Economic Impact Joint Process Action Team Report

Purpose

This report summarizes and documents the approach and process used by the Base Realignment and Closure 2005 Selection Criterion 6 Joint Process Action Team.

Criterion 6

"In selecting military installations for closure or realignment, the Department of Defense, giving priority consideration to military value…, will consider:

"The economic impact on existing communities in the vicinity of military installations."
— Defense Base Closure and Realignment Act of 1990, as amended, Section 2913(c)(2)

Executive Summary

The Office of the Secretary of Defense (OSD) authorized establishment of a Joint Process Action Team (JPAT) to develop a Department-wide approach to the application of Base Realignment and Closure (BRAC) Final Selection Criterion on economic impact. The JPAT was tasked to provide the DoD Components with a common approach to assess all scenarios considered during the BRAC scenario analysis process against this criterion. JPAT 6 oversaw the development of a web-based Economic Impact Tool (EIT). The EIT provided a uniform methodology for estimating the total direct and indirect/induced job changes associated with BRAC closure and realignment scenarios, both in absolute numbers and as a percentage of employment in the local economic areas, or regions of influence (ROI). These job-change impacts were considered in the context of the historical trends in jobs, unemployment rate, and per-capita income for each ROI.

Authority

The BRAC statute (P.L. 101-510, as amended) requires that the Secretary of Defense's base realignment and closure recommendations be made based in part upon "the final selection criteria prepared by the Secretary under section 2913." The Section 2913 criteria were published under 69 Fed. Reg. 6948 (February 12, 2004). They include consideration of the economic impact on existing communities in the vicinity of military installations. The Joint Cross-Service Groups (JCSGs) and Military Departments are required to consider all final selection criteria in developing the recommendations that will be forwarded to the Secretary of Defense.

Establishment

Exercising authority provided by the BRAC 2005 Infrastructure Steering Group (ISG), the OSD BRAC Director and the Military Departments' Deputy Assistant Secretaries responsible for the BRAC process (BRAC DASs) established a JPAT to develop the procedures for determining economic impact of BRAC actions.

Mission and Concept

The BRAC DASs directed the JPAT to develop a DoD-wide approach. The concept that the JPAT developed was consistent with previous BRAC rounds: to measure the economic impact of BRAC 2005 recommendations on local communities by estimating the total potential job change in the economic area surrounding each installation. In addition to the absolute numbers, the job-change estimates were also estimated as a percentage of total employment in the local economic area. Historical economic data would be used to help understand trends in the local economy.

To ensure consistency and accuracy, the analysis was done through a web-based Economic Impact Tool (EIT). DoD Components entered the direct job changes by base, personnel category, and year. The EIT performed the calculations to estimate the total job impacts, and to present the results along with historical trend data in a graphical format.

Specifically, the integrated EIT system included:

- A listing of all installations under consideration for BRAC action
- Economic ROI assignments for each installation
- Current ROI population
- Current ROI employment levels
- Base authorized manpower
- Input screens for entry of direct job changes under a proposed action
- Algorithms to estimate potential indirect and induced job changes that might result from direct job changes
- Historic economic data including:
    - Total employment
    - Annual unemployment rates
    - Real per capita income
- The ability to generate scenario-based output reports grouped by:
    - Individual actions (impacts of one specific action for the installation)
    - Base (net result of multiple actions for the installation)
    - ROI (net result of all actions in the economic region of influence)

Organization and Responsibilities

Office of the Deputy Under Secretary of Defense (Installations and Environment)

The Office of the DUSD(I&E) was responsible for overseeing the work of the JPAT, and for presenting the recommended approach to the DoD Infrastructure Steering Group (ISG) for approval.

Joint Process Action Team on Economic Impact (JPAT 6)

The JPAT was responsible for developing the economic impact methodology and overseeing the creation of the EIT. It monitored implementation of all guidance on

economic impacts that was issued by DUSD(I&E), the ISG, and the Infrastructure Executive Council (IEC), and performed analyses as requested by these authorities.

DoD Components, JCSGs, and Defense Agencies

The DoD Components, Joint Cross-Service Groups (JCSGs), and Defense Agencies were responsible for providing the JPAT with certified data on installation names, locations, and authorized manpower.

These EIT users were also responsible for entering Proposed Direct Job Changes into the EIT for each candidate recommendation. Proposed Direct Job Changes are the number of authorizations for DoD military personnel, military trainees, civilian employees and mission support contractor full-time equivalents (FTEs) to be gained, eliminated, or relocated as a result of proposed BRAC 2005 actions. These were to be broken down by installation and by fiscal year for 2006 through 2011.

To ensure proper net accounting and complete analysis of economic impact, the Components, JCSGs, and Defense Agencies were responsible for entering information on *all* proposed direct job changes, including job gains, for their scenarios. Because of the difficulty of obtaining accurate estimates on timing, contractor job changes were authorized to be aggregated into a single year.

All data were required to be collected and handled in accordance with the Internal Control Plan established by the JPAT and respective Internal Control Plans of each DoD Component.

Process Development and Quality Assurance

The JPAT met regularly in mid-2004 until the methodology and data sources were agreed upon and the EIT was functioning as desired. Thereafter, the JPAT met as required to resolve any emergent issues. JPAT members included OSD staff and representatives from each of the Military Departments. Observers included representatives from the DoD Inspector General's office (DoD IG) to advise on data integrity and auditability, and an economist from the Government Accountability Office (GAO) to independently evaluate the methodology and data sources used.

The JPAT's initial tasks were to review the analytic methodologies proposed by the JPAT economic and information-technology support staff. After evaluation and modification of the proposed approach, the JPAT reached consensus on approval, subject to input from an independent review panel. Subsequent tasks dealt with specific issues that arose during implementation, such as data availability on contractors, potential modifications of ROIs, and process flow.

To ensure data quality, the JPAT developed an Internal Control Plan (ICP) in which the policies and responsibilities for validation and document controls were specified. Documentation controls were put in place to ensure that the information used was certified for accuracy and completeness, where appropriate, and that the information was

used consistently by OSD, the Military Departments, the Defense Agencies, and the JCSGs throughout the BRAC 2005 process. The ICP covered user verification reviews on direct job-change data entered by the DoD Components into the Cost of Base Realignment Actions (COBRA) system and subsequently into the EIT. It also required certification of the official government data, as well as data obtained from runs of the IMPLAN commercial input-output modeling system.

In addition to the data reviews conducted as part of the ICP, the JPAT conducted coding validation by manually performing job loss calculations on a sample set of BRAC scenarios, and comparing the results with those from the web-based EIT to ensure agreement.

To validate the analytic approach, the JPAT convened an Independent Review Panel on August 25, 2004. This panel consisted of four economists and policy analysts who were experienced in estimating regional economic impacts, and who were not otherwise associated with the BRAC 2005 process. The purpose of the panel was to review the methodology to determine if it met the objectives for the BRAC 2005 economic impact analysis, and if it conformed to accepted economic practices. The panel was not tasked with reviewing the specific data within the model, but on the process for obtaining the data and methodology for conducting the analysis.

Overall, the IRP found that the proposed EIA methodology meets the following criteria:

- Consistent with economic practices
- Treats all bases equally
- Respects cost of data collection and certification procedures
- Flexible for analyzing alternative scenarios
- Straightforward and uncomplicated, reducing error risk
- Credible and defensible

The panel's recommendations are summarized in Appendix 1. The JPAT considered the panel's input and modified the methodology where appropriate and practical.

Methodology

This section summarizes and explains the economic impact methodology used by the JPAT. Additional details are given in Appendix 2.

When a base's workforce is reduced due to a realignment or closure, the local economy is affected in two major ways:

- Business is lost by firms that support the base itself
- Business is lost by firms that support the households of the base's workforce

The first effect is known as the *indirect* effect, and the second as the *induced* effect. For example, revenue lost by local base operating support contractors due to a closure would

be an indirect loss. Revenue lost by local department stores that serve the base community would be an induced loss.

Input-output (I-O) models are a standard way of estimating the indirect and induced impacts of major changes to a community. I-O models typically estimate revenue, income, or job effects. Consistent with previous BRAC rounds, the JPAT chose to use job changes as a representative measure of the impact of a base action on the surrounding communities. A basic description of how Input-Output models work is given in Appendix 3.

The JPAT's specific approach was to:

1. Identify the appropriate region of economic influence (ROI) for each base
2. For each ROI, use I-O model data to estimate the indirect and induced jobs that would be lost per direct (base) job loss, and use these indirect and induced "multipliers" to estimate the total job losses within the ROI under each proposed BRAC scenario
3. Compare the estimated BRAC job losses to the total jobs in the ROI to estimate the relative size of the impact
4. Examine the employment, unemployment, and per-capita income trends in the ROI to provide broader insight into the local economy

Regions of economic influence

The JPAT required analysis of economic impacts on "existing communities in the vicinity of military installations." The first step in this analysis was to determine the "vicinity"—that is, what the economic region of influence (ROI) is for each installation.

Consistent with previous BRAC rounds, the JPAT chose to assign ROIs based upon statistical areas defined by the Office of Management and Budget (OMB). The most recent specification of these areas is given in OMB Bulletin 04-03, *Update of Statistical Area Definitions and Additional Guidance on Their Uses*. Under the OMB system, economically integrated counties near a large urbanized area are grouped into Metropolitan Statistical Areas (MSAs). Eleven of the largest MSAs are further subdivided into smaller Metropolitan Divisions (MDs). Counties near smaller urbanized areas are grouped into Micropolitan Statistical Areas.[1]

Installations that are located in MDs were assigned the MD as their ROI. Installations located in MSAs without MDs were assigned the MSA as their ROI. Installations located in Micropolitan Statistical Areas were assigned the Micropolitan Statistical Area as their

[1] "Metropolitan Statistical Areas have at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Micropolitan Statistical Areas... have at least one urban cluster of at least 10,000 but less than 50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Metropolitan and Micropolitan Statistical Areas are defined in terms of whole counties (or equivalent entities). If the [additional] specified criteria are met, a Metropolitan Statistical Area containing a single core with a population of 2.5 million or more may be subdivided into Metropolitan Divisions." [OMB Bulletin 04-03, p. 2.]

ROI. For installations outside of any Metropolitan or Micropolitan Statistical Area, the individual county where the installation is located was designated as their ROI.

The Independent Review Panel had suggested reviewing ROI assignments for this last class of installations, those outside of OMB statistical areas, to ensure no important economic links would be missed. The DoD Components reviewed such bases under their purview, but ultimately did not recommend any changes to the standard assignments.

Estimated Potential Job Changes

"Total potential job change" was defined as the sum of direct, indirect, and induced potential job changes for each BRAC 2005 closure or realignment alternative or recommendation.

Direct job changes are the net addition or loss of jobs for each of the following categories of personnel:

- Military Personnel
- Government Civilian Employees
- Trainees: On-base military trainees, expressed in full time equivalents
- Mission Support Contractors: Non-government employees who perform one or more of the *military* missions on the base, and whose work tasks are virtually identical to government civilian employees or military personnel, expressed in full time equivalents

Indirect job changes are the net addition or loss of local non-government jobs supporting base material, service, and infrastructure needs, such as a local motor pool parts distributors or base operations support (BOS) contractors.

Induced job changes are the net addition or loss of local non-government jobs in industries that provide goods or services to the households of direct or indirect base employees. Examples include local grocery stores, retail stores, and restaurants.

The JPAT economics staff developed estimates of the indirect and induced job changes that would result per direct military, civilian, mission-contractor, or trainee job change in the ROI. These "multipliers" were based upon results from a commercially available economic input-output (I-O) model, IMPLAN.

I-O models typically have induced multipliers for the military and non-military government sectors, since data on salaries and spending patterns is usually available. However, they may not have an explicit indirect multiplier for government "industries." To estimate the indirect multipliers, the economics staff used a weighted mapping technique: data on the number of members with different military occupational specialties in each ROI was obtained, and the specialties were mapped onto civilian industries that were economically similar. Multipliers for the mapped industries were then averaged together, weighted by the number of personnel mapped to each industry.

The JPAT assumed that mission contractors had salaries and spending patterns distinct from those of non-military government employees. To estimate the contractor induced multipliers, the staff used the sectoral weighting from the indirect-multiplier calculation and applied them to the IMPLAN induced multipliers for the corresponding industries.

Basic-training trainees were assumed to be economically distinct from other trainees. For basic-training trainees, induced multiplier for military was reduced by a fixed fraction based upon their relative compensation level.

In summary:

- Induced multipliers for military and civilian government jobs were obtained directly from IMPLAN
- Induced multipliers for trainee FTEs at basic-training installations were estimated as a fixed fraction of the military induced multipliers for the ROI, based upon their lower average compensation; for other trainees, the military induced multiplier for the ROI was used
- Indirect multipliers for all personnel categories were estimated by mapping military occupational specialties (MOSes) to economically similar industrial sectors, as suggested by the Independent Review Panel. The MOS distribution within each ROI was obtained from the Defense Manpower Data Center (DMDC), and was used to generate a set of relative MOS weightings for the ROI. The indirect multipliers from IMPLAN were multiplied by the corresponding MOS weightings (as mapped to the industrial sectors) to get an estimate of the ROI's indirect multiplier for direct base jobs.
- The weightings and mappings from the indirect-multiplier calculation were applied to the industrial induced multipliers from IMPLAN to get an estimate of the mission contractor induced multiplier

The EIT applied these ROI-specific multipliers to each candidate BRAC action to estimate the resulting indirect and induced job changes. For each scenario, it summed the direct job changes with the indirect and induced job-change estimates to generate the Total Potential Job Change.

Any BRAC 2005 actions that relocated military personnel, civilian employees, or mission support contractor jobs within the same economic ROI were considered to have no net economic impact on communities in the vicinity of the base. Under these circumstances, the loss of a certain number of positions at one installation is offset by the gain of the identical number of positions of the same category at other installations in the same ROI.

Changes as a fraction of ROI employment

The loss of 1,000 jobs in a small rural county would have a larger relative economic impact on local communities than the same loss of 1,000 jobs in a huge metropolitan area. To capture this relative impact, the JPAT chose to estimate the total potential job changes as not just an absolute number, but also as a fraction of the total employment within the ROI.

The latest county-level employment data available from the Department of Commerce's Bureau of Economic Analysis (BEA) at the time of the EIT development were for calendar year 2002. The total potential job changes from a BRAC scenario were summed over FY 2006 to 2011 for each ROI and were divided by 2002 employment data for the ROI to get an indicator of the relative impact of the job changes under the scenario.

Economic context information

To capture recent economic trends in each ROI, the JPAT chose to include ROI historical economic data in the impact reports used in the analysis.

For historical economic context, the JPAT considered the following historical data:

- Total Employment: 1988-2002 (Source: BEA)
- Annual Unemployment Rates: 1990-2003 (Source: Bureau of Labor Statistics)
- Real Per Capita Income: 1988-2002 (Source: BEA)

These years were selected to capture most recent official actual (not estimated) economic data. Starting dates were chosen to include cumulative economic impacts from earlier BRAC rounds (1988, 1991 1993 and 1995) where available. The JPAT decided that there was no requirement to consider separately the cumulative economic impact of the prior BRAC rounds.

Economic Impact Tool

The BRAC 2005 Economic Impact Tool (EIT) is a web-based application that allows users to enter economic data and produce reports depicting the BRAC actions created for the scenarios within the tool. Users accessed the EIT through a web browser. Account access was password protected, and specific permissions were assigned to each user.

The tool mirrored the process developed by the JPAT, estimating the economic impact on communities of BRAC 2005 scenarios using:

(1) The total potential job change in the ROI
(2) Total potential job changes as a percentage of total employment in the ROI

Users entered direct job changes for military personnel, civilian government employees, trainees, and mission contractors. EIT produced a report that indicated the local economic employment impact and displayed historical economic information for the ROI.

The EIT contained the following information:

- Listing of DoD installations
- ROI to which each installation is assigned
- ROI population (2002)

- ROI employment (2002)
- Base authorized manpower (2005)
- Multipliers to estimate potential indirect and induced job changes that could result from direct job changes
- Historic economic data:
    - Total employment (1988-2002)
    - Annual unemployment rates (1989-2003)
    - Per capita income (1988-2002)

It was able to generate scenario-based output reports by:

- Individual action (stand-alone reports for one specific action for the base)
- Installation (net result of multiple actions for the base)
- ROI (net result of all actions for the economic area)

Multiple scenarios could be rolled up into one summary report as well.

The EIT produced a Portable Document Format (PDF) file that displayed the ROI population and employment, each installation's authorized manpower, the authorized manpower as a percentage of the ROI's employment, the total job change (sum of direct and indirect job changes) and the total job change as a percentage of ROI employment. A sample report output is provided in Appendix 4.

Appendix 1: Report of the Expert Panel

INDEPENDENT REVIEW PANEL COMMENTS ON PROPOSED ECONOMIC IMPACT ANALYSIS METHODOLOGY FOR THE BRAC 2005 PROCESS

(AUGUST 25, 2004)

Introduction and Background

On August 25, 2004, the Office of the Secretary of Defense Base Realignment and Closure (OSD BRAC) staff briefed an Independent Review Panel (IRP) on the JPAT's proposed economic impact analysis (EIA) methodology. OSD and the individual Services plan to use the EIA methodology to evaluate potential realignments and closures with respect to BRAC Criterion 6, "The economic impact on existing communities in the vicinity of military installations" (69. F.R. 6948, February 12, 2004). OSD had convened the IRP to ensure that the final EIA methodology is consistent with acceptable economic practices, and that it meets the objectives of the BRAC 2005 process.

Overall, the IRP found that the proposed EIA methodology meets the following criteria:

- Consistent with economic practices
- Treats all bases equally
- Respects cost of data collection and certification procedures
- Flexible for analyzing alternative scenarios
- Straightforward and uncomplicated, reducing error risk
- Credible and defensible

To further strengthen the validity of the EIA model, the panel made the following recommendations:

HISTORICAL CONTEXT

A great deal of discussion occurred between the IRP and the Staff's Economics Team regarding the historical data that will be provided on each region of economic influence (ROI) to put the results of the impact analysis in perspective. The discussion focused on parameters that may provide more information on the stability of a local economy, and on its ability to respond to proposed BRAC actions. The IRP suggested adding three additional parameters.

1. **Real Estate Value**: The IRP suggested considering an economic area's real estate value as a proxy for measuring stability of the local economy. For instance, in addition to full-market value of real estate per capita and median home values, adjusted value of real

estate ($/sq[2] or $/acre) could be used as a proxy for the health of the commercial and agricultural real estate markets. A robust economic area, measured by the real estate market value, might adjust and rebound more successfully to base closures than would a less robust area. There was not a consensus on how to obtain consistent annual real-estate value data the over 250 ROIs being considered. (Note: median home values are available from 2000 census; other real estate value data is available from state tax and audit agencies, although data quality among states may vary. Commercial real estate information services cover MSA's. Sources such as "Homefair.com" and "realtor.com" permit comparisons in costs of living, housing costs, etc. among cities. The value of taxable real estate is pretty well standardized (with the use of assessment ratios) because of its use in municipal bond ratings (and within states because of use in aid formulas. [2]

2. **Total Population** – One member of the IRP suggested that total population trends and forecasts for each ROI would provide additional valuable context for factoring an ROI's degree of sustainability from the potential impacts of a BRAC action.[3]

3. **Diversification Index** – The IRP suggested that an employment diversification index could also provide additional perspective on a local economy's susceptibility for absorbing the potential economic impacts of a BRAC action. [Note diversification will be highly correlated with size or employment area].

ROIs OUTSIDE OF MSAs

The proposed methodology designates a base's County as its ROI if the base is not located within a Metropolitan District, a Metropolitan Statistical Area, or a Micropolitan Statistical Area. The IRP suggested that the Staff's Economics Team evaluate the validity of this approach for each of the bases so located. With so few "single" counties, the IRP suggested creating "mini-MSAs" based on inflow and outflow of workers. Another method is to evaluate retail sales per capita to get a feel for where shopping takes place. The IRP's concern was whether the multipliers estimated for individual counties would accurately capture the impacts of a BRAC action. For instance, excluding counties from an ROI may under estimate changes in employment due to action such as BRAC. One suggestion was to evaluate commuting patterns of local county residents, which provides information on the regional scope of economic interdependence.

MILITARY SPENDING PATTERNS

For measuring induced employment impacts, the IRP suggested conducting a more detailed analysis of spending and consumption patterns of different categories of military personnel. For instance, where do base personnel shop for food (e.g., base commissaries or off-base stores)? Do spending patterns (absolute amounts and types of expenditures)

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[2] After researching this issue, the JPAT was unable to obtain data that was consistent across all the ROIs that needed to be analyzed. To ensure consistency of treatment, this recommendation was not adopted.
[3] This recommendation was partially adopted. Total population is indicated in the economic impact reports. The JPAT did not believe that it was appropriate to forecast population trends.

differ from one category of personnel to another? Obtaining payroll and allowance data would help with this analysis. [See note on "Mission-Based Contractors][4]

STANDARD DEFINITION OF MULTIPLIERS

The IRP suggested that the JPAT's Economics Team clearly distinguish and describe the type of employment multipliers it and its contractors were estimating. A clear definition of direct, indirect and induced multipliers would help users to better understand the I/O Model results.

MULTIPLIERS FOR MILITARY-UNIQUE ACTIVITIES

The Staff's Economics Team proposed using private sector industries in IMPLAN to estimate employment multipliers for base activities. The proposed EIA model would map base activities to between 10 and 15 North American Industrial Classification (NAICS) industries with similar activities and income levels. For military-specific activities for which there are no comparable private sector activities in the economic ROI (resulting in employment multipliers of zero in the ROI), the panel recommended that the Economics Team develop and apply appropriate and consistent multipliers (such as a national average) to ensure more accurate economic impact estimates. In mapping or developing multipliers for base activities, the IRP felt that equivalent income levels were a more important criterion than actual job functions. For instance, they recommended that the EIA model use relatively low multipliers for infantry personnel on base, whether or not a near-equivalent civilian (such as law enforcement) had high incomes locally. [Note: Consistent multipliers will be market-size sensitive, since small areas have a lot more leakage. In rural areas, where the Walmart is located will have a large impact on where the induced retail spending impacts are felt.] [5]

MULTIPLIERS FOR GUAM AND PUERTO RICO

IMPLAN, the model used by the Staff's Economics Team to develop employment multipliers, does not provide multipliers for Guam or Puerto Rico. The IRP suggested finding employment multipliers for these areas from alternative models or sources. Some suggestions included obtaining advice of the IMPLAN contractor's staff, purchasing multipliers from the Bureau of Economic Analysis (BEA) from their Regional Input-Output Model System (RIMS-II) for these areas, or determining if a unique I/O model has been developed for Guam and Puerto Rico. For Puerto Rico, either Hacienda (Department of Finance) or the Development Bank of Puerto Rico will likely have some information on this issue.

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[4] The JPAT recognized the value of this recommendation. After consulting with members of the RAND Corporation and the Defense Manpower Data Center (DMDC), they were unable to locate recent publicly available data on spending patterns. Available payroll and allowance data did not

[5] The JPAT economics team adopted this approach using Military Occupational Specialty (MOS) data from DMDC. For specialties that were not military-unique, the team mapped to the equivalent civilian industry sectors. For military-unique specialties, they mapped the MOSes to sectors that had indirect and induced characteristics that were similar to those that were expected for positions the MOSes.

AIMING HIGH

The IRP agreed that, for the purposes of Criterion 6, it was generally a sound approach to err in the direction of overestimating economic impacts. However, the panel cautioned against overusing over-estimation. One comment from the IRP raised the concern that induced effects are always suspect since they are so diffused and only start to make sense in very large areas (very large SMAs, states and regions).

DATA FOR MISSION-BASED CONTRACTORS

The Economics Team requested that the IRP comment on feasible and credible methods for estimating changes in mission-based contractor jobs under different BRAC scenarios. Three options that were presented were:

1) Requesting estimates from the field in a Scenario data call
2) Estimating contractor job changes from direct job changes with a proportionality index
3) Ignoring contractors altogether

After exploring the pros and cons of each option, and generating other options (such as counting security badges or parking permits), the IRP recommended using a scenario-based data call to obtain mission-based contractor job-change information. One possible scenario not discussed at the meeting is detailed sampling at a select number of bases. A really good, detailed survey that collects information on 15 to 20 bases would be an improvement over receiving poor information on 300 or so bases for purposes of benchmarking. In any event, doing a reality-check of on-site work to understand the data limitations would be worthwhile.

INCOME DEFLATOR

The JPAT's Economics Team discussed appropriate indices to use when adjusting per-capita income (PCI) for inflation, such as CPI-U and GDP-based deflators. The IRP recommended using the CPI-Superlative for this adjustment. BLS began issuing the new superlative index in 2002.

For more information on this see Greenstein, *A Simple Proposal That Can Mean Substantial Savings over Time* (May 18,2004) at "www.cbpp.org" [6]

[6] At the time the EIT needed to be implemented, the CPI-Superlative had not been retroactively computed back to 1988. Rather than omitting data relevant to previous BRAC rounds, or using inconsistent deflators over the historical periods, the JPAT decided to use the CPI-U deflator, which had been the Panel's second choice.

Appendix 2: Methodology details

BRAC Criterion 6 Economic Impact Tool:

Detailed Methodology and Data Sources
11 February 2005

This paper documents the methodology used to create and calibrate the economic analysis model and contextual data for the 2005 Base Realignment and Closure (BRAC) Criterion 6 Economic Impact Tool (EIT). The intent is to permit auditors to replicate the process, and to provide full visibility to the public of the methods, assumptions, and data used.

Step 1: Identify the bases under consideration and their county codes

Representatives from each service (Army, Air Force, Navy/USMC, and DoD) on the Criterion 6 Joint Process Action Team (JPAT) provided a list of bases for consideration. These lists were not in a standard format, but at a minimum had:

- The base name
- A unique identifier, identical to that used in the OSD COBRA model
- State

The initial files submitted by the JPAT representatives were

USN/USMC:	CRIT7 DATA CALL 1 TBL.xls	submitted 11 June 2004
USAF:	RMurray-Inst-State-County Codes2.xls	submitted 24 June 2004
USA:	BoozeAllenHamilton.xlw	submitted 18 June 2004
OSD:	Hard copy, duplicated as DoD_standalone.xls	submitted 24 June 2004

The Navy list provided Federal Information Processing Standards (FIPS) codes for the primary counties in which the base was located. The Army and Air Force data included a county name and state, but no FIPS codes. To assign a FIPS code to the Army and Air Force bases, a list was created mapping all U.S. county and county-equivalent names to FIPS codes.

County FIPS codes were cut and pasted from a Census Bureau text table at http://www.census.gov/datamap/fipslist/AllSt.txt. This table was effective as of January 1, 1990. Change notices 2–7 to the reference source, FIPS Publication 6-4, *Counties and Equivalent Entities of the United States, Its Possessions, and Associated Areas* were manually entered into the downloaded table. All remaining county-equivalents from the Publications Appendices A and B (U.S. Possessions and Freely Associated States) were cut and pasted into the table as well for completeness. The resulting spreadsheet was imported into Microsoft Access and compared, for QA purposes, with a similar table downloaded from http://www.census.gov/geo/www/fips/fips65/data/national.txt. The only differences

found were minor spelling variations (e.g., De Kalb vs. DeKalb), a typographic error in the reference source document (e.g., 1sabela vs. Isabela for FIPS 72071), and the extra county-equivalents from Appendices A and B.

A list of state FIPS codes was collected from Tables 1 and 2 of FIPS Publication 5-2, *Codes for the Identification of the States, the District of Columbia and the Outlying Areas of the United States, and Associated Areas*, obtained online at http://www.itl.nist.gov/fipspubs/fip5-2.htm. The names and codes were cut and pasted into Excel spreadsheet states.xls. Change notice 1 of the Publication was examined and found not to affect the spreadsheet.

The OSD list did not supply county FIPS codes or county names. For these bases, address and zip code information was obtained from the base web site. For example, Defense Finance and Accounting Service installation addresses were obtained from http://www.dfas.mil/about/locations, and Defense Commissary Agency installation addresses were obtained from http://www.commissaries.com/locations.htm.

The OSD-base zip codes were compared against a zip-to-FIPS table obtained from the Missouri Census Data Center. The table was obtained from the MCDC web site at http://mcdc2.missouri.edu/cgi-bin/callapp.pl?dir=/pub/data/corrlst&dset=us_stzcta5_county&form=xtract.html. This comma-delimited file was saved as Excel file zip2xounty.xls. To enhance searching, the table was modified by adding a field, "text fipco", which transformed numerical county FIPS codes into text to allow display of the full 5 digits of the code (such as 01115, rather than 1115). The first row, listing the field abbreviations, was removed for filtering convenience.

The MCDC table was based upon ZIP Census Tabulation Areas, or (ZCTAs), rather than the dynamic and not-necessarily contiguous ZIP codes themselves. To double-check the assignments, a text file of 1991 actual ZIP code ranges and FIPS counties was also downloaded from MCDC (http://www.oseda.missouri.edu/mscdc/sasfmats/Szipcnty.sas), and FIPS assignments of bases compared with this table.

The Military Department data submissions to the JPAT were then imported into MS Access, along with the state and the county name-to-FIPS tables, and a query was run to create a single, all-services draft base list, "Unified by CBSA 14 July 04.xls". The list included fields for Service, Activity ID, Activity Name, City, State, County Code, County, as well as other fields to be described in the next section. Military Department representatives on the JPAT were asked to review the draft on July 15, 2004.

Updates to the list of bases were submitted both before and after this unified draft was distributed. These updates were:

USN/USMC:	C6_Rresolved_UICs_6_23_04.xls	submitted 23 June 2004
	C6_Rresolved_UICs_7_14_04.xls	submitted 14 July 2004
	C6_DATA_7_18_04.xls	submitted 18 July 2004

	"DETSNewList to be added to DONBITS_7_18markup.xls"	submitted 18 July 2004
	2 e-mails updating zip codes	submitted 20 July 2004
	C6_Base_List_9_1_draft.xls	submitted 01 Sept 2004
USA:	Counties MSA and Stuff.xls	submitted 15 July 2004
	JPAT Six List.xls	submitted 31 Aug 2004
USAF:	E-mail updating 3 identifiers	submitted 16 July 2004
	Base List (31 Aug).xls	submitted 31 Aug 2004
	E-mail updating 1 identifier	submitted 08 Sep 2004
	Corrected AF Base Codes.xls	submitted 15 Sept 2004

After implementation of the web-based Economic Impact Tool (EIT), the Joint Cross-Service Groups (JCSGs) identified additional bases for analysis, including a large number of leased properties and Reserve/Guard centers. This process continues as of early February 2005.

Step 2: Identify the FY2005 authorized manpower for each base

For context purposes, the FY2005 authorized manpower for each base was compared with the total ROI population. A list of authorized manpower for each base was obtained from the COBRA database and stored as Booze Allen Population.xls. Data for the separate services was cut and pasted onto a single excel worksheet for ease of database loading, and the Officer, Enlisted, Civilian, and Student data was added together to obtain a total authorized manpower number.

JCSGs supplied certified manpower numbers for the bases and leases that they requested to be added after the implementation of the EIT.

Step 3: Identify a Region of economic Influence (ROI) for each base

The Region of economic Influence (ROI) for each base was defined as the Metropolitan Statistical Area (MSA) or Micropolitan Statistical Area in which the base's primary county lies. For bases in MSAs that are divided into Metropolitan Divisions (MDs), the ROI was defined as the MD in which the base's primary county lies. The 2000 standards for defining Metropolitan and Micropolitan Statistical Areas (65 FR 82228 – 82238, Dec 27, 2000) were used.

The mapping of the county FIPS codes to Statistical Areas was done using the appendix to OMB Bulletin No. 04-03, obtained online at http://www.whitehouse.gov/omb/bulletins/fy04/b04-03_appendix.pdf. Because the listings in the appendix were not in a format easily converted to .xls or .csv format, a columnar listing of the ROIs was obtained from http://www.census.gov/population/estimates/metro-city/03mfips.txt. This was converted to .xls format using text-to-columns function, and was updated from the June 2003 mapping to the December 2003 mapping using the attachment to OMB 04-03 (http://www.whitehouse.gov/omb/bulletins/fy04/b04-03_attachment.pdf). The result was checked visually against the OMB 04-03 appendix. The 04-03 errata issued by OMB on March 17, 2004 (http://www.whitehouse.gov/omb/bulletins/fy04/b04-

03_errata.pdf) was examined, but none of the errata were found to be relevant to the ROIs.

For bases in counties that are not in one of these statistical areas, the ROI was defined as the county itself. Based on a suggestion by the Independent Review Panel, these bases were further examined to rule out an MSA-like relationship between their counties and adjacent counties. The nine such counties (Mono, CA; Martin, IN; Aroostook, ME; Accomack, VA; King George, VA; Jefferson, WA; Pendleton, WV; Monroe, WI; and Guam), were investigated for potentially affected adjacent counties, and one (King George VA) was given further in-depth investigation. County-to-county worker flow files, obtained from the Census Bureau (http://www.census.gov/population/www/cen2000/commuting.html), revealed that there was less than a 15% cross-commute ratio between King George County and any adjacent county. For consistency sake, the Navy JPAT representative decided to keep this county as its own ROI.

Since multiplier and context data were available primarily at the county level, no partial counties were included in any ROIs. However, per P.L. 100-202 Section 530, the part of Sullivan city in Crawford County, MO, was added to the St. Louis, MO-IL Metropolitan Statistical Area effective December 22, 1987. For BRAC purposes, Crawford County was included in the MSA. BEA data does not include Crawford County in its summary statistics for this MSA.

Step 4: Develop indirect employment multipliers for each ROI

Direct job changes due to a realignment or closure will result in secondary job changes in the local economy. These jobs are of two types:

- Indirect jobs, which provide goods and services for the mission of the base
- Induced jobs, which provide goods and services to the households that derive income from direct and indirect jobs

Input–Output (I/O) models can use national and local data on production inputs, production outputs, and household consumption to estimate the number of indirect and induced job changes in all industries per direct job change in a given industry. The basic equation for estimating job impacts of a BRAC action is:

Estimated total job changes =
Direct Job Changes x (1 + indirect multiplier + induced multiplier)

Unfortunately, most I/O models do not have input–output production data on military services. To deal with this issue, indirect multipliers for BRAC actions were estimated by mapping military occupational specialties (MOSes) onto economically similar industrial sectors, and weighting the ROI's industrial-sector multipliers by the number of military employees mapped to each sector. That is,

Indirect multiplier for ROI=

(Fraction of personnel in ROI with MOSes that map to industry sector 1
x Indirect Multiplier for Sector 1 in the ROI)

+ (Fraction of personnel in ROI with MOSes that map to industry sector 2
x Indirect Multiplier for Sector 2 in the ROI)

+ ….

+ (Fraction of personnel in ROI with MOSes that map to industry sector 509
x Indirect Multiplier for Sector 509 in the ROI)

The following steps detail the steps taken to estimate the indirect multipliers.

4a. Obtain military population by Military Occupation Specialty (MOS) by county

A zipped file of military personnel assigned to each county, specified by MOS, was obtained from the Defense Manpower Data Center (DMDC) and saved as MOS State County.mdb. This data was current as of August 2004. After conducting a quality assurance inspection of the data received, the data was found to have an out-of-date FIPS county code for Miami-Dade County FL. This data was corrected. The file also contained entries that were distinguished by state, but not by county (FIPS codes xx000). These data were not considered in the subsequent analysis.

4b. Map MOSes to civilian industry sectors

The DMDC data file contained approximately 16,000 different MOSs. To simplify the mapping of these to civilian industry sectors, a crosswalk table from MOS (also referred to as MOC, Military Occupational Code) to Standard Occupational Classification (SOC) was obtained from DMDC and saved as crosswalks0904.mdb. The table was found to have 31 entries with duplicate MOCs. The duplicates were due to mappings of MOCs to other, non-SOC classifications, and so were eliminated without loss of relevant SOC information. SOC 1 was chosen as field to map to.

The level of MOS detail in the population listing (MOS State County.mdb) was finer than in the crosswalk table (crosswalks0904.mdb). As a result, over 13,000 of the MOSs in the former table did not have identical entries in the latter table. For example, the population table had entries for MOSs 003A0, 003A0B2, and 003A0H3, all of which corresponded to MOS 003A in the crosswalk table. To alleviate this mismatch, a table mapping the detailed MOSs to more the more generic crosswalk MOSs was created manually. For Navy entries, rating information was removed to leave Naval Enlisted Classification or Naval Officer Billet Classification numbers (e.g., YN 9502 mapped to 9502). For other forces, detail fields were removed from the end of the MOS (e.g., 003A0B2 mapped to 003A) or from the beginning of the MOS (e.g., X2E151 mapped to 2E151) to better match the crosswalk level of detail.

The personnel table, generic MOS mapping table, and the crosswalk table were loaded into Access and joined with a query. These steps resulted in a mapping of each personnel-table entry onto one of 343 SOCs.

SOCs describe employee occupations, whereas I/O multipliers describe industries, so a mapping was made from each of the SOCs onto one of the 509 industry sectors distinguished in the IMPLAN I/O model. Many mappings were straightforward, such as mapping Surgeons to the Hospital sector. Less obvious mappings were made based on economic similarities. For example, the SOC for Armored Assault Vehicle Crew Members was mapped to the Truck Transportation civilian industry sector, since the local civilian-sector goods and services required to support Armored Assault Vehicle operations would be similar to those required to support heavy land transportation equipment.

To assist in this mapping, a list of IMPLAN sectors and their corresponding North American Industrial Classification (NAICS) codes was obtained from MIG and saved as implan_sectoring_2001.pdf. This data was compared to NAICS sector breakdowns obtained from the Census Bureau's NAICS site (http://www.census.gov/epcd/www/naics.html) to assist in better mapping the IMPLAN sectors to the SOCs

The SOC–IMPLAN mapping table was joined with the previous query to result in a mapping of each personnel-table entry onto one of the IMPLAN industry sectors.

4c. Find relative sector weight for each ROI

The fraction of personnel in each sector was created by ROI. This fraction was:

$$\text{Fraction of personnel in ROI with MOSes that map to industry sector } i = \frac{\text{Number of personnel in ROI with MOSes that map to industry sector } i}{\text{Number of all personnel in ROI}}$$

This was done by an Access query joining the personnel-to-sector query with the county-to-ROI table.

4d. Obtain sector indirect-employment multipliers for each ROI that contains a base

Employment multipliers for all 509 civilian industry sectors were obtained from the Minnesota IMPLAN Group, Inc. (MIG) for each MSA or Micropolitan Statistical Area. These were requested for ROIs that contained at least one base identified in the pre-implementation listings of bases, and saved as models.mdb. A separate file contained multipliers for Metropolitan Divisions: IMPLAN_Multipliers_BRAC_2.mdb. Due to an initial ROI misassignment of Fort Campbell, a set of multipliers for its correct ROI were obtained in a separate file, Ft Campbell 17300.mdb.

The indirect-employment multipliers were calculated from the table as the Type-1 Multiplier minus 1. (Type-1 multipliers are direct + indirect).

IMPLAN does not have data for Puerto Rico or Guam. Based on recommendations from the BRAC JPAT-6 Expert Review Panel, MIG experts, and the Chief Economist of the Guam Department of Labor, multipliers for Key West-Marathon, FL Micropolitan Statistical Area (Monroe County, FL) were assigned to the San Juan-Caguas-Guaynabo, PR Metropolitan Statistical Area, and multipliers for the Honolulu, HI MSA were assigned to the Guam ROI.

4e. Multiply sector weights by sector indirect multipliers to obtain a military-equivalent multiplier for each ROI that contains a base

The sector weights from step 4c were multiplied by the sector multipliers from step 4d to yield the estimated DOD indirect multiplier for each ROI:

Military-equivalent indirect multiplier for ROI=
(ROI's weighting for industry sector 1
x ROI's Indirect Multiplier for Sector 1 in the ROI)
+ (ROI's weighting for industry sector 2
x ROI's Indirect Multiplier for Sector 2 in the ROI)
+ ….

+ (ROI's weighting for industry sector 509
x ROI's Indirect Multiplier for Sector 509 in the ROI)

Step 5: Develop induced employment multipliers for military, civilian, contractor, and student employees

Although IMPLAN has no specific indirect multipliers for military activities, it does have induced multipliers for military and non-military government jobs for each ROI. These were used for BRAC military and DOD-civilian job changes, respectively. Multipliers for contractor job changes were estimated by multiplying the sector weightings (from step 4c above) by the sector induced multipliers from IMPLAN. Student multipliers for bases with basic-training programs were estimated by multiplying the military induced multiplier by the ratio of basic-training wages to average military wages. Student induced multipliers for bases without basic-training programs were set equal to the military induced multiplier for the base's ROI.

The following steps detail the steps taken to estimate the induced multipliers.

5a. Obtain industry-sector induced employment multipliers for each ROI that contains a base

Sector induced multipliers were taken from the same files as the indirect multipliers: models.mdb, IMPLAN_Multipliers_BRAC_2.mdb., and Ft Campbell 17300.mdb. They were calculated as (Type N Multiplier – Type 1 Multiplier).

5b. Identify military and non-military government induced multipliers

The IMPLAN sector descriptions in implan_sectoring_2001.pdf show that Sector 505 is Federal Military, and Sector 506 is Federal Non-military. These were extracted from the multiplier tables using an Access query.

5c. Multiply sector weights by sector induced multipliers to obtain contractor induced multipliers

The sector weights form step 4c were multiplier by the corresponding induced multipliers from step 5a using Access query.

5d. Estimate the pay ratio between the average military member and basic-training students

Information on the Enlisted and Officer Average Cash Compensation for Enlisted and Officers by service (1999 data) was extracted from the DoD Ninth Quadrennial Review of Military Compensation, Volume II, Chapter 2, Table 1, obtained via the internet (http://www.dod.mil/prhome/qrmc/v2/index.htm). The total number of active duty members by service and rank/grade on Sept 20, 1999, was obtained from the Washington Headquarters Services via the internet (http://web1.whs.osd.mil/mmid/military/history/rg9909.pdf).
Both tables were cut and pasted into Excel format. Officers and enlisted numbers were summed for each service in Excel, and these numbers were multiplied by the corresponding average Regular Military Compensation (RMC) to get the average RMC across the military. This was divided by 12 and compared to the monthly cash payment for an E-1 under 4 months from the 1999 pay table (obtained online at http://www.defense.gov/specials/paycharts/99BasPay.html). The ratio was 34.97%.

5e. For each ROI with a recruit-training base, multiply the pay ratio (from 5d) by the military induced multiplier to obtain a basic-training student induced multiplier

Ten bases were designated by JPAT members as being recruit-training ("boot-camp") bases. They were BENNING, KNOX, LEONARD WOOD, SILL, JACKSON, CG MCRD SAN DIEGO, CG MCRD PARRIS ISL, Lackland AFB, and NAVSTA GREAT LAKES.

The ROIs for these bases was obtained by an Access query. The Student induced multipliers for these bases were calculated by multiplying the military induced multipliers for their corresponding ROIs by the basic-training pay ratio of 0.3497 (from step 5d) in MS Access.

Step 6: Calculate total (Indirect + Induced) multipliers for each base

(Indirect + Induced) multipliers were calculated for each class of personnel for each base as follows:

Military:
ROI Estimated Indirect (from step 4)
+ ROI Federal Military Induced (from step 5b, sector 505)

Civilian:
ROI Estimated Indirect
+ ROI Federal non-Military Induced (from step 5b, sector 506)

Contractor:
ROI Estimated Indirect
+ ROI Estimated Induced (from step 5c)

Student, base not in boot-camp list:
Same as Military

Student, base in boot-camp list:
ROI Estimated Indirect (from step 4)
+ 0.3497 x ROI Federal Military Induced

These calculations were done in an Access database and downloaded to an Excel spreadsheet for loading into the EIT.

Step 7: Identify historical population levels for each ROI

It was not possible to extract all context data consistently at the ROI level from source data online, since unemployment statistics are currently summarized by the Department of Labor using a pre-2000 MSA structure. To be consistent, all source context data—population, employment, unemployment, and personal income— was extracted by county and summed up within the EIT, using the mapping of county FIPS codes to ROIs from step 3 above.

Historical population data for 1988–2002 for the 50 states was obtained from the Bureau of Economic Analysis's Regional Economic Information System, "REIS" (http://www.bea.gov/bea/regional/reis) and stored as reis_download_population_13Oct04.csv.

For Puerto Rico, population data by municipio (county) for 2000–2002 was obtained at http://www.census.gov/popest/municipios/files/PRM-EST2003.csv
For 1990, it was obtained from http://www.census.gov/popest/archives/1990s/PR-99-1.txt. Between 1990 and 2000, population by municipio was interpolated from 1990 and 2000 data. For 1988 and 1989, the 1990 number was used so as not to extrapolate.

For Guam, total midyear population numbers were obtained from the Census Bureau's International Database at http://www.census.gov/ipc/www/idbprint.html

Some inconsistencies between the BEA groupings, OMB 04-03, and FIPS 6-4 county codes required some minor modifications of the source data. The Sullivan city/Crawford County, MO issue was mentioned at the end of Step 3 above. BEA groups several independent cities in Virginia with their surrounding counties and gives them a new FIPS code. These cities had to be broken out as a separate line (with zero population) and the new FIPS code had to be changed back to that of the surrounding county to allow for automatic roll-up by the EIT using the FIPS 6-4 and OMB 04-03 mappings. Since these cities all belonged to the same ROI as their surrounding counties, this breakout led to consistent ROI results. Likewise, BEA combines Kalawao County, HI, with Maui County and gives it a new FIPS code. Kalawao was broken out as a separate county with zero population

Step 8: Identify historical unemployment rates for each ROI

Historical unemployment and work-force data for 1990-2003 was obtained by e-mail from the Bureau of Labor Statistics (BLS) and stored as cnaaseries.xls. This data included information for Puerto Rico by Municipio.

Subsequent to this data being received and loaded in June 2004, BLS adjusted the data for 2001 and 2002. The adjustments lead to minor differences when comparing data from the BLS website with unemployment rates for 2001 and 2002 in the EIT.

Unemployment numbers for Guam were difficult to obtain from a single source for the entire period. The Guam Department of Labor's Department of Labor Statistics conducts a Current Labor Force Survey, usually quarterly; results from that survey were obtained from a variety of sources. The 1992–2000, intercensal survey were obtained from the U.S. Dept of Interior, Office of Insular Affairs (OIA), Statistical Enhancement Program website (http://www.pacificweb.org/guam.html, and verified as official); since not all quarters were available, the March survey was used for 1993–1999, whereas September was used for 1992, and July for 2000. Data for 2001 was obtained from the Guam Economic Review, 23:4 via the Guam Dept of Commerce website (http://www.admin.gov.gu/commerce/reports/Guam%20Economic%20Review%20Quarterly%20Report%204thQtr2001.pdf). Data for 2002 came from Dept of Interior, Office of Insular Affairs Summary website (http://www.doi.gov/oia/commerce/sumislstat/guamstat.htm). In all cases, 1992 numbers

were used for 1990 and 1991 to avoid extrapolation; 2002 numbers were used for 2003 for the same reason.

Step 9: Identify historical total-employment levels for each ROI

Historical employment data was obtained from the BEA REIS site and stored as reis_download_employment_14Oct04.csv.

For Puerto Rico, employment numbers from the BLS file in step 8 (cnaaseries.xls) were used; no BEA numbers were available by Municipio. For 1988 and 1989, the 1990 number was used so as not to extrapolate.

For Guam, the same sources were used as in Step 8.

Step 10: Calculate the ratio of authorized manpower to ROI employment

This ratio of interest to decision makers was calculated as:

$$\textbf{Base size ratio} = \frac{\textbf{Authorized Manpower (2005)}}{\textbf{ROI Employment (2002)}}$$

For computational convenience, the ROI Employment (2002) was summed directly once in Excel, rather than dynamically in the EIT.

Step 11: Identify historical per-capita income (PCI) for each ROI

Real per-capita income by ROI was calculated by normalizing counties' total personal income to 2003 real dollars using the Consumer Price Index (CPI-U) in Excel, summing over the counties in the ROI, and dividing by the sum of population for all the counties in the ROI.

The following steps detail the procedure:

11a. Obtain nominal total personal income by county

Personal income (nominal) by county was obtained from BEA REIS and stored as reis_download_personal_income_13Oct04.csv.

11b. Multiply nominal personal by a CPI inflator to obtain real personal income

The Consumer Price Index for All Urban Consumers (CPI-U), U.S. All items, 1982-84=100 – Series CUUR0000SA0 (http://data.bls.gov/cgi-bin/surveymost?cu) was

obtained online for 1988 to 2003 from the BLS and cut and pasted into Excel. To get inflators normalized to 2003=1.0, the following formula was used:

Inflator(2003=1.0) = CPI[2003]/CPI(t)

For example, since the CPI-U for 1989 is 124, and for 2003 it is 184, the inflation factor for 1989 is 184/124 = 1.484.

11c. Calculate nominal PCI for each ROI

Real PCI by ROI was calculated in the EIT by summing up the real personal income for all of the counties in the ROI, and dividing by the sum of population for all of the counties in the ROI.

For Puerto Rico, no income data was available at the municipio level. Island-level nominal PCI for was obtained for 1990–2003 via e-mail from BEA and stored as BEA_OUTLY03.doc. Personal income was back-figured in Excel by multiplying this island PCI by municipio population from step 10. For 1988 and 1989, real PCI from 1990 was used. Note that this will give identical PCI histories for all ROIs in Puerto Rico.

The BEA Island-level nominal PCI (BEA_OUTLY03.doc) included data for Guam as well. Personal income was back-figured using the same method as for Puerto Rico.

Step 12: Multiply direct job changes for each BRAC scenario action by the (indirect + induced) multipliers for each base to estimate the total job changes due to the action

After the multipliers for each base and the context data for each ROI were calculated, scenario actions were applied to the multipliers to estimate total job changes. The formula used was:

Estimated total job changes =
Direct Job Changes x (1 + [indirect+ induced] multiplier)

As mentioned at the end of step (2) above, some of the Joint Cross-Service Groups added bases for analysis after the initial deployment of the EIT. These ‘bases’ were mostly leased spaces or Reserve/Guard centers. The majority were in ROIs that had other bases in them, so ROI-specific multipliers were already available. A small number were in ROIs that did not have multipliers developed at deployment. For these ROIs, a generic set of multipliers was developed by averaging the multipliers of each category (military, civilian, contractor, student, boot-camp student) for the existing ROIs. Although a full quantitative analysis was not done, most of these new ROIs appeared to have populations smaller than the average of existing ROIs. Thus, they could be expected to have multipliers smaller than the average; averaging would tend to overestimate the indirect/induced job impact on these ROIs.

Step 13: Sum job changes by action, base, or region as desired

Estimated job changes were summed over actions, base, or ROI in the EIT and plotted as a function of time.

Step 14: Calculate the ratio of total job changes by ROI employment

The ratio of interest to decision makers was calculated in the EIT as:

$$\text{Effect ratio} = \frac{\text{Sum of estimated total job changes (2006-2011)}}{\text{ROI Employment (2002)}}$$

These 14 steps generate the decision variables designated by BRAC leadership to be used when considering economic impacts on local communities.

Appendix 3: Brief Overview of Input-Output Models

Input–output models use national-level data to estimate how the inputs for one industry (such as armored vehicle and tank parts manufacturing) correspond to the outputs from another industry (such as metalworking equipment or ferrous metal production). The amount of these outputs that local firms can supply is estimated from local economic data. The supplier industries themselves require inputs; these input requirements are estimated from the national data, and the local supply is estimated from the local data. This chain of input-for-A = output-of-B continues until all required inputs are accounted for, either as generated from raw materials and labor locally, or as imported from outside the region. In this way, the local "indirect" revenue, household income, and jobs are estimated per dollar of direct revenues for the top-level industry.

The household income generated by an industry also creates demand in household-servicing industries, such as food stores or child day-care services. To account for this, Input-Output models use national-level consumer data to estimate how households spend their money as a function of annual income, and they use local data to estimate how much of these expenditures can be met locally. The input–output chain analysis on these "induced" impacts proceeds until all inputs are accounted for as either generated from raw materials and labor locally, or imported from outside the region.

Appendix 4: Sample EIT Report

The EIT allows users to produce a report(s) by selecting scenarios created within the EIT. The reports will display the affect of applying the economic impact criterion in decision-making processes for the Department of Defense's 2005 recommendations to the BRAC Commission.

The report will be opened in a PDF document using Adobe Acrobat. Users select a scenario that has already been created and stored in the EIT database, and then choose to roll up that report by a particular report type:

- By individual actions (stand-alone reports for one specific action for the base)
- By base (net result of multiple actions for the base)
- By ROI (net result of all actions for the economic Region of Influence).

The report will display economic impact data for each scenario for a proposed BRAC 05 Action. The report displays net job changes from a BRAC Action, which includes Direct, Indirect (e.g., base support), and Induced (e.g., households) data. The report includes the following for each ROI:

- Economic ROI to each installation that has been assigned
- ROI population (2002)
- ROI employment (2002)
- Base authorized manpower (2005)
- Estimated job changes summed over the period 2006-2011.

The report also depicts historic economic data, which includes:

- Total employment (1988-2002)
- Annual unemployment rates (1990-2003)*
- Per capita income (1988-2002), in real 2003 dollars.

These graphs provide users with a reference for determining the relative impact a scenario might have on a local community's economy. A sample report output has been provided in the following pages.

Definitions

Definitions for terms found in the Report:
Total potential job change: sum of direct, indirect and induced job changes attributable to a potential BRAC action

Direct jobs: sum of jobs for military personnel, government civilian employees, contractors performing the base's mission(s), and military trainees

Indirect jobs: non-government jobs that supply goods and services to support the base's performance of its mission(s)

Induced jobs: jobs supported by households in the surrounding economic area

Total employment: all military and civilian jobs, including trainees and mission support contractors

Region of Influence (ROI): The existing communities in the vicinity of a military installation in which significant economic impact might occur due to potential BRAC actions. The EIT uses the Metropolitan District (MD), Metropolitan Statistical Area (MSA), or Micropolitan Statistical Area in which the base is located as the ROI. For bases that are not located in one of these OMB-defined areas, the EIT uses the base's county as the ROI.

Below are screen shots of a demonstration scenario, moving a band at Aberdeen Proving Grounds to Fort Huachuca. A cover page describes the report. Each action (removal from Aberdeen, moving into Huachuca) generates one page of impact results and another page of historical economic trend data.

Economic Impact Report

This report depicts the economic impact of the following Scenarios:

12345: Demo-- Realign Aberdeen

The data in this report is rolled up by Action

As of: Wed May 04 14:50:15 EDT 2005

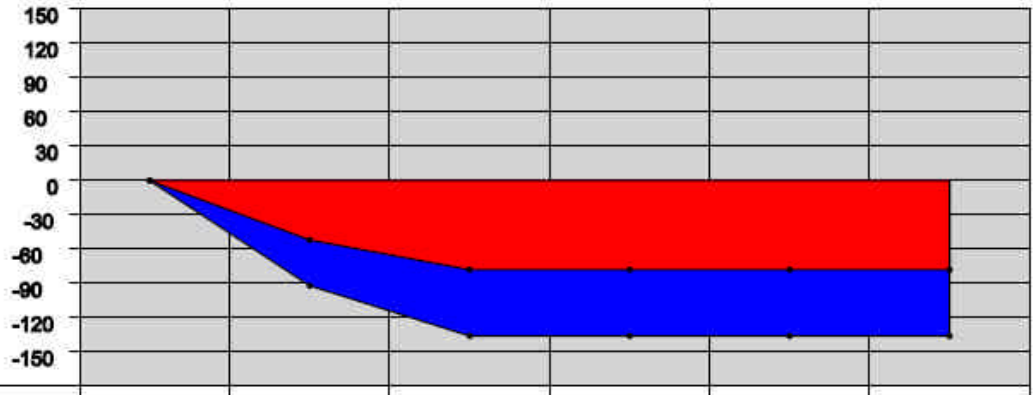
ECONOMIC IMPACT DATA

Scenario:	Demo-- Realign Aberdeen
Economic Region of Influence(ROI):	Baltimore-Towson, MD Metropolitan Statistical Area
Base:	ABERDEEN
Action:	Move 389th Army Band

Overall Economic Impact of Proposed BRAC-05 Action:

ROI Population (2002):	2,598,976
ROI Employment (2002):	1,568,140
Authorized Manpower (2005):	11,689
Authorized Manpower(2005) / ROI Employment(2002):	0.75%
Total Estimated Job Change:	-138
Total Estimated Job Change / ROI Employment(2002):	-0.01%

Cumulative Job Change (Gain/Loss) Over Time:

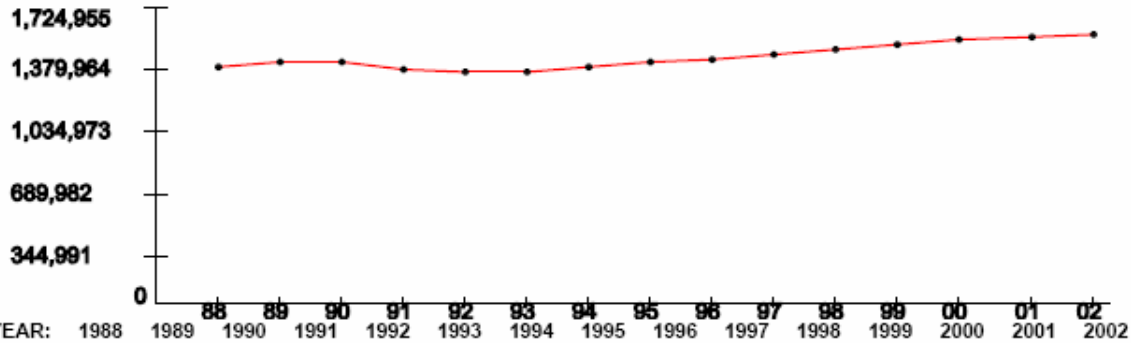


YEAR:	2006	2007	2008	2009	2010	2011
Direct Military:	0	-50	-25	0	0	0
Direct Civilian:	0	-2	-1	0	0	0
Direct Student:	0	0	0	0	0	0
Direct Contractor:	0	-1	0	0	0	0
Cumulative Direct:	0	-53	-79	-79	-79	-79
Cum Indir/Induc:	0	-40	-59	-59	-59	-59
Cumulative Total:	0	-93	-138	-138	-138	-138

Deliberative Document - For Discussion Purposes Only - Do Not Release Under FOIA
Page 2

Baltimore-Towson, MD Metropolitan Statistical Area Trend Data

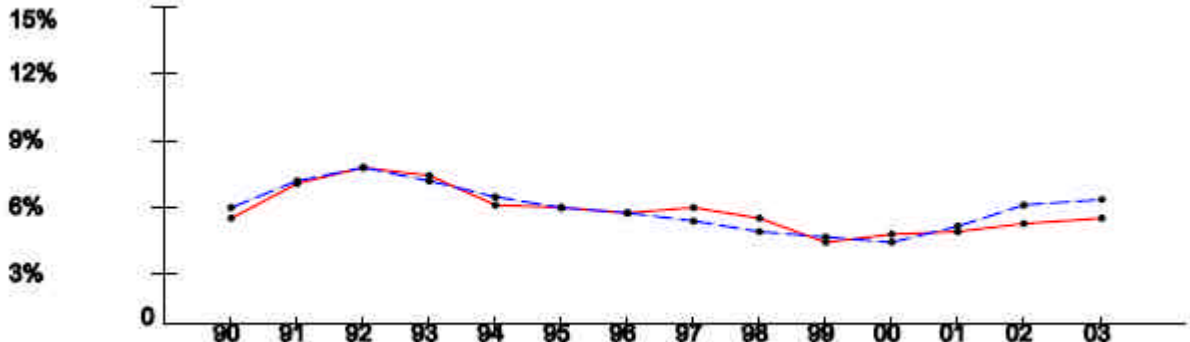
Employment Trend (1988-2002)



YEAR:	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Index:	1	1.02	1.03	0.99	0.98	0.99	1	1.02	1.03	1.05	1.07	1.1	1.12	1.13	1.14

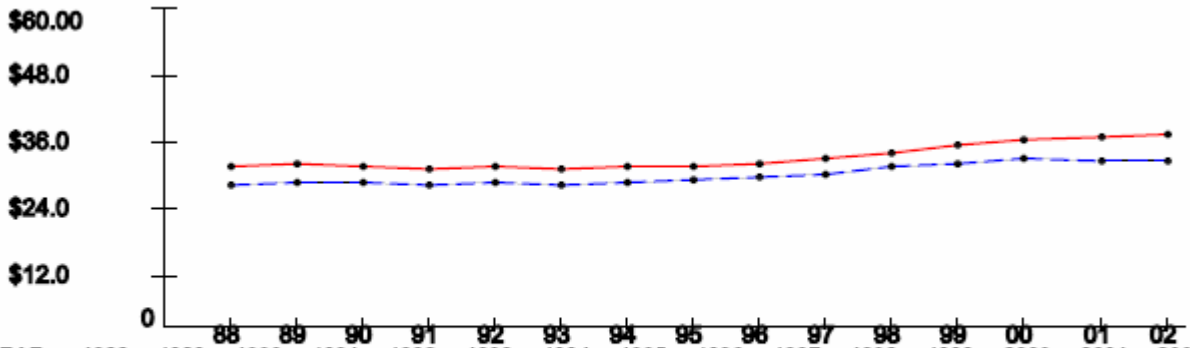
Represents the ROI's indexed employment change since 1988

Unemployment Percentage Trend (1990-2003)



YEAR:	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ROI:	5.16%	6.71%	7.5%	7.07%	5.8%	5.6%	5.38%	5.63%	5.15%	3.99%	4.4%	4.5%	4.83%	5.1%
USA:	5.6%	6.83%	7.5%	6.91%	6.09%	5.59%	5.4%	4.94%	4.51%	4.21%	3.99%	4.74%	5.79%	5.99%

Per Capita Income x $1,000 (1988-2002)



YEAR:	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ROI:	$30.56	$30.86	$30.69	$30.11	$30.32	$30.01	$30.33	$30.56	$30.96	$31.97	$33.22	$34.33	$35.58	$35.86	$36.37
USA:	$26.96	$27.48	$27.42	$26.87	$27.35	$27.18	$27.53	$27.86	$28.35	$29.04	$30.35	$30.86	$31.89	$31.72	$31.61

Note: National trend lines are dashed

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As of: Wed May 04 15:20:37 EDT 2005

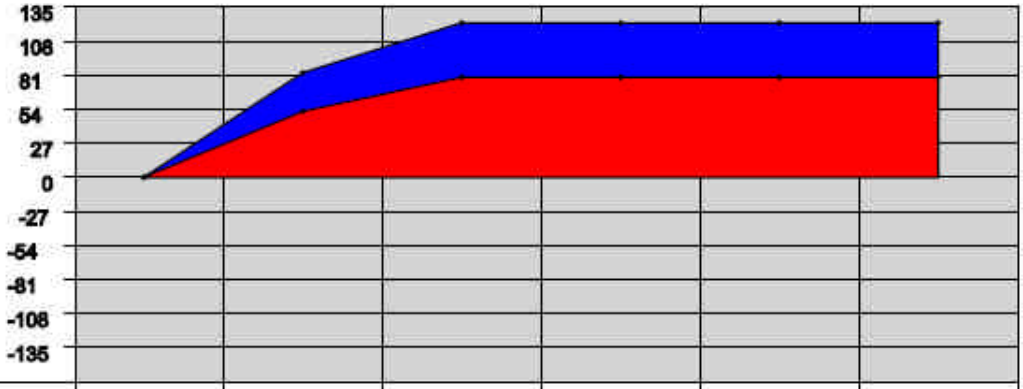
ECONOMIC IMPACT DATA

Scenario:	Demo-- Realign Aberdeen
Economic Region of Influence(ROI):	Sierra Vista-Douglas, AZ Micropolitan Statistical Area
Base:	HUACHUCA
Action:	Accept 389th Army Band in

Overall Economic Impact of Proposed BRAC-05 Action:

ROI Population (2002):	120,330
ROI Employment (2002):	51,749
Authorized Manpower (2005):	9,871
Authorized Manpower(2005) / ROI Employment(2002):	19.07%
Total Estimated Job Change:	122
Total Estimated Job Change / ROI Employment(2002):	0.24%

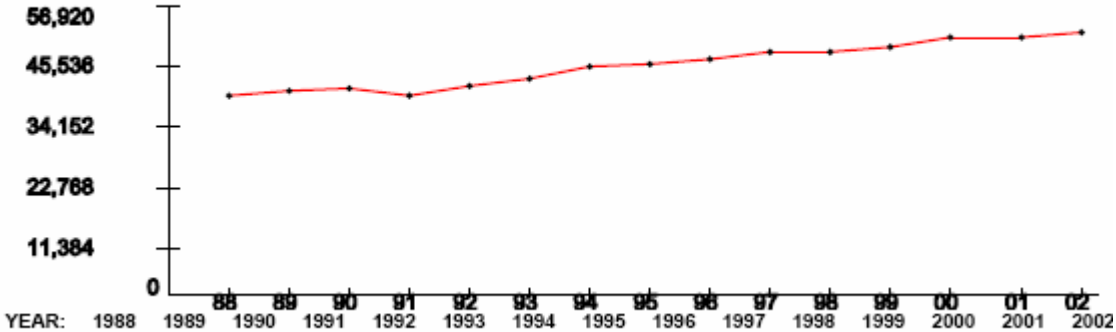
Cumulative Job Change (Gain/Loss) Over Time:



YEAR:	2006	2007	2008	2009	2010	2011
Direct Military:	0	50	25	0	0	0
Direct Civilian:	0	2	1	0	0	0
Direct Student:	0	0	0	0	0	0
Direct Contractor:	0	1	0	0	0	0
Cumulative Direct:	0	53	79	79	79	79
Cum Indir/Induc:	0	29	43	43	43	43
Cumulative Total:	0	82	122	122	122	122

Sierra Vista-Douglas, AZ Micropolitan Statistical Area Trend Data

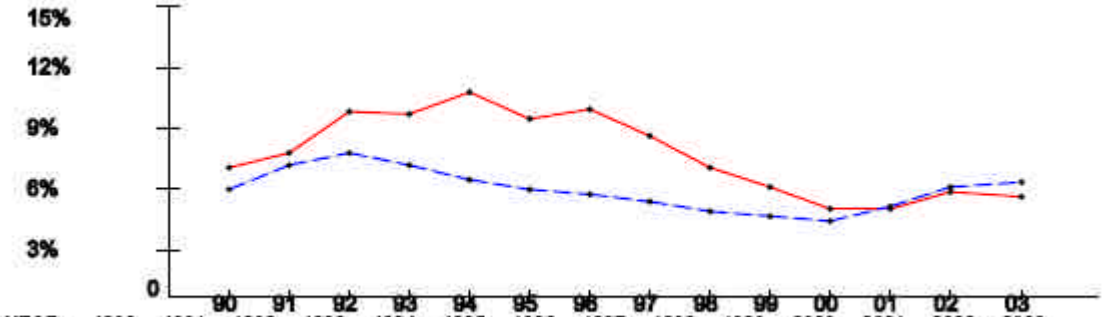
Employment Trend (1988-2002)



YEAR:	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Index:	1	1.02	1.03	0.99	1.04	1.08	1.13	1.15	1.18	1.21	1.22	1.23	1.28	1.29	1.31

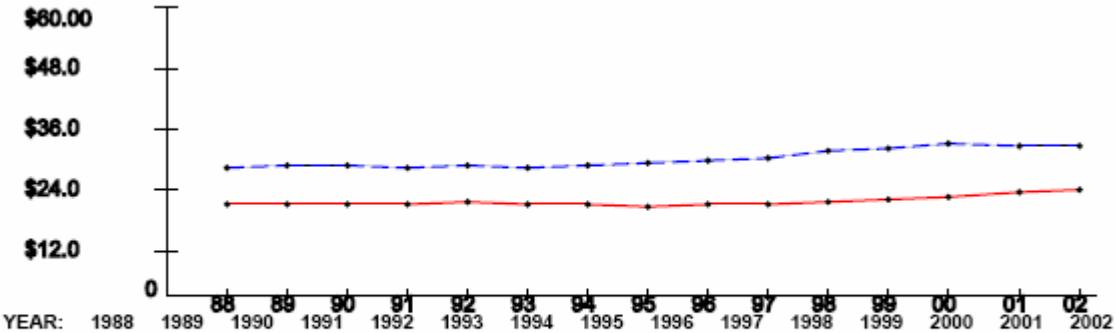
Represents the ROI's indexed employment change since 1988

Unemployment Percentage Trend (1990-2003)



YEAR:	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ROI:	6.7%	7.44%	9.58%	9.53%	10.68%	9.21%	9.72%	8.36%	6.75%	5.71%	4.62%	4.61%	5.49%	5.24%
USA:	5.6%	6.83%	7.5%	6.91%	6.09%	5.59%	5.4%	4.94%	4.51%	4.21%	3.99%	4.74%	5.79%	5.99%

Per Capita Income x $1,000 (1988-2002)



YEAR:	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ROI:	$19.58	$19.38	$19.47	$19.62	$20.16	$19.65	$19.32	$18.81	$19.31	$19.53	$20.18	$20.42	$21.08	$21.81	$22.63
USA:	$26.96	$27.48	$27.42	$26.87	$27.35	$27.18	$27.53	$27.86	$28.35	$29.04	$30.35	$30.86	$31.89	$31.72	$31.61

Note: National trend lines are dashed

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