	\$ 70,123,511
Indirect	93	\$ 3,891,221	\$ 6,132,145	\$ 10,245,068
Induced	186	\$ 7,531,944	\$ 13,666,116	\$ 22,221,198
	1,315	\$ 49,191,854	\$ 59,854,569	\$ 102,589,777
Other Tricare				
	Employment	Labor Income	Value Added	Output
Direct	6	288,329	317,736	524,769
Indirect	1	29,706	48,642	76,669
Induced	1	57,499	108,403	166,292
	8	375,534	474,780	767,730
Veterans and Military Retirees				
	Employment	Labor Income	Value Added	Output
Direct				
Indirect				
Induced	825	\$ 34,437,182	\$ 49,492,897	\$ 80,348,981
	825	\$ 34,437,182	\$ 49,492,897	\$ 80,348,981
Grand Total DoD Impacts (Active Duty, Retirees, Veterans, Installation O&M, DoD Contracts)				
	Employment	Labor Income	Value Added	Output
Direct	2,690	111,439,608	179,699,388	273,812,736
Indirect	288	13,347,758	21,559,048	35,692,004
Induced	1,382	56,973,155	90,380,429	146,820,874
	4,360	\$ 181,760,520	\$ 291,638,865	\$ 456,325,614

Source: Summit Economics, LLC

Piñon Canon

There are 15 full time employees associated with Pinon Canon, earning about \$750,000 per year. The Army also spends about \$100,000 per year making local purchases, and an additional \$500,000 per year on environmental remediation. When there are major exercises, the Army also spends approximately \$125,000 per year on lodging for contractors and government employees per exercise, and \$300,000 on rentals per exercise. Assuming an average of two major exercises per year means that about \$2.2 million is spent in Las Animas County per year.

The impact of those expenditures is that a total of 32 jobs are supported, along with \$1.6 million in earnings.

Average Labor Income of DoD and VA Related Activities

Table 13 shows the average wage of jobs supported by DoD and VA expenditures in the four counties with significant military installations.

Table 13 - Average Labor Income of DoD and VA Related Activities, El Paso, Arapahoe, Pueblo and Weld Counties			
Job Type	Employment	Avg Labor Income	
Direct	97,888	\$	79,275
Indirect	19,244	\$	53,782
Induced	44,489	\$	44,543
Total	161,621	\$	66,679

Source: Summit Economics, LLC

In total, the employment impact of the Defense Sector in the four counties is approximately 161,600 jobs. Labor income, which includes all benefits and labor overheads, totals \$10.8 billion. The average labor income for direct jobs is about \$79,300 per job, while the indirect and induced job averages are somewhat lower. Indirect jobs are those that arise due to providing support directly to the military installations and typically consist of a larger mix of non-professional jobs, and subsequently have lower wages. Induced jobs typically include the general retail and service jobs found in all economies, and have the lowest percentage of highly skilled and highly paid workers.

Average wages vary significantly between sectors. Most military installations have an effective average wage in the \$58,000 per year range, while aerospace and other defense professionals often have wages well above \$100,000 per year. The average labor income is not the same as an average wage. Labor income does include a non-wage component of proprietors' income, and some non-wage benefits. In general, average wages are about 10% lower than average labor income. Wages of indirect and induced workers will more closely reflect the community at large.

The statewide economic impact occurs not just in the four counties with military installations, but throughout the state. Contracts and assistance awards for DoD are identified based on the location where the work is performed by the firm receiving the contract. While the majority of such firms are located throughout the Metro Denver area and in El Paso County, significant numbers are located throughout the state. There are approximately 25,000 separate contracts and assistance award actions let to firms and other entities doing business in Colorado, with more than half of all counties having some recipients of these funds. Tables 14 and 15 show the value of DoD contracts made in all counties of Colorado, and the totals of assistance awards. Assistance awards usually went to local government, schools, and nonprofits, while contracts were for the deliverance of a specific product or service. The economic impacts of the expenditures in all other counties other than El Paso, Arapahoe, Pueblo and Weld counties were separately modeled in IMPLAN, and added to the impacts from the three counties. It is important to note that not all awards are spent in one year, however this is offset by the fact that previous year's awards may still be spent in 2016, with the assumption that they offset each other.

Table 14 - DoD Contracts (Prime and Sub) by County, 2016					
ADAMS	\$	1,027,145,730	LAS ANIMAS	\$	794,872
ARAPAHOE	\$	2,306,136,422	MESA	\$	39,582,600
BENT	\$	336,869	MONTEZUMA	\$	98,145
BOULDER	\$	590,015,638	MONTROSE	\$	379,627
BROOMFIELD	\$	65,510,959	MORGAN	\$	7,544
CHAFEE	\$	250,744	OTERO	\$	30,127
CHEYENNE	\$	29,742	OURAY	\$	49,919
DELTA	\$	65,300	PARK	\$	106,862
DENVER	\$	96,768,914	PITKIN	\$	53,218
DOUGLAS	\$	9,126,923	PUEBLO	\$	53,135,687
EAGLE	\$	1,532,259	ROUTT	\$	31,592
EL PASO	\$	2,143,956,817	SAN JUAN	\$	85,200
ELBERT	\$	1,961,867	SAN MIGUEL	\$	494,927
JEFFERSON	\$	101,397,549	SUMMIT	\$	42,820
LA PLATA	\$	1,050,673	TELLER	\$	11,899,660
LAKE	\$	3,488,888	WELD	\$	2,522,382
LARIMER	\$	78,022,530	WASHINGTON	\$	95,164
Grand Total				\$	6,536,208,170
Source: Summit Economics, LLC and USASpending.gov					

Table 15 - DoD Assistance Awards by County, 2016		
	Total	
ADAMS	\$	4,050,105
ALAMOSA	\$	3,716
ARAPAHOE	\$	14,692,326
BOULDER	\$	49,646,320
DENVER	\$	27,281,061
EL PASO	\$	9,571,779
JEFFERSON	\$	1,485,666
LARIMER	\$	41,649,910
LA PLATA	\$	135,000
TOTAL	\$	148,515,883
Source: Summit Economics, LLC and USASpending.gov		

VA contracts were modeled using county level expenditure reports provided by the VA by expenditure type (construction, general operations, medical care, educational services, vocational rehabilitation and insurance payments). The data were provided by the VA county by county for FY2016. The report, titled GDY, is included in the appendix.

Other Tricare expenditure data by state and county is not available. Tricare expenditures that are not included in military installation budgets were estimated by multiplying the total Tricare expenditures in the US by Colorado's share of Tricare enrollees, and then subtracting the Tricare dollars already modeled in the military installation impacts. They were allocated by county based on the distribution of active duty and retired military personnel by county.

Trade Flow Analysis

As military and civilian employees spend their paychecks, they travel throughout the state for shopping, recreation, tourism, visiting family and friends, and a host of other reasons. As an example, the ski industry of Colorado is made up primarily of skiers from counties other than the county in which the ski resort is located. As military bases purchase goods and services, some of these purchases are made from suppliers outside the home county. These expenditures and their impacts are defined as the *trade flow effects*.

To assess the trade flow effects, additional IMPLAN modeling was performed to determine the number of jobs created in all other counties as a result of economic activity in a military installation county. For example, the impacts of the military installations in El Paso County, plus the DoD contracts and assistance awards were run through a separate IMPLAN model that calculated the employment and earnings impacts in the remaining 63 counties of Colorado. This was done for the

installations in El Paso County, Buckley AFB in Arapahoe County, the Pueblo Chemical depot, and Greeley ANGS in Weld County.

The trade flow job creation totaled more than 12,000 jobs in the rest of Colorado. The employment impact of this trade flow is shown in Table 2, included with the impacts from all DoD and VA impact streams.

National Guard Analysis

Estimates were obtained of National Guard and Reserve employment. The figures represent employment by place of work, but do not distinguish between full time and part time employment. The number of National Guard personnel by county was not available, so locations of National Guard facilities were used to approximate the county level Guard employment. The earnings of these Guard units were also run through IMPLAN models, based on estimated earnings of \$7,600 per year per Guardsman. Actual earnings, in either total or an average earnings figure, were not available. Summit Economics, using the National Guard pay schedules, estimated the \$7,600 average based on an assumption that 90% of the reservists earn \$4,000 for the one weekend per month and two weeks per year requirement, while 10% are full time earning \$40,000 per year. The total number of National Guard remains unchanged from the 2015 Report, however the report tables now show FTE (full time equivalents) instead of actual positions.

Colorado Economic Value Added

Table 16 presents the DoD, Veterans, Retirees and VA contribution to the Gross Regional Product (GRP) of the State of Colorado. GRP is equivalent to GDP (Gross Domestic Product) on a national level. In addition to share of employment and share of income, share of GDP is a key measure as to the total contribution of any sector. Using the GRP share to refer to how much a particular industry contributes to an economy is a widely used measure. The GRP figure is significantly higher than the employment and earnings share due to the nature of defense spending. Gross Regional Product is essentially a measure of the value added by an activity as opposed to simply its total sales or output value. Military and contracting activities have a high value added element to them, raising the overall GRP ratio above share of employment.

Table 16 - Total 2016 Colorado Gross Regional Product Attributable to DoD, Veterans and Military Retirees and the Veterans Administration	
Total 2016 Value Added of DoD, Veterans/Retirees and VA	\$ 24,980,329,174
Total Colorado Value Added, All Sources	\$ 293,324,385,295
Total Percentage of State Value Added Due to DoD, Veterans, Retirees and VA	8.52%
* Value Added is also known as Gross Regional Product	
Source: Summit Economics & Implan	

Comparison of 2014 and 2016 Military Installation Personnel and Employment

With a significant degree of dependence upon DoD revenues, the stability of the DoD in Colorado is of great importance to the state. Table 17 shows how the contribution attributable to the military installations and DoD contractors has changed between the 2015 study and the 2017 study within the two counties that make up the bulk of the military presence in Colorado. As can be seen, over the past two years, the total impact of the DoD has increased by about 5% in Arapahoe County and has declined by 6.0% in El Paso County. The decline in El Paso County however is primarily due to a change in methodology that overrode model estimated wages with actual wages reported. The increase in Arapahoe County is largely due to the inclusion of off-budget personnel working at the Aerospace Data Facility in the 2017 study that was left out of the 2015 analysis. The off-budget employment is an approximation.

Changes in VA expenditures and veteran/retiree expenditures are not available due to not being included in the 2015 study. A more detailed and longer time horizon comparison of DoD contracting since 2006 is presented in Figures 5-8.

Table 17 - Comparison of Direct and Total DoD Military Installation Employment: 2014-2016			
		<u>Arapahoe</u>	<u>EPC</u>
2014	Military Personnel	8,930	51,957
	Indirect & Induced Impact	3,315	26,463
		<hr/>	<hr/>
		12,245	78,420
2016	Military Personnel	11,726	52,662
	Indirect & Induced Impact	5,178	19,387
		<hr/>	<hr/>
		16,904	72,049
Comparison of DoD Operations, Milcon & Contract Empl		<u>Arapahoe</u>	<u>EPC</u>
2014	Direct Employment	9,247	16,654
	Indirect & Induced Impact	14,818	11,839
		<hr/>	<hr/>
		24,065	28,493
2016	Direct Employment	8,210	14,853
	Indirect & Induced Impact	13,111	13,147
		<hr/>	<hr/>
		21,321	28,000
Comparison of Total Employment		<u>Arapahoe</u>	<u>EPC</u>
	2014 Total Direct, Indirect and Induced	36,310	106,913
	2016 Total Direct, Indirect and Induced	38,225	100,049
	Percent Change 2014-2016	5.3%	-6.4%
Source: Summit Economics			

SECTION 3

Other Economic Analyses

The economic impact analysis presented above represents the most common analysis used nationally to document jobs, income, value added, and output created by an economic sector such as DoD or VA funding of installations, operations and contracts executed in Colorado. There are other, more subtle impacts that in the course of a region’s history can be just as important. These are discussed below.

The figure below shows how the DoD and VA would compare with other basic industry sectors if it were a sector of its own

Figure 3 - Colorado Basic Sector Industry Analysis	
Sector	Estimated Employment as Basic (1)
Retirees	238,475
Government	234,095
Tourism	225,138
Prof & Business	220,732
All Other Households	200,591
Health & Educ	197,867
Agribusiness	114,057
Manufacturing	89,247
Trade & Transportation	72,272
Mining & Construction	71,994
Finance, Insurance & Real Estate	54,624
Information, Comm.	20,031
Indirect Basic	358,598
Total Colorado Basic Employment - 2016	2,097,721
Total Colorado Employment	3,232,675
Estimated Basic Jobs Due to the Defense Sector (2)	173,000
Ratio Basic/Total	64.9%
Source: (1) Colorado Dept of Local Affairs, (2) Estimated by Summit Economics	

The jobs shown in the table are “basic” jobs. **Basic jobs** are those jobs created directly from dollars coming into the state from the rest of the world. All jobs in an economy result from the basic jobs. In this sense, basic jobs are similar to the direct impact noted previously in this report in that the basic jobs create indirect and induced jobs.

The industries are arranged from largest to smallest in terms of number of basic jobs created in each industry. As the table shows, retirement income coming to Colorado households from out-of-state creates the largest number of basic jobs in the state, at 238,475 jobs, followed by government and then tourism. The estimated basic jobs due to the Defense Sector can be compared to the basic job estimates of the Colorado Department of Local Affairs. Subtracting the estimated impact for the military installations, DoD contractors, VA, Military Retirees and Veterans, and the National Guard by industry category above, the Defense Sector would be larger than a downward adjusted figure for government and health/education, and would be about 10,000 jobs smaller than the professional and business sector.

From this perspective, the Defense Sector makes up the fourth largest basic sector in Colorado, lagging only Tourism at 225,138 jobs, non-military retirees at 210,000, and non-military professional and business services at about 190,000. In terms of traditional industries, the Defense Sector is larger than either Agriculture, Manufacturing, Trade & Transportation, Mining, or Finance/Insurance/Real Estate.

Office Space Demand Estimates from DoD Contracting

The analysis up to this point has been to define the broad contribution of the Defense Sector. Impacts on specific sectors can also be presented that reveal impacts on specific industries. Two such industries are Office Space and Housing.

The amount of office space demanded by DoD contractors can only be roughly estimated. The location of the DoD contractors is known only by the county in which they perform the contract. Some of that work is known to be done on military installations, and yet other significant amounts are done elsewhere. Headquarters offices are often located in a different county or state, so estimation by place of contract performance is only an approximation.

Estimating the demand for office space requires the use of a number of calculations that use industry averages and multiple assumptions. No central repository exists for tracking how much or where contractors own or rent office space. Accurate accounting would require polling each office building in a region and obtaining cooperation from the leasing agent to obtain a profile of the tenants.

The table below makes a number of assumptions to create an approximation of total office space demand. The total number of DoD contractor employees was determined by running the total contract amounts through IMPLAN, which then estimated total employment resulting from those contracts. Total estimated employment was then assumed to be either housed in office space or manufacturing space, based on the contract's NAICS. While manufacturing is just a small element of DoD contracting in El Paso County, it makes up a much larger proportion in Arapahoe County due to significant dollars being spent on space launch services.

Once total office worker numbers were estimated, the total number of workers needing office space was reduced by the number of workers already officed on military installations, with the assumption that the rest would need office space off base.

Using an average office space per worker figure of 150 square feet, the total off-installation demand for office space was estimated. Total office space existing in each county was obtained through the El Paso County and Arapahoe County Assessor’s office. The total demand from DoD contractors working off base was divided by the total estimated supply of office space. While demand from DoD contractors is significant (621,000 square feet in El Paso County and 524,000 square feet in Arapahoe County, the percent of office space demanded by DoD contractors is small (3% and 2% respectively)

The table below presents an estimate of the demand for office space by DoD contractors.

Table 18 - Office Space Demand from DoD Contractors in El Paso and Arapahoe Counties	
Total Estimated DoD Contract Direct Employees in El Paso County	12,241
Total Contractors in EPC Installations	
Ft Carson	1,000
Peterson/Cheyenne Mtn	1,299
Schreiver	4,175
AFA	585
Total	7,059
Number of DoD Contract Employees Not on Installations	5,182
Average Office Space per Employee, SqFt (CoreNet)	150
Estimated Percent Needing Office Space	80%
Total Off Base Office Space Demand from DoD Contractors	621,840
Total Office Space in EPC	18,208,629
Percent of Office Space In El Paso County Associated with DoD	3%
Total Estimated DoD Contract Direct Employees in Arapahoe County	11,055
Total Contractors at Buckley	4,069
Number of DoD Contract Employees not at Buckley	6,986
Estimated Percentage Needing Office Space	50%
Average Office Space per Employee, SqFt (CoreNet)	150
Total Off Base Office Space Demand from DoD Contractors	523,950
Total Office Space in Arapahoe County	33,500,000
Percent of Office Space in Arapahoe County Associated with DoD	2%
Source: Summit Economics, County Assessors, CoreNet	

Housing Demand Estimates from DoD Installation Personnel, DoD Contracting, VA, Veterans and Military Retirees

Table 19 addresses how much housing demand in the private market exists due to demand created by the economic impacts of DoD, the VA and veterans in Colorado. While the figures are only approximate, it can be seen that more than 174,000 housing units are needed to house families directly or indirectly supported by DoD and VA expenditures. Of the total demand, assuming a distribution of housing types the same as the current statewide demand, demand for almost 109,000 single family homes and another 64,000 other (multi-family and mobile home) dwellings exists due to the DoD or VA. The total home value of the single family home demand is approximately \$27 billion, with just under another \$9.6 billion of value for other housing types.

While an average mill levy for Colorado's more than 2,000 property taxing entities is not known, if the average were 60 mills, these properties generate about \$181 million dollars for local governments and taxing authorities each year. An assumed mill levy of 60 is quite low in that many localities have school district mill levies much higher than that.

Table 19 - Housing Demand and Property Tax Revenue Estimates Resulting from Military Installation Personnel, DoD Contracting, VA Operations, and Veteran and Military Retirees	
Total Number of Jobs Created in Colorado Due to DoD, VA and Veterans	246,723
Estimated Number of Workers per Household	1.30
Number of Households Supported in Part or in Whole By DoD, VA or Retiree/Veteran Incomes	190,320
Less Base Housing	(16,829)
Market Demand	173,491
Distribution of All Colorado Housing by Housing Type	2,261,063
Single Family Detached	1,422,286
Single Family Attached Units	157,133
MultiFamily/Mobile Homes/Other	681,644
Assumed Distribution of Housing for DoD, VA and Veterans by Housing Type	173,491
Single Family Detached	109,126
Single Family Attached Units	11,971
MultiFamily/Mobile Homes/Other	52,394
Median Value of Owner Occupied Units	247,000
Median Value of Renter Occupied Units	150,000
Value of Single Family Detached Homes Demanded by DoD, VA and Veterans	\$ 26,954,111,970
Value of Multi Family Detached Homes Demanded by DoD, VA and Veterans	\$ 9,654,784,802
Total Value of Homes Demanded by DoD, VA and Veterans	\$ 36,608,896,772
Assessed Valuation (.0824% of Market Value)	\$ 3,016,573,094
Assumed Average Mill Levy Revenue - 60 mills	\$ 180,994,386
Source: Summit Economics, Military Installation Economic Impact Reports and Census's American Fact Finder. Average mill levy and average value of rental units are assumptions.	

Employment Impacts by Industry

The total number of jobs created by industry is given in Table 20 below. The total employment impact by industry was generated with each of the 21 IMPLAN runs; then summed together; and then adjusted for trade flow effects in counties other than the four that contained major military installations. Table 20 shows that a wide variety of industries are affected, and with that a wide variety of professions and occupations. These figures include both basic and indirect/induced jobs. Using Bureau of Labor Statistics occupational distribution estimates, the number of specific occupations by industry can be estimated. For example, in Health Care, the physicians, nurses, therapists and other health care professions can be estimated. Table 21 shows an estimated demand of almost 35,000 various health care occupations based on the economic impact of the Defense

Sector. Some of this demand is provided for by on-installation facilities such as the Evans Army Hospital, however the majority to the demand is thought to be for civilian health care providers paid by Tricare or by the installations themselves, as well as the demand from indirect and induced employees. Similarly, the demand for selected educational occupations is presented in Table 22.

Table 20 - Industry Impacts Resulting From Defense Sector Expenditures in Colorado	
Health Care	34,636
Professional/R&D/Scientific/Engineering	40,434
Education	19,625
Local Government	10,457
Restaraunts & Drinking Places/Hotels	21,386
Construction/Building Services/ Maintenance	23,168
Other Retail	5,574
Other Jobs (Includes Military and VA and State & Local Government)	91,443
Total	246,723
Source: Summit Economics & Implan	

Table 21 - Health Care Occupational Demand

Total Health Care Jobs Created		34,636
Occupational Demand		
Physicians and Surgeons	15.7%	5,430
Therapists	8.6%	2,992
Diagnostic Related Technologists and Technicians	4.7%	1,642
Miscellaneous Health Technologists and Technicians	2.4%	818
Nursing, Psychiatric, and Home Health Aides	20.5%	7,115
Occupational Therapy and Physical Therapist Assistants and Aides	4.2%	1,439
Other Healthcare Support Occupations	36.2%	12,523
All Other Healthcare occupations	7.7%	2,676
		34,636
Total Health Care and Social Assistance Emp in Colorado		327,897
Percent Due to Defense Sector		10.6%
Source: Summit Economics and Bureau of Labor Statistics https://www.bls.gov/oes/current/naics3_621000.htm#31-0000		

Table 22 - Education Industry Occupational Demand

Total Professional and Technical Jobs Created, Excluding Public Schools		19,625
Occupational Demand		
Preschool, Primary, Secondary, and Special Education School Teachers	49.4%	9,686
Postsecondary Teachers	19.6%	3,853
Other Teachers and Instructors	12.7%	2,489
Other Education, Training, and Library Occupations	16.9%	3,316
All Other Education Occupations	1.4%	291
Total Education Emp in Colorado		222,495
Percent Due to Defense Sector		8.8%
Source: Summit Economics and Bureau of Labor Statistics https://www.bls.gov/oes/current/naics3_611000.htm		

Economic Diversity & Cycles

All economies are made up of some combination of economic sectors. Some economic sectors add greater economic diversity, some add more stability, and some add greater opportunity than others. The diversity of economic sectors is a valuable attribute because diverse sectors operate on different business and economic life cycles compared to the majority of the regional economy.

DoD funding for military installations and contracts and assistance adds great diversity to Colorado's economy, since the peaks and valleys of DoD funding have very little to do with the overall business cycle which includes periods of expansion and recession. The DoD cycle is driven by geopolitical events and long-term defense strategies (e.g., the Cold War, friction with North Korea, and the Global War on Terror), mobilizations for intense wars (e.g., WWII), and the need for periodic surges to respond to short-term incidents (e.g., domestic natural disasters and small-scale overseas contingencies). Furthermore, the focus of DoD funding changes based upon technology. When DoD funding is increasing during poor overall economic conditions, a degree of downside stability is created. For example, in January 2009, as the "Great Recession" was hitting its zenith, a major news network reported that the Colorado Springs metropolitan statistical area (MSA) had the largest number of federal job openings outside of the Washington DC MSA. This fact provided a degree of stability to Colorado at the time. The reverse has been the case since the onset of sequestration this decade. A chart of DoD contracts showing changes in expenditures over a 10 year period is given later in this report and shows a trend of increases, followed by a drop, and then a plateau over that period of time.

The other types of cycles influencing economies are product and technology lifecycles. These life cycles have introduction, growth, maturity, and decline stages. A diversified economy is not reliant on just one or two niche specialties since different sectors might both hit a maturity and/or decline stage at the same time. Ideally, an economy has a portfolio of activities such as technologies, programs, products, processes and projects at different stages of the lifecycle so that growing sectors counter declining sectors. Well-run organizations with a long-term strategic perspective adjust to different environments, including opportunities and threats. As a result, they tend to have different aspects of operations in different phases of the life cycle. The DoD, being one of the largest militaries in the world charged with protecting the U.S. and its global interests, is very aware of the need to change with evolving challenges in the international arena and thus is diverse from a life cycle perspective.

Military history tends to point towards leadership, training, morale, and strategy as wartime critical success factors. All of these efforts occur within the context of a technological state that further defines how wars are fought. Often the tide of a war can change rapidly when one side introduces a leap-ahead technological innovation. Since WWII the U.S. has focused on defeating the enemy with mass, or "overwhelming combat power at the decisive place and time". The overwhelming combat power may come from sheer numbers or from far superior technology. This principle has remained constant since the end of WWII and the beginning of the Cold War, but the method of

delivery appears to rely upon adopting a doctrine of greater flexibility via small, tactically focused efforts that use the nation’s long-standing advantage of superior technology. Maintaining the technological advantage is critical, not only for benefit of our national defense, but because it also provides a steady source of research and development funding that permeates the entire national economy greatly enhancing private sector research, development, and innovation. In this sense, the DoD is a large national economic driver pushing new technologies as well as capital investment and labor force training. With the advent of cyber threats and more countries having greater access to space and satellites, technology and new skill sets remain of critical importance to our national defense.

One way to view DoD as an economic driver is to consider different military elements placed on a technology life cycle curve (TLC) as shown in Figure 4 below. All of the elements have a presence in Colorado. The stage of the life cycle is shown at the bottom of the figure. Starting with the decline state, one finds the traditional Army and Air Force in the decline stage being replaced by a growing emphasis on rapid response, intelligence, surveillance, and reconnaissance (ISR) on dispersed threats, both offensive and defensive cyber operational and tactical capabilities, missile defense, a new space paradigm, and timely processing and delivery of big data from multiple sources. Although the decline phase can be extended, or even rejuvenated due to specific events, in the long run a technology in the decline phase tends to become a smaller part of the overall defense posture. This is an important consideration as over time each technology tends to move to the right becoming less cutting edge, until eventually it moves into the maturity and then decline phase. As a result, strategic planning must always be cognizant of the next new technology to introduce to the life cycle in order to provide the environment needed for a state economy to seize the opportunity by providing the infrastructure and regulatory environment needed to attract companies involved in that new technology.

Current Life Cycle Position of DoD Colorado Elements

Elements include technologies and war fighting operational modalities



Developed by Summit Economics, LLC

Figure 4: Current Life Cycle Position of DoD Colorado Elements

Some of the technology life cycle shifts can be seen at Colorado facilities. Fort Carson and Peterson AFB recently hosted a rapid deployment of rocket launchers from Oklahoma to Fort Carson after landing at Peterson and then being moved down range to attack targets within three hours. The Air National Guard (ANG) in Greeley practices rapid deployment to provide defenses for incoming missiles to the U.S. and our allies around the world. This is increasingly important as smaller nations gain nuclear weapon capability. Schriever AFB hosts space war games with allied leaders. This is important as the old paradigm of U.S. space dominance enters the decline phase to be replaced with space access by more countries, new generation satellites, and growing debris fields in historical space orbits. Buckley AFB provides air sovereignty/air control for the Rocky Mountain and Great Plains regions and hosts the Aerospace Data Facility (ADF).

Both an opportunity and a challenge for Colorado have been to simultaneously protect and support missions and facilities in the mature and/or decline phase, while simultaneously growing and attracting those in the introductory and growth stages. The competition for those technologies comes from other communities in the U.S. While the presence of compatible military missions is a critical element, a number of other supporting features must be present as well. These include educational institutions, infrastructure, and the presence of key civilian customers as well as military customers to attract cutting edge technology firms, state technical, research and political support to defense related businesses, business friendly tax policies, and the existence of a cultural and social environment attractive to both military and civilian entities. Having a strong knowledge of the competitive policies of competing states, and being able to match or exceed competing locations is critical to moving along the technology life cycle for creating the Colorado economy of 2040 and beyond.

It is critical to constantly envision what new technologies might be joining the TLC at the introductory phase in order to capture them for Colorado. Examples of technologies that might fit on the TLC for Colorado include the emergence of pulse weapons, artificial intelligence, robotics, enhanced integration of land, air, aerospace and sea defense through intelligence and space monitoring, and other technologies as they emerge. With the strong presence in Colorado of space-based surveillance and cyber, many future technologies and application opportunities will arise.

Locations of Veterans and Military Retirees

In addition to the impacts arising from military installations and DoD contracting, veterans and retirees (and their survivors) bring in pension and compensation revenues to the state (as well as a small number of Coast Guard retirees who are paid by the Department of Homeland Security). Table 23 shows the location of military veterans and retirees, how many are in each county, and their aggregate annual compensation. Using IMPLAN household multipliers, the estimated employment generated by the expenditure of those incomes is shown. The incomes were based on expenditure patterns exhibited by households with incomes between \$25,000 and \$35,000 per year.

While the average compensation was much less than that on an annual basis, a large percentage of retirees and veterans have other incomes on top of the their pensions or compensation.

The 416,000 veterans and survivors created about 29,400 jobs in Colorado through their expenditures of the pensions and compensation. Total direct compensation and pensions from the VA and from the DoD was \$3.3 billion in 2016. This excluded all services and benefits paid for by the VA or DoD. The average compensation of \$7,932 annually reflects the large number of veterans that do not receive a pension, but do receive a disability rating of less than 100% and therefor a reduced monthly compensation benefit.

Table 23 - Military Veteran, Retiree and Spousal Benefits and Impact by County, 2016

	2016 Estimated Veterans (incl Retirees)		2016 Estimated Survivors		Estimated Total Employment Impact
	Number (1)	Compensation (2)	Number	Compensation	
Adams	28,680	223,543,233	495	6,928,875	2,323
Alamosa	1,088	8,480,310	19	262,853	88
Arapahoe	43,257	337,156,818	747	10,450,406	2,736
Archuleta	1,359	10,592,327	23	328,316	110
Baca	367	2,861,702	6	88,700	30
Bent	638	4,973,718	11	154,164	52
Boulder	15,306	119,296,683	264	3,697,682	1,240
Broomfield	3,869	30,156,692	67	934,727	313
Chaffee	2,056	16,025,529	36	496,722	167
Cheyenne	133	1,039,886	2	32,232	11
Clear Creek	889	6,932,573	15	214,880	72
Conejos	544	4,240,155	9	131,427	44
Costilla	505	3,933,832	9	121,932	41
Crowley	445	3,466,286	8	107,440	36
Custer	748	5,828,198	13	180,649	61
Delta	3,379	26,335,716	58	816,294	274
Denver	33,353	259,963,425	576	8,057,744	2,702
Dolores	138	1,072,130	2	33,231	11
Douglas	19,530	152,218,343	337	4,718,112	1,582
Eagle	1,957	15,251,660	34	472,736	159
EL Paso	91,459	712,853,906	1,579	22,095,394	5,313
Elbert	2,464	19,201,615	43	595,167	200
Fremont	5,765	44,932,746	100	1,392,721	467
Garfield	3,103	24,183,394	54	749,581	251
Gilpin	587	4,578,723	10	141,921	48
Grand	1,353	10,543,960	23	326,817	110
Gunnison	859	6,698,800	15	207,634	70
Hinsdale	120	935,091	2	28,984	10
Huerfano	868	6,763,289	15	209,633	70
Jackson	146	1,136,620	3	35,230	12
Jefferson	41,703	325,040,938	720	10,074,866	3,378
Kiowa	73	572,340	1	17,740	6
Kit Carson	582	4,538,417	10	140,671	47
Lake	563	4,385,255	10	135,924	46
LaPlata	3,923	30,575,871	68	947,720	318
Larimer	22,878	178,320,286	395	5,527,159	1,853
Las Animas	1,311	10,221,515	23	316,823	106
Lincoln	416	3,240,575	7	100,444	34
Logan	1,780	13,873,207	31	430,010	144
Mesa	13,706	106,826,113	237	3,311,148	1,110
Mineral	99	773,869	2	23,987	8
Moffet	1,064	8,294,904	18	257,106	86
Montezuma	2,120	16,525,319	37	512,214	172
Montrose	3,611	28,141,410	62	872,262	292
Morgan	1,592	12,406,081	27	384,535	129
Otero	1,558	12,140,064	27	376,290	126
Ouray	502	3,909,649	9	121,182	41
Park	1,945	15,162,988	34	469,987	158
Philips	380	2,958,435	7	91,699	31
Pitkin	817	6,368,294	14	197,390	66
Prowers	1,007	7,851,542	17	243,364	82
Pueblo	15,324	119,441,783	265	3,702,180	825
RioBlanco	552	4,304,644	10	133,425	45
Rio Grande	915	7,134,101	16	221,126	74
Routt	1,411	10,995,383	24	340,809	114
Saguache	540	4,207,911	9	130,427	44
SanJuan	49	378,873	1	11,743	4
SanMiguel	432	3,369,553	7	104,442	35
Sedgwick	249	1,942,733	4	60,216	20
Summit	1,406	10,955,077	24	339,560	114
Teller	3,386	26,392,144	58	818,043	274
Washington	390	3,039,047	7	94,197	32
Weld	17,075	133,089,278	295	4,125,193	730
Yuma	677	5,280,041	12	163,658	55
Total	409,001	3,187,855,000	7,063	98,809,744	29,197

Sources: Veterans and Survivors Compensation from VA State Summaries file. Military retiree compensation from the Sept 2015 Statistical Report of the MRS. Coast Guard veterans are paid by Homeland Security and are included in above figures. Employment estimated by Summit Economics using Implan.

The retirees shown in Table 24 are already included in Table 23, as are their pensions and compensation.

Table 24 - Total DOD Retirees by County, 2016					
County					
Adams	1,731	Fremont	561	Morgan	60
Alamosa	56	Garfield	135	Otero	123
Arapahoe	5,057	Gilpin	24	Ouray	27
Archuleta	103	Grand	70	Park	156
Baca	10	Gunnison	57	Philips	14
Bent	42	Hinsdale	10	Pitkin	16
Boulder	805	Huerfano	66	Prowers	39
Broomfield	191	Jackson	5	Pueblo	1,315
Chaffee	152	Jefferson	2,820	RioBlanco	20
Cheyenne	8	Kiowa	6	Rio Grande	71
Clear Creek	24	Kit Carson	162	Routt	78
Conejos	23	Lake	215	Saguache	19
Costilla	33	LaPlata	10	SanJuan	6
Crowley	25	Larimer	1,836	SanMiguel	8
Custer	83	Las Animas	117	Sedgwick	12
Delta	231	Lincoln	27	Summit	139
Denver	1,718	Logan	51	Teller	713
Dolores	8	Mesa	774	Washington	5
Douglas	2,525	Mineral	6	Weld	1,221
Eagle	88	Moffet	27	Yuma	27
EL Paso	25,277	Montezuma	140		
Elbert	219	Montrose	274	Total	49,871

Source: Summit Economics, LLC

DoD Contracting Trends

Following declines in DoD contracting expenditures from 2009 through 2015, it appears that the trend in contracting may be starting to inch up. In a recently released report “Defense Acquisition Trends, 2016: The End of Contracting Drawdown” by the Center for Strategic and International Studies, 2016 saw an increase in total U.S. contract spending of about \$18 billion. While the drop from 2009 to 2015 was quite steep (\$414 billion to \$278 billion), the increase in 2016 over 2015 may signal the end of that decline. However, most of the \$18 billion increase was for projects as

opposed to services. Nationwide, the Air Force was the recipient of much of that gain, followed by Navy and then Army projects.

Figure 5 shows total DoD contracts by year in Colorado, including both prime and subcontract awards. After reaching a peak of almost \$8 billion in 2013, totals have been in the \$6 to \$7 billion since. Current levels however are still higher than any time before 2011.

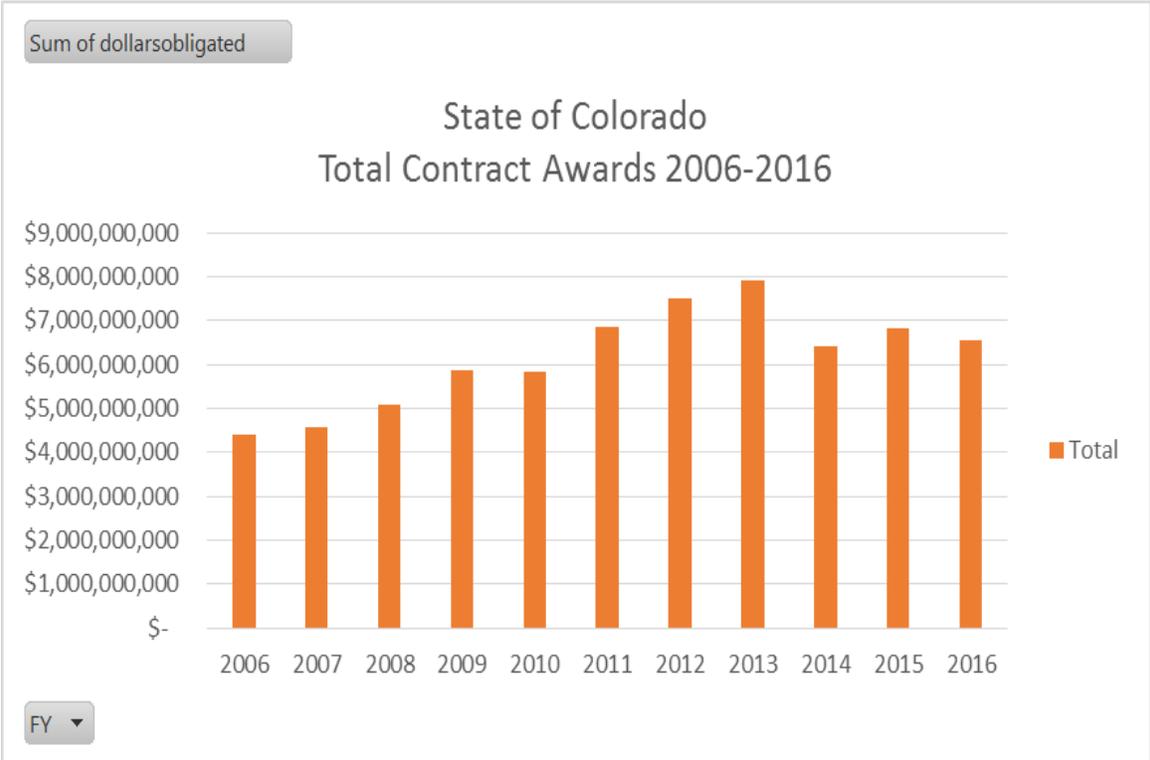


Figure 6 below, shows the totals for grants and awards. Grants and awards are usually given to local government, schools and universities and nonprofits. While much smaller in magnitude than contract awards, they make up a significant revenue source for the recipients. The past two years have seen significant increases in the level of those awards, to a total of \$180 million in 2016.

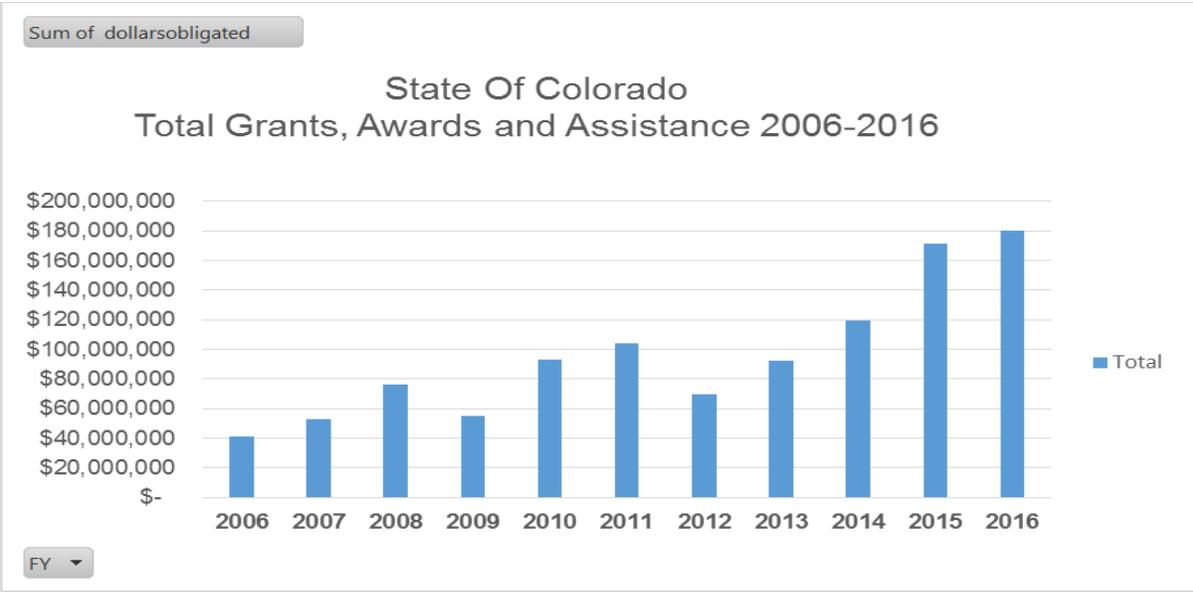


Figure 7 shows contracts, awards and grants for just El Paso County since 2007. After peaking in 2011 at \$3 billion, it has dropped by about 20 percent to \$2.3 billion

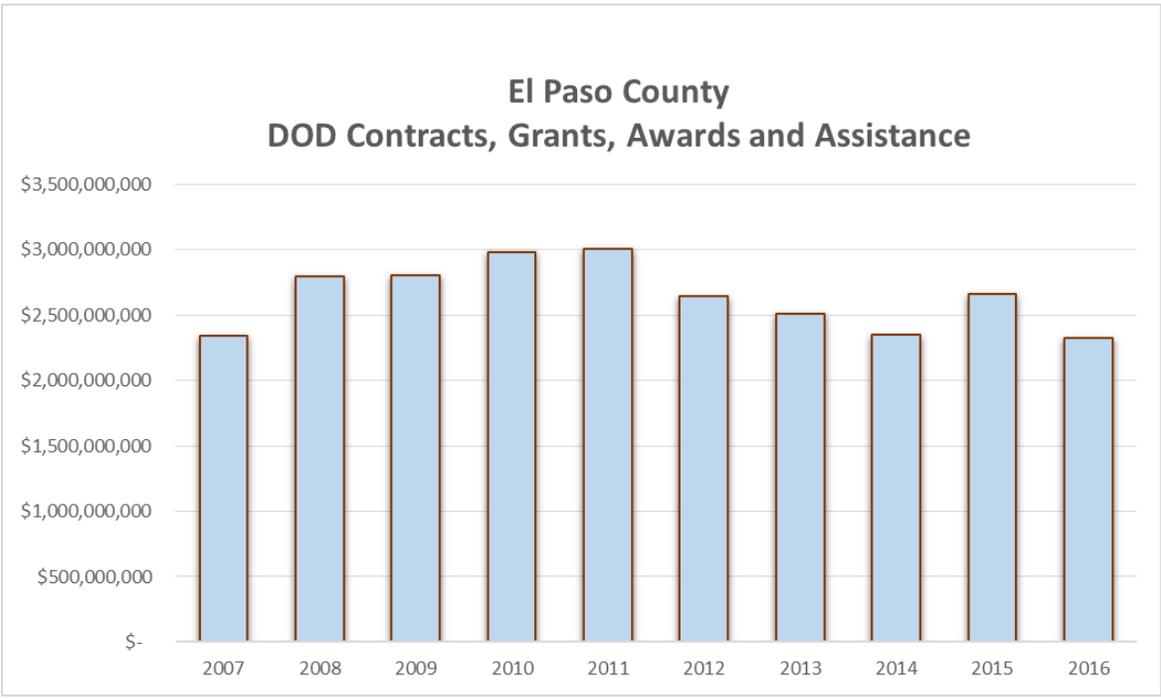
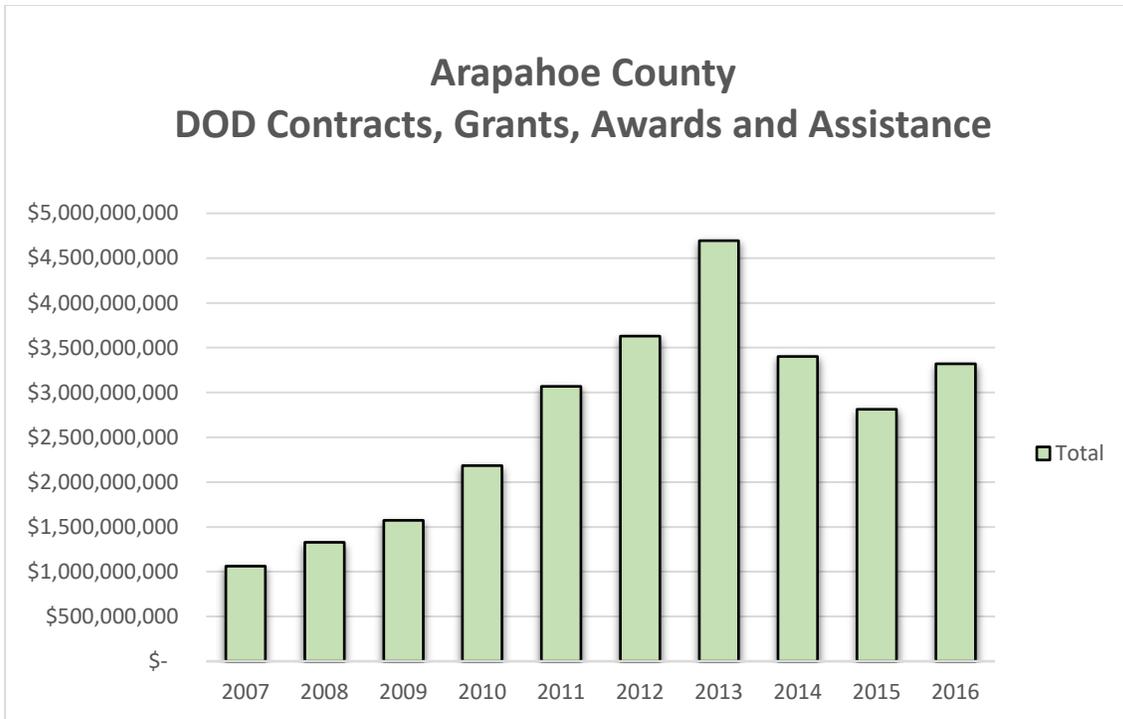
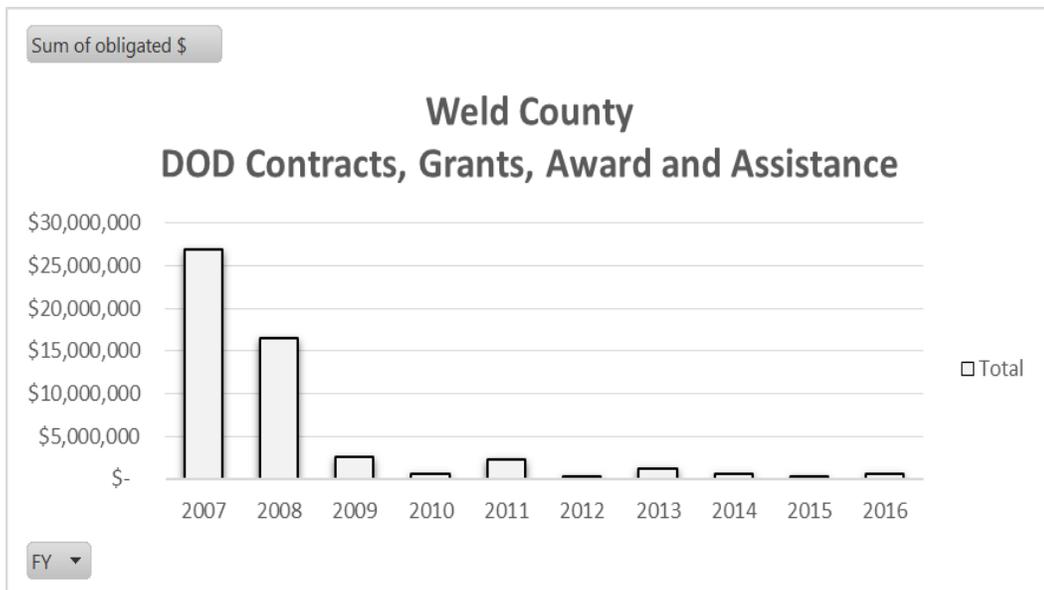


Figure 8 shows contracts, awards and grants for Arapahoe County since 2007. After peaking in 2013 at \$4.7 billion, it has dropped to \$2.8 billion in 2015 and has since recovered somewhat to \$3.3 billion in 2016.



Figures 9 and 10 show the total revenue amount for contracts, grants, and awards for Pueblo and Weld Counties.



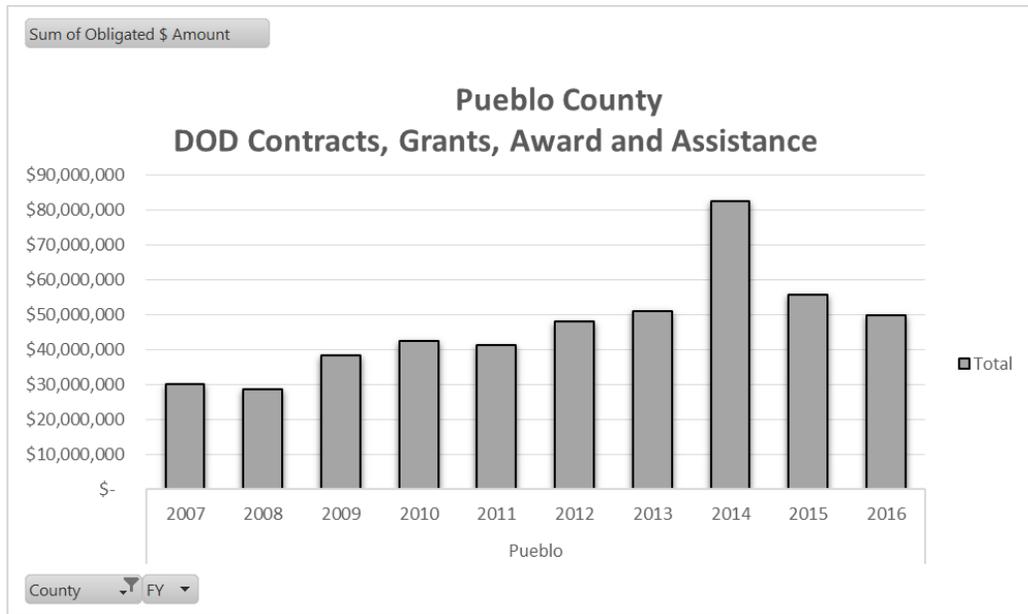


Figure 11 offers a look at which individual companies have received the largest contracts. Of the top ten firms, nine are aerospace related and accounted for more than 50% of total contracts awarded. What is not seen in this figure are awards to small companies, often the source of new ideas that then show up on the technology life cycle chart.

Figure 11 - Largest Individual DOD Contractors 2016	
Vendor	Dollars Obligated
UNITED LAUNCH SERVICES, LLC	\$ 1,536,923,764
LOCKHEED MARTIN CORPORATION	\$ 670,598,434
KIEWIT-TURNER A JOINT VENTURE	\$ 573,780,271
RAYTHEON COMPANY	\$ 417,585,922
NORTHROP GRUMMAN SPACE & MISSION SYS	\$ 352,955,352
HARRIS CORPORATION	\$ 166,138,925
HONEYWELL TECHNOLOGY SOLUTIONS INC.	\$ 106,119,652
INTELLIGENT SOFTWARE SOLUTIONS, INC.	\$ 92,650,846
FLIGHTSAFETY SERVICES CORPORATION	\$ 56,203,318
BALL AEROSPACE & TECHNOLOGIES CORP.	\$ 54,306,481
L-3 NATIONAL SECURITY SOLUTIONS INC	\$ 49,585,045
SIERRA FOUR INDUSTRIES CORP.	\$ 42,237,586
EXELIS INC.	\$ 41,765,572
DOSS AVIATION, INC	\$ 41,513,431
COUNTERTRADE PRODUCTS, INC.	\$ 40,408,406
KIRA, INCORPORATED	\$ 32,541,393
HARRIS IT SERVICES CORPORATION	\$ 30,511,879
LEVEL 3 COMMUNICATIONS, LLC	\$ 30,057,699
MEDVOLT, LLC	\$ 29,937,833
OLGOONIK DIVERSIFIED SERVICES, LLC	\$ 27,197,131
Total of 20 largest DoD contract recipients	\$ 4,393,018,941
% of FY Total	67%
2016 Total Contracts (Prime& Sub)	\$ 6,538,710,666

Existing Industry Clusters by NAICS Code

One additional method of examining the formation of economic clusters is to analyze the USASpending.gov files and look for large concentrations of DoD contract awards in specific NAICS codes that are thought to represent targeted industries for the state. There are several clusters where the total number of firms is significant (more than 100 in computer services and R&D) and where the average contract let is more than \$1,000,000 per firm. Research and Development particularly stands out with more than 115 companies receiving contract awards, averaging more than \$8.7 million per contract.

A further examination of a wide range of DoD contracts by NAICS codes, and including sub-awards, could yield clearer opportunities for Colorado to build on already established and growing clusters. Building on established clusters is an example of agglomeration, or the process of growth within a sector, industry or technology partially based on the momentum established from previous growth. As a follow up effort, a deeper examination of the contract database to identify specific NAICS codes that pertain to aerospace could yield further important insights.

Table 25 - 2016 DoD Contracts by Selected NAICS Codes

Sector	Sector Description	Number of Contract Actions*	Number of Individual Firms	Dollar Value of Contracts	Avg Dollar Value per Firm
517	Telecommunications	50	13	\$120,664,337	\$9,281,872
5413	Professional Services and Laboratories	491	82	\$383,832,056	\$4,680,879
5415	Computer Services	443	113	\$195,905,293	\$1,733,675
5416	Scientific, Environmental, Logistics and Other Technical Consulting	107	32	\$41,800,156	\$1,306,255
5417	Research and Development	825	115	\$1,011,642,023	\$8,796,887

* a contract action is one separate transaction within a contract. Contracts may have numerous actions in a given year.

Source: Summit Economics and USASpending.gov

Other Expenditures Related to Defense

There are several other efforts, programs and expenditures in Colorado that have not been included in this analysis but could be. The first, the **REPI** (Readiness and Environmental Protection Integration) program, represents a land purchase whose economic impact may not be felt until a later date, depending on who received the revenue and how they spend it. The REPI program spent \$4.9 million in 2016 for land acquisition around Buckley.

The Office of Economic Adjustment lists a USAFA/Peterson/Ft Carson JLUS study. Date on that award was not available in time for this analysis. Similarly, there may have been expenditures under the Community Investment program of the OEA in Colorado for 2016, but information had not been provided in time for the study.

Not directly related to DoD, but closely linked is Colorado’s Aerospace Industry. Colorado’s 400 aerospace industry companies employ 25,000 workers and have a \$3.4 billion annual payroll. It is estimated that the proportion of the aerospace industry tied to defense is about 61%, which is included in this analysis, however, even the 39% that is the civilian side of aerospace industry of Colorado can be linked to defense, either through the historic or plans for future commercialization of defense technology, or through the ability of aerospace firms to use economies of scale, economies of scope, and economies of knowledge afforded by defense contracts to compete in the civilian markets. The transfer of technology, talent and applications from defense to civilian use are considered crucial elements that Colorado can provide to civilian firms. Going forward, Colorado is well positioned for a new upcoming space race with Russia and China. As the state with the second largest aerospace industry and with United Launch Alliance’s winning a \$191 million NASA contract, this sector will continue to grow, mutually enhancing the defense and aerospace position of Colorado.

Colorado Space Symposium – in 2014, there were 11,000 visitors, spending between \$30 and \$35 million in the state. Running those figures through impact models suggests an impact of 220 jobs, \$8.8 million in payroll and \$15 million in GRP. The Symposium draws a mixture of defense and civilian companies and projects, each of which needs the other to be as successful as it is. The Space Symposium continues to grow in size each year.

Other non-DoD Federal Agencies – Co-Labs is a consortium of 30 federally funded scientific research laboratories that have a high concentration of renowned scientists working in areas such as natural resource management, climate change, renewable energy, photonics, and astrophysics. The laboratories work closely with Colorado’s research universities on basic research and development as well as the deployment of technologies. While only a few of these agencies are directly defense related, many others perform research or work that are utilized in our national defense. It is estimated that in 2016 Co-Labs had an annual economic impact to Colorado of \$2.7 billion, supporting about 18,000 jobs. For the most part, the Co-Labs impact is not included in the findings of this report, except for the portion attributable to DoD funds.

- [Cooperative Institute for Research in the Atmosphere \(CIRA\)](#)
- [U.S. Department of Agriculture \(ARS\)](#)
- [National Renewable Energy Laboratory \(NREL\)](#)
- [National Oceanic and Atmospheric Administration \(NOAA\)](#)
- [Bureau of Reclamation \(BuRec\)](#)
- [Cooperative Institute for Research in Environmental Sciences \(CIRES\)](#)
- [National Institute for Standards and Technology \(NIST\)](#)
- [JILA \(JILA\)](#)
- [Centers for Disease Control and Prevention Lab \(CDC/DVBID\)](#)
- [Institute for Telecommunications Science \(ITS\)](#)
- [National Wildlife Research Center \(NWRC\)](#)
- [Rocky Mountain Research Station \(RMRS\)](#)
- [Transportation Technology Center \(TTC\)](#)
- [University Corporation for Atmospheric Research \(UCAR\)](#)
- [US Air Force Academy \(ASAFA\)](#)
- [UNAVCO \(UNAVCO\)](#)
- [U.S. Geological Survey \(USGS\)](#)
- [Laboratory for Atmospheric and Space Physics \(LASP\)](#)
- [National Center for Atmospheric Research \(NCAR\)](#)
- [National Ecological Observatory Network \(NEON\)](#)
- [Renewable and Sustainable Energy Institute \(RASEI\)](#)

Comparison of Defense Industry in Colorado vs Other States

While the DoD presence in Colorado is large, based on the number of defense personnel, 12 other states have more personnel than Colorado. A 2017 National Conference of State Legislators report listed the number of personnel by state, showing the states with the most defense personnel were California (269,540), Virginia (246,553), Texas (218,523), N Carolina (144,881), Georgia (129,463) and Florida (126,292). Colorado was listed as having 61,294 active, civilian and Guard/Reserve. Interestingly, ranked by percentage of state GDP dependent on the military, only Virginia ranked in the top 10. The other states listed as have the most defense personnel are in states where defense is only a small proportion of that state’s economy.

Colorado Economic Development Assistance Returns

The State of Colorado participates in a number of economic development efforts to grow and support the various industries of Colorado. A cursory examination of a few of those efforts illustrates the return on investment that the citizens of Colorado get for their investment. Given

the size, importance and future potential of the Defense Sector on Colorado, continued and even expanded State support for growth of this sector should be strongly considered.

Return on Investment from OEDIT's Advanced Industry Accelerator and Export Accelerator Programs

To date, the Colorado Office of Economic Development and International Trade (OEDIT) has awarded \$8,762,261 in grants through their Advanced Industry Accelerator Program, resulting in first year increase in sales of the recipient companies of \$14.3 million. Using an economic impact model, it is estimated that the state receives about \$500,000 to \$700,000 per year in new sales tax and personal income revenues due to the direct, indirect and induced effects of those new sales. Over 20 years the total tax revenue benefit to the state is in the neighborhood of \$10 to \$14 million. If the annual increase in sales from the grant grows, the benefit becomes even greater.

The return on Investment from OEDIT's Export Accelerator Program is even more positive. From \$117,000 in grants, it is estimated that the first year increase in sales was about \$8.5 million. Due to the multiplier effect, the State might expect to collect about \$210,000 per year more in sales and personal income taxes, for a 180% rate of return in just 1 year.

Return on Investment from Tourism Promotion

In 2015, Colorado spent \$7.4 million to promote tourism, which in turn generated \$1.13 billion in state and local tax revenues, and tourism expenditures of \$19.1 billion (Colorado Tourism Office). Assuming that 40% of the total sales tax revenue goes to the State of Colorado, the resulting benefit/cost ratio to the state would be 24:1 (Summit Economics).

In 1992, Colorado cut their entire promotion budget of \$12 million to promote tourism, which in turn resulted in a flowing loss of \$1.4 billion in state and local tax revenues. Again assuming a 40% state sales tax share, the lost benefit/cost ratio was 47:1 (Summit Economics).

Future State Economic Development Support Opportunities

The question that should be considered is what return on investment might the state see from additional investment to grow the Defense Sector of Colorado. Keeping in mind that there is significant opportunity for defense related business in Colorado due to the concepts presented in the technology life cycle illustration, Colorado should be able to see very significant returns on investment in targeted defense related sectors, especially as they relate to emerging technologies and applications. Space, cyber, advanced materials, artificial intelligence, robotics, and the interface between defense and many other industries presents a truly large opportunity for the state. Colorado has emphasized enabling technologies (software, electronics, photonics, advanced materials which support all industries through assistance programs that encourage private venture capital investment. This includes not just the production of these products and provision of these services, but also the development of the infrastructure that these sectors will

require: education, financing, transportation, housing, logistics, research and development, and local government.

Conclusion:

The Colorado economy is more dependent upon the Department of Defense and Veterans Administration than many think. Almost 1 out of every 12 wage and salary jobs are dependent upon them (7.5%), as is 7.4% of total labor income. In addition, personal income is enhanced by almost \$3.3 billion from military retiree and veteran pensions and compensation. With a total labor income of \$220 billion, the combined Defense sector related income of about \$16.3 billion represents a sizeable percentage of total income.

Impacts are also spread out more widely than commonly assumed. About half of the DoD impacts occur in El Paso County (49%), with the most of the rest spread along the front range. While uniformed personnel are concentrated in El Paso County, DoD contracts are let across much of the state. The same is true for VA facilities, Tricare medical expenditures and veteran/retiree pensions and compensation in that they comprise an important economic driver in many smaller counties.

The 2015 study examined the risk of a future Base Realignment and Closure (BRAC) to Colorado military installations, and concluded the risk to Colorado was low. The 2017 study adds additional detail to elements of the economic impact of the DoD, plus assesses the impact of the VA and retirees/veterans. The additional analysis shows that the diversification found in the 2015 study is actually even greater, and therefore reduces the risk of a significant and damaging economic downturn from defense reductions.

Colorado shows significant diversity in providing national defense facilities and services, and enjoys growing presence in related fields such as aerospace, artificial intelligence and cyber. The opportunity to grow existing emergent clusters exists, although an intentional effort must be made to capture those opportunities.

The 2017 study also shows that the economic impacts are widespread both geographically and across all occupational categories. Coloradoans benefit from the presence of the Defense Sector, even if their occupation appears not to be remotely connected to defense. Local employment, incomes, sales and tax revenues are all enhanced by the Defense Sector.

Detailed recommendations are not included as part of this study, but in general, the State of Colorado, its political subdivisions, the business and professional communities and citizens of all walks of life can benefit from careful consideration of the benefits of supporting and growing the presence of the DoD, and from the development of a strategic growth plan that recognizes economic concepts of agglomeration, the technology life cycle, cluster growth, support of advanced R&D and education, the benefits to the entire state, and the competitive environment

from other cities and states across the nation to capture the emerging technologies and applications.

In short, the economy of 2040 in Colorado can be positively impacted by understanding the opportunities and challenges and capturing those opportunities presented by the changing technological element of national defense.

SECTION 4

Data Sources, Methodology and Approach

This report entails the use of a significant number of data elements from a variety of data sources. Many of the data sources were available in a format that could easily be modeled, while others required reformatting, interpretation, use of assumptions and approximations.

Whenever the data inputs were not clearly available and required the use of assumptions or approximations, conservative assumptions were made. As an example, obtaining a definitive amount of military construction at a given base or in a given time period was relatively difficult. Each military installation provided an estimated dollar figure for ‘milcon’ (military construction), however, since military construction is planned and coordinated through the Army Corps of Engineers, the Corp of Engineers totals were obtained and compared. In many instances the amounts varied significantly between the two sources. Additionally, since construction is performed by private contractors, the contracts would show up in the USASpending.gov reports, which again yielded a third set of construction amounts. For this analysis, when the amounts were significantly different, the lowest value amount was used.

The following data sources were utilized in this analysis:

Military Installations –

Each of the installations, except for the Pueblo Chemical Depot, was able to provide its own economic impact analysis which include the number of uniformed and civilian personnel on base. In some cases, wages were also provided and used in place of the calculation of wages by generated by IMPLAN, that then drive the indirect and induced impacts. The wages provided were not broken down between military and civilian. On-installation contractor wages were not included, as they are accounted for through the DoD contractor analyses.

Unlike all other sectors, the IMPLAN code for Federal Government installations does not include an induced component. To capture this impact, the expenditures by the installations were modeled separately. The military installations provided expenditures for services in total. Some of the installations broke out expenditures for major categories such as utilities, health care, education, and “other”. Other expenditures included both expenditures made under contract,

which will show up in the USASpending.gov report, and expenditures made with purchase cards or direct billing. In order to not double count expenditures, all amounts were reduced by 50% except for health care, in order to eliminate the portion that would be picked up through the DoD contractor analysis. Health care contracts did not show up in the contract lists, and therefore were modeled in full.

The Chemical Spill Emergency Program Office provided specific employment and expenditure data for Pueblo County. The Pinon Canyon Maneuver site also provided site specific data.

An unknown amount of “Black Budget” expenditures are not included in this report due to the unavailability of the figures. It is thought that there may be other federal or civilian employment through agencies such as the National Geospatial Intelligence Agency and the National Reconnaissance Agency, as well as other federal programs primarily concerned with non-defense missions. A rough estimate of employment at the Aerospace Data facility at Buckley was included however, although expenditures at that facility were not.

DoD Contractors -

A separate modeling effort was made to determine the impact of spending by the DoD for contracts. While the installation economic impact reports included employment for DoD contractors, they only included those personnel that worked on the installation. Because much DoD contract work is done off-base, the DoD contractors reported by the installation were left out of the military installation analysis but were captured in full through the DoD Contractor portion of the analysis.

A variety of DoD expenditures occur throughout the state. The primary file for DoD contracts is for DoD prime contract awards by place of performance. Place of performance is thought to capture contracts that may be awarded to a company with its headquarters in another state, but with local Colorado offices where the work is done. An additional file captured was the DoD Contract Sub-award by place of performance file. A third data file used was the DoD grants and assistance awards. A total of more than 26,000 contract and award actions were downloaded.

Each file was sorted by place of performance city, then tagged to the appropriate county. The dollar amount appropriated for FY2016 was captured, as was the NAICS code for each action, and then mapped to the appropriate IMPLAN code. A list of the IMPLAN codes that made up 95% of the totals contracted was then prepared.

The dollar amounts of the top 95% of contracts was then run through IMPLAN, with the resulting direct, indirect, and induced employment, labor earnings, value added, and output entered into the main impact analysis spreadsheet that is linked to all report tables. This was done for the four counties that had military installations, as well as another six counties that had significant DoD expenditures on contracts.

Veterans Administration –

The primary data source for the VA is the VA's GDX report. This report lists the number of veterans in the state by county. It also provides total VA expenditures for: compensation and pension, construction, education/vocational rehabilitation and employment assistance, loan guarantees, general operating expenses, insurances and indemnities, and medical care. Education and rehabilitation programs include the GI Bill, the Vocational Rehabilitation and Education Program, the Dependents' Education Assistance program and Fry Scholarships.

Other than compensation and pensions, each expenditure category was assigned one or more IMPLAN codes, and then run through the IMPLAN impact model to produce estimates of jobs and earnings by county. This was done for the four counties with military installations, as well as for an additional three counties with significant VA expenditures. The impacts on the balance of Colorado's 64 counties were produced using an overall average ratio. Compensation and pension impacts are estimated separately under Veterans and Military Retirees.

Tricare Expenditures –

Approximately \$360 million in Tricare expenditures are captured in the military installation budgets, however a much larger amount of Tricare dollars are spent in the state, paid directly to health care providers by the DoD. Total expenditures in Colorado was also obtained. To avoid double counting for Tricare expenditures at installations, the difference between the statewide total and the amounts spent through the installations was run as a separate impact. Total Tricare expenditures in Colorado were approximately \$1.06 billion. All Tricare expenditures were distributed through four different health care NAICS codes for the analysis.

Veterans and Military Retirees –

The compensation paid through the VA to veterans is only a portion of the total veteran and retiree total. Military retirees are also by definition veterans, however they receive compensation from the DoD above and beyond that from the VA. Military retiree survivors also receive compensation. In total, the VA pays Colorado veterans about \$1.68 billion. The DoD pays military retirees and survivors another \$1.5 billion.

The total incomes to veterans and retirees equaled about \$3.2 billion in 2016. That income, when spent, creates additional economic impacts. Using the household income multipliers for households earning between \$25,000 and \$35,000 per year, the total induced job, labor income, value added, and output was estimated from the veteran and retiree income totals. The distribution of total household income for veterans is not known, so using the \$25,000 to \$35,000 range was a reasonable compromise between assuming veterans only live on their pensions, and veterans earn as much as the average household income of Coloradoans. Different brackets have different expenditure patterns, thus different impacts, however choosing the mid to low range yielded a relatively conservative impact.

Data Sources –

The list below presents the primary data sources used for this study. The data are made up of a mix of FY 2016 and calendar year 2016, due to the differing reporting practices of the sources. Additional sources were used in order to clarify data and definitions, assist with allocations into categories represented in NAICS and IMPLAN, provide background explanations into budgeting and categorization decisions, and provide general guidance on the overlapping roles of various agencies in healthcare, education, and construction.

- Ft Carson FY 16 Economic Impact Report and USAG Fact Sheet as of Feb 17
- Peterson AFB Economic Impact Report
- Schriever AFB Economic Impact Report
- Buckley FY 16 Economic Impact Report
- USAFA FY 16 EIS
- USASpending.Gov
- US Army Corps of Engineers, Colorado office
- Bechtel Chemical Weapon De-Militarization Project Office
- PuebloPlex
- Pueblo Chemical Storage Emergency Preparedness Program Office
- Bureau of Labor Statistics Industry Employment profiles
- Colorado Department of Military and Veterans Affairs
- US Census
- Colorado Department of Revenue
- Bureau of Economic Analysis
- El Paso and Arapahoe County Assessors
- CoreNet
- FY 16 DoD Tricare Report to Congress
- The office of Congressman Doug Lamborn
- The office of Senator Michael Bennet
- The office of Senator Corey Gardner

Overall Methodology -

The primary methodology used was to gather and input all expenditures into impact models create with IMPLAN. IMPLAN is a widely used proprietary impact modelling system and generally accepted for use in both the government and private sector.

Impact models were run for numerous individual sets of inputs. Models were most often run at the county level, and then combined into a statewide total. For example, separate runs were made El Paso County for first, military installation employment. Another run was then made for the non-contract operations. This was needed since the federal government multipliers do not include an induced effect. A third run was then performed for DoD contracts, across a number of NAICS codes. A fourth run was made for VA operations in El Paso County, while a 5th run was made for the household earnings by veterans and military retirees. The same was also done for Arapahoe, Greeley and Pueblo Counties. Additional runs were done for other

counties within the state that had significant VA or DoD contract expenditures. Representative runs were also completed to determine impacts within other counties with smaller VA or DoD contractor expenditures. Each run produced estimates of the employment, earnings, value added, and total output, as well as induced and indirect impacts by industry.

Colorado sales tax revenue impacts were estimated by modelling labor incomes times assumed percentages spent on taxable goods and services times the state sales tax rate. Business and personal income tax revenue estimates were based on State averages, modified for exclusions and differences such as the percentage of military personnel that claim Colorado as their home state.

The analysis began with analysis of the economic impact reports provided by each military installation in the state. The reports generally contained a count of military personnel, civilian employees, operating expenses, payroll, and on-site DoD contractors. On-site DoD were excluded at this step because they are included in the overall DoD contractor analysis step. Civilian employees were then split between professional and non-professional categories to account for differing multipliers. Operating expenditures were split into ten NAICS codes to represent the variety of impacts from different spending types.

DoD contracts were downloaded from USASpending.gov. Contracts and subcontracts let by the Department of Defense were limited to those that indicated Colorado as the place of performance. It is unknown how much contract work is awarded to a firm in another state, but performed in Colorado. Any such work is not included in this analysis. The DoD contracts were sorted first by county, and then by NAICS. The NAICS that made up 95% of the total were then entered into the IMPLAN models, with the output increased by 5% to account for the remainder. The remaining NAICS codes numbered in the hundreds for El Paso County and in the dozens for Arapahoe County.

National Guard estimates were the same ones used in the 2015 study, as updated information was not made available. The original estimates were based on Census estimates of employment types.

Estimates of the number of veterans by county were made by comparing the known zip codes of veterans with a zip code by county table. Estimates of military retirees were provided by the DoD. Amounts of VA expenditures were provided by the VA in the 2016 GDX report, and were broken down into five categories, one of which (Medical Care) was subsequently broken down into four separate NAICS codes by the research team.

Incomes for veterans and military retirees consisted of pensions and compensation provided to veterans, provided by the VA, and compensation provided to military retirees provided through the Statistical Report of the MRS. Coast Guard pensions were also included although they are paid by the Department of Homeland Security.

Detailed occupational data were estimated by converting the employment impacts by NAICS into occupational demand by NAICS as determined by the Bureau of Labor Statistics. Office space and housing demand were estimated using industry average demand per employee, adjusted for on base office space and housing supply.

Trade flow runs were estimated by comparing the impact of specific employment by types for one county, with the impacts for the same input but at the statewide geography. Detailed trade flow runs were completed for the 2015 study and were used as the basis for the 2017 study.

Key Definitions -

- Direct, indirect and induced refers to the level of the impacted economy. Direct consists of firms and entities whose impact is being modeled. Indirect and induced industries generally move in concert with direct industries through multiplier effects. Indirect activities sell goods and services to the direct entities. Induced activities result from employee expenditures among direct and indirect employees as well as subsequent rounds of economic multipliers.
- Basic and non-basic are usually the same as primary and secondary industries respectively. Industries that derive revenues from outside the region (via exports) are basic, while non basic derives revenues for inside the region through the multiplier. Many firms are a mix of basic and non-basic.
- Employment us wage and salary employment, excluding proprietors.
- Labor income is wages and salaries excluding proprietors' income.
- Value Added includes labor income and profits and generally equates to GDP when total for all sectors.
- Output is all revenue to firms and organizations.

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