

Parametric Modeling of Decontamination and Decommissioning Costs Using MCACES Gold

Michael G. Deiters, PE CCE

The preparation of detailed, defensible, and well-documented baseline estimates for projects has become paramount. Rigorously-prepared cost estimates reflect adequate planning and scoping of projects and provide managers with information that can be used to better allocate program resources. For US federal projects, cost estimates are reviewed and validated by agency planning and budgeting staff as well as by the Office of Management and Budget and the US Congress. These reviews are intended to ensure that a technically-sound basis exists for the cost estimate and to verify the appropriateness of planned expenditures. Cost estimates are the primary documents used to justify


budget requests and must withstand rigorous scrutiny. Lack of rigor and documentation conveys the impression of poorly developed scopes of work and inadequate planning and presents an opportunity to recommend spending cuts.

In June of 1993, the US Department of Energy (DOE), Richland Operations Office, recognized the need for rigor, consistency, and credibility in the preparation of decontamination and decommissioning planning estimates for surplus facilities at the Hanford Site in northwest Washington State. Previously, no detailed estimates existed for the decontamination and decommissioning of facilities at Hanford. The DOE tasked the US Army Corps of Engineers, Walla Walla District, with

preparing parametric baseline estimates for the decontamination and decommissioning of 175 surplus facilities at Hanford. By using MCACES Gold estimating software, parametric decontamination and decommissioning cost models were developed, and credible baseline estimates were produced. The effort also included the modeling and estimating for the environmental remediation of 1,100 waste sites and was known at the time as the Hanford Remedial Action Cost Engineering System.

Since inception, the Hanford decontamination and decommissioning models and estimates have undergone internal DOE mid-year and year-end reviews and validations with favorable results. Additionally, an independent cost estimate, which is required by DOE for all major programs, was performed by an outside subcontractor. The report was favorable and concluded that the cost engineering system employed at Hanford was traceable, based on sound assumptions, and well-supported.

Currently, during the annual budget cycle, the Hanford decontamination and decommissioning models and estimates are calibrated and updated based on actual field experience and changes in assumptions. Due to the successful parametric modeling done with MCACES Gold for baseline estimate development at Hanford,



Hull sections of decommissioned nuclear-powered submarines at the US Department of Energy's Hanford Site, Washington State, USA.

the DOE has used the methodology at the Savannah River Site and the Headquarters DOE Office of Nuclear Material and Facility Stabilization (EM-60).

THEORETICAL BACKGROUND

Overview of MCACES Gold

MCACES Gold is a sophisticated, personal computer-based, cost estimating system developed for the US Army Corps of Engineers. MCACES is used to estimate costs for capital construction, environmental remediation, decommissioning, and plant operations projects. Users include the US Army, US Navy, US Air Force, Environmental Protection Agency, DOE, and other government agencies.

MCACES uses multiple databases that contain approximately 24,000 detailed environmental, civil works, and construction line items, as well as labor rates, material costs, and crew productivity rates. All databases are fully interactive and fully adjustable to allow the cost estimator complete flexibility in developing cost estimates. Reporting formats may begin at a detailed level of material, labor, and equipment costs, with subsequent reports available through numerous summary levels to total project cost.

Parametric Estimating

No substitute exists for using a detailed quantity survey as a costing basis when preparing an estimate. However, there are many situations in which time constraints and a lack of definitive information necessitate that a different estimating solution be used. In those situations, parametric estimating is employed, and can be defined as a fast yet reliable method for determining the approximate cost of a project without the benefit of a well-defined scope of work.

A parametric estimate includes certain parameters that reflect the size and scope of a project. These estimates are usually prepared after the preliminary design phase is complete and the project's key features, dimensions, and scope are defined. Parametric estimates are commonly used in the building construction industry, with the square foot cost method being the most common. The building

area is usually the only quantifiable parameter. Information on which to base the cost per square foot amount includes discussions with the architect, scope statements, conceptual design criteria, and historical data for given building types.

Parametric estimates can be more accurate than other types of order-of-magnitude estimates because the project has been broken down into greater detail. Once the reference data is compiled, it can be used to estimate a comparable new project. The new project is classified by the same cost elements used in the reference project, and unit prices for the reference project are multiplied by the actual number of units in the new project.

Parametric Estimating With MCACES

Historically, MCACES Gold has primarily been used for definitive, "bottom-up" cost estimating when the project scope of work is well defined and plans and specifications are available to prepare a detailed quantity survey. Additionally, MCACES possesses very powerful parametric estimating and modeling capabilities. Parametric estimating with MCACES can produce detailed cost estimates during the early design phase. Features of parametric MCACES estimates are discussed below.

- MCACES parametric estimates are conceptual, but detailed. Details about the project can be entered, based on information available or created using sound assumptions.
- MCACES parametric estimates are easy to review and modify. Algorithms, parameters, crews, production rates, and assumptions are easily evaluated and edited.
- The estimate format and level of detail remain relatively unchanged as the design progresses. Assumptions are replaced with actual design information as the estimate is refined.
- MCACES is not a "default-driven" system. Predefined design values and assumptions are not built into a variety of model types. Cost engineers have complete flexibility to build their own theoretical models and store them for later use.

PARAMETRIC COST MODELING

Cost modeling, a form of parametric estimating, is generally more detailed. A cost model typically is a detailed estimate of a theoretical or actual facility where the detailed cost elements are driven by a select group of parameters or cost drivers. The primary purpose of modeling is to save time in estimate compilation, particularly when numerous estimates must be prepared for similar project types. For example, when an estimate for an environmental remediation project is prepared, begin by copying a model of a similar project. Then enter quantities specific to the project, such as waste volumes, sample frequency, haul distances, and disposal costs. Based on this input, the model would automatically adjust subordinate quantities and their resulting costs. Additionally, use of a model provides cost engineers with an outline shell structure and checklist during the early estimating stages. Therefore, a model serves as a catalyst because cost engineers are not starting with a "blank screen" when beginning the estimating process. Modeling should be used only for early-level estimates during the programming, budgeting, and planning phases. This would correlate to a 0 to 30 percent complete design stage. As the design progresses, quantity surveys should be prepared and definitive estimates developed.

Types of Modeling

Facility modeling—the process of creating an estimate based on a previously estimated actual or theoretical facility is known as facility modeling. A model of a previous project is copied and the quantities in the model are adjusted to match the current estimate. Facility modeling would generally produce a total project cost estimate.

Task modeling—having a more concentrated focus than facility modeling, a task model constitutes only part of an estimate. Task modeling is employed to quickly analyze the effects of different scenarios on cost. For example, the construction of a landfill cap would constitute a facility model, and the installation of the impervious clay layer would be a task model. The task model could include loading, hauling, spreading, compacting, and testing for

the clay layer. Factors such as equipment types, productivities, and haul distances can be analyzed more efficiently using a task model.

Assembly development—assemblies are more detailed than task models. An assembly is a group of detail cost items representing all of the costs required to create a larger piece of a project. For example, the personal protective equipment used by a worker in an 8-hour day operating in OSHA Level B [US Occupational Safety and Health Administration] at a certain work intensity and temperature would be an assembly. For a given project, the total number of Level B workdays would be quantified and input into the assembly, resulting in the required quantities and costs of personal protective equipment for the Level B portion of the project.

General Cost Modeling Sequence

Perform data collection—begin data collection by first defining the baseline technology or generic engineering solution to the environmental problem. For instance, the solution for remediating a burial ground may be to excavate, haul the waste to a disposal facility, and restore the site. On the other hand, the decision may be to leave the waste in place, stabilize, and construct a cap. For the decontamination and decommissioning of a building, the alternatives could be entombment or dismantlement.

In order to establish the baseline, assumptions are made and documented concerning the technologies, construction activities, sizes, volumes, and materials at the early design stage. It is mandatory that a “team” approach be employed during this process. The team includes design, geotechnical, cost engineering, and health and safety, as well as other professionals needed to establish the baseline assumptions, set standard “business” rules such as markups and rates, and achieve necessary “buy-in” so the process can proceed.

Determine the cost parameters—list the primary cost parameters that can be measured. A more accurate estimate can be developed by using more parameters for relating the cost estimate details. The pri-

mary cost parameters are also referred to as cost drivers or input parameters. Determine additional design ratios and design characteristics using the team approach and making rational assumptions. These will also become additional lower-tier parameters.

Develop the cost model—prepare the MCACES estimate for the theoretical facility. Electronically link or relate all detail cost elements to the cost parameters. Each detail item is linked to a parameter considered to affect its cost the most. Configure the MCACES databases by creating the site-specific labor rates, equipment rates, and crew databases.

Create the cost estimate—quantify the input parameters for each specific project to be estimated and load into the model. Based on this input, the model automatically adjusts subordinate quantities and their resulting costs based on formulas built into the model. Review and adjust the estimate as applicable.

Document all assumptions—make sure all notes, qualifications, and assumptions are included in the estimate. These form the basis for the model and facilitate the review process. The MCACES Gold software has the capability to accommodate extensive notes.

Calibrate the cost model—replace assumptions in the cost models with actual design information as the design progresses. Make adjustments and calibrate the cost models based on field observation, actual cost data, and changes in assumptions.

HANFORD DECONTAMINATION AND DECOMMISSIONING COST MODEL DEVELOPMENT

Methodology

The US DOE tasked the US Army Corps of Engineers, Walla Walla District, with the preparation of baseline estimates for the decontamination and decommissioning of surplus facilities at Hanford. Because over 1,000 facilities must ultimately be dispositioned at Hanford, a system had to be developed for producing and updating credible decontamination and decommissioning estimates on an

annual basis. Parametric modeling using MCACES Gold was selected for this task. The general methodology outlining the steps required to complete this ambitious effort are summarized below.

Identify the facilities to be estimated—since over 1,000 facilities must be dispositioned at Hanford, the highest-priority facilities had to be identified. Based on current surplus facilities and an estimate of those that could potentially be transferred to decontamination and decommissioning within the next 10 years, 175 facilities were identified and considered as the decontamination and decommissioning “base program.”

Conduct a library search—a library search was conducted to identify decontamination and decommissioning work plans, conceptual design reports, cost estimates, actual cost data, transition to decontamination and decommissioning criteria, and other guidance.

Determine the estimate reporting requirements—meetings were held with program managers to define estimate reporting requirements (programmatic information that must be included in the cost estimates). Program managers were required to report the total number of full-time equivalents, labor workhours by contractor and craft type, and cost by fiscal year.

Establish the “business rules”—labor rates, contractor markups, division of work by contractor (onsite versus offsite forces), contingency, sales tax, escalation, and other rates were established.

Determine the cost models to be developed—models were developed based on the type of facility, construction materials, decommissioning approach, and number of similar facilities (frequency of occurrence). A list of cost models developed is included [below].

Compile a list of decontamination and decommissioning activities—a list of estimate activities was compiled for each model. The activities were grouped by pre-decommissioning, mobilization, monitoring and sampling, excavation, dismantling, waste disposal, recycling, site restoration, demobilization, and project manage-

ment. A complete list of activities for a typical cost model is included [see figure 1].

Develop the cost model work breakdown structure—the WBS defines the hierarchical structure of the project, which is used to categorize cost estimate details, summarize, and report costs. MCACES Gold allows up to 6 levels of hierarchy in a project. The cost model WBS is described [see figure 1].

Configure the MCACES databases—site-specific labor rates, equipment rates, and crew databases were constructed in MCACES. For the initial effort, equipment rates did not include ownership costs

(depreciation and cost of capital). An assumption was made that equipment would be provided to the construction contractor by DOE, left onsite after construction, and ultimately disposed of in a burial ground. The construction contractor would only be responsible for operating costs (fuel, oil, lube, repair, and tire wear).

Establish the input parameters—input parameters are the primary cost drivers for the project. After input into the cost model, MCACES adjusts subordinate quantities and resulting costs based on formulas or algorithms built into the model. Several input parameters were selected for the decontamination and decommission-

Table 1—Building Input Parameters Radiologically Contaminated Building

Parameter	Unit of Measure
Concrete <= 2-ft (.6 m) thick	yd ³
Concrete > 2-ft (.6 m) thick	yd ³
Masonry	ft ³
Building footprint	ft ²
Gross building area	ft ²
Exterior wall surface area	ft ²
Interior partition surface area	ft ²
Roof area	ft ²
Equipment density	ft ³ /ft ² floor area
% Radiologically contaminated	%
Asbestos lagged pipe	lf
Asbestos covered duct	ft ²

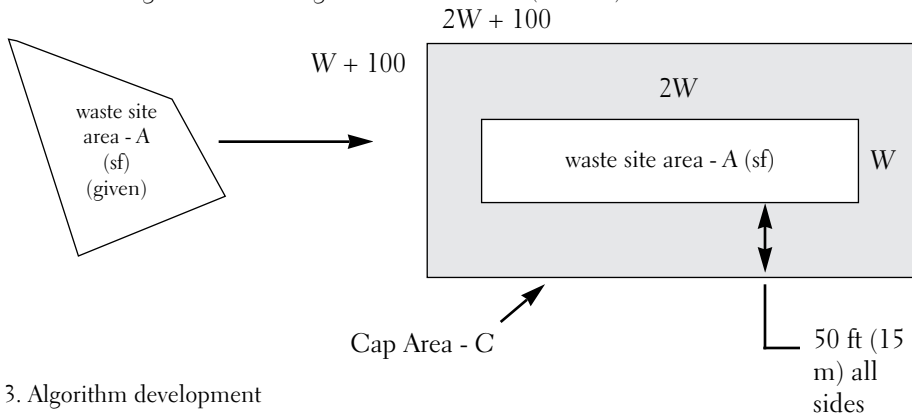
<p>1.0 <i>Pre-Decommissioning Operations</i></p> <ul style="list-style-type: none"> Prepare Decommissioning Plan <ul style="list-style-type: none"> NEPA Documentation Prepare Building-Specific Decontamination and Decommissioning Plan Prepare Waste Forecast Prepare Safety Documentation Conduct Operational Readiness Review Cultural Resource Review Licensing and Permitting <ul style="list-style-type: none"> Hazardous Material and Radiological Survey Characterization Plan Characterization Work Characterization Report <p>2.0 <i>Mobilization and Preparatory Work</i></p> <ul style="list-style-type: none"> Building Dismantlement Preparation Mobilization of Personnel and Equipment <ul style="list-style-type: none"> Mob Asbestos Air Monitoring Crew Mob Demolition Prep Crew Mob Site work Equipment Set Up and Construct Temporary Facilities <ul style="list-style-type: none"> Install Temporary Construction Barrier Mobilize and Set Up Temporary Trailers Facility Rental Construct Decontamination Area <p>3.0 <i>Monitoring, Sampling, and Analysis</i></p> <ul style="list-style-type: none"> Asbestos Air Monitoring and Sampling Obtain Hazardous and Rad Samples Analysis of Rad-Contaminated Media <ul style="list-style-type: none"> Sludge and Solid Waste Equipment, Piping, Duct, and Asbestos Analysis of Hazardous Waste <p>4.0 <i>Solids Collection and Containment</i></p> <ul style="list-style-type: none"> Excavation <ul style="list-style-type: none"> Uncontaminated Soil <ul style="list-style-type: none"> Excavate and Stockpile Provide Dust Suppression Contaminated Soil <ul style="list-style-type: none"> Excavate and Stockpile Provide Dust Suppression Independent Verification Contractor Support 	<p>5.0 <i>Dismantling Activities</i></p> <ul style="list-style-type: none"> Personnel Training Remove and Package Asbestos <ul style="list-style-type: none"> Floor and Ceiling Asbestos Removal Piping Asbestos Removal Duct Asbestos Removal Exterior Wall Transite Panels Roof Transite Panels Remove Material and Equipment Package/Transfer Rad-Contaminated Equipment Remove Hazardous Materials Reduce Contamination From Areas and Structures <ul style="list-style-type: none"> Surface Decontamination Final Radiation Survey Dismantle Building Structure <ul style="list-style-type: none"> Dismantle Masonry Walls Dismantle Concrete <= 2-ft (.6 m) thick Dismantle Concrete > 2-ft (.6 m) thick Dismantle Steel <p>6.0 <i>Disposal</i></p> <ul style="list-style-type: none"> Transport to Storage/Disposal Facility <ul style="list-style-type: none"> Load and Haul Asbestos Load and Haul Non-Rad Pipe, Equipment, Duct Load and Haul Rad-Cont. Pipe, Equipment, Duct Load and Haul Rad-Contaminated Concrete Load and Haul Rad-Contaminated Soil Load and Haul Hazardous Waste <p>7.0 <i>Recycle Waste</i></p> <ul style="list-style-type: none"> Load and Haul Concrete and Masonry for Recycling Load and Haul Steel for Recycling <p>8.0 <i>Site Restoration</i></p> <ul style="list-style-type: none"> Revegetation and Planting Load and Haul Borrow Spread and Compact Borrow and Stockpiled Soil <p>9.0 <i>Demobilization</i></p> <ul style="list-style-type: none"> Demobilize Temporary Facilities <ul style="list-style-type: none"> Remove Temporary Construction Barrier Remove Decontamination Area Post-Decommissioning Activities <ul style="list-style-type: none"> Prepare Final Decontamination/Decommissioning Report Prepare Release Report <p>10.0 <i>Project Management Support</i></p>
---	--

Figure 1—Sample Cost Model WBS for a Typical Radiologically Contaminated Building

1. Problem statement: numerous waste sites, foundations, and basements will not be excavated and need to be capped with a specially designed barrier (cap). Develop an algorithm that parametrically models the cap area.

Given: The waste site area, square feet (sf), for each site.

2. Assumptions: The cap boundary extends 50 ft (15 m) from the limit of the waste site. The waste site is a rectangle where the length is twice the width ($L = 2W$).



3. Algorithm development

Waste site area: $A = L \times W$
 $A = 2W \times W$
 $A = 2W^2$

Solve for W : $W^2 = A/2$
 $W = (A/2)^{1/2}$

Cap area, $C = (W + 50 + 50) \times (2W + 50 + 50)$
 $C = (W + 100) \times (2W + 100)$
 $C = ((A/2)^{1/2} + 100) \times (2(A/2)^{1/2} + 100)$
 $C = A + 300(A/2)^{1/2} + 10,000$

Figure 2—Algorithm Development

ing models in order to make the cost estimates more accurate. It was determined that the primary cost drivers for the decontamination and decommissioning of a building were the size of the facility, construction materials, and level of contamination. Parameters were selected that defined the building “envelope,” characterization and decontamination area, and amount of material to be dismantled, downsized, and disposed (see table 1) . . .

Establish other ratios and assumptions—using the team approach, rational assumptions were made for each detailed decontamination and decommissioning activity. For example, it was assumed that a radiological survey (gridding and mapping) would be conducted for 100 percent of the floor area and 50 percent of the wall area of the building. All assumptions were documented within the cost models.

Develop the cost models—using the model work breakdown structure, a

detailed estimate for each theoretical facility decontamination and decommissioning was created. Crews and productivities were established for each activity. Formulas or algorithms were built into the model that tie or link the subordinate quantities to the primary input parameters. The models were adjusted and calibrated based on any actual cost data that existed.

Perform a quantity survey for input parameters—the input parameters for each facility were measured by performing a quantity survey using structural drawings obtained from the Hanford document control system.

Run the cost estimates—a unique file was created for each facility by copying the appropriate cost model. The input parameters were inserted into the model and subordinate quantities and resulting costs were adjusted based on formulas built into the model. The cost estimate was reviewed and adjusted, if necessary, based on any facility-specific information that was available.

Compile the summary “roll-up” estimates—summary roll-up files were created using MCACES, which aggregated and summarized multiple decontamination and decommissioning estimates into one easy-to-review, less-detailed, estimate. After presenting the methodology and bases for the estimates, these summary files were the primary document used during programmatic reviews by outside validators. Individual detailed estimates for each facility were available if needed.

Prepare the programmatic cost estimates—estimates were prepared for cost elements that cannot be assigned directly to one individual facility. These estimates include infrastructure development, burial ground construction, and equipment procurement.

HANFORD DECONTAMINATION AND DECOMMISSIONING COST MODELS

Twenty-one cost models were developed for the decontamination and decommissioning of facilities within the “100 Area” (reactor areas) at Hanford. Models were also developed for the “200 Area” (fuel processing area), but are not described in this article. Models were developed based on the type of facility, construction materials, decommissioning approach, and number of similar facilities (frequency of occurrence). The models are listed as follows.

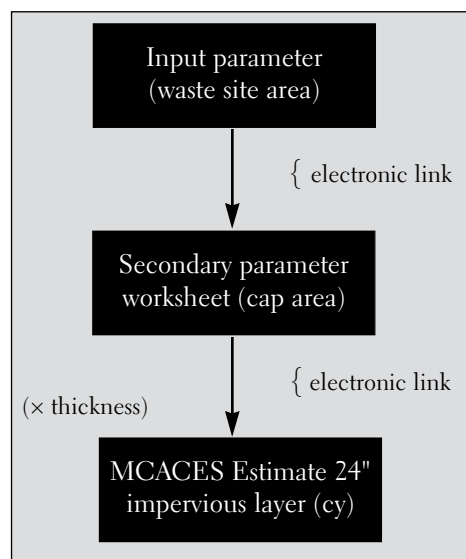


Figure 3—Example of MCACES Parameter Worksheets Linking to Cost Estimate Details

Table 2—190-B Main Pumphouse Complex

Item	Model Cost	Actual Cost
Project mgt.	\$408K	\$387K
Monitoring and sampling	155	0
Training	55	100
Engineering	152	337
Asbestos, haz. waste and equip. removal	374	194
Demolition	577	519
Recycling	77	84
Waste disposal	103	203
Site restoration	394	0
Total	\$2295K	\$1823K

Non-contaminated buildings:

- building area < 1,000 gross square feet (GSF);
- 1,000 GSF < building area < 5,000 GSF; and
- building area > 5,000 GSF.

Non-contaminated buildings with exterior asbestos:

- building area < 1,000 GSF;
- 1,000 GSF < building area < 5,000 GSF; and
- building area > 5,000 GSF.

Radiologically contaminated buildings:

- building area < 1,000 GSF;
- 1,000 GSF < building area < 5,000 GSF;
- 5,000 GSF < building area < 30,000; and
- building area > 30,000 GSF.

Radiologically contaminated buildings with exterior asbestos:

- building area < 1,000 GSF;
- 1,000 GSF < building area < 5,000 GSF;
- 5,000 GSF < building area < 30,000; and
- building area > 30,000 GSF.

[The following models also were developed:]

- reactor surveillance and maintenance;
- radiologically contaminated building surveillance and maintenance;

- non-contaminated building surveillance and maintenance;
- concrete stack;
- river-line water tunnel; and
- basin fill removal.

Decontamination and Decommissioning Cost Model Work Breakdown Structure

The cost model work breakdown structure (WBS) defines the hierarchical structure of the project, which is used to categorize cost estimate details, summarize, and report costs. The WBS organizes cost items under various levels of categories called “titles.” MCACES Gold allows a maximum of six levels of titling hierarchy in a project. The number of levels used depends on the complexity of the project. All six levels do not need to be used. Figure 1 shows an example of the cost model WBS for a typical radiologically contaminated building.

Algorithm Development Example

Figure 2 is a brief example outlining the development of an algorithm or formula based on a set of assumptions. This algorithm was used in the Hanford decontamination and decommissioning models for calculating the area of a closure cap placed over waste sites, specific building foundations, and basements assumed not to be excavated.

An “input” parameter was established in MCACES for the site area A. A parameter “worksheet” (electronic spreadsheet) for the algorithm that computes the cap area C was then created in MCACES. The parameter worksheet references the input parameter, site area A. Therefore, given a waste site with an area A, the corresponding cap area C was automatically computed.

Detailed estimate quantities associated with construction of the cap were referenced to the cap area C by being electronically “linked” to it. Third-tier calculations were programmed as necessary. For example, the volume for the cap impervious layer was computed by referencing the cap area C and multiplying by the thickness of the layer. Quantities with planar area (sf) as the unit of measure, such as a flexible membrane liner, would simply be equal to the cap area C, plus a waste factor, if desired. This is illustrated in figure 3.

A Comparison of Models to Actual Costs

The parametric cost engineering system developed for Hanford produces credible estimates for the decontamination and decommissioning and remediation of hundreds of facilities and sites. To complete the estimating cycle, actual costs should be collected as projects are completed and should be used to refine the models and planning estimates being produced. The validity of the system can be proven by comparing modeled and actual costs. Generally, the decontamination and decommissioning models produce a more conservative estimate due to the default values in the models for characterization, hazardous waste removal, and degree of radioactive contaminated concrete, masonry, and equipment. Additionally, the models tend to be over-conservative for very small buildings. In table 2, the recently-completed decontamination and decommissioning of the 190-B Pumphouse Complex, a 105,000 ft² (9755 m²) concrete and masonry building, is compared with the modeled cost. The cost data for the project was reconciled as closely as possible with the decontamination and decommissioning model.

As can be seen from table 2, the decontamination and decommissioning cost model compares favorably with the actual cost for the project. The model produces a more-conservative cost, which is desirable in the early estimating phases. The cost model included a substantial amount of site restoration, specifically backfilling to grade with imported borrow material [fill from another source]. The actual project contained very little site restoration cost. Hence, as the design progresses, the cost model should be refined accordingly. Even though the level of detail in the model estimate remains the same, the assumed activities and quantities are replaced with actuals.

Parametric cost modeling using MCACES Gold is a viable means for producing credible planning estimates. Using rational assumptions, complex tasks can be modeled and edited easily. This valuable tool allows the cost engineer complete flexibility in the development of cost models and estimates



Michael G. Deiters, PE CCE, is executive vice president, director of operations, with Project Time & Cost, Inc. (PT&C), of Atlanta, GA. Mr. Deiters has 15 years of experience in cost engineering and project management. He was instrumental in the development of many environmental cost engineering initiatives, including model and assembly

development, parametric modeling, and baseline estimate development for the US Department of Energy's environmental restoration program at Hanford and Savannah River. He has also been involved in research on environmental worker productivity and the development and instruction of the environmental cost engineering training course for the US Army Corps of Engineers. He is a registered engineer in Virginia and Georgia and is a member of AACE International.

This article originally appeared in the *Proceedings of the American Nuclear Society Topical Meeting, The Best of D&D . . . Creative, Comprehensive and Cost Effective*. April 14-17, 1996. Copyright 1996 by the American Nuclear Society, La Grange Park, IL. ♦

[Back to Table of Contents](#)

Sponsorship Opportunities at the

41st Annual Meeting of AACE International

Dallas, TX • July 13-16, 1997



Don't miss out on your chance to maximize your company's exposure, show your commitment to Total Cost Management, and network with many cost professionals—sponsorship opportunities are available for AACE International's 41st Annual Meeting, which will be held at the Hyatt Regency Dallas.

LEVELS OF PARTICIPATION

PLATINUM: \$1,000 or more
GOLD: \$500 or more
SILVER: \$100 or more

SPECIFIC WAYS TO INCREASE YOUR VISIBILITY

Speaker Gifts: \$2,000
General Reception: \$2,000
International Reception: \$1,500
Coffee Break: \$1,500

ALL SPONSORS HAVE THEIR NAMES AND LOGOS PROMINENTLY DISPLAYED THROUGHOUT THE EVENT!

Sponsors (\$500 and above) also will be promoted on AACE International's new website located at:

<http://www.aacei.org>
 or
<http://www.cost.org>

Charla Miller/AACE International
 209 Prairie Avenue, Suite 100
 Morgantown, WV 26505 USA
Phone:
 800-858-COST/304-296-8444
Fax:
 304-291-5728
E-Mail:
 102232.2223@compuserve.com

For more information, contact:



Where a World of Cost Professionals Comes Together in 1997

DALLAS