



## **Indian Health Service**

The Federal Health Program for American Indians and Alaska Natives

# **MANAGING CAPITAL INVESTMENTS AT THE INDIAN HEALTH SERVICE**

A "HOW-TO" GUIDE TO EARNED VALUE MANAGEMENT

JULY 2007

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# A “How-To” Guide to Earned value Management

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## PURPOSE

This guide is intended for use by Indian Health Service (IHS) project managers responsible for managing an investment or sub-project using earned value management (EVM).<sup>1</sup> The guide’s purpose is to provide a basic, easy, step-wise method for using EVM to control the scope and measure the cost and schedule performance associated with an investment—consistent with federal and Department of Health and Human Services (HHS) requirements. It is not intended to be a comprehensive reference guide.

This guide is divided into three sections. The first two sections discuss EVM in theory; “The Basics” provides background information about EVM, and “The Process” describes the process and data required for EVM. The third section “Using EVM to Manage Projects” discusses the use of EVM to manage IHS projects. The guide also has three appendixes:

- Appendix A contains guidelines excerpted from the American National Standards Institute/Electronic Industries Alliance (ANSI/EIA) Standard 748-A-1998, *Earned Value Management Systems*.
- Appendix B contains Contract Performance Report formats 1 through 5.
- Appendix C contains the DoD guidance for inserting the information required in the individual data elements for the Contract Performance Report formats 1 through 5. The DoD guidance is probably the best information available.

## THE BASICS

### What Is Earned Value?

Earned value, also referred to as the budgeted cost of work performed, is the value of the work that has been completed. Earned value is a quantifiable dollar figure that allows a project manager to measure the performance of a project by incorporating costs and schedule as well as project accomplishments. Specifically, the earned value represents the amount of the overall project budget that has been “earned” based on the percentage of the work that has been accomplished.

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<sup>1</sup> Because this guide supports the capital planning and investment control (CPIC) process, the term “investment” is used to refer to the projects, programs, systems, etc., that fall under the purview of the CPIC process.

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## What Is Earned Value Management?

EVM, developed in 1967 initially for the defense and aerospace fields, is a project management method for planning and controlling an investment's schedule and budget. EVM provides an objective measurement of how much work has been accomplished on a project in relation to the project's schedule and budget. EVM enables managers to identify performance trends and cost and schedule variances early, while there is adequate time to implement corrective actions.

Simply stated, EVM is a collection of management practices. It provides a structured method to:

- establish a performance measurement baseline and
- measure and analyze performance.

Earned value management provides its greatest value to projects that are in the development, modernization, or enhancement (DME) phase of their life-cycle, but may be collected in all phases of the life-cycle.

## Why Use EVM?

EVM provides project managers with accurate data for making timely, informed management decisions, enabling them to take corrective action before it is too late. Specifically, it provides them with the cost, schedule, and performance data necessary to ensure that investments are delivered on time and within budget and scope.<sup>2</sup> EVM minimizes risk by integrating the investment scope of work with cost and schedule performance for optimum project planning and control. EVM provides a quantitative measure of progress against a performance measurement baseline (PMB) established from a project's work breakdown structure (WBS) and project plan. This method also enables a manager to predict future performance; specifically, it can be used to estimate the completion date and the total cost to complete a project, assuming that the status quo is maintained. By using EVM as an early warning tool, managers can act proactively rather than reactively. It is a critical part of the Control phase of the Capital Planning and Investment Control (CPIC) process.

Not only is EVM an effective and proven performance management technique, it is required on federal capital asset projects. Consistently, and most recently in June 2006, OMB has mandated in Part 7 of Circular No. A-11 (*Planning, Budgeting, Acquisition, and Management of Capital Assets*) that federal agencies implement performance measures and management processes based on EVM guiding principles. Both agencies and their contractors must use these processes. In addition, HHS requires EVM for all DME projects.

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<sup>2</sup> HHS OCIO IT Earned Value Management Processes and Procedures, December 2005.

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Further, EVM is scalable to all sizes of projects. It can benefit small projects and large projects alike.

## What Is an Earned Value Management System?

An earned value management system (EVMS) is an integrated management approach that a project manager uses to control scope and measure cost and schedule performance. OMB has specified that all investments that require an OMB Exhibit 300 must use an EVMS that meets ANSI/EIA Standard 748-A guidelines. The ANSI guidelines

“incorporate best business practices for program management systems that have proven to provide strong benefits for program or enterprise planning and control. The processes include integration of program scope, schedule, and cost objectives; establishment of a baseline plan for accomplishment of program objectives; and use of earned value techniques for performance measurement during the execution of a program. The system provides a sound basis for problem identification, corrective actions, and management replanning as required.”<sup>3</sup>

Appendix A contains a synopsis of the ANSI/EIA guidelines.

## Is EVM Too Costly for Small Projects?

EVM costs do not need to be burdensome for small projects. Because the level of detail and the depth of analysis of the EVM data reported on should vary based on the size of the project, EVM can still provide benefits to small projects without increasing costs disproportionately. According to several studies, the costs of EVM are a very small percentage of the overall project costs, typically 5 percent or less.<sup>4</sup>

## What Automated Tools Are Available to Support EVM Requirements?

Several automated tools are available to assist staff members with setting up, maintaining, and reporting on EVM data. An EVMS can use a simple MS Excel workbook or a more complex commercial software package to track EVM data and produce EVM reports. Based on the complexity of the project and the project team’s familiarity with the various EVMS tools, the project manager should use the tool most appropriate for the particular investment.

HHS requires monthly EVM reports for some investments. At IHS, projects are normally rolled up into the overall system that they support: the Resource and

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<sup>3</sup> See <http://webstore.ansi.org/ansidocstore/product.asp?sku=ANSI%2FEIA%2D748%2DA%2D1998>.

<sup>4</sup> David S. Christensen, “The Costs and Benefits of the Earned Value Management Process,” *Acquisition Review Quarterly*, Fall 1998.

Patient Management System (RPMS), the Infrastructure, Office Automation, and Telecommunications (IOAT), or the National Patient Information Reporting System (NPIRS). For these projects, ProSight, the HHS portfolio management tool (PMT), currently is used to report EVM data. HHS is in the process of migrating its EVMS to a new tool, Dekker TRAKKER®, which will provide EVM data to the PPT. For new IT projects that will not be an application under the umbrella of one of these investments, and for these three IHS IT investments, the project or investment manager must report EVM data using the tool required by the Department based on the established investment thresholds.

## What Are the Key EVM Terms?

Table 1 lists and defines basic EVM terms. OMB has recently begun using the two-letter abbreviations and simpler terms, but the former terms are provided as well for those who are more familiar with them.

*Table 1. EVM Terminology*

Term	Abbreviation	Definition	Former term (if different than abbreviation)
Planned value	PV	Planned costs. This is also the budgeted cost of work scheduled to date.	Budgeted Cost of Work Scheduled (BCWS)
Earned value	EV	The portion of the overall budget that can be claimed as earned based on the percentage complete. This is the budgeted cost of work performed to date. <i>Earned value = planned cost × percentage complete</i>	Budgeted Cost of Work Performed (BCWP)
Actual cost of work performed	AC	Actual costs of work performed to date.	Actual Cost of Work Performed (ACWP)
Cost variance	CV	A comparison of the earned value with the actual costs. Negative variance means that the project is failing to meet its cost objectives and is over budget. <i>Cost variance (CV) = EV – AC</i>	
Cost variance	CV%	The ratio of the cost variance to the budgeted cost of the work scheduled to date. <i>Cost variance percentage = CV/EV</i>	
Cost performance index	CPI	A metric used to compare the actual costs relative to the earned value. A value of less than 1 means that the project is not meeting cost objectives or spending more money than anticipated to complete the required work. <i>Cost performance index (CPI) = EV/AC</i>	
Schedule variance	SV	A comparison of the amount of work scheduled to be performed in a period with the work that was actually performed in that period. Negative variance means that the planned value exceeds the earned value and therefore the project is behind schedule. <i>Schedule variance (SV) = EV – PV</i>	

Table 1. EVM Terminology

Term	Abbreviation	Definition	Former term (if different than abbreviation)
Schedule variance percentage	SV%	The ratio of the schedule variance to the budgeted cost of the work scheduled to date. <i>Schedule variance percentage = SV/PV</i>	
Schedule performance index	SPI	A metric used to compare the earned value relative to the planned value. A value of less than 1 means that the project is falling short of meeting its schedule objectives and therefore is taking more time than anticipated to complete the required work. <i>Schedule variance (SV) = EV - PV</i>	
Budget at completion	BAC	The overall budget for the project. It is the sum of the PV for each of the individual tasks and equals the planned value at the completion of the project.	
Estimate at completion	EAC	Estimated overall cost of the project at completion. This incorporates actual costs for milestones that have begun with planned value for milestones that have not yet begun.	

## What Are the Required EVM Elements?

As directed by OMB and in accordance with the HHS CPIC policy, the IT project manager must do the following:<sup>5</sup>

- Use EVM to manage and measure investments to within 10 percent of baseline goals<sup>6</sup>
- Use EVM performance measures and management processes to monitor actual versus expected results
- Use EVM to measure progress against milestones on an independently verifiable basis
- Use EVM to ensure that IT investments proceed in a timely fashion toward meeting approved milestones and satisfying security requirements
- Use EVM in conjunction with a risk management strategy
- Ensure accurate recognition of earned value by applying EVM to established project WBSs that permit independently verifiable measurement of progress in terms of cost, schedule, and performance goals

<sup>5</sup> Office of Management and Budget, *Improving Information Technology (IT) Project Planning and Execution*, Memorandum M-05-23, August 2005.

<sup>6</sup> IHS uses a threshold of 7 percent rather than 10 percent, in accordance with HHS guidance for monitoring EVM projects at the agency level.

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- Prepare corrective action plans when variances exceed acceptable performance tolerances
  - Document the methods for analyzing and using the EVM data to assess and monitor contract performance
  - Comply with departmental requirements for reporting the EVM status of investments
  - For steady-state investments, perform operational analyses. Although operational analysis evaluates a number of factors, one of the requirements is to report steady-state earned value data.

The appropriate level of earned value management for any investment depends on three main factors:

- *Overall project budget.* Larger projects require a more extensive WBS and more milestones than a smaller project. For example, some organizations state that, to be managed effectively, a single DME milestone should not exceed \$1 million in planned costs. Any milestone exceeding that threshold should be broken down into additional milestones
- *Life-cycle phase.* EVM is performed for investments that have a DME component (e.g., DME investments and mixed life-cycle investments). For steady-state investments, managers must perform operational analyses (refer to HHS-CPIC policy for operational analysis requirements)
- *Level of risk.* Projects that are high risk are also good candidates for use of full EVM. A project can be defined as high risk based on specific aspects of the project (e.g., using a new technology that has not been proven at the agency) or based on generalities such as the public scrutiny associated with a particular project.

## THE PROCESS

The EVM process requires the completion of four basic steps:

- Step 1: Establish the performance measurement baseline (PMB)
- Step 2: Monitor the work
- Step 3: Develop earned value reports
- Step 4: Control change (as necessary).

This section summarizes each step.

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## Step 1: Establish the Performance Measurement Baseline

The first and arguably the most critical step of the EVM process is to establish the Performance Measurement Baseline (PMB). The PMB is the time-phased WBS against which project performance is measured. If the PMB is not set up correctly in the beginning, the variance analysis will yield unreliable results, and significant resources will be required to modify the baseline. Therefore, this part of the process requires extensive planning.

The PMB is where the project activities, schedule, and cost objectives are integrated to form a single baseline against which performance can be measured. Technical scope objectives must be defined; the work must be scheduled; and, finally, resources must be allocated, in a time-phased manner, to the work. These steps are described in more detail below.

### STEP 1.1: DEFINE THE SCOPE

The first step in establishing the PMB is to define the scope of the project. This requires developing a WBS that breaks down a complex project into individual components using a hierarchical structure. In other words, a WBS is a deliverable-oriented family tree composed of the tasks and subtasks required to complete a project. It is a visible framework that defines the deliverables as elements that relate to the end product. These products are represented as milestones in the project plan. The WBS is the foundation of a project baseline. It defines the scope of the project and is integral to project planning. Any work that is not included in the WBS is out of scope. HHS is in the process of developing an Enterprise Project Life-cycle (EPLC) framework that is being implemented at HHS. The EPLC has 10 distinct phases for a project life-cycle and should be used as a template in developing the WBS, tailored for the size and complexity of the project.

The number of WBS levels depends on the complexity of the project and should be selected carefully. A more complex project with a sizable budget will have more milestones and more WBS levels than a smaller project. Most projects will need two to three levels within a WBS. However, it is not unusual for work to be defined down to four or five levels on larger projects.

There are five steps to follow in developing a WBS:

1. Identify the final “product(s)” of the project based upon the approved scope of the project.
2. Determine all the activities that are required to produce those “products.” Categorize these activities using the 10 EPLC phases.
3. Define the major deliverables necessary to project success. These will be the required project artifacts for each investment, plus any additional

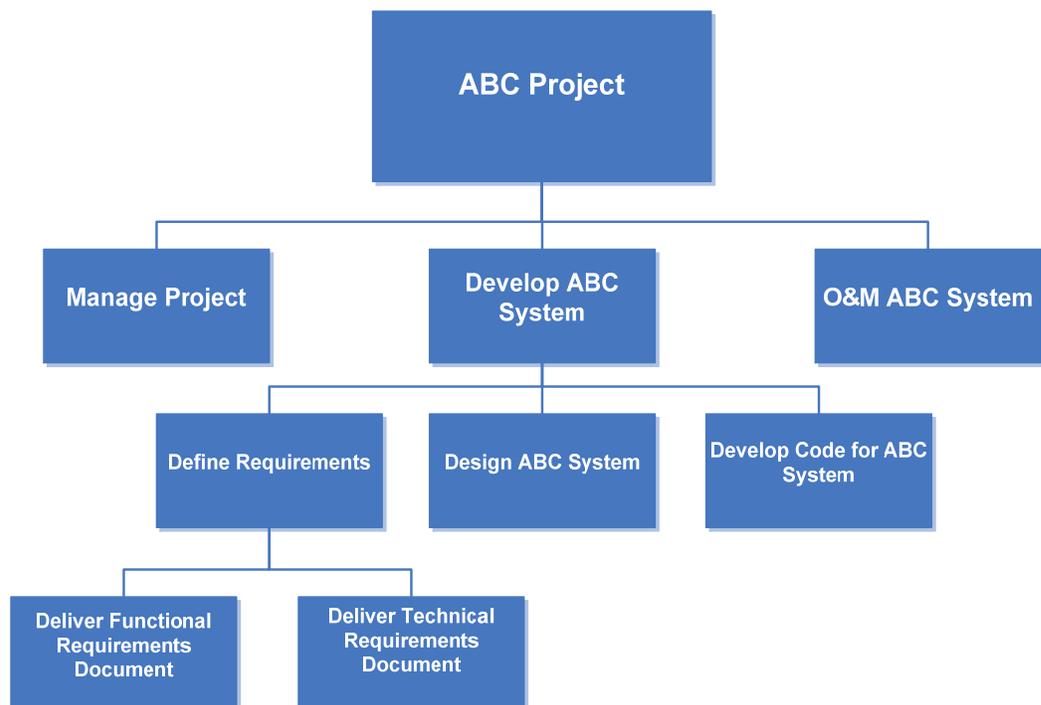
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artifacts applicable to the specific project. (e.g., a project management plan, requirements documentation, design documentation, a test plan, a deployment plan, etc.)

4. Decompose the major deliverables to a level of detail appropriate for management and internal control. The level of detail should capture a reasonable breakdown of activities geared toward the completion of the project artifacts. It is neither cost effective nor necessary to include more minute details (e.g., holding a status meeting or a completing a basic monthly report). These tasks fall under the general project management activities and should be accounted for using a basic level of effort estimate.
5. Review and refine the WBS until stakeholders agree with the level of planning and reporting. Each project team member must understand the activities for which they are responsible and the metrics used to take credit for those activities.

Figure 1 shows the decomposition of a project into multiple tasks and sub-tasks, which is critical to the development of a WBS, for an example IT development project—ABC project. The top level of the WBS is the project name. The first level of the WBS typically reflects the project life-cycle phases (for IHS projects, use the ten HHS EPLC phases). The subsequent levels subdivide the work into smaller pieces until a level is reached where the work can be broken down into discrete work packages.

*Figure 1. Decomposition of a Project into Multiple Tasks*



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The following are some best practices for developing the WBS:

- The WBS should be defined by those individuals knowledgeable about the work. It might be valuable for the PM to include others outside of the immediate work to find out potential ramifications that the immediate project team might not consider—such as representatives in the areas of acquisition, finance, security, enterprise architecture, human resources, etc. It is recommended that the core project team schedule a 1-2 day meeting to work through the WBS to develop a comprehensive view of the project in its entirety.
- The entire project should be included in the highest levels of the WBS. The WBS should be broken down only to the level at which work can be effectively managed, logically subdivided, and realistically estimated. Therefore, some levels of the WBS will be broken down further than others.
- For larger projects, a current WBS should be stored on a web-based SharePoint document repository during project execution to allow project team members to access and updating their individual progress.
- Each level of the WBS should have no more than 7 items.
- Identify at least one milestone for each fiscal year in the project life-cycle. Make every effort to identify milestones at a level that keeps them within fiscal year boundaries. When reporting to HHS, it is required that all milestone costs be aligned with the fiscal year; this is reconciled more easily if lower level milestones are scheduled within fiscal years and not across fiscal years.
- Make sure that milestone names begin with a verb and are stated simply.
- For most projects, define work packages whose durations are between a few days and a few months.
- Ensure that each work package corresponds to a deliverable.
- Assign a clearly identified organization and person to be responsible for each task. When using Microsoft Project to develop the project plan, record this information in the Resources field for each task or group of tasks.

Note that the lowest level of decomposition is a deliverable required to complete the project. It is by completing this deliverable that value is earned. If there are tasks on the WBS that do not result in normal life-cycle deliverables, such as “Perform Internal Testing,” the task for internal testing should have as its last milestone something like “Submit Completed Testing Checklist to Developer,” which infers that internal testing occurred in order to complete the checklist.

At a minimum, milestones are required. However, larger projects require further decomposition of milestones into discrete work packages. Table 2 depicts a sample WBS for the ABC project in outline form.

*Table 2. Sample WBS*

Milestone number	Milestone name
1	ABC project
1.1	Manage project
1.1.1	Deliver project management plan
1.1.2	Deliver monthly status reports
1.1.3	Manage operations
1.2	Develop ABC system
1.2.1	Define requirements for ABC system
1.2.1.1	Deliver functional requirements document
1.2.1.2	Deliver technical requirements document
1.2.2	Design ABC system
1.2.2.1	Deliver preliminary design documents
1.2.2.2	Deliver detailed design documents
1.2.3	Develop code for ABC system
1.2.3.1	Deliver Module 1 source code and unit test reports
1.2.3.2	Deliver Module 2 source code and unit test reports
1.2.3.3	Deliver Module 3 source code and unit test reports
1.2.4	Perform system testing
1.2.4.1	Deliver audit and IV&V reports
1.2.4.2	Deliver test reports
1.2.5	Train users on ABC system
1.2.5.1	Deliver technical training documents
1.2.5.2	Deliver functional training documents
1.2.6	Implement ABC system
1.2.6.1	Attain training certificate and security certificate
1.2.6.2	Convert legacy data
1.3	Operate and maintain ABC system
1.3.1	Operate and maintain ABC system–FY08
1.3.2	Update and maintain security–FY08
1.3.3	Operate and maintain ABC system–FY09
1.3.4	Update and maintain security–FY09
1.3.5	Operate and maintain ABC system–FY10
1.3.6	Update and maintain security–FY10
1.3.7	Operate and maintain ABC system–FY11
1.3.8	Update and maintain security–FY11

## STEP 1.2: DEVELOP A MILESTONE SCHEDULE

The next step in establishing the PMB is to develop a milestone schedule. The project manager or project management team should establish and validate the schedule goals. Each milestone should have a projected start date and a projected end date. To develop the milestone schedule, dependencies and resources must be taken into account. It is helpful to use a planning tool such as MS Project when developing the milestone schedule.

HHS requires that each milestone that is not a summary milestone be designated as DME or steady state. Project managers should define milestones that involve development or system improvement as DME. Project managers should designate milestones that are operational or involve maintaining the system as steady state. Milestones will be grouped into these two categories, and then cost and schedule performance will be measured for each category.

Table 3 is a sample milestone schedule for the ABC project, with each milestone designated as DME or steady state (SS).

*Table 3. Sample Milestone Schedule*

Milestone number	Milestone name	Start date (planned)	End date (planned)	Type
1	ABC project	10/1/06	9/30/11	DME/SS
1.1	Manage project	10/1/06	9/30/11	DME/SS
1.1.1	Deliver project management plan	10/1/06	10/15/06	DME
1.1.2	Deliver monthly status reports	10/1/06	9/30/07	DME
1.1.3	Manage operations	10/1/07	9/30/11	SS
1.2	Develop ABC system	10/1/06	9/30/07	DME
1.2.1	Define requirements for ABC system	10/1/06	12/1/06	DME
1.2.1.1	Deliver functional requirements document	10/1/06	12/1/06	DME
1.2.1.2	Deliver technical requirements document	10/1/06	12/1/06	DME
1.2.2	Design ABC system	12/1/06	1/15/07	DME
1.2.2.1	Deliver preliminary design documents	12/1/06	1/15/07	DME
1.2.2.2	Deliver detailed design documents	1/15/07	2/15/07	DME
1.2.3	Develop code for ABC system	2/16/07	6/15/07	DME
1.2.3.1	Deliver Module 1 source code and unit test reports	1/16/07	2/28/07	DME
1.2.3.2	Deliver Module 2 source code and unit test reports	2/15/07	4/30/07	DME
1.2.3.3	Deliver Module 3 source code and unit test reports	3/1/07	6/15/07	DME
1.2.4	Perform system testing	6/15/07	8/31/07	DME
1.2.4.1	Deliver audit and IV&V reports	6/15/07	8/31/07	DME
1.2.4.2	Deliver test reports	6/15/07	8/31/07	DME
1.2.5	Train users on ABC system	8/15/07	9/30/07	DME
1.2.5.1	Deliver technical training documents	8/15/07	9/15/07	DME
1.2.5.2	Deliver functional training documents	9/1/07	9/30/07	DME

*Table 3. Sample Milestone Schedule*

Milestone number	Milestone name	Start date (planned)	End date (planned)	Type
1.2.6	Implement ABC system	9/1/07	9/30/07	DME
1.2.6.1	Attain training certificate and security certificate	9/1/07	9/30/07	DME
1.2.6.2	Convert legacy data	9/1/07	9/30/07	DME
1.3	Operate and maintain ABC system	10/1/07	9/30/11	SS
1.3.1	Operate and maintain ABC system–FY08	10/1/07	9/30/08	SS
1.3.2	Update and maintain security–FY08	10/1/07	9/30/08	SS
1.3.3	Operate and maintain ABC system–FY09	10/1/08	9/30/09	SS
1.3.4	Update and maintain security–FY09	10/1/08	9/30/09	SS
1.3.5	Operate and maintain ABC system–FY10	10/1/09	9/30/10	SS
1.3.6	Update and maintain security–FY10	10/1/09	9/30/10	SS
1.3.7	Operate and maintain ABC system–FY11	10/1/10	9/30/11	SS
1.3.8	Update and maintain security–FY11	10/1/10	9/30/11	SS

### STEP 1.3: ALLOCATE RESOURCES

The last step in establishing the PMB is to allocate the resources to the work that has been scheduled. The project manager or project management team should do this by developing the planned costs for each task, subtask, and milestone. All costs (contractor and government labor, software, hardware, for example) should be included in the cost estimate. When feasible, it is best to develop a bottom-up cost estimate, one in which the component costs are identified and then summed to yield the overall costs. When that is not feasible, the estimate can be developed using a top-down approach in which, for example, costs are allocated based on a percentage of total costs.

The combination of WBS, schedule, and allocation of resources (i.e., costs) yields the PMB. Once the PMB is established, it must be validated. One method to accomplish this is through an Integrated Baseline Review (IBR), which is a formal review conducted jointly by the government and the contractor to verify the PMB and identify potential risks. Once the PMB is validated, it should not be changed unless certain procedures are followed. For example, if a change in the planned costs is necessary, the rationale for the change and the new planned cost should be provided, along with the impact of the change on schedule goals, if applicable. Any changes to the PMB should be submitted to the IHS Chief Information Officer (CIO) through the IHS CPIC manager for approval. In some cases, these changes may have to be submitted to the HHS Office of the Chief Information Officer (OCIO) by the IHS CIO. Once changes to the PMB are approved, the revised PMB becomes the baseline against which project performance is measured.

Table 4 depicts the performance measurement baseline using the ABC project as an example.

*Table 4. Sample Performance Measurement Baseline*

Milestone number	Milestone name	Start date (planned)	End date (planned)	Type	PV (\$000)
1	ABC project	10/1/06	9/30/11	DME/SS	5.07
1.1	Manage project	10/1/06	9/30/11	DME/SS	0.47
1.1.1	Deliver project management plan	10/1/06	10/15/06	DME	0.01
1.1.2	Deliver monthly status reports	10/1/06	9/30/07	DME	0.10
1.1.3	Manage operations	10/1/07	9/30/11	SS	0.36
1.2	Develop ABC system	10/1/06	9/30/07	DME	2.44
1.2.1	Define requirements for ABC system	10/1/06	12/1/06	DME	0.44
1.2.1.1	Deliver functional requirements document	10/1/06	12/1/06	DME	0.26
1.2.1.2	Deliver technical requirements document	10/1/06	12/1/06	DME	0.18
1.2.2	Design ABC system	12/1/06	1/15/07	DME	0.24
1.2.2.1	Deliver preliminary design documents	12/1/06	1/15/07	DME	0.14
1.2.2.2	Deliver detailed design documents	1/15/07	2/15/07	DME	0.10
1.2.3	Develop code for ABC system	2/16/07	6/15/07	DME	0.91
1.2.3.1	Deliver Module 1 source code and unit test reports	1/16/07	2/28/07	DME	0.18
1.2.3.2	Deliver Module 2 source code and unit test reports	2/15/07	4/30/07	DME	0.33
1.2.3.3	Deliver Module 3 source code and unit test reports	3/1/07	6/15/07	DME	0.40
1.2.4	Perform system testing	6/15/07	8/31/07	DME	0.23
1.2.4.1	Deliver audit and IV&V reports	6/15/07	8/31/07	DME	0.13
1.2.4.2	Deliver test reports	6/15/07	8/31/07	DME	0.10
1.2.5	Train users on ABC system	8/15/07	9/30/07	DME	0.35
1.2.5.1	Deliver technical training documents	8/15/07	9/15/07	DME	0.16
1.2.5.2	Deliver functional training documents	9/1/07	9/30/07	DME	0.19
1.2.6	Implement ABC system	9/1/07	9/30/07	DME	0.27
1.2.6.1	Attain training certificate and security certificate	9/1/07	9/30/07	DME	0.17
1.2.6.2	Convert legacy data	9/1/07	9/30/07	DME	0.10
1.3	Operate and maintain ABC system	10/1/07	9/30/11	SS	2.16
1.3.1	Operate and maintain ABC system–FY08	10/1/07	9/30/08	SS	0.40
1.3.2	Update and maintain security–FY08	10/1/07	9/30/08	SS	0.12
1.3.3	Operate and maintain ABC system–FY09	10/1/08	9/30/09	SS	0.41
1.3.4	Update and maintain security–FY09	10/1/08	9/30/09	SS	0.12
1.3.5	Operate and maintain ABC system–FY10	10/1/09	9/30/10	SS	0.42
1.3.6	Update and maintain security–FY10	10/1/09	9/30/10	SS	0.13
1.3.7	Operate and maintain ABC system–FY11	10/1/10	9/30/11	SS	0.43
1.3.8	Update and maintain security–FY11	10/1/10	9/30/11	SS	0.13

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## Step 2: Determine the EVM Measurement Method

One of the most difficult areas of earned value management is to determine the earned value, or budgeted cost of work performed. Earned value for any particular deliverable or milestone is defined as the planned value multiplied by the percentage complete. Percentage complete is calculated by using a predetermined earned value measurement method. Table 5 presents some of these methods.

*Table 5. Description of Common EVM Measurement Methods*

Method	Description
Subjective Percentage Complete	This is a subjective method in which the project manager or task manager assigns a percentage complete value based on his or her judgment.
Level of Effort	This method is used for tasks that have no defined product (e.g., program management). Percentage complete is calculated based on the passage of time.
Fixed Formula, also called Start-Finish	When using this method, two values that add up to 100% are earned when milestones are started and finished. The first value is earned when the milestone is started and the second value is earned when the milestone is finished. Common combinations of values include 0/100, 25/75, and 50/50.
Units Complete	This is a simple, objective method that can be used on production or development tasks. Percentage complete is calculated by dividing the number of units completed by the total number of units to be developed.
Apportioned Effort	This method is used for support tasks that relate directly to a discrete task (e.g., quality control).

You can, and should, use different EVM measurement methods for different milestones within the same project. Use the EVM measurement method that gives you the most accurate result for each milestone. IHS is establishing a standard set of project activities with the preferred measurement methods to ensure consistency in receiving credit for work completed.

The subjective percentage complete method is based on the Project Manager's subjective assessment of the work progress. It is best if based on objective metrics.

The level of effort methodology is typically used for projects in the milestones in the SS life-cycle phase and for project management milestones in the DME life-cycle phase, when there is no well-defined product to be delivered.

Using the fixed formula EVM measurement method, the first number (i.e., 25 if the formula is 25/75) is the percentage of the planned cost that is considered earned when the work actually begins, and the second number (i.e., 75 if the formula is 25/75) is the additional percentage of the planned cost that is earned when the work is completed. In all cases, the per-

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centage of the planned cost that is earned when the work is completed totals 100% of the planned cost.

The fixed formula method is generally used for milestones that span a short period of time because it can provide erroneous results when used for a milestone of long duration and high cost. For example, consider a project that is using the fixed formula method with values of 50/50. Initially, the earned value is 50% of the planned value when the milestone is started and the remaining 50% is not earned until the task is completed and the deliverables are accepted. Using this method, a task actually could be 95 percent complete, but will be reported as 50 percent complete until the task is fully completed. Thus, earned value, which is calculated by multiplying the percent complete by the planned value, will be underreported until project completion. This will negatively affect both the schedule and the cost metrics, and this is why this method is primarily used only for tasks of short duration.

The units complete method is the most objective way of determining the earned value for an activity. However, it is limited to production type of activities of similar items that are fixed unit prices. It is rarely applicable to IT projects.

The apportioned effort is for work that is not easily measured, but is work that is proportional to a measured effort. The classic example is quality control.

### Step 3: Monitor the Work

Once the project has begun, performance against the PMB must be monitored regularly. The manager must track actual performance by milestone using the PMB established in Step 1 using the methodology determined in Step 2. Actual start and end dates need to be recorded as milestones are begun and completed. Actual costs need to be captured and attributed to the corresponding work package. Percentage complete must be estimated for each milestone or work package. Actual costs and percentage complete should be calculated monthly, at a minimum. The data will be instrumental in performing EVM calculations periodically. Continuing with the ABC project as an example, Table 6 depicts how the actual data to date are often displayed.

Table 6. Reporting Actual Data (as of 12/31/06)

Milestone number	Milestone name	Start date (planned)	End date (planned)	Type	PV (\$000)	Start date (actual)	End date (actual)	% Comp.	Actual costs
1	ABC project	10/1/06	9/30/11	DME/SS	5.07	10/1/06		4	0.42
1.1	Manage project	10/1/06	9/30/11	DME/SS	0.47	10/1/06		4	0.03
1.1.1	Deliver project management plan	10/1/06	10/15/06	DME	0.01	10/1/06	10/15/06	100	0.01
1.1.2	Deliver monthly status reports	10/1/06	9/30/07	DME	0.10	10/1/06		20	0.03
1.1.3	Manage operations	10/1/07	9/30/11	SS	0.36				
1.2	Develop ABC system	10/1/06	9/30/07	DME	2.44	10/1/06		19	0.39
1.2.1	Define requirements for ABC system	10/1/06	12/1/06	DME	0.44	10/1/06	12/15/06	100	0.32
1.2.1.1	Deliver functional requirements document	10/1/06	12/1/06	DME	0.26	10/1/06	12/8/06	100	0.21
1.2.1.2	Deliver technical requirements document	10/1/06	12/1/06	DME	0.18	10/16/06	12/15/06	100	0.11
1.2.2	Design ABC system	12/1/06	1/15/07	DME	0.24	12/16/06		60	0.07
1.2.2.1	Deliver preliminary design documents	12/1/06	1/15/07	DME	0.14	12/16/06		95	0.07
1.2.2.2	Deliver detailed design documents	1/15/07	2/15/07	DME	0.10				
1.2.3	Develop code for ABC system	2/16/07	6/15/07	DME	0.91				
1.2.3.1	Deliver Module 1 source code and unit test reports	1/16/07	2/28/07	DME	0.18				
1.2.3.2	Deliver Module 2 source code and unit test reports	2/15/07	4/30/07	DME	0.33				
1.2.3.3	Deliver Module 3 source code and unit test reports	3/1/07	6/15/07	DME	0.40				
1.2.4	Perform system testing	6/15/07	8/31/07	DME	0.23				
1.2.4.1	Deliver audit and IV&V reports	6/15/07	8/31/07	DME	0.13				
1.2.4.2	Deliver test reports	6/15/07	8/31/07	DME	0.10				
1.2.5	Train users on ABC system	8/15/07	9/30/07	DME	0.35				
1.2.5.1	Deliver technical training documents	8/15/07	9/15/07	DME	0.16				
1.2.5.2	Deliver functional training documents	9/1/07	9/30/07	DME	0.19				
1.2.6	Implement ABC system	9/1/07	9/30/07	DME	0.27				
1.2.6.1	Attain training certificate and security certificate	9/1/07	9/30/07	DME	0.17				
1.2.6.2	Convert legacy data	9/1/07	9/30/07	DME	0.10				
1.3	Operate and maintain ABC system	10/1/07	9/30/11	SS	2.16				

Table 6. Reporting Actual Data (as of 12/31/06)

Milestone number	Milestone name	Start date (planned)	End date (planned)	Type	PV (\$000)	Start date (actual)	End date (actual)	% Comp.	Actual costs
1.3.1	Operate and maintain ABC system–FY08	10/1/07	9/30/08	SS	0.40				
1.3.2	Update and maintain security–FY08	10/1/07	9/30/08	SS	0.12				
1.3.3	Operate and maintain ABC system–FY09	10/1/08	9/30/09	SS	0.41				
1.3.4	Update and maintain security–FY09	10/1/08	9/30/09	SS	0.12				
1.3.5	Operate and maintain ABC system–FY10	10/1/09	9/30/10	SS	0.42				
1.3.6	Update and maintain security–FY10	10/1/09	9/30/10	SS	0.13				
1.3.7	Operate and maintain ABC system–FY11	10/1/10	9/30/11	SS	0.43				
1.3.8	Update and maintain security–FY11	10/1/10	9/30/11	SS	0.13				

Note: Text in **RED** is automatically calculated by the project management tool in place at HHS (e.g., ProSight, Dekker TRAKKER®).

Three EVM figures, which are the basis for earned value analysis, must be calculated for the DME milestones, for the steady-state milestones, and for the overall project:<sup>7</sup>

- First, calculate the sum of the planned costs for both the entire task and the as-of date. The sum of the planned costs for the period to date yields the planned value (PV).
- Next, calculate the sum of the actual costs for each of the milestones to get the actual costs (AC) to date for the overall project.
- Then, calculate the sum of the earned value (EV) for each of the milestones to get the earned value for the overall project. EV is calculated using the following formula:

$$\text{Earned value} = \text{planned cost} \times \text{percentage complete.}$$

Percentage complete is calculated by using the predetermined earned value measurement method. Table 5 presented some of these methods. In the ABC project example, the percentage complete is estimated using the “% Complete” method.

Table 7 shows the calculated earned value for each milestone of the ABC project.

<sup>7</sup> HHS is collecting EVM data on steady-state investments in support of the required operational analysis. Typically, on steady-state investments, the EVM data are used primarily to monitor cost variances.

Table 7. Reporting Earned Value Data (as of 12/31/06)

Milestone number	Milestone name	Start date (planned)	End date (planned)	Type	PV (\$000s)	Start date (actual)	End date (actual)	% Comp.	Actual costs	EV
1	ABC project	10/1/06	9/30/11	DME/SS	5.07	10/1/06		4	0.42	0.20
1.1	Manage project	10/1/06	9/30/11	DME/SS	0.47	10/1/06		4	0.03	0.02
1.1.1	Deliver project management plan	10/1/06	10/15/06	DME	0.01	10/1/06	10/15/06	100	0.01	0.01
1.1.2	Deliver monthly status reports	10/1/06	9/30/07	DME	0.10	10/1/06		20	0.03	0.02
1.1.3	Manage operations	10/1/07	9/30/11	SS	0.36					
1.2	Develop ABC system	10/1/06	9/30/07	DME	2.44	10/1/06		19	0.39	0.46
1.2.1	Define requirements for ABC system	10/1/06	12/1/06	DME	0.44	10/1/06	12/15/06	100	0.32	0.44
1.2.1.1	Deliver functional requirements document	10/1/06	12/1/06	DME	0.26	10/1/06	12/8/06	100	0.21	0.26
1.2.1.2	Deliver technical requirements document	10/1/06	12/1/06	DME	0.18	10/16/06	12/15/06	100	0.11	0.18
1.2.2	Design ABC system	12/1/06	1/15/07	DME	0.24	12/16/06		60	0.07	0.14
1.2.2.1	Deliver preliminary design documents	12/1/06	1/15/07	DME	0.14	12/16/06		95	0.07	
1.2.2.2	Deliver detailed design documents	1/15/07	2/15/07	DME	0.10					
1.2.3	Develop code for ABC system	1/16/07	6/15/07	DME	0.91					
1.2.3.1	Deliver Module 1 source code and unit test reports	1/16/07	2/28/07	DME	0.18					
1.2.3.2	Deliver Module 2 source code and unit test reports	2/15/07	4/30/07	DME	0.33					
1.2.3.3	Deliver Module 3 source code and unit test reports	3/1/07	6/15/07	DME	0.40					
1.2.4	Perform system testing	6/15/07	8/31/07	DME	0.23					
1.2.4.1	Deliver audit and IV&V reports	6/15/07	8/31/07	DME	0.13					
1.2.4.2	Deliver test reports	6/15/07	8/31/07	DME	0.10					
1.2.5	Train users on ABC system	8/15/07	9/30/07	DME	0.35					
1.2.5.1	Deliver technical training documents	8/15/07	9/15/07	DME	0.16					
1.2.5.2	Deliver functional training documents	9/1/07	9/30/07	DME	0.19					
1.2.6	Implement ABC system	9/1/07	9/30/07	DME	0.27					
1.2.6.1	Attain training certificate and security certificate	9/1/07	9/30/07	DME	0.17					
1.2.6.2	Convert legacy data	9/1/07	9/30/07	DME	0.10					
1.3	Operate and maintain ABC system	10/1/07	9/30/11	SS	2.16					
1.3.1	Operate and maintain ABC system—FY08	10/1/07	9/30/08	SS	0.40					
1.3.2	Update and maintain security—FY08	10/1/07	9/30/08	SS	0.12					

Table 7. Reporting Earned Value Data (as of 12/31/06)

Milestone number	Milestone name	Start date (planned)	End date (planned)	Type	PV (\$000s)	Start date (actual)	End date (actual)	% Comp.	Actual costs	EV
1.3.3	Operate and maintain ABC system–FY09	10/1/08	9/30/09	SS	0.41					
1.3.4	Update and maintain security–FY09	10/1/08	9/30/09	SS	0.12					
1.3.5	Operate and maintain ABC system–FY10	10/1/09	9/30/10	SS	0.42					
1.3.6	Update and maintain security–FY10	10/1/09	9/30/10	SS	0.13					
1.3.7	Operate and maintain ABC system–FY11	10/1/10	9/30/11	SS	0.43					
1.3.8	Update and maintain security–FY11	10/1/10	9/30/11	SS	0.13					

Note: Text in **RED** is automatically calculated by the project management tool in place at HHS (e.g., PPT, Dekker TRAKKER®).

Using the ABC project example, the EVM figures are as follows:

- PV = \$640,000 for the period to date.
- AC = \$420,000 for the period to date.
- EV = \$483,000 for the period to date.
- BAC = \$5.07 million.

Once the earned value, planned value, and actual costs have been calculated, the earned value analysis can begin. To perform earned value analysis, the following EVM formulas should be used:<sup>8</sup>

- Cost variance (CV) = EV – AC.
  - A negative cost variance indicates that more money has been spent than anticipated to complete the work that has been earned to date (i.e., the project is exceeding the budget).
  - A positive cost variance indicates that the earned value exceeds the costs (i.e., work is being completed under budget).
- Cost variance percentage = CV/EV.

<sup>8</sup> Office of Management and Budget, Circular A-11, Exhibit 300, Section II.C, Cost and Schedule Performance, June 2006.

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- A negative cost variance percentage indicates that the project is exceeding the budget, but this metric puts the variance in proportion to the earned value.
  - A positive cost variance percentage indicates that the project is under budget, but this metric puts it in proportion to the earned value.
  - Cost performance index (CPI) =  $EV/AC$ .
    - A value greater than 1.0 means that the project is exceeding its cost objectives (i.e., is within budget).
    - A value less than 1.0 indicates that the project is falling short of its cost objectives (i.e., is over budget).
  - Schedule variance (SV) =  $EV - PV$ .
    - A negative schedule variance indicates that not as much work has been completed as planned (i.e., the project is behind schedule).
    - A positive schedule variance indicates that the earned value exceeds the plan (i.e., work is being completed more quickly than anticipated).
  - Schedule variance percentage =  $SV/PV$ .
    - A negative schedule variance percentage indicates that the project is behind schedule, but this metric relates the amount of variance to the planned value.
    - A positive schedule variance percentage indicates that the project is ahead of schedule, but this metric relates the amount of variance to the planned value.
  - Schedule performance index (SPI) =  $EV/PV$ .
    - A value greater than 1.0 means that the project is exceeding its schedule objectives (i.e., is ahead of schedule).
    - A value less than 1.0 indicates that the project is falling short of its schedule objectives (i.e., is behind schedule).
  - Estimate at completion (EAC) =  $AC + (BAC - EV) / (CPI \times SPI)$ .
    - A value that is greater than the BAC means that the project is expected to exceed planned costs or overrun its budget.

- A value that is less than the BAC means that the project is expected to come in under budget.

Again, each formula must be calculated for the DME milestones, for the steady-state milestones, and for the overall project.

For the ABC project, the cost and schedule metrics are as follows:

PV=	\$640,000	CV=	\$63,000	SV=	-\$157,000
AC=	\$420,000	CV %=	13%	SV %=	-25%
EV=	\$483,000	CPI=	1.15	SPI=	0.75

Since no steady-state milestones have started or were planned to start, both the DME and the overall project cost and schedule metrics are identical.

At IHS, positive and negative variances of 7 percent or more require that certain actions be taken. First, the reasons for the variance must be evaluated. Also, the impact of the variance on performance goals must be evaluated. Next, the project manager should determine what corrective actions are necessary to bring the investment closer to the planned cost and schedule goals. If applicable, revised cost and schedule goals must be provided and defined in the form of a revised PMB. Developing a revised PMB, also known as rebaselining, is a time-consuming process that requires multiple levels of approval and that must be well justified. Therefore, careful consideration is required before deciding to rebaseline a project. Finally, the project manager should seek the appropriate approval to continue the investment and to utilize the revised PMB.

In the ABC project example, both variances exceed the threshold and must follow the procedures outlined above.

## Step 4: Develop Earned Value Reports

The next step in the EVM process is to develop the earned value reports. If the project meets the threshold requirements set forth by HHS for reporting EVM to HHS, then the project management tool currently in place at HHS (PPT or Dekker Trakker) prepares the earned value reports using the project cost and schedule data input by the Program Management Offices (PMOs). Regardless of the size of the project, the calculations to measure performance against the PMB must be completed.

Various EVM reports can be produced to reflect project performance. Below are some basic reports that can be produced with minimal effort. Table 8 shows a sample “snapshot” EVM report format for the ABC project, which has three subtasks.

Table 8. Sample Snapshot EVM Report

<b>As of 31 December 2006</b>											
Task	Baseline Duration (weeks)	Baseline Start	Baseline Finish	Baseline Cost (Budgeted Cost)	% Work Scheduled (Wks)	Planned Value (PV)	% Work Completed	Earned Value (EV)	Actual Cost (AC)	CPI (EV/AC)	SPI (EV/PV) *
<b>Overall</b>	<b>257</b>	<b>10/01/06</b>	<b>09/30/11</b>	<b>5,073,850</b>	<b>13%</b>	<b>640,144</b>	<b>4%</b>	<b>483,188</b>	<b>420,403</b>	<b>1.15</b>	<b>0.75</b>
Task 1	257	10/01/06	09/30/11	470,350	4%	20,587	4%	19,586	30,155	0.65	0.95
Task 2	51	10/01/06	09/30/07	2,441,000	25%	619,557	19%	463,602	390,248	1.19	0.75
Task 3	206	10/01/07	09/30/11	2,162,500	0%	—	0%				

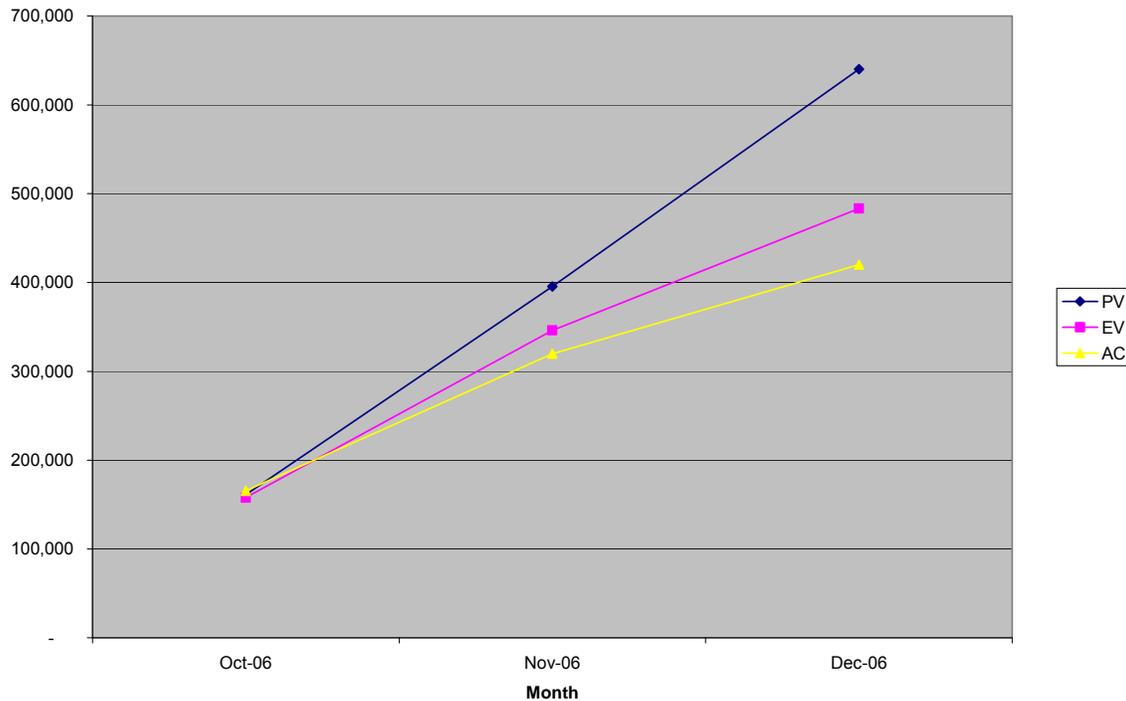
Table 9 shows a sample report format, using data from the ABC project example, that meets the reporting requirements of the OMB Circular A-11, Exhibit 300. Presenting the monthly values for the EVM metrics enables the project manager to identify trends in the cost and schedule metrics.

Table 9. Sample Report for OMB A-11 Requirements

Item	Oct. 2006	Nov. 2006	Dec. 2006
Planned value (PV)	161,167	395,533	640,234
Earned value (EV)	157,688	345,983	483,397
Actual cost of work performed (AC)	165,587	319,763	420,112
<b><u>Project summary (cumulative)</u></b>	<b><u>Value</u></b>	<b><u>Value</u></b>	<b><u>Value</u></b>
Cost variance = (EV - AC) =	(7,899)	26,220	63,285
Cost variance % = (CV/EV × 100%) =	-5.01%	7.58%	13.09%
Cost performance index (CPI) = (EV/AC) =	0.95	1.08	1.15
Schedule variance = (EV - PV) =	(3,479)	(49,550)	(156,837)
Schedule variance % = (SV/PV × 100%) =	-2.16%	-12.53%	-24.50%
Schedule performance index (SPI) = (EV/PV) =	0.98	0.87	0.76
Estimate at completion (EAC) = AC + (BAC - EV)/(CPI × SPI)	5,441,898	5,315,126	5,703,974

Finally, a graph is also very useful to identify performance trends. Figure 2 displays the three earned value figures graphically. (ProSight, the project management tool currently in place at HHS, does not prepare this graph. Dekker Trakker should be able to produce this graph).

Figure 2. EVM Graph for ABC Project



The sample earned value reports and graph presented above were created using MS Excel and can be easily updated.

According to HHS policy, the EVM reports required depend on the size and complexity of the investment. HHS groups investments into three tiers:<sup>9</sup>

- Tier 1: IT investments that have current-year DME funding equal to or greater than \$10 million or future life-cycle DME funding equal to or greater than \$10 million.
- Tier 2: IT investments that have current-year DME funding equal to or greater than \$1 million and less than \$10 million or future life-cycle DME funding equal to or greater than \$1 million and less than \$10 million.
- Tier 3: IT investments that have current-year DME funding or of less than \$1 million or future life-cycle DME funding less than \$1 million.

For internal reporting purposes, HHS has informally defined the following three additional tiers for use within the PPT<sup>10</sup>:

<sup>9</sup> HHS OCIO Policy for Information Technology (IT) Earned Value Management (EVM), December 2005. A draft revision of the policy is being circulated to incorporate the future life-cycle DME funding requirements.

<sup>10</sup> HHS CPIC teleconference meeting minutes, January 16, 2007.

- Tier 4: IT investments that have current-year DME funding less than \$500,000.
- Tier 8: IT investments that have current-year DME funding greater than \$0, but have been deemed not necessary to report EVM data. Examples are grants to states or other extramural investments and programmatic investments such as Secure One.
- Tier 9: IT investments that have current-year DME funding equal to \$0 (steady state investments with a phase designation of “Operations and Maintenance”).

Investments that are within one of these three tiers are not required to report EVM to the department. However, because some projects that fall within these tiers roll up into IHS investments that are reported to the department, earned value information on those projects is required so that IHS can provide the summary data on their investments (i.e., RPMS, IOAT, or NPIRS) to the Department.

The IHS RPMS and IOAT investments are currently classified as Tier 1 Major investments and NPIRS is a Tier 2 Tactical investment.

Table 10 lists the HHS EVM requirements by tier.

*Table 10. EVM Reporting Requirements, by Tier*

Report	Tier 1	Tier 2	Tier 3
Contract Performance Report (CPR)	R	T	O
Integrated Master Schedule (IMS)	R	T	T
Integrated Baseline Reviews (IBR)	R	O	O
EVMS ANSI 748-A-1998 Standard Compliance*	R	R	O
EVM System Certification**	R	O	O

Source: *HHS OCIO Policy for Information Technology (IT) Earned Value Management (EVM)*, June 11, 2007.

Notes:

R = required

T = tailored (requirement may be tailored by investment)

O = optional.

The HHS OCIO policy establishes contractor reporting requirements as listed above and in Table 11.

*Table 11. Contractor EVM Reporting Requirements, by Tier*

Report	Tier 1	Tier 2	Tier 3
CPR Format 1–WBS	R	R	T
CPR Format 2–Organizational Categories	R	O	O
CPR Format 3–Baseline	R	O	O
CPR Format 4–Staffing	R	O	O
CPR Format 5–Explanation and Problem Analyses	R	R	T
Contract Funds Status Report	R	R	O

Source: *HHS OCIO Policy for Information Technology (IT) Earned Value Management (EVM)*, June 11, 2007.

Notes:

R = required

T = tailored (requirement may be tailored by investment)

O = optional.

Appendix B contains Contract Performance Report (CPR) formats 1 through 5. Additional guidance and definitions regarding the CPR and the Integrated Master Schedule can be found in *HHS OCIO IT Earned Value Management Processes and Procedures*, issued in December 2005 and in Appendix C.

Reports, graphs, and charts should be tailored based on several factors:

- Type of project
- Complexity of project
- Project size
- Project risk
- Audience.

Tailoring reports in this manner makes them as useful and simple as possible—they provide only the level of detail necessary—while maximizing efficiencies.

## Step 5: Control Change (as necessary)

The final step in the EVM process is to control changes to the PMB as necessary. When proposing changes to the PMB, it is important to identify and evaluate the risks of accepting the proposed changes. When changing the PMB, certain processes must be followed. This means accepting or rejecting any proposed changes to scope, schedule, or planned value. Incorporation of approved changes must be timely. In addition, all revisions to the baseline should be documented in such a way that the rationale for such changes and the impact of these changes on the project are clear. A copy of the original PMB and any subsequent revisions

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should be retained by the project manager. It should also be noted that a change to the PMB often requires a contract modification.

Finally, changes to the baseline must be approved in accordance with HHS OCIO policy:

For investments that meet the Department threshold for review, IT Investment Managers shall submit the EVM PMB and any changes to the PMB to the HHS ITIRB for review and approval. For investments that do not meet the Departmental threshold for review, IT Investment Managers shall submit the EVM PMB and any changes to the PMB to the OPDIV ITIRB for review and approval. Submissions shall address the rationale and driving factors leading to the new investment EVM PMB or any changed PMB.<sup>11</sup>

Specifically, at IHS, investments meeting the threshold for earned value review will be reviewed and evaluated by the IHS CPIC Council on a monthly basis. The IHS CPIC manager will make recommendations regarding the investments to the IHS CIO, if necessary. Changes to the PMB for major investments must be approved by the IHS ITIRB.

## USING EVM TO MANAGE PROJECTS

This section addresses the practical application of EVM to IHS projects. It describes how to interpret the metrics and how to use them to better manage a project.

### Interpreting the Metrics

To interpret the EVM metrics, look at the cost metrics first: cost variance, cost variance percent, and CPI. Cost variance (CV) is the least meaningful of the three cost metrics because it indicates only the difference between the EV and the AC. It is possible that a large project with a large CV could very well be outperforming a smaller project with a smaller CV when the other two cost metrics are considered.

Let's take a look at two sample projects to demonstrate this:

- Project A has a \$5 million budget. Currently, PV is \$2.4 million, AC is \$2.6 million, and EV is \$2.45 million. Thus, the variance for Project A is -\$150,000.
- Project B has a budget of \$750,000. Currently, PV is \$500,000, AC is \$555,000, and EV is \$463,000. Thus, the variance for Project B is -\$92,000.

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<sup>11</sup> *HHS OCIO Policy for Information Technology (IT) Earned Value Management (EVM)*, December 2005.

The negative cost variance for Project A far exceeds the negative cost variance for Project B. Thus, one might conjecture that Project A is performing better with regard to meeting cost objectives. To test this assumption, let's look at the other two cost metrics, cost variance percentage (CV%) and CPI. Table 12 shows the cost metrics for both projects.

*Table 12. Comparison of Project Cost Metrics*

Metric	Project A	Project B
PV	\$2,400,000	\$500,000
AC	\$2,600,000	\$555,000
EV	\$2,450,000	\$463,000
CV	-\$150,000	-\$92,000
CV %	-6%	-20%
CPI	0.94	0.83

The CV% is -6 percent for Project A and -20 percent for Project B, which indicates that Project B has a greater negative cost variance when compared to the EV. Remember that IHS guidance dictates a threshold of positive or negative 7 percent when determining the projects that fall outside of acceptable performance metrics and thus require special attention. Project A falls within this threshold while Project B does not.

Now, let's look at the CPI. The CPI will be greater than 1.0 for any project with a positive cost variance or, in other words, for any project for which the EV is greater than the AC; that is, the project ideally should have a CPI that is greater than 1.0. In this example, both projects have a CPI of less than 1.0, but Project A at 0.94 is greater than Project B at 0.83. So, although both projects have a negative cost variance, the CPI for Project A is greater than the CPI for Project B and thus Project A is performing better with regard to meeting its cost objectives.

In summary, this example demonstrates that the cost metrics that are most meaningful are those that compare the cost variance to another number, thus putting the variance in perspective.

Now, let's look at the schedule variance. The same concepts presented above regarding the cost variance also apply to the schedule variance. The most meaningful schedule variance metrics are those that relate the schedule variance to another number, in this case, the budget or PV. Therefore, SV% and SPI are more meaningful indicators than SV alone. Also, the same negative or positive 7 percent threshold applies for SV%. And for SPI, the value ideally should be greater than 1.0, indicating a positive schedule variance or that the project is ahead of schedule. Table 13 shows the schedule metrics for the two sample projects.

*Table 13. Comparison of Project Schedule Metrics*

Metric	Project A	Project B
PV	\$2,400,000	\$500,000
AC	\$2,600,000	\$555,000
EV	\$2,450,000	\$463,000
SV	\$50,000	-\$37,000
SV %	2%	-7%
SPI	1.02	0.93

The schedule metrics indicate that Project A is ahead of schedule (positive SV and SV% and SPI greater than 1), while Project B is behind schedule (negative SV and SV% and SPI less than 1). Project A falls within the 7 percent variance threshold, while Project B exceeds the threshold at 7.4 percent.

Based on the metrics for Project A:

- Negative cost variance indicates it is falling short of cost objectives and is presently over budget.
- Positive schedule variance indicates that the project is ahead of schedule.
- Both variances are within the 7 percent threshold.

At this point, one might ask, is it acceptable that there is a negative cost variance since the project is ahead of schedule? This theory assumes that the project should be over budget because more work has been accomplished at this point in time than predicted. However, the fact that the project is ahead of schedule does not contribute to the fact that there is a negative cost variance. To understand this, remember that both performance indicators use the earned value as the numerator. Thus, the amount of work that has been accomplished is compared to the actual costs to accomplish the work for the CPI and compared to the planned costs to accomplish the work for the SPI. The planned value is not being directly compared to the actual costs. By using EV as the numerator, the schedule variance and the cost variance can be isolated and evaluated individually. This is a key concept behind EVM.

Based on the metrics for Project B:

- Negative cost variance indicates it is falling short of cost objectives and is presently over budget.
- Negative schedule variance indicates that the project is behind schedule.
- Both variances fall outside of the 7 percent threshold.

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Based on this information, further action must be taken (see the corrective action steps outlined in Step 3 to ensure that the project performance against cost and schedule objectives is improved.

## Applying the Metrics

As with most metrics, the numbers tell only part of the story. To interpret the metrics correctly, the project manager needs to know the context of the numbers. In other words, in addition to knowing what the metrics are, the manager needs to know the cause behind the metrics. For example, a project may have a negative schedule variance as a result of schedule slippage on a dependent project or another event outside of the project manager's control. Or, a project may not be meeting its cost objectives because of an unforeseen increase in costs that is outside of the project manager's control. It is very important to consider such things when evaluating the EVM metrics.

In addition, the earned value measurement method must be considered when applying the metrics. For example, let's take a project that is using the fixed formula method with values of 50/50. Initially, the earned value is 50% of the planned value when the milestone is started and the remaining 50% is not earned until the task is completed and the deliverables are accepted. Using this method, a task actually could be 95 percent complete, but will be reported as 50 percent complete until the task is fully completed. Thus, earned value, which is calculated by multiplying the percent complete by the planned value, will be underreported until project completion. This will negatively affect both the schedule and the cost metrics, and this is why this method is primarily used only for tasks of short duration.

When evaluating a project's EVM metrics, it is also necessary to look at the EVM metrics for each milestone when assessing overall performance. For example, one or more milestones have negative cost and schedule variances, but the overall performance of the project results in positive cost and schedule variances. These milestones may show negative cost and schedule variances because of a realignment of resources due to changing priorities for example. While variances at the milestone level should be analyzed, especially when identifying areas of concern, they should be evaluated in the context of the overall project performance.

When applying EVM metrics, it is very useful to analyze the historical trend of the metrics to gain a more complete picture of project performance. For example, if Project B in our example has a CPI of 0.89 the next reporting period, the positive trend indicates that the project is coming closer to meeting cost objectives and therefore is improving. This is not to say that the project should not still be monitored closely, but the trend should be taken into account when considering cost performance. Also, if a project has a positive variance for several reporting periods and suddenly develops a negative variance, the project manager should

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investigate the root cause of the variance even if the variance falls within the 7 percent threshold set by IHS.

In sum, by using EVM, a project manager can control the scope and measure the cost and schedule performance associated with an investment—all consistent with federal and IHS requirements.

# APPENDIX A. ANSI/EIA 748-A-1998 GUIDELINES

The following text is a direct excerpt from ANSI/EIA Standard 748-A-1998, *Earned Value Management Systems*, May 1998.

## Organization

1. Define the authorized work elements for the program. A work breakdown structure (WBS), tailored for effective internal management control, is commonly used in this process.
2. Identify the program organizational structure including the major sub-contractors responsible for accomplishing the authorized work, and define the organizational elements in which work will be planned and controlled.
3. Provide for the integration of the company's planning, scheduling, budgeting, work authorization and cost accumulation processes with each other, and as appropriate, the program work breakdown structure and the program organizational structure.
4. Identify the company organization or function responsible for controlling overhead (indirect costs).
5. Provide for integration of the program work breakdown structure and the program organizational structure in a manner that permits cost and schedule performance measurement by elements of either or both structures as needed.

## Planning, Scheduling and Budgeting

6. Schedule the authorized work in a manner which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program.
7. Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.
8. Establish and maintain a time-phased budget baseline, at the control account level, against which program performance can be measured. Initial budgets established for performance measurement will be based on either internal management goals or the external customer negotiated target cost including estimates for authorized but undefinitized work. Budget for far-term efforts may be held in higher level accounts until an appropriate time for allocation at the control account level. On government contracts, if an over target baseline is used for performance measurement reporting purposes; prior notification must be provided to the customer.

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9. Establish budgets for authorized work with identification of significant cost elements (labor, material, etc.) as needed for internal management and for control of subcontractors.
  10. To the extent it is practicable to identify the authorized work in discrete work packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire control account is not subdivided into work packages, identify the far term effort in larger planning packages for budget and scheduling purposes.
  11. Provide that the sum of all work package budgets plus planning package budgets within a control account equals the control account budget.
  12. Identify and control level of effort activity by time-phased budgets established for this purpose. Only that effort which is unmeasurable or for which measurement is impractical may be classified as level of effort.
  13. Establish overhead budgets for each significant organizational component of the company for expenses which will become indirect costs. Reflect in the program budgets, at the appropriate level, the amounts in overhead pools that are planned to be allocated to the program as indirect costs.
  14. Identify management reserves and undistributed budget.
  15. Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.

#### Accounting Considerations

16. Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.
17. When a work breakdown structure is used, summarize direct costs from control accounts into the work breakdown structure without allocation of a single control account to two or more work breakdown structure elements.
18. Summarize direct costs from the control accounts into the contractor's organizational elements without allocation of a single control account to two or more organizational elements.
19. Record all indirect costs which will be allocated to the contract.
20. Identify unit costs, equivalent unit costs, or lot costs when needed.
21. For EVMS, the material accounting system will provide for:
  - Accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques.

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- Cost performance measurement at the point in time most suitable for the category of material involved, but no earlier than the time of progress payments or actual receipt of material.
  - Full accountability of all material purchased for the program including the residual inventory.

### Analysis and Management Reports

22. At least on a monthly basis, generate the following information at the control account and other levels as necessary for management control using actual cost data from, or reconcilable with, the accounting system:
  - Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance.
  - Comparison of the amount of the budget earned and the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.
23. Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.
24. Identify budgeted and applied (or actual) indirect costs at the level and frequency needed by management for effective control, along with the reasons for any significant variances.
25. Summarize the data elements and associated variances through the program organization and/or work breakdown structure to support management needs and any customer reporting specified in the contract.
26. Implement managerial actions taken as the result of earned value information.
27. Develop revised estimates of cost at completion based on performance to date, commitment values for material, and estimates of future conditions. Compare this information with the performance measurement baseline to identify variances at completion important to company management and any applicable customer reporting requirements including statements of funding requirements.

### Revisions and Data Maintenance

28. Incorporate authorized changes in a timely manner, recording the effects of such changes in budgets and schedules. In the directed effort prior to negotiation of a change, base such revisions on the amount estimated and budgeted to the program organizations.

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29. Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal replanning in the detail needed by management for effective control.
  30. Control retroactive changes to records pertaining to work performed that would change previously reported amounts for actual costs, earned value, or budgets. Adjustments should be made only for correction of errors, routine accounting adjustments, effects of customer or management directed changes, or to improve the baseline integrity and accuracy of performance measurement data.
  31. Prevent revisions to the program budget except for authorized changes.
  32. Document changes to the performance measurement baseline.

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## APPENDIX B. CONTRACT PERFORMANCE REPORT FORMATS

The Contract Performance Reports (CPRs) are submitted to the project manager by a contractor for the set of tasks being performed by the contractor in support of the project. They provide the project manager with information for (1) integrating cost and schedule performance data with technical performance measures, (2) assessing the magnitude and impact of actual and potential problem areas causing significant cost and schedule variances, and (3) providing valid, timely project status information to higher management. They are normally provided to the project manager monthly by each of the prime contractors supporting the project.

Formats 1 and 5 provide the IHS IT Investment Manager with the insight needed to manage the investment. Format 1 is a WBS-oriented contract report. Costs are organized by WBS element at a level pre-determined by the HHS IT Investment team. Format 5, Variance Narrative, is a problem analysis and variance-oriented report. It provides explanations for cost and schedule variances that have exceeded thresholds. It provides a written explanation as to why the variance occurred, as well as written descriptions on how the contractor plans to resolve the cause of the variance.

This appendix contains the five different CPR formats:

- Format 1, Work Breakdown Structure (WBS), provides data to measure cost and schedule performance by summary level WBS elements, and the hardware, software, and services IHS is buying.
- Format 2, Organizational Categories, provides the same data as Format 1, sorted by the contractor organization. If the contractor is organized by product, Format 2 is optional. Organizational category reporting should be reported to the first level of the program's organizational structure.
- Format 3, Baseline, provides the budget baseline plan against which performance is measured. It is the baseline report used to track all changes to the Performance Measurement Baseline (PMB). Format 3 contains workforce forecasts for two 3-month periods (columns 10 and 11), two subsequent 12-month periods (columns 12 and 13), and the remainder of the contract for the last period (column 14).
- Format 4, Staffing, provides workforce staffing forecasts for correlation with the budget plan and cost estimates and contain the workforce baseline which will be updated and submitted whenever the PMB changes. Organizational category reporting should be reported to the first level of the program's organizational structure. Format 4 contains baseline and workforce forecasts for two 3-month periods (columns 10 and 11), two subsequent

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12-month periods (columns 12 and 13), and the remainder of the contract for the last period (column 14).

- Format 5, Explanations and Problem Analyses, is a narrative report used to explain significant cost and schedule variances and other identified contract problems. Subcontractor variance analyses (determined by the prime contractor) and a discussion of the prime contractor's analysis of the subcontractor's performance are in Format 5. In the initial submission of the CPR (Format 5), the contractor ranks, in descending order of criticality (i.e., the most critical elements will be at the top of the list and the least critical will be at the bottom), all reporting-level WBS elements anticipated to be schedule drivers, and all WBS elements (in a similar ranking) anticipated to be the cost drivers on the project.

CPR FORMAT 1

CLASSIFICATION (When Filled In)

CONTRACT PERFORMANCE REPORT FORMAT 1 - WORK BREAKDOWN STRUCTURE												DOLLARS IN _____			FORM APPROVED OMB No. 0704-0188	
The public reporting burden for this collection of information is estimated to average 3.1 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and re																
<b>1. CONTRACTOR</b>			<b>2. CONTRACT</b>			<b>3. PROGRAM</b>			<b>4. REPORT PERIOD</b>							
a. NAME			a. NAME			a. NAME			a. FROM (YYYYMMDD)							
b. LOCATION (Address and ZIP Code)			b. NUMBER			b. PHASE			b. TO (YYYYMMDD)							
			c. TYPE			d. SHARE RATIO			c. EVMS ACCEPTANCE NO YES (YYYYMMDD)							
<b>5. CONTRACT DATA</b>																
a. QUANTITY		b. NEGOTIATED COST		c. ESTIMATED COST OF AUTHORIZED UNPRICED WORK		d. TARGET PROFIT/ FEE		e. TARGET PRICE		f. ESTIMATED PRICE		g. CONTRACT CEILING		h. ESTIMATED CONTRACT CEILING		i. DATE OF OTB/OTS (YYYYMMDD)
<b>6. ESTIMATED COST AT COMPLETION</b>																
		MANAGEMENT ESTIMATE AT COMPLETION (1)		CONTRACT BUDGET BASE (2)		VARIANCE (3)		a. NAME (Last, First, Middle Initial)			b. TITLE					
a. BEST CASE								c. SIGNATURE			d. DATE SIGNED (YYYYMMDD)					
b. WORST CASE																
c. MOST LIKELY																
<b>8. PERFORMANCE DATA</b>																
ITEM (1)	CURRENT PERIOD					CUMULATIVE TO DATE					REPROGRAMMING ADJUSTMENTS			AT COMPLETION		
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE		REPROGRAMMING ADJUSTMENTS			BUDGETED	ESTIMATED	VARIANCE
	WORK SCHEDULED (2)	WORK PERFORMED (3)	WORK PERFORMED (4)	SCHEDULE (5)	COST (6)	WORK SCHEDULED (7)	WORK PERFORMED (8)	WORK PERFORMED (9)	SCHEDULE (10)	COST (11)	COST VARIANCE (12a)	SCHEDULE VARIANCE (12b)	BUDGET (13)	(14)	(15)	(16)
a. WORK BREAKDOWN STRUCTURE ELEMENT																
b. COST OF MONEY																
c. GENERAL AND ADMINISTRATIVE																
d. UNDISTRIBUTED BUDGET																
e. SUB TOTAL (PERFORMANCE MEASUREMENT BASELINE)																
f. MANAGEMENT RESERVE																
g. TOTAL																
<b>9. RECONCILIATION TO CONTRACT BUDGET BASE</b>																
a. VARIANCE ADJUSTMENT																
b. TOTAL CONTRACT VARIANCE																

DD FORM 2734/1, MAR 05

LOCAL REPRODUCTION AUTHORIZED.

CLASSIFICATION (When Filled In)

CPR FORMAT 2

CLASSIFICATION (When Filled In)

CONTRACT PERFORMANCE REPORT FORMAT 2 - ORGANIZATIONAL CATEGORIES											DOLLARS IN _____			FORM APPROVED OMB No. 0704-0188		
The public reporting burden for this collection of information is estimated to average .6 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and rev																
1. CONTRACTOR			2. CONTRACT				3. PROGRAM				4. REPORT PERIOD					
a. NAME			a. NAME				a. NAME				a. FROM (YYYYMMDD)					
b. LOCATION (Address and ZIP Code)			b. NUMBER				b. PHASE				b. TO (YYYYMMDD)					
			c. TYPE		d. SHARE RATIO		c. EVMS ACCEPTANCE NO YES (YYYYMMDD)									
5. PERFORMANCE DATA																
ITEM (1)	CURRENT PERIOD					CUMULATIVE TO DATE					REPROGRAMMING ADJUSTMENTS			AT COMPLETION		
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE		COST VARIANCE (12a)	SCHEDULE VARIANCE (12b)	BUDGET (13)	BUDGETED (14)	ESTIMATED (15)	VARIANCE (16)
	WORK SCHEDULED (2)	WORK PERFORMED (3)	WORK PERFORMED (4)	SCHEDULE (5)	COST (6)	WORK SCHEDULED (7)	WORK PERFORMED (8)	WORK PERFORMED (9)	SCHEDULE (10)	COST (11)						
a. ORGANIZATIONAL CATEGORY																
b. COST OF MONEY																
c. GENERAL AND ADMINISTRATIVE																
d. UNDISTRIBUTED BUDGET																
e. SUB TOTAL (PERFORMANCE MEASUREMENT BASELINE)																
f. MANAGEMENT RESERVE																
g. TOTAL																

DD FORM 2734/2, MAR 05

LOCAL REPRODUCTION AUTHORIZED.

CLASSIFICATION (When Filled In)

CPR FORMAT 3

CLASSIFICATION (When Filled In)

CONTRACT PERFORMANCE REPORT FORMAT 3 - BASELINE										DOLLARS IN _____				FORM APPROVED OMB No. 0704-0188	
The public reporting burden for this collection of information is estimated to average 6.3 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and re															
1. CONTRACTOR			2. CONTRACT				3. PROGRAM				4. REPORT PERIOD				
a. NAME			a. NAME				a. NAME				a. FROM (YYYYMMDD)				
b. LOCATION (Address and ZIP Code)			b. NUMBER				b. PHASE				b. TO (YYYYMMDD)				
			c. TYPE		d. SHARE RATIO		c. EVMS ACCEPTANCE NO YES (YYYYMMDD)								
5. CONTRACT DATA															
a. ORIGINAL NEGOTIATED COST			b. NEGOTIATED CONTRACT CHANGES		c. CURRENT NEGOTIATED COST (a. + b.)		d. ESTIMATED COST OF AUTHORIZED UNPRICED WORK		e. CONTRACT BUDGET BASE (c. + d.)		f. TOTAL ALLOCATED BUDGET			g. DIFFERENCE (e. - f.)	
h. CONTRACT START DATE (YYYYMMDD)				i. CONTRACT DEFINITIZATION DATE (YYYYMMDD)			j. PLANNED COMPLETION DATE (YYYYMMDD)			k. CONTRACT COMPLETION DATE (YYYYMMDD)			l. ESTIMATED COMPLETION DATE (YYYYMMDD)		
6. PERFORMANCE DATA															
ITEM (1)	BCWS CUMULATIVE TO DATE (2)	BCWS FOR REPORT PERIOD (3)	BUDGETED COST FOR WORK SCHEDULED (BCWS) (Non-Cumulative)											UNDISTRIBUTED BUDGET (15)	TOTAL BUDGET (16)
			SIX MONTH FORECAST						ENTER SPECIFIED PERIODS						
			+1 (4)	+2 (5)	+3 (6)	+4 (7)	+5 (8)	+6 (9)	(10)	(11)	(12)	(13)	(14)		
a. PERFORMANCE MEASUREMENT BASELINE (Beginning of Period)															
b. BASELINE CHANGES AUTHORIZED DURING REPORT PERIOD															
c. PERFORMANCE MEASUREMENT BASELINE (End of Period)															
7. MANAGEMENT RESERVE															
8. TOTAL															

# CPR FORMAT 4

CLASSIFICATION (When Filled In)

CONTRACT PERFORMANCE REPORT FORMAT 4 - STAFFING											FORM APPROVED OMB No. 0704-0188			
The public reporting burden for this collection of information is estimated to average 5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.														
1. CONTRACTOR			2. CONTRACT				3. PROGRAM			4. REPORT PERIOD				
a. NAME			a. NAME				a. NAME			a. FROM (YYYYMMDD)				
b. LOCATION (Address and ZIP Code)			b. NUMBER		b. PHASE		c. EVMS ACCEPTANCE NO YES (YYYYMMDD)			b. TO (YYYYMMDD)				
			c. TYPE	d. SHARE RATIO										
5. PERFORMANCE DATA (All figures in whole numbers)														
ORGANIZATIONAL CATEGORY  (1)	ACTUAL CURRENT PERIOD  (2)	ACTUAL END OF CURRENT PERIOD (Cumulative)  (3)	FORECAST (Non-Cumulative)											
			SIX MONTH FORECAST BY MONTH (Enter Names of Months)						ENTER SPECIFIED PERIODS					AT COMPLETION  (15)
			+1 (4)	+2 (5)	+3 (6)	+4 (7)	+5 (8)	+6 (9)	(10)	(11)	(12)	(13)	(14)	
6. TOTAL DIRECT														

DD FORM 2734/4, MAR 05

LOCAL REPRODUCTION AUTHORIZED.

CPR FORMAT 5

CLASSIFICATION (When Filled In)

<b>CONTRACT PERFORMANCE REPORT FORMAT 5 - EXPLANATIONS AND PROBLEM ANALYSES</b>			FORM APPROVED OMB No. 0704-0188
The public reporting burden for this collection of information is estimated to average 36 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and rev			
<b>1. CONTRACTOR</b>	<b>2. CONTRACT</b>	<b>3. PROGRAM</b>	<b>4. REPORT PERIOD</b>
a. NAME	a. NAME	a. NAME	a. FROM (YYYYMMDD)
b. LOCATION (Address and ZIP Code)	b. NUMBER	b. PHASE	b. TO (YYYYMMDD)
	c. TYPE	d. SHARE RATIO	c. EVMS ACCEPTANCE NO YES (YYYYMMDD)

**5. EVALUATION**

**Discussion should include but is not limited to:**

Summary Analysis

- Summary of Overall Contract Variances
- Differences between EAC's (Blocks 6.a, 6.b, 6.c, or Block 8.15)
- Changes in Undistributed Budget
- Changes in Management Reserve
- Significant timephasing shifts in Baseline (BCWS) (Format 3)
- Significant timephasing shifts or Overall Changes in Forecasted Staffing (Format 4)
- Discussion of Over Target Baseline and/or Over Target Schedule incorporation

Analysis of Significant Variances: (identify and describe each)

- Type and Magnitude of Variance
- Explanation of Significant Reasons
- Effect on Immediate Task
- Effect on Total Contract
- Corrective Actions Taken or Planned

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# APPENDIX C. CONTRACT PERFORMANCE REPORT GUIDANCE

This Appendix presents guidance extracted from the DoD documentation describing the five contract performance reports (CPRs). The information was extracted from the DoD web site:

[http://www.acq.osd.mil/pm/currentpolicy/cpr\\_cfsr/CPR%20Final%203-30-05.pdf](http://www.acq.osd.mil/pm/currentpolicy/cpr_cfsr/CPR%20Final%203-30-05.pdf)

The CPR is used to obtain cost and schedule performance information on contracts requiring compliance with the American National Standards Institute/Electronic Industries Alliance Standard 748 (ANSI/EIA-748), Earned Value Management Systems (EVMS) (current version in effect at time of contract award). Refer to the Federal Acquisition Regulation (FAR) The CPR data elements shall reflect the output of the contractor's ANSI/EIA-748 compliant integrated management system.

## **REQUIREMENTS:**

1. Format. Use the relevant forms for the five CPR reports. Contractor formats may be substituted whenever they contain all of the required data elements at the specified reporting levels and are compliant with the X12 standard, XML schema, or equivalent. On-line access to the data may be provided to augment formal CPR submission.

2. Content. The CPR shall contain the following:

2.1 Heading Information - Formats 1 - 5. Preparation instructions for Heading Information (Blocks 1 through 4) apply to Formats 1 through 5.

2.1.1 Contractor. Enter in Block 1.a the contractor's name and division (if applicable). Enter in Block 1.b the facility location and mailing address of the reporting contractor.

2.1.2 Contract. Enter the contract name in Block 2.a, the contract number (and the applicable Contract Line Item Number(s) (CLIN(s)) in Block 2.b, the contract type in Block 2.c, and the contract share ratio (if applicable) in Block 2.d.

2.1.3 Program. Enter in Block 3.a the program name, number, acronym, type, model, and series, or other designation of the prime item(s) purchased under the contract. Indicate the program phase (development, production, etc.) in Block 3.b. Indicate whether the contractor's Earned Value Management System (EVMS) has been accepted by the Government and the date of the acceptance.

2.1.4 Report Period. Enter the beginning date in Block 4.a and the ending date in Block 4.b of the period covered by the report.

2.1.5 Security Classification. Enter the appropriate security classification at the top and bottom of each page.

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2.1.6 Dollars in \_\_\_\_\_. If reported dollar amounts are in thousands, millions, or billions, enter the factor at the top of each page.

## **2.2 Format 1 - Work Breakdown Structure.**

### 2.2.1 Contract Data.

2.2.1.1 Quantity. Enter in Block 5.a the number of principal items to be procured on this contract.

2.2.1.2 Negotiated Cost. Enter in Block 5.b the dollar value (excluding fee or profit) on which contractual agreement has been reached as of the cutoff date of the report. For an incentive contract, enter the definitized contract target cost. Amounts for changes shall not be included in this item until they have been priced and incorporated in the contract through contract change order or supplemental agreement. For a cost plus fixed fee, award fee, or incentive fee contract, enter the estimated cost negotiated. Changes to the estimated cost shall consist only of estimated amounts for changes in the contract scope of work, not for cost growth ("overrun") above the original estimated cost.

2.2.1.3 Estimated Cost of Authorized, Unpriced Work. Enter in Block 5.c the amount (excluding fee or profit) estimated for that work for which written authorization has been received, but for which definitized contract prices have not been incorporated in the contract through contract change order or supplemental agreement.

2.2.1.4 Target Profit/Fee. Enter in Block 5.d the fee or percentage of profit that shall apply if the negotiated cost of the contract is met. (See 2.2.1.2 above.)

2.2.1.5 Target Price. Enter in Block 5.e the target price (negotiated contract cost plus profit/fee) applicable to the definitized contract effort.

2.2.1.6 Estimated Price. Based on the most likely estimate of cost at completion for all authorized contract work and the appropriate profit/fee, incentive, and cost sharing provisions, enter in Block 5.f the estimated final contract price (total estimated cost to the Government). This number shall be based on the most likely management EAC in Block 6.c.1 and normally will change whenever the management estimate or the contract is revised.

2.2.1.7 Contract Ceiling. Enter in Block 5.g the contract ceiling price applicable to the definitized effort.

2.2.1.8 Estimated Contract Ceiling. Enter in Block 5.h the estimated ceiling price applicable to all authorized contract effort including both definitized and undefinitized effort.

2.2.1.9 Over Target Baseline/Over Target Schedule. Enter in Block 5.i the date the last over target baseline or over target schedule was implemented (if applicable).

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2.2.2 Estimated Cost at Completion. These blocks shall present the contractor's range of estimated costs at completion. The range of estimates is intended to allow contractor management flexibility to express possible cost outcomes. Contractors shall provide the most accurate Estimates at Completion (EACs) possible through program-level assessments of factors that may affect the cost, schedule, or technical outcome of the contract. Such program-level assessments shall include consideration of known or anticipated risk areas, and planned risk reductions or cost containment measures. EACs shall be reported without regard to contract ceiling.

2.2.2.1 Management Estimate at Completion - Best Case. Enter in Block 6.a.1 the contractor's best case EAC. The best case estimate is the one that results in the lowest cost to the Government. This estimate shall be based on the outcome of the most favorable set of circumstances. If this estimate is different from the most likely EAC (Block 6.c.1), the assumptions, conditions, and methodology underlying this estimate shall be explained briefly in Format 5. This estimate is for informational purposes only; it is not an official company estimate. There is no requirement for the contractor to prepare and maintain backup data beyond the explanation provided in Format 5.

2.2.2.2 Management Estimate at Completion - Worst Case. Enter in Block 6.b.1 the contractor's worst case EAC. The worst case estimate is the one that results in the highest cost to the Government. This estimate shall be based on the outcome of the least favorable set of circumstances. If this estimate is different from the most likely EAC (Block 6.c.1), the assumptions, conditions, and methodology underlying this estimate shall be explained briefly in Format 5. This estimate is for informational purposes only; it is not an official company estimate. There is no requirement for the contractor to prepare and maintain backup data beyond the explanation provided in Format 5.

2.2.2.3 Management Estimate at Completion - Most Likely. Enter in Block 6. c.1 the contractor's most likely EAC. This estimate is the contractor's official contract EAC and, as such, takes precedence over the estimates presented in Column (15) of Formats 1 and 2 and Blocks 6.a.1 and 6.b.1. This EAC is the value that the contractor's management believes is the most likely outcome based on a knowledgeable estimate of all authorized work, known risks, and probable future conditions. This value need not agree with the total of Column (15) (Block 8.e). However, any difference shall be explained in Format5 in such terms as risk, use of Management Reserve (MR), or higher management knowledge of current or future contract conditions. The assumptions, conditions, and methodology underlying this estimate shall be explained briefly in Format 5. This EAC need not agree with EACs contained in the contractor's internal data, but must be reconcilable to them. The most likely shall also be reconcilable to the contractor's latest statement of funds required as reported in the contract funds status report (CFSR), or its equivalent, if this report is a contractual requirement.

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2.2.2.4 Contract Budget Base. Enter in Block 6.c.2 the total of negotiated cost (Block 5.b) and estimated cost of authorized, unpriced work (Block 5.c).

2.2.2.5 Variance. Enter in Block 6.c.3 the Contract Budget Base (Block 6.c.2) minus the most likely estimate at complete (Block 6.c.1). This value shall be explained in Format 5 according to applicable contractual requirements.

2.2.3 Authorized Contractor Representative. Enter in Block 7.a the name of the authorized person (program manager or designee) signing the report. Enter that person's title in Block 7.b. The authorized person shall sign in Block 7.c. Enter the date signed in Block 7.d. Electronic signatures are encouraged.

2.2.4 Performance Data.

2.2.4.1 Column (1) - Work Breakdown Structure Element. Enter in Column (1) of Block 8.a the noun description of the contract work breakdown structure (CWBS) items for which cost information's being reported. CWBS elements and levels reported shall be those specified in the contract. (See f.1 above.)

2.2.4.2 Cost of Money. Enter in Columns (2) through (16) of Block 8.b the Facilities Capital Cost of Money applicable to the contract.

2.2.4.3 General and Administrative. Enter in Columns (2) through (16) of Block 8.c the appropriate General and Administrative (G&A) costs. If G&A costs have not been included in the CWBS costs reported in Block 8.a above, G&A shall be shown as an add entry in Block 8.a. If G&A costs have been included in the CWBS costs reported in Block 8.a above, G&A shall be shown as a non-add entry in Block 8.c with an appropriate notation to that effect. For contracts that require contractor cost data reports (CCDRs), contractors may also have to submit separate costs without G&A for the CWBS elements reported in Block 8.a on an exception basis if the Government specifies such a requirement in the contract data requirements list (CDRL). If a G&A classification is not used, no entry shall be made other than an appropriate notation to that effect.

2.2.4.4 Undistributed Budget. Enter the amount of budget applicable to contract effort that has not yet been identified to CWBS elements at or below the reporting level. For example, if contract changes were authorized late in the reporting period, they should have received a total budget; however, assignment of work and allocation of budgets to individual CWBS elements may not have been accomplished as of the contractor's accounting period cutoff date. Budgets that can be identified to CWBS elements at or below the specified reporting level shall be included in the total budgets shown for the CWBS elements in Block 8.a and shall not be shown as Undistributed Budget(UB). Enter in Column (15) of Block 8.d the EAC for the scope of work represented by the UB in Column (14) of Block 8.d. Enter in Column (16) of Block 8.d the variance, if any, and fully explain it in Format 5. The reason(s) for UB shall be fully explained in Format 5.

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2.2.4.4.1 Use of Undistributed Budget. UB is used to accommodate temporary situations where time constraints prevent adequate budget planning or where contract effort can only be defined in very general terms. UB shall not be used as a substitute for adequate contract planning. Formal budgets shall be allocated to contract effort and responsible organizations at the earliest possible time, preferably within the next reporting period.

2.2.4.5 Subtotal (Performance Measurement Baseline). In Columns (2) through (16) of Blocks 8.a through 8.e, enter the sum of the costs and budgets for direct, indirect, cost of money, and G&A. This subtotal represents the dollars in the allocated budget (less MR), which is the Performance Measurement Baseline (PMB) against which performance is measured.

2.2.4.6 Management Reserve. MR is an amount of the overall contract budget withheld for management control purposes and is held for program unknowns (realized risks on authorized work scope). Reserve is held for future needs and shall not be used to offset cumulative cost variances. It shall not be eliminated from contract prices by the Government during subsequent negotiations nor used to absorb the cost of contract changes. In Column (14) of Block 8.f enter the total amount of budget identified as MR as of the end of the current reporting period. The amounts shown as MR in Formats 1, 2, and 3 should agree. Amounts of MR applied to CWBS elements during the reporting period shall be listed in Block 6.b of Format 3 and explained in Format 5.

2.2.4.6.1 Negative Management Reserve. Negative entries shall not be made in Management Reserve (Column (14) of Block 8.f). There is no such thing as "negative MR." If the contract is budgeted in excess of the Contract Budget Base (the negotiated contract cost plus the estimated cost for authorized, unpriced work), the provisions applicable to formal reprogramming and the instructions in paragraphs 2.2.5.1, 2.2.6.6, 2.2.6.7, and 2.4.1.7 apply.

2.2.4.7 Total. Enter the sum of all direct, indirect, cost of money, and G&A costs, and UB and MR (if applicable) in Columns (2) through (14) of Block 8.g. The Total lines of Format 1 (Block 8.g) and Format 2 (Block 5.g) should agree. The total of Column (14), Block 8.g, should equal the Total Allocated Budget shown in Block 5.f on Format 3.

## 2.2.5 Reconciliation to Contract Budget Base.

2.2.5.1 Formal Reprogramming. In exceptional cases, the contractor may establish performance measurement budgets that exceed the Contract Budget Base. Acceptance of the new baseline in excess of the Contract Budget Base will be predicated on Government approval. This process is called formal reprogramming. The contractor and the Government shall agree on how the results of a formal reprogramming will be reported in the CPR before the formal reprogramming is initiated. This agreement and any other pertinent details on the reporting of the formal reprogramming shall be included in Format 5. Blocks 9.a and 9.b are used to reconcile the higher performance

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measurement budgets, also called an "over target baseline," to the Contract Budget Base. (See 2.2.6.6, 2.2.6.7, 2.4.1.7, and 2.6.5 below for more information on reporting over target baselines (Formal Reprogramming).)

2.2.5.2 Variance Adjustment. In a formal reprogramming (over target baseline), the contractor may: (1) apply the additional budget to completed work, thereby eliminating some or all of the existing cost or schedule variances, (2) apply the additional budget to remaining work, (3) apply some of the additional budget to completed work and some to remaining work, and/or (4) apply some of the additional budget to MR. If the contractor uses a portion of the additional budget to eliminate variances applicable to completed work, the total adjustments made to the cost and schedule variances shall be shown in Columns (10) and (11) of Block 9.a. The total cost variance adjustment entered in Column (11) of Block 9.a should be the sum of the individual cost variance adjustments shown in Column (12) of Block 8.g.

2.2.5.3 Total Contract Variance. In Columns (10) and (11) of Block 9.b, enter the sum of the cost and schedule variances shown on the Total line (Block 8.g) and on the Variance Adjustment line (Block 9.a). In Column (14) enter the Contract Budget Base from Block 6.c.2. In Column (15) enter the management EAC from Block 6.c.1. In Column (16) of Block 9.b enter the difference between Columns (14) and (15) of Block 9.b.

2.2.6 Columns (2) Through (16). When compliance with the ANSI/EIA-748(current version in effect at time of contract award) is contractually required, the data in Columns (2) through (16) shall reflect the output of the contractor's ANSI/EIA-748 compliant integrated management system.

2.2.6.1 Column (2) and Column (7) - Budgeted Cost - Work Scheduled. For the time period indicated, enter the Budgeted Cost for Work Scheduled (BCWS) in these columns.

2.2.6.2 Column (3) and Column (8) - Budgeted Cost - Work Performed. For the time period indicated, enter the Budgeted Cost for Work Performed (BCWP) in these columns.

2.2.6.3 Column (4) and Column (9) - Actual Cost - Work Performed. For the time period indicated, enter the Actual Cost of Work Performed (ACWP) without regard to ceiling. In all cases, costs and budgets shall be reported on a comparable basis.

2.2.6.4 Column (5) and Column (10) - Variance – Schedule (i.e., accomplishment). For the time period indicated, these columns reflect the differences between BCWS and BCWP. For the current period column, Column (5)(schedule variance) is derived by subtracting Column (2) (BCWS) from Column (3) (BCWP). For the cumulative to date column, Column (10) (schedule variance) is derived by subtracting Column (7) (BCWS) from Column (8) (BCWP). A positive number in Column (5) and Column (10) indicates a favorable variance. A negative number (indicated by parentheses) indicates an unfavorable variance. Significant variances as specified in the contract

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shall be fully explained in Format 5. If the contract does not specify variance analysis thresholds, the contractor shall provide appropriate variance analyses. (See 2.6.3 below.)

2.2.6.5 Column (6) and Column (11) - Variance - Cost. For the time period indicated, these columns reflect the difference between BCWP and ACWP. For the current period column, Column (6) (cost variance) is derived by subtracting Column (4) (ACWP) from Column (3) (BCWP). For the cumulative to date column, Column (11) (cost variance) is derived by subtracting Column (9) (ACWP) from Column (8) (BCWP). A positive value indicates a favorable variance. A negative value (indicated by parentheses) indicates an unfavorable variance. Significant variances as specified in the contract shall be fully explained in Format 5. If the contract does not specify variance analysis thresholds, the contractor shall provide appropriate variance analyses. (See 2.6.3 below.)

2.2.6.6 Column (12a) and Column (12b) Reprogramming Adjustments - Cost Variance and Schedule Variance. Formal reprogramming (over target baseline) results in budget allocations in excess of the Contract Budget Base and, in some instances, adjustments to previously reported variances. If previously reported variances are being adjusted, the adjustment applicable to each reporting line item affected shall be entered in Column (12a) if for a cost variance and Column (12b) if for a schedule variance. The total of Column (12a) and Column (12b) should equal the amount shown on the Variance Adjustment line (Block 9.a) in Column (10) and Column (11).

2.2.6.7 Column (13) Reprogramming Adjustments - Budget. Enter the total amounts added to the budget for each reporting line item as the result of formal reprogramming (over target baseline). The amounts shown shall consist of the sum of the budgets used to adjust cost variances (Column (12)) plus the additional budget added to the CWBS element for remaining work. Enter the amount of budget added to MR in the space provided on the Management Reserve line (Block 8.f of Column (13)). The total of Column (13) should equal the budget amount by which the Total Allocated Budget exceeds the Contract Budget Base as shown in Block 5.g of Format 3. An explanation of the reprogramming shall be provided in Format 5.

2.2.6.7.1 Formal Reprogramming Reporting. Columns (12) and (13) are intended for use only in situations involving formal reprogramming (over target baseline). Internal replanning actions within the Contract Budget Base do not require entries in these columns. Where contractors are submitting CPR data directly from automated systems, the addition of Columns (12) and (13) as shown may not be practical due to computer reprogramming problems or space limitations. In such cases, the information shall be provided in Format 5. Contractors shall not be required to abandon or modify existing automated reporting systems to include Columns (12) and (13) if significant costs will be associated with such change. Nor shall contractors be required to prepare the report manually solely to include this information.

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2.2.6.7.2. Formal Reprogramming Timeliness. Formal reprogramming (over target baseline) can be a significant undertaking that may require more than a month to implement. To preclude a disruption of management visibility caused by a reporting hiatus, formal reprogramming shall be implemented expeditiously. If a reporting hiatus is needed, the contractor and the Government shall agree on the date and duration of the hiatus before the formal reprogramming is initiated.

2.2.6.8 Column (14) - At Completion - Budgeted. Enter the budgeted cost at completion for the items listed in Column (1). This entry shall consist of the sum of the original budgets plus or minus budget changes resulting from contract changes, internal replanning, and application of MR. The total (Block 8.g) should equal the Total Allocated Budget shown in Block 5.f on Format 3.

2.2.6.9 Column (15) - At Completion - Estimated. Enter the latest revised estimate of cost at completion including estimated overrun/underrun for all authorized work. If the subtotal (Block 8.e) does not agree with the most likely management EAC (Block 6.c.1), the difference shall be explained in Format 5. (See 2.2.2.3 above.)

2.2.6.10 Column (16) - At Completion - Variance. Enter the difference between the Budgeted - At Completion (Column (14)) and the Estimated - At Completion (Column (15)) by subtracting Column (15) from Column (14). A negative value (indicated by parentheses) reflects an unfavorable variance. Significant variances as specified in the contract shall be fully explained in Format 5. If the contract does not specify variance analysis thresholds, the contractor shall provide appropriate variance analyses. (See 2.6.3 below.)

## **2.3 Format 2 - Organizational Categories.**

### **2.3.1 Performance Data.**

2.3.1.1 Column (1) - Organizational Category. In Block 5.a list the organizational categories that reflect the contractor's internal management structure. This format shall be used to collect organizational cost information at the total contract level for organizational elements rather than for individual CWBS elements. This column shall also identify each major subcontractor as defined in the contract. The individual subcontractor line shall reconcile with the cost to the prime (includes subcontractor fee, MR, UB, G&A, cost of money, etc.) or shall track directly with the subcontractor submittal consistent with the company/program documented process for subcontract integration. The process for subcontract integration shall be explained in Format 5. This column shall also identify each major subcontractor and each major vendor separately as an add item. (Note: The separation of subcontractor efforts is for reporting purposes and not intended to impact how contracts are managed.) Except for material included in the add item for each major subcontractor or major vendor, the column shall also identify material separately as an add item. The level of detail to be reported normally will be limited to the organizational level immediately under the operating head of the facility. The contractor may report this information according to

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its own internal management structure. If the contractor is organized by product teams, this format may not be needed because it may resemble Format 1.

2.3.1.2 Cost of Money. Enter in Columns (2) through (16) of Block 5.b the Facilities Capital Cost of Money applicable to the contract.

2.3.1.3 General and Administrative. Enter in Columns (2) through (16) of Block 5.c the appropriate G&A costs. If G&A costs have not been included in the CWBS costs reported in Block 5.a above, G&A shall be shown as an add entry in Block 5.a. If G&A costs have been included in the CWBS costs reported in Block 5.a above, G&A shall be shown as a non-add entry in Block 5.c with an appropriate notation to that effect. If a G&A classification is not used, no entry shall be made other than an appropriate notation to that effect. (See 2.2.4.3 above.)

2.3.1.4 Undistributed Budget. Enter in Column (14) of Block 5.d the budget applicable to contract effort that cannot be planned in sufficient detail to be assigned to a responsible organizational area at the reporting level. The amount shown on this format may exceed the amount shown as UB on Format 1 if budget is identified to a task at or below the CWBS reporting level but organizational identification has not been made; or may be less than the amount on Format 1 where budgets have been assigned to organizations but not to CWBS elements. Enter in Column (15) of Block 5.d the EAC for the scope of work represented by the UB in Column (14) of Block 5.d. Enter in Column (16) of Block 5.d the variance, if any, and fully explain it in Format 5. (See 2.2.4.4 above.)

2.3.1.5 Subtotal (Performance Measurement Baseline). Enter the sum of the direct, indirect, cost of money, and G&A costs and budgets in Columns (2) through (16) of Blocks 5.a through 5.e. (See 2.2.4.5 above.)

2.3.1.6 Management Reserve. In Column (14) of Block 5.f enter the amount of budget identified as MR. The Management Reserve entry should agree with the amounts shown in Formats 1 and 3. (See 2.2.4.6 above.)

2.3.1.7 Total. Enter the sum of all direct, indirect, cost of money, and G&A costs and budgets, UB, and MR (if applicable) in Columns (2) through (14) of Block 5.g. The totals on this page should equal the Total line on Format 1. The total of Column (14) should equal the Total Allocated Budget shown in Block 5.f on Format 3.

2.3.2 Columns (2) Through (16). The instructions applicable to these columns are the same as the instructions for corresponding columns on Format 1. (See 2.2.6 and 2.2.6.1 through 2.2.6.10 above.)

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## **2.4 Format 3 - Baseline.**

### 2.4.1 Contract Data.

2.4.1.1 Original Negotiated Cost. Enter in Block 5.a the dollar value (excluding fee or profit) negotiated in the original contract. For a cost plus fixed fee, incentive, or award fee contract, enter the estimated cost negotiated. For an incentive contract, enter the definitized contract target cost.

2.4.1.2 Negotiated Contract Changes. Enter in Block 5.b the cumulative cost (excluding fee or profit) applicable to definitized contract changes that have occurred since the beginning of the contract.

2.4.1.3 Current Negotiated Cost. Enter in Block 5.c the sum of Blocks 5.a and 5.b. The amount shown should equal the current dollar value (excluding fee or profit) on which contractual agreement has been reached and should be the same as the amount in Negotiated Cost (Block 5.b) on Format 1.

2.4.1.4 Estimated Cost of Authorized, Unpriced Work. Enter in Block 5.d the estimated cost (excluding fee or profit) for contract changes for which authorization has been received from the contracting officer, but for which contract prices have not been incorporated in the contract, as shown in Block 5.c of Format 1.

2.4.1.5 Contract Budget Base. Enter in Block 5.e the sum of Blocks 5.c and 5.d.

2.4.1.6 Total Allocated Budget. Enter in Block 5.f the sum of all budgets allocated to the performance of the contractual effort. The amount shown shall include all MR and UB. This amount should be the same as that shown on the Total line in Column (14) on Format 1 (Block 8.g) and Format 2 (Block 5.g).

2.4.1.7 Difference. Enter in Block 5.g the difference between Blocks 5.e and 5.f. In most cases, the amounts shown in Blocks 5.e and 5.f will be identical. If the amount shown in Block 5.f exceeds that shown in Block 5.e, it usually is an indication of a formal reprogramming (over target baseline). The difference shall be explained in Format 5 at the time the negative value appears and subsequently for any changes in the difference between Contract Budget Base and the Total Allocated Budget.

2.4.1.8 Contract Start Date. Enter in Block 5.h the date the contractor was authorized to start work on the contract, regardless of the date of contract definitization. (Note: Long-lead procurement efforts authorized under prior contracts are not to be considered.)

2.4.1.9 Contract Definitization Date. Enter in Block 5.i the date the contract was definitized.

2.4.1.10 Planned Completion Date. Enter in Block 5.j the completion date to which the budgets allocated in the PMB have been planned. This date represents the planned

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completion of all significant effort on the contract. The cost associated with the schedule from which this date is taken is the Total Allocated Budget (Block 5.f of Format 3).

2.4.1.10.1 Performance Measurement Schedule Inconsistent With Contractual Schedule. In exceptional cases, the contractor may determine that the existing contract schedule cannot be achieved and no longer represents a reasonable basis for management control. With Government approval, the contractor may rephase its performance measurement schedule to new dates that exceed the contractual milestones, a condition known as "over target schedule." These new dates are for performance measurement purposes only and do not represent an agreement to modify the contract terms and conditions.

2.4.1.10.2 Over Target Schedule Agreement. The Government and the contractor shall agree on the new performance measurement schedule prior to reporting it in the CPR. The contractor shall provide pertinent information in Format 5 on any schedule milestones that are inconsistent with contractual milestones, beginning the month the schedule is implemented and each month thereafter.

2.4.1.10.3 Indicators of a Performance Measurement Schedule Inconsistent With the Contractual Schedule. Formal reprogramming or internal replanning may result in performance measurement milestones that are inconsistent with the contractual milestones (Over Target Schedule). A difference between the planned completion date (Block 5.j) and the contract completion date (Block 5.k) usually indicates that some or all of the performance measurement milestones are inconsistent with the contractual milestones.

2.4.1.11 Contract Completion Date. Enter in Block 5.k the contract scheduled completion date in accordance with the latest contract modification. The cost associated with the schedule from which this date is taken is the Contract Budget Base (Block 5.e of Format 3).

2.4.1.12 Estimated Completion Date. Enter in Block 5.l the contractor's latest revised estimated completion date. This date represents the estimated completion of all significant effort on the contract. The cost associated with the schedule from which this date is taken is the "most likely" management EAC (Block 6.c.1 of Format 1).

## 2.4.2 Performance Data.

2.4.2.1 Column (1) - Performance Measurement Baseline (Beginning of Period). Enter in Block 6.a the time-phased PMB (including G&A) that existed at the beginning of the current reporting period. Most of the entries on this line (e.g., for Columns (4) through (9)) are taken directly from the PMB (End of Period) line on the previous report. For example, the number in Column (4) on the PMB (End of Period) line from the last report becomes the number in Column (3) on the PMB (Beginning of Period) line on this report. The number in Column (5) (End of Period) last report becomes

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Column (4) (Beginning of Period) on this report, etc. (if each of the two columns covers the same length of time).

2.4.2.2 Baseline Changes. In Block 6.b, list all significant baseline changes that have occurred during the reporting period. This listing shall include the contract changes and supplemental agreements authorized during the reporting period, allocations from MR and UB, and any significant rephrasing of budgets. All significant authorized baseline changes shall be listed whether priced or unpriced.

2.4.2.3 Performance Measurement Baseline (End of Period). Enter in Block 6.c the time-phased PMB as it exists at the end of the reporting period. The difference between this line and the PMB (Beginning of Period) represents the effects of all significant changes, including the authorized changes, allocations of MR made during the period, and changes to time phasing due to internal replanning or formal reprogramming. The reasons for these changes shall be explained in Format 5.

2.4.2.4 Management Reserve. Enter in Block 7 the total amount of MR remaining as of the end of the reporting period. This value should agree with the amounts shown as MR in Formats 1 and 2.

2.4.2.5 Total. Enter in Column (16) of Block 8 the sum of Column (16) of Block 6.c (PMB (End of Period)) and Column (16) of Block 7 (Management Reserve). This amount should be the same as that shown on the Total line (Block 8.g) in Column (14) on Format 1.

2.4.3 Column (2) - BCWS - Cumulative To Date. On the PMB (Beginning of Period) line (Block 6.a), enter the cumulative BCWS as of the first day of the reporting period. This should be the same number reported as BCWS -Cumulative To Date on the Total line (Column (7) of Block 8.g) of Format 1 of the previous CPR. On the PMB (End of Period) line (Block 6.c), enter the cumulative BCWS as of the last day of the reporting period. This should be the same number reported as BCWS - Cumulative to Date on the Total line(Column (7) of Block 8.g) of Format 1 for this CPR.

2.4.4 Column (3) - BCWS For Report Period. On the PMB (Beginning of Period)line (Block 6.a), enter the BCWS planned for the reporting period. This should be the number in Column (4) on the PMB (End of Period) line (Block 6.c)on the previous CPR.

2.4.5 Columns (4) Through (14). Enter the names of each month for the contract period of performance in the headings of each of the Columns (4)through (9), and the names of the appropriate periods in the headings of each of the Columns (10) through (14) of Block 6. Columns beyond (14) may be added when necessary or desirable. In the PMB (Beginning of Period) line (Block6.a), enter the BCWS projection reported in Format 3 of the previous CPR as PMB (End of Period) (Block 6.c). In the PMB (End of Period) line (Block 6.c)of this report, enter the projected BCWS by month for the next six months and for periodic increments (monthly, quarterly, or annually) thereafter for the remainder of the contract. The time phasing of each item listed in

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Column (1) of Block 6.b need not be shown in Columns (4) through (14). It is useful to show the time phasing of any baseline changes. (Note: For the purposes of illustration, Sample Format 3 has Columns (4) through (14) for reporting BCWS. The actual number of columns will vary from contract to contract.)

2.4.6 Column (15) - Undistributed Budget. On the PMB (Beginning of Period) line (Block 6.a), enter the number from Column (15) on the PMB (End of Period) line (Block 6.c) from the previous CPR. On the PMB (End of Period) line, enter the UB shown in Column (14) of Block 8.d on Format 1 of this report.

2.4.7 Column (16) - Total Budget. On the PMB (Beginning of Period) line (Block 6.a) enter the number from Column (16) on the PMB (End of Period) line (Block 6.c) from the previous CPR. In the section where baseline changes that occurred during the period are listed (Column (1) of Block 6.b), enter the amount of each of the changes listed. On the PMB (End of Period) line (Block 6.c), enter the sum of the amounts in the preceding columns on this line. On the Management Reserve line (Block 7), enter the amount of MR available at the end of the period. On the Total line (Block 8) enter the sum of the amounts in this column on the PMB (End of Period) line and the Management Reserve line. (Note: This should equal the amount in Block 5.f on this format and also the amount of the Total line in Column (14), Block 8.g, of Format 1.)

## **2.5 Format 4 - Staffing.**

2.5.1 Performance Data. For those organizational categories shown in Column (1) of Block 5, equivalent months shall be indicated for the current reporting period (Column (2)), cumulative through the current period (Column (3)), forecast to completion (Columns (4) through (14)), and at completion (Column (15)). Direct equivalent months shall be shown for each organizational category for the contract. An equivalent month is defined as the effort equal to that of one person for one month. Values shall be reported in whole numbers. (Note: Partial months, .5 and above, shall be rounded to 1; below .5 to 0.) When the Government and the contractor agree, staffing may be reported in equivalent days or hours.

2.5.1.1 Column (1) - Organizational Category. In Block 5, list the organizational categories that reflect the contractor's internal management structure. Format 4 categories may differ from those reported in Format 2. If the Government needs different categories in Formats 2 and 4, the Format 4 categories shall be addressed during negotiations. (See f.4 above.)

2.5.1.2 Total Direct. In Block 6, Columns (2) through (15), enter the sum of all direct equivalent months for the organizational categories shown in Column (1).

2.5.2 Column (2) - Actual - Current Period. Enter the actual equivalent months incurred during the current reporting period.

2.5.3 Column (3) - Actual End of Current Period (Cumulative). Enter the actual equivalent months incurred to date (cumulative) as of the end of the reporting period.

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2.5.4 Columns (4) Through (14) - Forecast (Non-Cumulative). Enter the names of each month for the contract period of performance in the headings of each of the Columns (4) through (9), and the names of the appropriate periods in the headings of each of the Columns (10) through (14) of Block 5. Enter a staffing forecast by month for the next six months and for periodic increments (monthly, quarterly, or annually) thereafter for the remainder of the contract. The staffing forecast shall be updated as part of the formal EAC process followed by the contractor. The staffing forecast shall reflect the same staffing estimate used as the basis for the EAC in Column (15) on both Format 1 and Format 2. (Note: For the purposes of illustration, Sample Format 4 has Columns (4) through (14) for reporting staffing forecast. The actual number of columns will vary from contract to contract.)

2.5.5 Column (15) - Forecast at Completion. Enter the estimate of equivalent months necessary for the total contract in Column (15) by organizational category. This estimate shall be consistent with the “most likely” management EAC shown in Column (15) of Block 8.e of Format 1. Any significant change in the total number of equivalent months at completion of the contract (i.e., Column (15) Total) shall be explained in Format 5.

## **2.6 Format 5 - Explanations and Problem Analyses.**

2.6.1 General. Format 5, Explanations and Problem Analyses, is a narrative report prepared to amplify and explain data in the other CPR formats. Format 5 shall normally address the following: (1) contractually required cost, schedule, and EAC variance analyses, (2) MR changes and usage, (3) UB contents, (4) differences between the best case, worst case, and most likely management EAC, if any, (5) the difference between the most likely management EAC and the estimate in Block 8.e of Column (15), if any, (6) significant differences between beginning of period PMB time phasing and end of period PMB time phasing in Format 3, (7) performance measurement milestones that are inconsistent with contractual milestones (Over Target Schedule), (8) formal reprogramming (over target baseline) implementation details, and (9) significant staffing estimate changes in Format 4. Any other topic relevant to contract cost, schedule, or technical performance may be addressed in this format. The date(s) of the Integrated Baseline Review(s) may also be addressed in this format. Contractors may elect to attach subcontractor Format 5 reporting and cross reference this analysis in the Format 5 reporting submitted to the Government to gain time efficiencies and meet submission dates.

2.6.2 Total Contract. Provide a summary analysis that identifies significant problems affecting performance. Indicate corrective actions required, including Government action where applicable. Significant changes since the previous report shall be highlighted. Discuss any other issues affecting successful attainment of contract cost, schedule, or technical objectives that the contractor deems significant or noteworthy. This section is brief, normally one page.

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**2.6.3 Cost and Schedule Variances.** Explain all variances that exceed specified variance thresholds. Explanations of variances shall clearly identify the nature of the problem, significant reasons for cost or schedule variance, effect on the immediate task, impact on the total contract, and the corrective action taken or planned. Explanations of cost variances shall identify amounts attributable to rate changes separately from amounts applicable to hours worked; amounts attributable to material price changes separately from amounts applicable to material usage; and amounts attributable to overhead rate changes separately from amounts applicable to overhead base changes or changes in the overhead allocation basis. To reduce the volume of variance analysis explanations, the contractor may refer to a prior CPR's variance analysis explanations if the explanation for the current CPR's variance has not changed significantly. Explanations of schedule variances and the impact on the contract shall be performed in parallel with the schedule analysis called out by the IMS DID. Accordingly, there is a requirement in b. above for the IMS DID, DI-MGMT-81650, to be used in conjunction with this DID. (See 2.2.6.4 and 2.2.6.5 above.)

**2.6.3.1 Setting Variance Analysis Thresholds.** In Format 5, the Government will require only that amount of variance analysis that satisfies its management information needs. Excessive variance analysis is burdensome and costly, and detracts from the CPR's usefulness, while too little information is equally undesirable.

**2.6.4 Other Analyses.** In addition to variance explanations, the following analyses are mandatory:

**2.6.4.1. Management Estimate at Completion.** If the best or worst case management EACs differ from the most likely estimate (Column (1) of Block 6 of Format 1), a brief explanation of the difference shall be provided. Also, if the most likely management EAC differs from the total entered in Column (15) of Format 1 or 2, the difference shall be explained. The explanations shall focus on such areas as a knowledgeable, realistic risk assessment; projected use of MR; estimate for UB; and higher management's knowledge of current or future contract conditions. The assumptions, conditions, and methodology underlying all management EACs shall be explained. (See 2.2.2 to 2.2.2.3, 2.2.2.5, 2.2.6.9, and 2.2.6.10 above.)

**2.6.4.2 Undistributed Budget.** Identify the effort to which the UB applies. Also, explain any variance between the UB and the estimate for UB in Formats 1 and 2. (See 2.2.4.4 and 2.3.1.4 above.)

**2.6.4.3 Management Reserve Changes.** Identify the sources and uses of MR changes during the reporting period. Identify the CWBS and organizational elements to which MR is applied, and the reasons for its application. (See 2.2.4.6 above.)

**2.6.4.4 Baseline Changes.** Explain reasons for significant shifts in time phasing of the PMB shown on Format 3. (See 2.4.2.3 above.)

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2.6.4.5 Staffing Level Changes. Explain significant changes in the total staffing EAC shown on Format 4. Also, explain reasons for significant shifts in time phasing of planned staffing. (See 2.5.5 above.)

2.6.5 Formal Reprogramming (Over Target Baseline). If the difference shown in Block 5.g on Format 3 becomes a negative value or changes in value, provide information on the following:

2.6.5.1 Authorization. Procuring activity authorization for the baseline change that resulted in negative value or change.

2.6.5.2 Reason. A discussion of the reason(s) for the change.

2.6.5.3 CPR Reporting. A discussion of how the change affected CPR reporting(i.e., amount allocated to MR, adjustments to cost or schedule variances, etc.). (See 2.4.1.7, 2.2.5.1, and 2.2.6.7 above.)

2.6.5.4 Schedule. Indicate whether the contract schedule was retained for performance measurement or was replaced with a schedule that exceeds the contractual schedule (Over Target Schedule).

2.6.6 Over Target Schedule. If a performance measurement schedule exceeding the contractual schedule (Over Target Schedule) has been implemented, provide a discussion of the pertinent information, such as authorization, reasons, and significant dates. (See 2.4.1.10.1 above.)

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## APPENDIX D. COST AND SCHEDULE VARIANCE SPREADSHEET

The attached page contains a Microsoft Excel spread sheet that can be used to calculate cost and schedule variances if you have an electronic copy of this document.

It is a suggested tool to calculate cost and schedule variances only and is not a replacement for an earned value management system.

