OFFICE OF ENVIRONMENTAL MANAGEMENT PROJECT DEFINITION RATING INDEX (EM•PDRI) MANUAL

OFFICE OF PROJECT MANAGEMENT, EM-6
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REVISION 1

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1.0 INTRODUCTION/EM•PDRI PURPOSE

In FY 1999, the Congressional Committee of Conference on Energy and Water Resources directed the Department of Energy (DOE) to have an independent expert review DOE's structure and process for managing its projects. In response to this request, DOE asked the National Research Council (NRC) to review and assess the procurement and management of DOE's major construction projects, as well as its environmental restoration and waste management projects. In July 1999, the NRC published a report entitled *Improving Project Management in the Department of Energy*. In general, the NRC report was very critical of DOE's project management efforts with one of the principal concerns being the lack of up-front planning.

Based on direction from Environmental Management's (EM's) leadership, the newly formed Office of Project Management (EM-6) convened a working group of experienced project management professionals representing a cross-section of federal and contractor project management expertise from around the DOE complex. The group was chartered to develop an EM Project Definition Rating Index (EM•PDRI) similar to the Construction Industry Institute's (CII) PDRI for the specific purpose of improving project planning in EM.

The EM•PDRI is a project management tool that provides a numerical assessment of how well a project is defined (i.e., planned). The rating is determined by evaluating a range of project management elements in the areas of Cost, Scope, Schedule, Management Planning and Control, and External Factors. Similarly to CII, EM has found this up-front planning tool to be very effective in assessing "readiness to proceed" to the next project phase. EM is also finding that the project rating elements provide a good road map for planning future project activities.

Revision 0 of the EM•PDRI was issued on March 6, 2000. In October 2000, DOE's Office of Engineering and Construction Management (OECM) issued DOE Order 413.3 and associated drafts of the *Program and Project Management* and *Project Management Practices* manuals. The Order and its associated manuals define, for each type of EM project, requirements for all project phases. Revision 1 (February 2001) of the EM•PDRI incorporates the DOE Order 413.3 requirements.

As with the initial EM•PDRI, the scores will be provided for all Critical Decisions (CDs) prior to construction/remediation (i.e., all CDs other than CD-4). The Critical Decisions for each type of EM project along with the expected EM•PDRI score for that project phase are given in Section 3.2. EM will not use the expected EM•PDRI scores as a "go/no-go" requirement for CD approval, but the scores will be an important factor in the decision to proceed to the next project phase. Projects that are more than 50 points below the expected score for that project phase should have justification for the reduced score at the Energy System Acquisition Advisory Board (ESAAB) briefing. Similarly, any low scores for specific key rating elements (e.g., alternative analyses at CD-0) should also be discussed at the ESAAB.

2.0 EM•PDRI DESCRIPTION/DEVELOPMENT OF SCORING SYSTEM

The summary descriptions and instructions for using the EM•PDRI are given in the subsections as described below.

2.1 EM•PDRI Rating Areas
2.2 Rating Element Definitions
2.3 EM•PDRI Maturity Values
2.4 EM•PDRI Scoring Methodology (Scoring the Project)
2.5 Application of the EM•PDRI Where Some Elements Are Not Applicable
2.6 Who Should Perform the EM•PDRI and How Long Does it Take?

2.1 EM•PDRI Rating Areas

The EM•PDRI has five (5) key areas of EM project planning. These are: 1) Cost, 2) Schedule, 3) Scope/Technical, 4) Management Planning and Control, and 5) External Factors.

For each of the project planning Rating Areas above, there are various Rating Elements that, in total, provide a good indication of project planning maturity at each stage of the project. The number of Rating Elements varies depending on the type of project. A summary of the number of Rating Elements are given in Table 2-1. The specific Rating Elements, and their definitions, for each project type are provided in Sections 4.0, 5.0, and 6.0.

Table 2-1. Number of Rating Elements by Project Type

Rating Area	Traditional (Conventional) Projects	Environmental Restoration Projects	Facility Disposition Projects
Cost	7	7	7
Schedule	7	7	7
Scope/Technical	39	24	27
Management Planning and Control	19	18	18
External Factors	5	5	5
Totals	**77**	**61**	**64**

2.2 Rating Element Definitions

As noted above, each of the five Rating Areas contain specific elements upon which to determine an overall rating. **Associated with each Rating Element is a definition that provides criteria for achieving the maximum score for that Rating Element**. The definitions are generally qualitative

and are expected to be improved as more experience is gained in the use of the EM•PDRI, as well as through EM's overall continued project management improvement.

As with many rating systems, it is difficult to provide comprehensive and very detailed definitions that are fully meaningful to a wide range of activities, as is the case with EM projects. In general, the definitions provided in the EM•PDRI are meant to provide a basis for determining that a Rating Element is fully mature, and, as importantly, has a high degree of quality.

2.3 EM•PDRI Maturity Values

The EM•PDRI Maturity Value provides a numerical assessment (from 0 to 5) based upon the maturity of the particular Rating Element, as provided by the Rating Element definition. A "0" value effectively means that the criteria embodied in the Rating Element definition is not met at all–where a value of "5" means full compliance with the Rating Element definition criteria. In general, Maturity Values should be developed by applying the qualitative and quantitative criteria in Table 2-2 to the Rating Element definition. (Note: Ultimately, as explained later in Section 2.4, the Maturity Value is the multiplier for a specified weighting factor to obtain EM•PDRI scores.)

The Maturity Values should be recorded on the EM•PDRI form along with the appropriate references that provide the basis for the Maturity Value. The expected or "targeted" Maturity Value will vary depending on the phase of the project. For example, a Maturity Value of "1" for "Cost Estimate" at the Pre-Conceptual Design phase is the expected score (i.e., the element matches expectations for that stage of the project). On the other hand, a Maturity Value of "1" at the end of the Preliminary Design phase indicates a potentially serious project deficiency.

For those projects where construction is executed by a subcontractor(s) and the subcontractor is responsible for providing final documentation as a submittal (e.g., Health and Safety Plan, Quality Assurance Plan), a score of "5" is acceptable provided that the requirements are fully and completely communicated in the contracting documents (e.g., special conditions, drawings, specifications, etc.).

While Table 2-2 criteria are used in assessing the Maturity Value of various Rating Elements, the Project Manager/staff or the external Review Team scoring a particular element are free to use some discretion based upon supporting documentation for a particular Rating Element. For example, where the preparation of a project-specific Quality Assurance Plan may not have been started but a documented and approved site-wide Quality Assurance Program is in place and fully implemented, the reviewer may assign a Maturity Value of "1" or "2" to the Quality Assurance Project Plan Rating Element due to the overall maturity of the site quality management system.

The Maturity Values for each of the ranking elements are used to determine the overall score of the project as described in Section 2.4.

Table 2-2. Maturity Value Criteria

Maturity Value	Qualitative Criteria	Quantitative (% Complete) Criteria
N/A	Not Applicable	-
0	Work Not Started	0
1	Work Initiated	1-20
2	Concept Defined	21-50
3	Substantive Working Detail	51-80
4	Final Draft	81-95
5	Complete/Fully Meets Definition Criteria	96-100

2.4 EM•PDRI Scoring Methodology (Scoring the Project)

2.4.1 Scoring System Bases

The underlying bases of the EM•PDRI weighted scoring system are as follows:

1. The overall maximum score is 1000 points at the completion of the Final Design phase. This score reflects a maximum Maturity Value (i.e., “5") times the appropriate weighting factor for all Rating Elements at the end of the Final Design phase of the project.

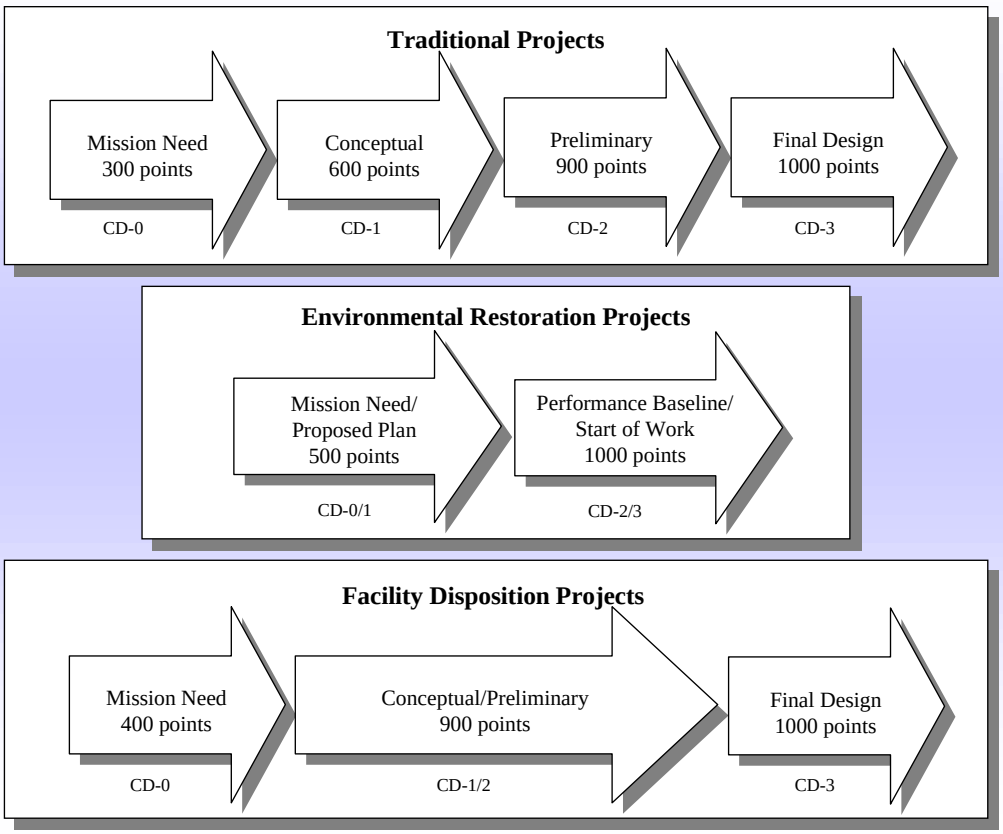
2. The 1000 points are obtained by combining scores from each Rating Area at the Final Design phase of the project. The maximum score for each Rating Area (e.g., Cost, Schedule, etc.) was established principally by considering both the number of Rating Elements in each area and the relative importance of the areas for defining a project. For example, for a Traditional Project at the Final Design phase, a breakdown of the 1000 points to each of the Rating Areas, and the number of Rating Elements is as follows:

Table 2-3. Maximum Score for Each Rating Area (Traditional Projects)

Rating Area	No. of Points	No. of Elements
Cost	150	7
Schedule	150	7
Scope/Technical	400	39
Management Planning and Control	200	19
External Factors	100	5
Total	**1000**	**77**

3. The overall "targeted" score depends on the project phase as indicated below for Traditional, Environmental Restoration, and Facility Disposition Projects. The basis for each of the approximate "targeted" scores shown below can be found in Sections 4.0, 5.0 and 6.0.

Figure 2-1. Targeted Scores for Each Project Type



4. Some Rating Elements are more important than others, and such elements are designated as high priority ("H"). The combination of all "H" Rating Elements for a given Rating Area receive 50 percent of the scoring for that Rating Area. For example, Rating Elements designated "H" in the "Cost" Rating Area for Final Design would have a total value of 75 points of the total 150 points for that Rating Area.

5. To account for the fact that some elements may not be applicable (i.e., N/A) for various projects, and to maintain consistent "targeted" scores for each Rating Area (e.g., 300 points for Pre-Conceptual under Traditional Projects), Rating Elements not designated by "H" are designated by "P" for pro-rated. The use of "H" and "P" scoring allows for keeping the "targeted" score the same, while accounting for the fact that some Rating Elements are more important than others.

6. For both the Preliminary Design Phase for a Traditional Project and the Conceptual/Preliminary Design Phase for a Facility Disposition Project the target score is set at 900 points out of 1000. In terms of the actual work effort for a Traditional Project, the completion of the Preliminary

Design phase is approximately 35 percent of the total design effort. However, the EM•PDRI target score is set at the 90 percent level to ensure that the planning and preliminary design effort will provide a more accurate performance baseline.

Based on the above, projects are scored and then compared to "targeted" values. This provides a good indication of how well a project is actually defined versus how well it should be defined at a given stage.

2.4.2 Project Score

For each Rating Element the actual score is determined by multiplying its Weighting Factor by the appropriate Maturity Value. After each Rating Element score is determined, the score for each Rating Area (Cost, Schedule, Scope/Technical, Management Planning and Control, and External Factors) and the Total Project Score are calculated.

Certain Rating Elements are not expected to be completed (or even started) at early stages of a project. For these Rating Elements, the tables showing expected Maturity Values show "N/A." When totaling the scores, N/A is considered to be a zero (0).

2.5 Application of EM•PDRI Where Some Rating Elements are Not Applicable

Prior to using this PDRI system for a specific project, all Rating Elements should be reviewed for applicability. If a particular Rating Element is not applicable (N/A) for the specific project, it should be so noted and the weights of the other Rating Elements should be re-calculated accordingly to keep the total possible score equal to 1000.

2.6 Who Should Perform the EM•PDRI and How Long Does it Take?

Application of the EM•PDRI should be performed by the Project Management Team for a given project, or by Review Groups that are well-versed in project management concepts, and have a good understanding of the particular project. For EM-6 reviews, the Project Team will be asked to self assess the project against the expected Maturity Value. Self assessment forms for each of the project types (Traditional, Environmental Restoration, Facility Disposition) for their respective design phases are given in Appendix B.

Based on field testing, scoring should take a maximum of eight hours when the EM•PDRI is first used. With subsequent use the time to prepare the scoring should take approximately 1-2 hours.

3.0 APPLICABILITY/USE OF THE EM•PDRI

This section discusses the applicability of the EM•PDRI, and describes how EM intends to use the EM•PDRI in improving its project management functions. Specifically discussed are:

3.1 Types of EM Projects for which the EM•PDRI is Developed
3.2 Critical Decisions (CDs)
3.3 EM-6 Independent Project Reviews (IPRs) and Self Assessment Reviews
3.4 OECM Requirements and External Independent Reviews (EIRs)

3.1 Types of EM Projects for which the EM•PDRI is Developed

DOE Order 413.3 definitions for "Capital Asset" and "Project" are summarized in Table 3-1 along with EM's definition for Capital Asset Project (CAP). Based on these definitions, EM has developed criteria for determining which of its projects are CAPs and therefore, subject to DOE Order 413.3 (see Table 3-2).

Table 3-1. Capital Asset and Project Definitions

DOE Order 413.3 Definitions
Capital Assets: Land, structures, equipment, and information technology (e.g., hardware, software, and applications) that are used by the federal government and have an estimated useful life of two years or more. Capital assets include environmental restoration of land and decontamination and decommissioning (sic) to make useful leasehold improvements and land rights, and assets whose ownership is shared by the federal government with other entities. This Order does not apply to capital assets acquired by state and local governments or other entities through DOE grants. Capital assets do not include intangible assets, such as the knowledge resulting from research and development and education and training.
Project: In general, a unique effort that supports a program mission, having defined start and end points, undertaken to create a product, facility, or system, and containing interdependent activities planned to meet a common objective or mission. Project types include planning and execution of construction, renovation, modification, line items for maintenance and repair, environmental remediation, decontamination and decommissioning (D&D) efforts, information technology, and large capital equipment or technology development activities. Tasks that do not include the above elements, such as basic research, grants, ordinary repairs, maintenance of facilities, and operations are not considered projects.
EM Definition
Capital Asset Project (CAP) Identification: A project which meets the OECM definitions for "capital asset" and "project" (i.e., is subject to the requirements of DOE Order 413.3), has a clearly defined mission and end point, and is executable as a single entity. A CAP is design and construct in nature, to include analogous D&D and environmental remediation activities such as remedial design and excavation work. A CAP is often associated with continuing PBS activities which are not included in OECM reporting, e.g., operations and long-term monitoring. **Note: In some instances, EM work that falls under the CAP definition may require an exception from certain DOE Order requirements, possibly because of the nature of an existing contract or other factors. Such exceptions should be requested from EM-1/2 through EM-6.**

Table 3-2. EM Capital Asset Project Criteria and Examples

EM CAP Criteria
• A real estate improvement, purchase of equipment, or acquisition of an information technology system, or major system upgrade.
• Clearly defined mission and end point with specific deliverables and start and end dates as milestones. For multi-year CAPs, clearly defined interim deliverables are identified for each budget year.
• Owned by the federal government or the federal government has shared ownership.
• Design and construct in nature, or includes analogous D&D and environmental remediation activities (e.g., remedial design and excavation work, or the design and construction of a "pump-and-treat" system).
• Is completed after construction, or after start-up testing when the latter is applicable.
• Linked or phased with other CAPs or other EM projects, as part of an overarching program or project (e.g., PBS), to provide a complete solution to an overall environmental engineering problem.
• Designated for each separate unit of work, when the work to be completed is made up of sequentially linked design and construct phases.
• Often a "line item" project, but not in the case of environmental remediation and D&D activities.
EM Examples of CAPs
• Six tanks are to be designed and built in groups of three to take advantage of Lessons Learned. — These should be managed as two CAPs, to take advantage of design efficiencies.
• Contaminated soil needs to be excavated, replaced with backfill, and capped. Soil is to be disposed off-site. — The remediation work is a single CAP. The resulting storage and transport of contaminated soil off-site is a non-CAP project, referred to as "Disposal."
• Contaminated groundwater requires treatment. —The design and construction of a "pump-and-treat" system to the start of operation is a CAP. Long-term operation is a non-CAP project.
• A contaminated facility is to be taken down and the contaminated soil removed. — The dismantlement of the facility is a single CAP. The excavation, removal, and backfill is a second CAP.
• Disposal Cell design and construction.
• Installation of monitoring wells.

In general, CAPs are "design and construct" type projects or analogous to "design and construct" (e.g., excavation and backfill activities for environmental remediation and decontamination/ decommissioning work). Operations or operational type activities (e.g., off-site transfer of drums) are not CAPs. **The EM•PDRI has been specifically designed to apply to all CAPs.**

The EM•PDRI has different Rating Elements for each type of CAP: Traditional, Environmental Restoration, and Facility Disposition. In general, Rating Elements recognize inherent differences (e.g., a piping and instrumentation diagram necessary for most traditional [conventional] projects would not be applicable for essentially all of the environmental restoration work), as well as unique regulatory requirements.

In some instances, an Environmental Restoration Project or a Facility Disposition Project can have a sub-project that is actually a Traditional type project. In such instances, this sub-project should be assessed using the EM•PDRI for Traditional Projects. Alternatively, and depending on the size and management of such a project, it may be better to establish a separate project.

3.2 Critical Decisions

EM•PDRI scores will be required for all CDs prior to construction/remediation (i.e., all CDs other than CD-4). Table 3-1 shows the Critical Decisions for each type of EM project along with the expected EM•PDRI score for that project phase. EM will not use the expected EM•PDRI scores as a "go/no-go" requirement for CD approval, but the scores will be an important factor in the decision to proceed to the next project phase. Projects that are more than 50 points below the expected score for that project phase should have justification for the reduced score at the Energy System Acquisition Advisory Board (ESAAB) briefing. Similarly, any low scores for specific key rating elements (e.g., alternative analyses at CD-0) should also be discussed at the ESAAB. (Note: In some cases, EM-6 is required to conduct independent project reviews in conjunction with the CD process and the EM-6 Team scoring will also be a significant input into the ESAAB process).

Due to differences in the nature of and regulatory requirements for each type of EM project (i.e., Traditional, Environmental Restoration, and Facility Disposition), they have distinct Critical Decision points. The Critical Decision points shown in Table 3-3 are the same as in DOE Order 413.3 with one exception. For Environmental Restoration projects, CD-0 and CD-1 have been combined. This combination reflects the fact that for Environmental Restoration projects, regulatory requirements do not allow a meaningful identification of a preferred remedial approach until the Proposed Plan; consequently, the first Critical Decision will be a decision to approve the Proposed Plan (i.e., CD-0/CD-1 combined). Note: EM-6 is working with OECM and expects this Critical Decision change to be made in the required one-year review.

Table 3-3. Critical Decisions for Each Project Type

		Expected Targeted Score
Traditional (Conventional) Projects		
CD-0	Preconceptual (Mission Need Approved)	300
CD-1	Conceptual Design	600
CD-2	Preliminary Design/Performance Baseline (Approved to Start Final Design)	900
CD-3	Final Design (Approved to Start Construction)	1000
Environmental Restoration Projects		
CD-0/CD-1	Mission Need/Proposed Plan	500
CD-2/3	Performance Baseline/Start Work (Approved to Start Environmental Restoration Work)	1000
Facility Disposition Projects		
CD-0	Mission Need Justification	400
CD-1/CD-2	Conceptual/Preliminary Design (Performance Baseline)	900
CD-3	Final Design (Approved to Start D&D)	1000

3.3 EM-6 Independent Project Reviews (IPRs) and Self Assessment Reviews

EM-6 will rely heavily on the EM•PDRI for performing the IPRs of EM's various projects. EM-6 will use the EM•PDRI in essentially all instances when the project is in any planning stage (e.g., Pre-Conceptual, Conceptual, Preliminary, and Final Design). Both the review and scoring are meant to identify both project strengths and weaknesses and to provide recommendations for project improvement. While the purpose of the EM-6 reviews will be similar when the project is in the Construction, Pre-Operations, or Operational/Execution phase, the EM•PDRI will have limited, if any, direct application. (Note: For projects beyond the Final Design phase, EM-6 may use checklists similar to the EM•PDRI in some instances, but the EM•PDRI will not be applied per se.)

When EM-6 IPRs are used in conjunction with CDs 0 through 3, the EM•PDRI scoring will be an important input into the ESAAB. While the EM•PDRI has applicability to multiple CDs per project, it is highly unlikely that EM-6 will conduct reviews for all CDs.

It is expected that the operations/field office Project Team will perform a self assessment using the EM•PDRI methodology as outlined in Section 2.0. The scoring sheets are given in Appendix B. As outlined in the EM-6 *Internal Independent Review Handbook*, the site Project Team will choose the applicable EM•PDRI scoring sheets to use depending on both the type and maturity of the project(s) being reviewed. The results from the self assessment should be transmitted to the Review Team one week before the IPR is scheduled to begin. This will allow the Review Team to study the self

assessment, request any clarifying information, and adjust the supplemental lines of inquiry, as required.

3.4 OECM Requirements and External Independent Reviews (EIRs)

EM-6 is working with OECM to establish some level of use of the EM•PDRI in their ESAAB consideration as well as in their EIR process. Ideally, it would be used similarly to EM, where the EM•PDRI will be a significant input into the CD process and the EM-6 IPRs.

4.0 EM•PDRI RATING ELEMENTS/DEFINITIONS FOR TRADITIONAL (CONVENTIONAL) PROJECTS

5.0 EM•PDRI RATING ELEMENTS/ DEFINITIONS FOR ENVIRONMENTAL RESTORATION PROJECTS

6.0 EM•PDRI RATING ELEMENTS/ DEFINITIONS FOR FACILITY DISPOSITION PROJECTS

APPENDIX A
CONSTRUCTION INDUSTRY INSTITUTE MEMBERS

ABB CE Services, Inc.
AT&T
Aluminum Company of America
Amoco Corporation
Anheuser-Busch Companies, Inc.
Aramco Services Company
Atlantic Richfield Company
BP Oil Company
Chevron Corporation
Consolidated Edison Company of New York, Inc.
Dow Chemical U.S.A.
DuPont
Eastman Chemical Company
Elf Atochem North America, Inc.
Enron Corporation
Exxon Research & Engineering Company
FMC Corporation
General Motors Corporation
Glaxo Inc.
Hoechst Celanese Corporation
Hoffman-La Roche Inc.
Houston Lighting & Power Company
International Paper Company
James River Corporation
Lever Brothers Company
Eli Lilly and Company
Merck & Co., Inc.
Mobil Corporation
Monsanto Company
Naval Facilities Engineering Command
Northern States Power Company
Ontario Hydro
Phillips Petroleum Company
The Procter & Gamble Company
Rohm and Haas Company
Shell Oil Company
Sun Company, Inc.
Tennessee Valley Authority
Texaco Inc.
U.S. Army Corps of Engineers
U.S. Department of Commerce
U.S. Department of State
Union Carbide Corporation
Weyerhaeuser Paper Company

ABB Lummus Crest Inc.
AMEC Holdings, Inc.
Guy F. Atkinson Company of California
BE&K Construction Company
Bechtel Group, Inc.
Belcan Engineering Group, Inc.
Black & Veatch
Brown & Root, Inc.
John Brown E&C
Burns and Roe Enterprises, Inc.
Cherne Contracting Corporation
Cianbro Corporation
Day & Zimmerman International, Inc.
Dillingham Construction Holdings Inc.
Eichleay Holdings Inc.
Fluor Daniel, Inc.
Ford, Bacon & Davis, Inc.
Foster Wheeler USA Corporation
Fru-Con Corporation
Gilbert/Commonwealth, Inc.
Graycor, Inc.
Gulf States, Inc.
Huber, Hunt & Nichols, Inc.
Hudson Engineering Corporation
International Technology Corporation
Jacobs Engineering Group, Inc.
J.A. Jones Construction Co.
The M.W. Kellogg Company
Kiewit Construction Group, Inc.
Litwin Engineers & Constructors, Inc.
Marshall Contractors, Inc.
Morrison Knudsen Corporation
North Bros. Company
The Parsons Corporation
Raytheon Engineers & Constructors International
Rust International Corporation
S&B Engineers and Constructors Ltd.
Skanska Engineering & Construction Inc.
Stone & Webster Engineering Corp.
Sverdrup Corporation
TPA, Inc.
Torcon, Inc.
Turner Construction Company
Woodward-Clyde Consultants
H.B. Zachry Company

APPENDIX B

EM•PDRI SELF ASSESSMENT FORMS FOR EACH PROJECT TYPE (TRADITIONAL, ENVIRONMENTAL RESTORATION AND FACILITY DISPOSITION)