

# **GMU OR 699 Economic Impact Tool**

Center for Army Analysis

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# Agenda

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# Problem Statement

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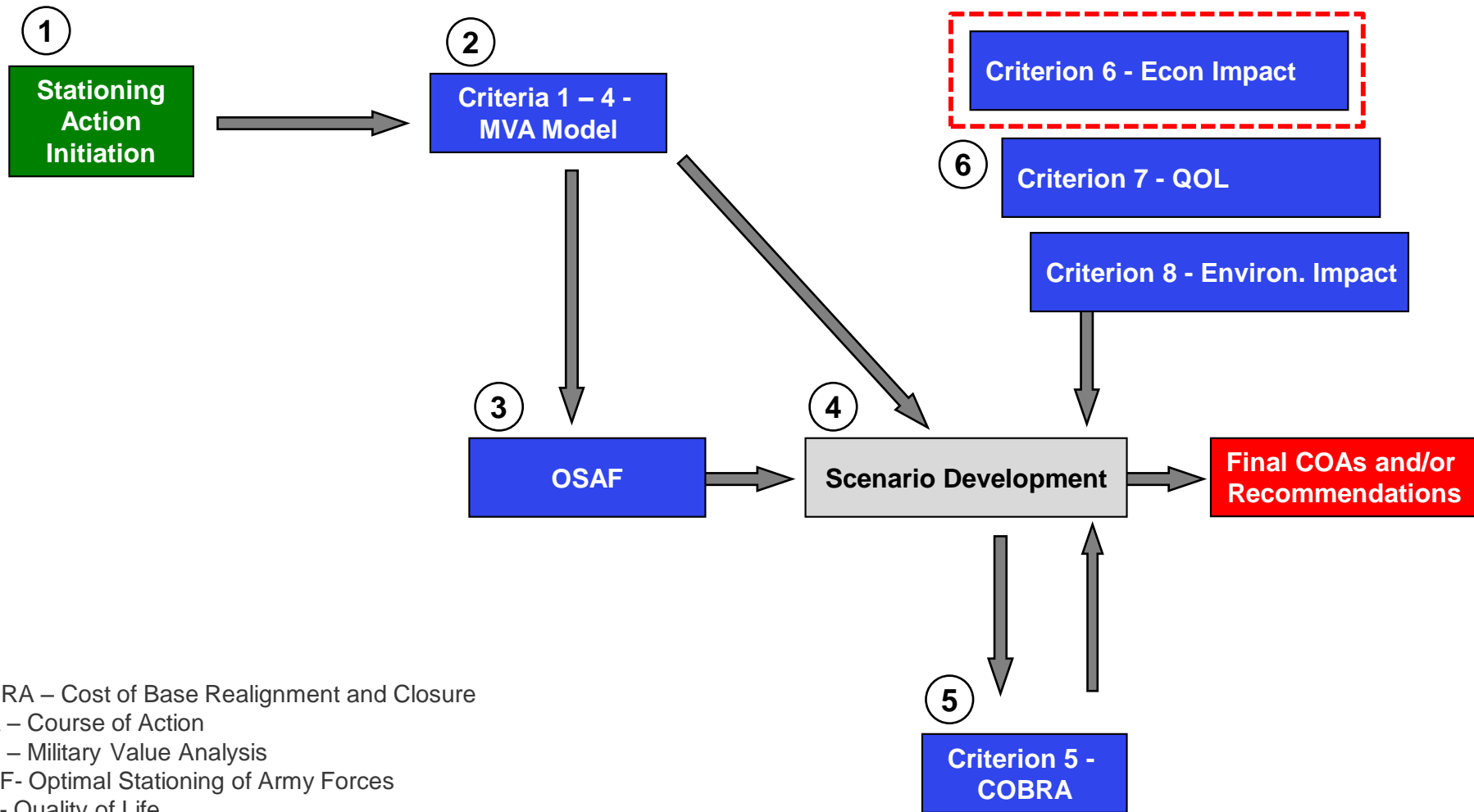
- Develop an economic impact tool (EIT) that will capture the impact of realigning or closing Army installations on the surrounding community
- Measures of success:
  - Include multiple factors that will capture the economic impact
  - Consider differences due to the location of the installation
  - Use authoritative databases
  - Ensure developed EIT is validated
  - Tool is Army-owned
  - Provide well documented methodology and tool

# Stationing Background

## U.S. ARMY

- The Department of Defense (DoD) and the Army need to make strategic and day-to-day stationing decisions due to excess, unwanted, or unneeded facilities, fiscal constraints, and force reduction requirements
- Base Realignment and Closure (BRAC)
  - After World War II and the Korean conflict, DoD started downsizing its inventory
  - BRAC rounds were conducted in 1988, 1991, 1993, 1995, and 2005
  - Congress mandates 8 criteria be considered when evaluating a BRAC scenario
    - Criterion 6: The *economic impact* on existing communities in the vicinity of military installations
    - Tool developed contained only one factor and used commercially-owned software
- CAA lacks an updated, robust tool to measure the economic impact

# Stationing Methodology



COBRA – Cost of Base Realignment and Closure  
COA – Course of Action  
MVA – Military Value Analysis  
OSAF- Optimal Stationing of Army Forces  
QOL- Quality of Life

# Literature Review and Findings

- BRAC05 Economic Impact Joint Process Action Team Report
  - Assign installations to their region
  - Calculated multipliers to estimate employment changes resulting from BRAC actions
- Construction Engineering Research Laboratory Economic Impact Forecast System
  - Utilized economic base analysis and location quotient (LQ) technique
  - Estimates employment, sales volume, income, and population changes due to stationing actions
- The Role of Economic Base Analysis in Regional Economic Development, Froesche, R
- A Comparison of Alternative Methods for Generating Economic Base Multipliers, Bloomquist, Kim

# Project Scope

## U.S. ARMY

- All major US Army Installations in the Continental United States (CONUS) plus Alaska and Hawaii
- The EIT considers multiple factors for economic impact:
  - All major industry employment including government and military (Army, Navy, Marine Corps, and Air Force) employment
  - *Mean income by region, normalized*
  - *Population changes by region and installation*
  - Installation location by region
  - *Installation type by function*
- *EIT accounts for uncertainty by providing a 90% confidence interval around the point estimates for employment and income impact*
  - *Standard error of employment data source*

# Assumptions

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- Data sources will be available for future use
- Active duty military population on an installation is the military employment for that installation
  - Reserve and National Guard are not included in military employment (they are employed in other industries)
  - Active Guard Reserve numbers are included
- The numbers of Navy, Marine Corps, and Air Force active duty personnel assigned to Army installations are not significant enough to affect the military employment on an installation
  - This does not apply to joint installations



# Challenges

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- Determining an appropriate methodology for economic impact analysis
  - Extensive literature review; discovered economic base analysis
- Collecting Navy, Marine Corps and Air Force population data on all installations
  - Sponsor did not have access; team had to contact POCs
- Determining the region for each installation and mapping all data to those same regions
  - Team utilized a cartographer to assist in mapping installations to regions properly

# Data Collection and Processing

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- Collect Military population data for all CONUS (plus Alaska and Hawaii) installations and civilian data for all Army installations
- Find employment data by industry category and region for the entire CONUS (plus Alaska and Hawaii)
- Find income data for all regions in the CONUS (plus Alaska and Hawaii)
- Map 79 Army, 53 Navy, 68 Air Force, 20 Marine Corps installations to 381 regions
- Employment data includes 11 industry categories for 381 Bureau of Labor Statistics (BLS) regions
- Income data includes mean income for 381 Bureau of Economic Analysis (BEA) regions
- Match BLS regions to BEA regions
- Link all calculations to the raw data

# Data Sources

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Data	Source	Date of Data
National and Region Employment	Bureau of Labor Statistics	Nov 2014
Total and Region Industry Employment	Bureau of Labor Statistics	Nov 2014
US Army Employment, Contractor, and Civilian Population	Army Stationing and Installation Plan	Oct 2014
US Air Force Employment <sup>1</sup>	USAF Manpower Programming and Execution System	Feb 2015
US Navy employment <sup>2</sup>	Total Force Manpower Management System	Sep 2014
US Marine Corps employment <sup>2</sup>	Marine Corps Community Services	Jun 2014
Region Real Personal Income	Bureau of Economic Analysis	2012

1 Data from USAF AF-A1

2 Data from Center for Naval Analyses

# Methodology

# Economic Impact Factors

## Installation

- Population change
  - Percent population change
- Installation type by function

## Region

- Population change
  - Percent population change
- Employment change
  - Direct and indirect change
  - Point estimate and range
  - Percent employment change
- Income change (normalized for cost of living in each region)
  - Point estimate and range
  - Percent income change

# Economic Base Analysis

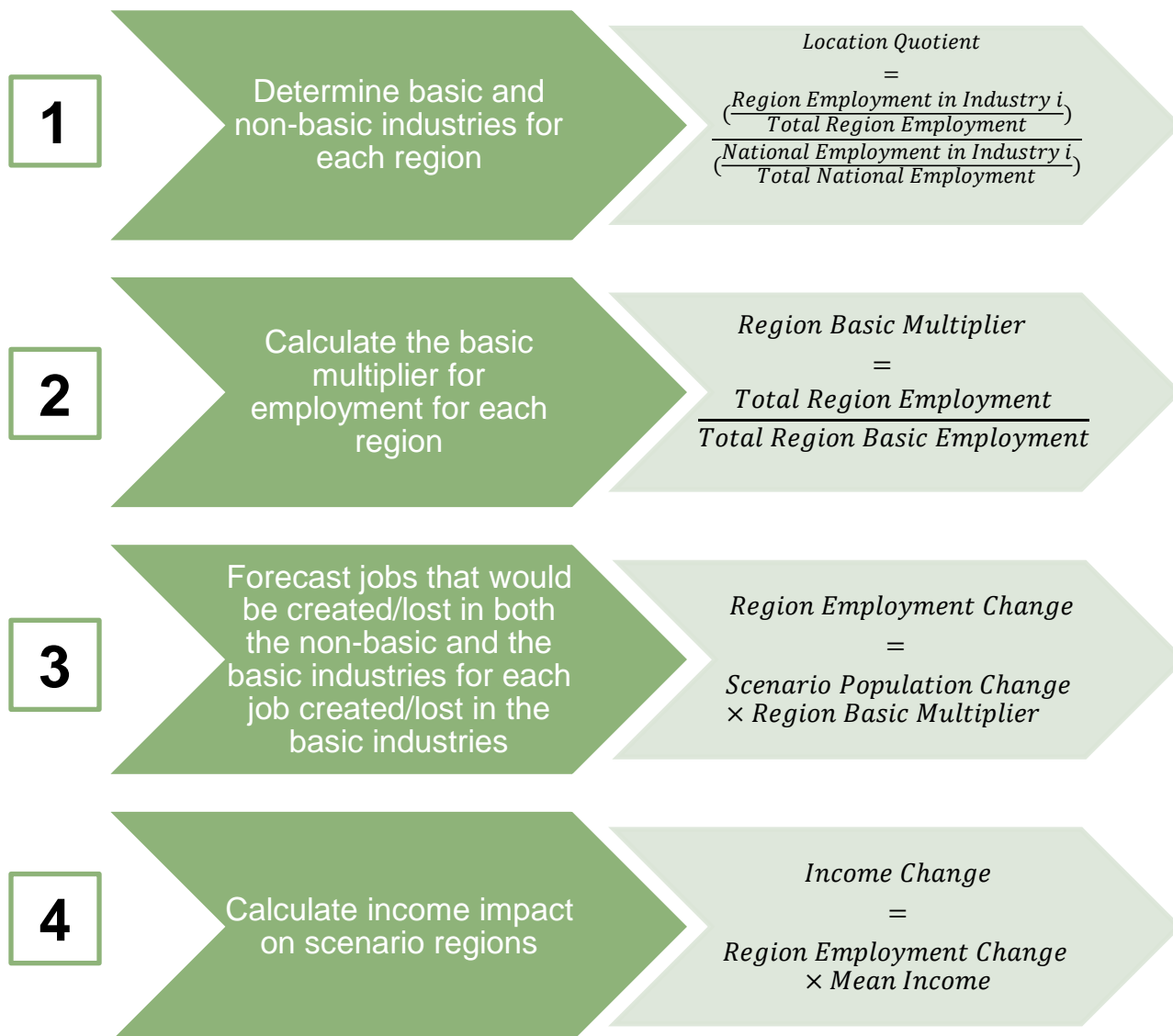
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- **Economic base** is a group of industries in a region that generate employment and income in excess of the needs of the region
- **Economic base analysis** a methodology to determine the impact of a specified industry on all other industries in a given region
  - **Basic industry** is an industry whose goods and services are exported, bringing additional employment and revenue into their respective region
    - Government/ military is a basic industry for all regions
  - **Non-basic industry** is an industry whose goods and services are totally consumed by the people and businesses located within their region
- **Location quotient (LQ)** identifies which industries in a given region are basic industries by comparing the region's consumption patterns with those of the US
- **Basic multiplier** is a derived, standard number for each region that when multiplied by a basic industry employment change, will forecast the total employment change (indirect + direct)
  - Assumes that each job in the basic industries supports some multiple of jobs in the non-basic industries

# Economic Base Analysis

## Methodology

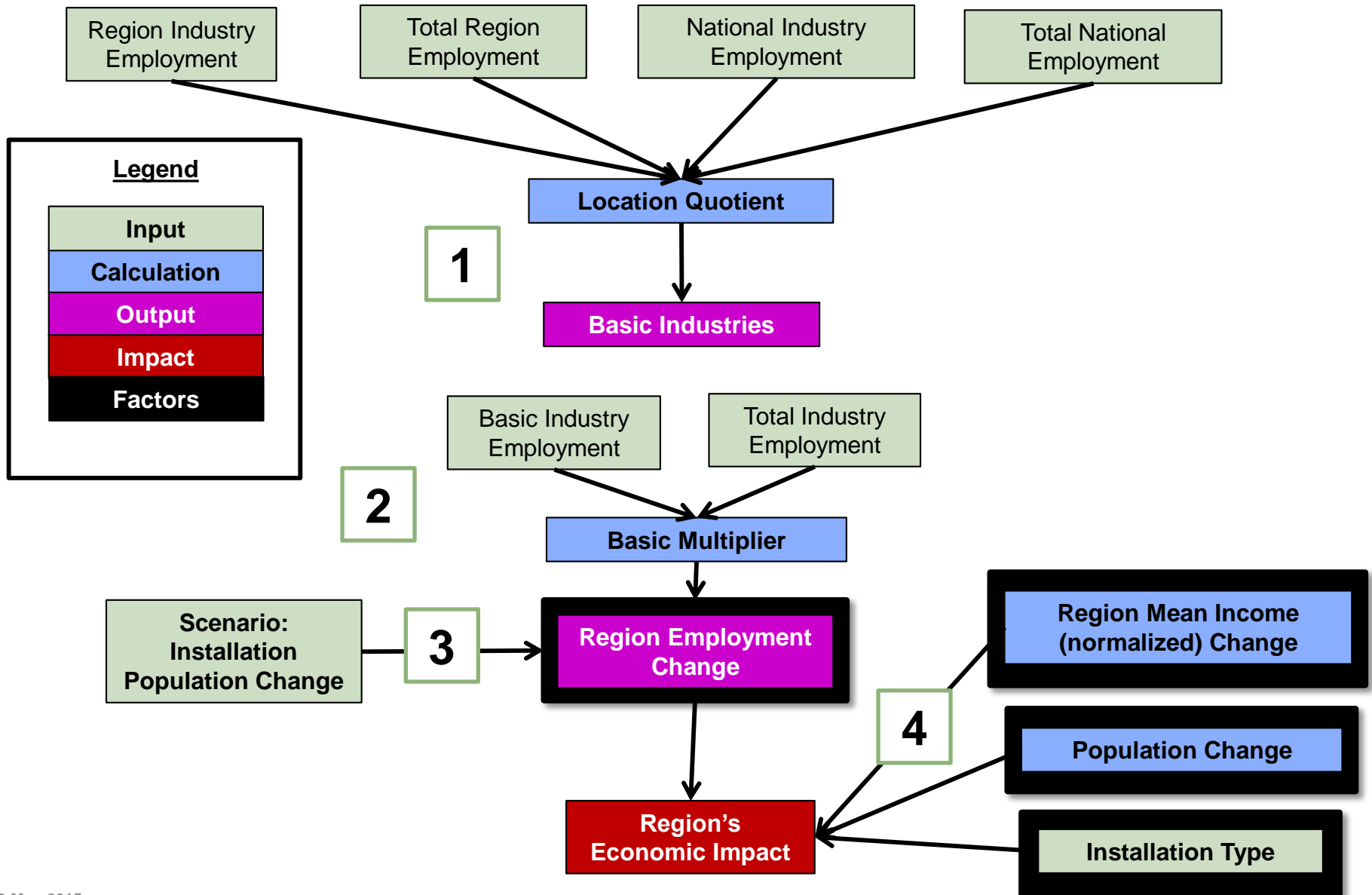
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# Economic Impact Tool

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# Scenario Example (1 of 2)

SCENARIO: 500 Active Duty Military and 500 DoD Civilians move from Fort Belvoir to Fort Hood.

Installation Inputs	Fort Belvoir	Fort Hood
Leaving Installation: Active Duty	500	0
Leaving Installation: Civilians	500	0
Leaving Installation: Contractors	0	0
Moving to Installation: Active Duty	0	500
Moving to Installation: Civilians	0	500
Moving to Installation: Contractors	0	0

Region	Fort Belvoir	Fort Hood
Region	Washington-Arlington-Alexandria	Killeen-Temple-Fort Hood
Basic Multiplier	1.7	1.5

Employment Change Output	Fort Belvoir	Fort Hood
Direct Employment Change	-1000	1000
Total Employment Change	-1700	1500
Indirect Employment Change	-700	500

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ALL DATA IS NOTIONAL

# Scenario Example (2 of 2)

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Region Income Data	Fort Belvoir	Fort Hood
Region	Washington-Arlington-Alexandria	Killeen-Temple-Fort Hood
Region's Mean Income (FY15 \$)	\$50,000	\$30,000

Region Economic Impact	Fort Belvoir	Fort Hood
Region	Washington-Arlington-Alexandria	Killeen-Temple-Fort Hood
Installation Type	Support Installation	Maneuver Installation
Employment Change	-1700	1500
Upper bound	-1785	1575
Lower bound	-1615	1425
Income Impact (FY15 \$)	-\$85,000,000	\$45,000,000
Upper bound (FY15 \$)	-\$89,250,000	\$47,250,000
Lower bound (FY15 \$)	-\$80,750,000	\$42,750,000
Employment Percent Change	1%	5%
Income Percent Change	3%	6%

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90%  
Range

ALL DATA IS NOTIONAL

# Verification and Validation

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- Manually calculated scenarios to verify tool produces correct results
- Compared BRAC05 and EIT multipliers
  - Multipliers had similar averages, standard deviations, and ranges (min/max)
  - Differences attributed to different source data (BRAC05 data is 10 years old)
- Ran 179 BRAC05 scenarios through EIT and compared results from BRAC05 report to those generated by the EIT
  - Analyzed indirect job change for each economic region
  - Non-parametric hypothesis test supported no difference between medians of indirect job change

	Multiplier		Indirect Job Change	
	BRAC05 Tool	EIT	BRAC05 Tool	EIT
Mean	1.69	1.95	-76	16
Std Dev	0.338	0.642	1,693	1,627
Median	1.70	1.79	-8	-21

- BRAC05 tool and EIT use different data and methodology, have different multipliers, but produce consistent indirect job change results
- External validation with Dr. Fuller, Director of the Center for Regional Analysis, School of Public Policy, GMU.

# Tool Demonstration

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The screenshot displays a Microsoft Excel spreadsheet with a tool interface. The interface is organized into several sections:

- Input Fields:**
  - Service:** A dropdown menu set to "Army".
  - Base Year \$ (XXXX):** A text box containing "2015".
  - Scenario Name:** A text box for entering a scenario name.
  - Installations Affected:** A text box containing "1".
  - Installation Inputs:** A table with the following data:

Installation Inputs	1
Installation	Fort Gordon
Leaving Installation: Active Duty	0
Leaving Installation: Civilians	0
Leaving Installation: Contractors	0
Moving to Installation: Active Duty	0
Moving to Installation: Civilians	0
Moving to Installation: Contractors	0
- Buttons:**
  - Add Installation:** A button to add a new installation.
  - Remove Installation:** A button to remove an installation.
  - Load Scenario:** A button to load a saved scenario.
  - Run Scenario:** A button to execute the scenario.
  - Save Scenario:** A button to save the current scenario.
  - Reset Tool:** A button to reset the tool to default settings.
  - Quit Tool:** A button to exit the tool.
- Navigation Bar:** A series of tabs at the bottom of the spreadsheet:
  - User Guide
  - Interface (Active)
  - Calculations
  - Output
  - Raw Data-->
  - Employment
  - Army Installations
  - AF Installations
  - Navy Installations
  - Navy Pop

<https://www.youtube.com/watch?v=RthWrxagABw>

# Conclusion

## U.S. ARMY

- Team delivered a completed and documented EIT to CAA for use in future stationing actions
  - ✓ Include multiple factors that will capture the economic impact
  - ✓ Consider differences due to the location of the installation
  - ✓ Use authoritative databases
  - ✓ Ensure developed EIT is validated
  - ✓ Tool is Army-owned
  - ✓ Provide well documented methodology and tool
- CAA will brief EIT to stationing decision makers
- Tool will be used in day-to-day stationing actions as well as future strategic stationing actions
- No follow-on tasks identified for the EIT; possible future collaborations for remaining stationing analysis
- Presenting at the 83<sup>rd</sup> Military Operations Research Society Symposium

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# Discussion

# Back-up



# Key Acronyms and Definitions

## U.S. ARMY

- **BEA** – Bureau of Economic Analysis
- **BLS** – Bureau of Labor Statistics
- **BRAC** – Base Realignment and Closure
- **CONUS** – Continental United States
- **DoD** – Department of Defense
- **EIT** – Economic Impact Tool
- **LQ** – Location Quotient
- **RPI** – Real Personal Income
- **Basic Industry**: an industry whose goods and services are exported bringing money into their respective communities
- **Basic Multiplier**: A derived standard number for each region that when multiplied by a basic industry job change, will produce the total job change (indirect + direct)
- **Direct Job Change**: number of authorizations for DoD military personnel, military trainees, civilian employees to be gained, eliminated, or relocated as a result of stationing actions
- **Economic Base Analysis**: a methodology to determine the impact of a specified industry on all other industries in a given region
- **Indirect Job Change**: jobs in a region gained or lost as a result of the direct job change
- **Location Quotient**: a number derived by comparing the percentage of employment in an industry and region with the percentage of employment nationwide
- **Non-basic Industry**: provides services for people and businesses located within the community; does not generate money from outside sources
- **Real Personal Income**: current-dollar personal income for a given year, normalized for cost of living for each region
- **Stationing Scenario**: the movement of some portion of the active duty, civilian, or contractors assigned from one installation to another

# Army Installations

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Installation Name	Region	Installation Name	Region
Aberdeen Proving Ground	Baltimore-Towson	Fort Wainwright	Fairbanks
Adelphi Laboratory	Washington-Arlington-Alexandria	Hawthorne AAP	Carson City
Anniston AD	Anniston-Oxford	Holston AAP	Kingsport-Bristol-Bristol
Bluegrass AD	Lexington-Fayette	Iowa Army Ammunition Plant	Iowa City
Carlisle Barracks	Harrisburg-Carlisle	JAG	Charlottesville
Corpus Christi NAS	Corpus Christi	Joint base Elmendorf-Richardson	Anchorage
Crane AAP	Bloomington	Joint base Langley-Eustis	Virginia Beach-Norfolk-Newport News
Detroit Arsenal	Detroit-Warren-Livonia	Joint base Lewis-McChord	Seattle-Tacoma-Bellevue
Dugway Proving Ground	Salt Lake City	Joint base Myer-Henderson	Washington-Arlington-Alexandria
Fort A. P. Hill	Richmond	Joint Lima Army Tank Center	Lima
Fort Belvoir	Washington-Arlington-Alexandria	Lake City Army Ammunition Plant	Kansas City
Fort Benning	Columbus-GA	Letterkenny AD	Harrisburg-Carlisle
Fort Bliss	El Paso	Longhorn AAP	Shreveport-Bossier City
Fort Bragg	Fayetteville	McAlester AAP	Tulsa
Fort Campbell	Clarksville	Military Ocean Terminal Concord	San Francisco-Oakland-Fremont
Fort Carson	Colorado Springs	Military Ocean Terminal Sunny Point	Myrtle Beach-North Myrtle Beach-Conway
Fort Detrick	Washington-Arlington-Alexandria	NTC and Fort Irwin	Riverside-San Bernardino-Ontario
Fort Drum	Utica-Rome	Picatinny Arsenal	Trenton-Ewing
Fort Gordon	Augusta-Richmond County	Pine Bluff Arsenal	Pine Bluff
Fort Greely	Fairbanks	Presidio of Monterey	Salinas
Fort Hamilton	New York-Northern New Jersey-Long Island	Pueblo Army Depot	Pueblo
Fort Hood	Killeen-Temple-Fort Hood	Radford Army Ammunition Plant	Blacksburg-Christiansburg-Radford
Fort Huachuca	Tucson	Red River AD	Shreveport-Bossier City
Fort Jackson	Columbia-SC	Redstone Arsenal	Huntsville
Fort Knox	Elizabethtown	Rock Island Arsenal	Davenport-Moline-Rock Island
Fort Leavenworth	Kansas City	Schofield Barracks	Honolulu
Fort Lee	Richmond	Scranton Army Ammunition Plant	Scranton--Wilkes-Barre
Fort Leonard Wood	Jefferson City	Sierra Army Depot	Reno-Sparks
Fort McNair	Washington-Arlington-Alexandria	Soldiers System Center Natick	Boston-Cambridge-Quincy
Fort Meade	Baltimore-Towson	Tobyhanna Army Depot	Scranton--Wilkes-Barre
Fort Polk	Alexandria	Tooele AD	Salt Lake City
Fort Riley	Manhattan	Tripler Army Medical Center	Honolulu
Fort Rucker	Dothan	United States Military Academy	New York-Northern New Jersey-Long Island
Fort Sam Houston	San Antonio-New Braunfels	Walter Reed Army Medical Center	Washington-Arlington-Alexandria
Fort Shafter	Honolulu	Watervliet Arsenal	Albany-Schenectady-Troy
Fort Sill	Lawton	White Sands Missile Complex	Las Cruces
Fort Stewart	Hinesville-Fort Stewart	Yuma Proving Ground	Yuma

# BRAC05 Scenarios

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Installation	Region	Direct Population Change	BRAC05 Indirect Job Change	EIT Indirect Job Change
Navy Reserve Center Glenn Falls	Glenn Falls	-7	-1	-6
Redstone Arsenal	Huntsville	1,655	1,289	1,256
Fort Hood	Killeen-Temple-Fort Hood	-191	-163	-243
U.S. Army Reserve Center	Lafayette-IN	-21	-11	-26
Fort Sill	Lawton	3,602	2,129	3,149
Fort Riley Gain	Manhattan	2,855	1,818	2,777
Fort Snelling	Minneapolis-St. Paul-Bloomington	-254	-155	-196
SGT Libby U.S. Army Reserve Close	New Haven	-21	-12	-34
Allen Hall Armed Forces Reserve Close	Tucson	-60	-52	-56
Sheppard Air Force Base	Wichita Falls	-2,624	-1,744	-1,457

# Industry Categories

## U.S. ARMY

- Mining and lodging
- Construction
- Manufacturing
- Education and Health services
- Leisure and hospitality
- Other services
- Government and Military
- Trade transportations and utilities
- Information
- Financial services
- Professional and business serves

# BRAC Criteria

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- Criterion 1 – The current and future *mission capabilities* and the impact on *operational readiness* of the total force of the Department of Defense, including the impact on joint warfighting, training, and readiness.
- Criterion 2 – *The availability and condition of land, facilities and associated airspace* (including training areas suitable for maneuver by ground, naval, or air forces throughout a diversity of climate and terrain areas and staging areas for the use of the Armed Forces in homeland defense missions) at both existing and potential receiving locations.
- Criterion 3 – The *ability to accommodate contingency, mobilization, and future total force requirements* at both existing and potential receiving locations to support operations and training.
- Criterion 4 – The *cost of operations* and the manpower implications.
- Criterion 5 – The extent and timing of *potential costs and savings*, including the number of years, beginning with the date of completion of the closure or realignment, for the savings to exceed the costs. (COBRA)
- Criterion 6 – The *economic impact* on existing communities in the vicinity of military installations.
- Criterion 7 – The *ability* of the infrastructure of both the existing and potential receiving communities *to support forces, missions, and personnel*.
- Criterion 8 – The *environmental impact*, including the impact of costs related to potential environmental restoration, waste management, and environmental compliance activities.