MACROENGINEERING

An Environmental Restoration Management Process

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The Author

Formerly a division vice president with Kearney/Centaur, John Darabaris is an experienced program manager on complex, sophisticated DOE, DOD, EPA, and industry environmental projects. Possessing both a professional engineer's (PE) license and a nonpracticing Certified Public Accountant (CPA) certificate, he marries both engineering and cost perspectives to the impacts of regulatory strategy alternatives.

With a background that combines graduate degrees in Geologic Engineering (MS, University of Missouri at Rolla) and Finance (MBA, Columbia University), Mr. Darabaris provides unique insights on the breadth of technical, regulatory, and management issues that program and project managers face in today's complex environmental corrective action management world.

In recognition of his achievements, Mr. Darabaris has been awarded an honorary Professional Development degree from the University of Missouri at Rolla and a commendation from the U.S. Army Corp of Engineer's Omaha, NE, office.

Preface

The purpose of this text is to provide the reader with some insight into the wide scope of subject matter that a project or program manager typically will face on a complex, large-scale environmental restoration project.

It has been my experience that few environmental professionals are fully prepared for the range of subject matter and issues that they will face as they progress through their careers into the ranks of project and program management. My aim is to provide junior and middle ranks, as well graduate programs, with a manual that, in a fashion, raises all the issues that a project or program manager will face.

Recognize that each of the subjects addressed, if dealt with at its proper depth, is a text unto itself. My goal is to provide a starting point and to also stress the interconnection between the key elements (e.g., remediation design and regulatory strategy need to be tied together, etc.).

Also, please realize that when I present specific examples (e.g., models, regulatory options, etc.), many of the details will be out of date before the ink dries. Models are continually being revised and improved, regulations are continually being redefined, site characterization techniques and mobile laboratory equipment are continually being improved. The point is not necessarily the specifics but the identification of the need for consideration of these issues, how they play out in the wider view of things and a stronger understanding of the integrative nature of all these separate items.

In addition, although I do provide some discussion into specialty areas (for example, unexploded ordnance), I have written the text to be universal in its applicability. In that sense, my hope is that it provides some useful management reference points for DOE, DOD, EPA, and industry led environmental restoration projects and programs. I also hope that it is written clear enough that it also provides insight that might be useful to less technical, tangential investment, insurance, and stakeholder communities who monitor and evaluate environmental restoration programs in some fashion.

Finally, it has been my pleasure to be involved with a wide array of high-profile projects and to have sat on different sides of the table at different times (regulated vs. regulatory). I have also seen the evolution of the

environmental remediation activities within the U.S. from site characterization, planning to implementation. With that background in mind, it is my hope that the text provides a broad perspective. It is not written from a "regulator" perspective or a "regulated" perspective, but from the simple perspective of "getting the job done" in an efficient, cost-effective, well-organized, and defensible fashion.

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chapter 1

Macroengineering as an integrated environmental restoration management process

1.1 Introduction

Environmental restoration is celebrating its 30th anniversary worldwide, in recognition of the enactment of the Resource Conservation and Recovery Act (RCRA) in the U.S. in 1976. The nation is restless over the manner in which environmental cleanup is being conducted; criticism is coming from capitols, legislatures, and Congress. The *status quo* is under attack for a variety of reasons and rationales. The entire hazardous waste management and cleanup process, the finest to be found and internationally considered the standard of excellence, is being held up for scrutiny. The hue and cry is for more efficient cleanup approaches, particularly from a large-scale perspective, and for better control over unique environmental restoration challenges (unexploded ordnance [UXO], radioactive waste management, and cleanup).

From this debate, a window of opportunity is opening in the field of environmental restoration. At Congress' urging, EPA is evaluating accepting a more "risk-based environmental restoration approach and encouraging more flexible municipal–industrial cooperative brownfield restoration arrangements to remediate contiguous blighted urban areas on a timely, cost-effective, and realistic basis." As a result, the emphasis is changing from a legal-dominated, fault-finding exercise, to a paradigm of "get it done" in an expeditious manner exercise. The latter emphasis offers industry the opportunity to proactively reconstruct their environmental restoration programs for major sites in a more cost-efficient and productive manner.

Similarly, on the RCRA Corrective Action side, recently promulgated portions of the Subpart S regulations provide more flexible regulatory

mechanisms that encourage quicker RCRA-driven corrective action. In particular, the corrective action management unit (CAMU) rule offers industry the opportunity to undertake major RCRA-required cleanup actions without necessarily triggering land disposal restrictions.

Furthermore, the prior financial advantages of delaying cleanup through legal strategies may no longer hold true in the current era of lower interest rates and greater potential regulatory flexibility. In point of fact, there may not be a better time for resolving long-standing cleanup issues.

However, apart from the regulatory-driven and financially driven reasons for acting, the record is now clear that environmental restoration costs and natural resource damage (NRD) costs will explode unless careful, up-front strategic planning of an integrated nature occurs, followed by timely self-examination and ongoing environmental restoration management control.

Proactive planning is not only possible but economically attractive through a macroengineering approach.

Macroengineering represents the assumption of management control over environmental site restoration by developing an integrated plan for site and waste characterization and risk assessment based on planned future use. Issues are identified, flagged, solved, and negotiated on a priority basis, in frequent, constant, direct contact with regulatory personnel, so that perturbations from personnel turnover or regulatory drift are minimized.

As shown in Figure 1.1, uncertainties drive the need for an integrated environmental restoration approach that maps out a realistic strategy and defines an achievable end product.

Uncertainties are project impacts nominally lying outside the control of project management. Uncertainties relate to unresolved issues or undeclared agenda or responses by parties to the remediation process. Macroengineering seeks to identify, early-envelope, and convert uncertainties to known factors that can be included in the overall management plan.

Besides the technical, cost, and schedule uncertainties identified in Figure 1.1, regulatory uncertainties also play a significant role in driving program uncertainties. The Superfund legislation of the 1980s provided the

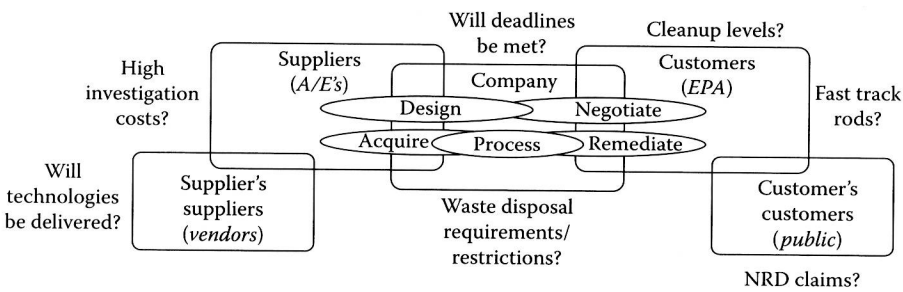

Figure 1.1 Few environmental restoration chains are effectively integrated.

impetus for promulgation of Natural Resource Damage Assessment (NRDA) regulations. In the past several years, the NRDA rules have undergone several major revisions and been subject to legal rulings (e.g., *Ohio v. U.S. DOI*), the net effect of which could potentially increase the dollar value of natural resource injury claims, if applicable restoration does not occur. The key factors driving this escalation are:

1. Expansion of what constitutes natural resources subject to damages.
2. Expansion of liabilities from "the lesser of restoration or replacement costs; or diminution of use values as the measure of damages ... " [43 CFR 11.35(b)(2)], to restoration or replacement costs plus the NRDs that occurred earlier and which will occur in the future.
3. Expansion of the value of damages to include nonuse values. Some measure of relief has been provided to potential responsible parties (PRPs) if they can prove that the restoration is unfeasible or the costs are "grossly disproportionate" compared to damages, and a spirit of action is presented.

The objective of the macroengineering environmental restoration management process presented herein is to increase the overall effectiveness by which organizational resources, committed to environmental restoration, are utilized. In essence, macroengineering is a management program to effectively integrate regulatory, technical, and management issues to provide well-rounded, cost-effective environmental restoration solutions for large-scale restoration projects.

The focus of macroengineering is not limited to overall environmental management goal setting, but includes establishing detailed technical planning, regulatory documentation, and cost estimation protocols to ensure the desired results are achieved. Although undertaken from a senior management perspective, macroengineering also encompasses detailed preparation of critical environmental regulatory documents (records of decision, remedial investigation and feasibility studies, environmental permits, etc.) and technical information (monitoring data, sampling plans, risk assessment studies, etc.) from the standpoint of their strategic value, given cost, schedule, and regulatory objectives.

Macroengineering takes a system-based, "big-picture" environmental restoration management approach to its review. Under a macroengineering process, select activities are not treated as individual units, but as a part of a total view to environmental restoration problem identification and resolution. As a result, the process generates a greater understanding of potential resource requirements and the impact of technical/regulatory hurdles ("showstoppers") on meeting remediation goals.

The macroengineering process involves development of a baseline engineering document and also calls for a review of available internal documentation and streamlining the internal procedures that define a company's environmental restoration program. The end product is the development of a preconceptual engineering baseline study. The scope of the assessment includes:

- Establishment of an environmental baseline engineering document
- Development and review of policies, guidelines, and procedures relevant to establishing technical approaches and controlling technical quality
- Development and review of cost- and schedule-estimating processes
- Independent cost and schedule review of a statistical sample of projects across the site's environmental restoration site universe
- Establishing the approach and review process for a statistical sample of monitoring data to ensure compliance with data quality objectives and cost-effective regulatory strategy
- Evaluation of the site remediation contract options for their ability to control contractor activities from a technical, cost, and schedule standpoint
- Evaluation of the control processes for activities funded by indirect charges under site remediation contracts
- Evaluation of the technical and regulatory decision-making process and documents prepared or to be prepared
- Identification and assessment of regulatory/technical impacts on cost and schedule via value engineering and cost benefit studies
- Identification of contingency management and enhanced cost control opportunities

The process can be used to address the adequacy by which the site's environmental restoration program is dealing with the issue, both corporate-wide (in the case of multiple sites) and at each individual site. Obviously, there is a need to reflect on the different programmatic needs for a given site.

A central question to ask is whether the company is better served in considering the environmental restoration activity as a program versus as a project. Inherent within the title "program" is a greater emphasis on development of internal resources for managing the mission via staff development and equipment acquisition. Perhaps the main factor in determining this is if the company (agency) owns or is involved in more than one site and there is, or can be effected, an agreement with the regulatory agency to allow a string of separate cleanups over one or two decades. In such case, a corporate level agreement may not only save money but could be used effectively to tighten up the restoration effort, making it more responsive to corporate goals. However, environmental restoration, in most cases, is a unique mission outside the mainstream scope of most corporate activities. Thus, it may be better for companies to consider the environmental restoration mission as a project management exercise in which technical resources are, by and large, contractor-supplied and the company's environmental restoration is focused on project management. Figure 1.2 provides a schematic way to assess the issue. The company is best focused on performing those activities in which it has proprietary capability and value-added support. Those functions may be essential, but "proprietary" should be continually reevaluated and with time, if possible, moved to the "Buy" category.

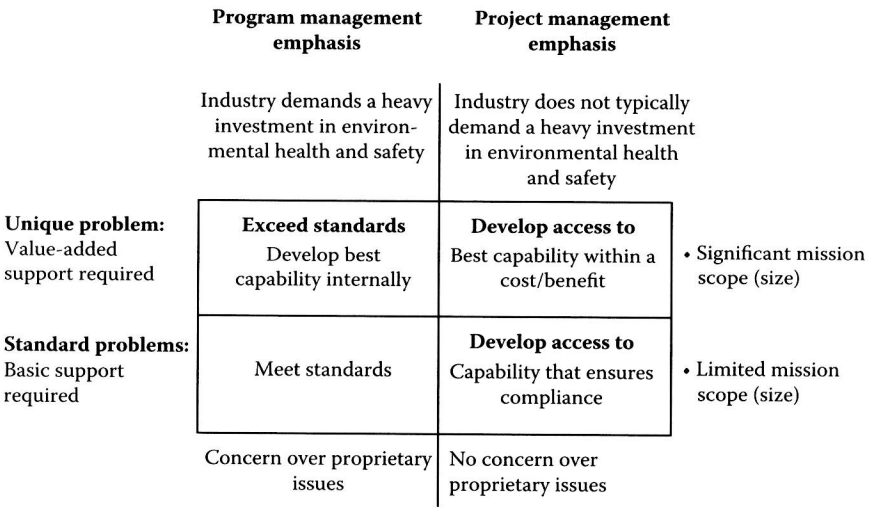

Figure 1.2 Program versus project management analysis.

In areas in which heavy emphasis is placed on utilizing outside subcontractor resources, a company's environmental restoration management philosophy should be structured so as to maximize the potential for sharing cost/schedule risk and management risk with subcontractors under well-designed incentive programs. This can be accomplished by addressing two issues: an independent NRD assessment element and a "managed risk" assessment that includes a public participation element and provides the company with independent feedback of key issues that define the ultimate success of its environmental restoration program at a given site.

The thrust of the NRD assessment activity is "How to avoid being a target of NRD"; or, if you cannot avoid becoming the target of a claim, at least do the best job you can to prepare and position yourself effectively. The assessment entails finding out (through knowledgeable third parties) whether any trustee agency has initiated an NRD review and (if so) what its review criteria and priorities may be, identifying others in the "same boat," as well as determining the basis for and scope of the claim. Chapter 8 discusses this issue in detail.

The second element is managed risk assessment.

From a management perspective, there are three types of environmental risks:

1. The technical risk (established by site service and regulatory/agency personnel)
2. The perceived risk (outrage) by the public
3. The regulatory risk relative to past, current, and future standards and positions