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Rethinking Restoration: Risk Based Corrective Action and the Future of Economic Regulation

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INTRODUCTION

Traditional state and federal environmental regulatory programs have successfully addressed the most obvious environmental problems with an emphasis on restoring the environment to contaminate-free levels. This emphasis, which ideologically is good, has proven impractical under many circumstances and has resulted in an inefficient allocation of time and resources while striving for often impractical and sometimes unnecessary standards.

Regulators, consultants, and property owners should shift their focus from detecting and removing contaminants at all costs. They should focus instead on using existing methods and discovering new ways to minimize or eliminate exposure to contaminants which will provide effective environmental protection and free limited resources to address other problem sites that are currently being ignored. Use of a comprehensive risk management approach

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to environmental corrective action will provide the tools necessary to achieve realistic levels of environmental protection at efficient costs.

I. THE GOAL OF ENVIRONMENTAL RESTORATION

The best way to protect human health and the environment has been an issue of debate for many years. The public, in general, desires a pollution-free environment. Therefore, the traditional goal of environmental regulation has been the restoration of a contaminated environment to pristine levels under all possible circumstances. Following that national mandate, the U.S. Environmental Protection Agency (EPA) was established in 1969 by President Nixon to oversee the implementation of revised and new legislation which was enacted to protect human health and the environment. The EPA has done well in protecting the environment. However, current political and public sentiment is telling us that we need to find a better way, a more efficient way, of human health and environmental protection.

Regulators have, for the most part, followed the original public expectation for a pristine environment. Whether one believes it or not, the goal of an environmental regulator is not to make life difficult for property owners, but rather to be conservative in the protection of the public. When I joined the EPA, I perceived my job as: (1) preventing any further degradation of the environment, (2) restoring the environment, and (3) regulating the damage done to the environment in such a way that the environment would become clean again. Most of us believed that with enough time and money, we could ensure both the clean up of all the nation's environmental problems and protect its natural resources for all future generations. We began by regulating damage and requiring people to restore the environment. As a result, the "polluter pays" concept and the policy of resource protection through non-degradation of the environment emerged as the basis for most of our environmental laws and regulations. While these concepts are certainly desirable, the reality is that they often demand unachievable results and inefficiently use limited public and private sector staff and financial resources. The current debate now focuses on the achievability of environmental goals, as well as what is an appropriate cost.

II. RE-EVALUATING TRADITIONAL METHODS

Since there have never been, nor is it likely there will ever be, adequate resources to address all potential environmental hazards, only one practical solution, in my opinion, emerges to address environmental regulation: implementing a carefully defined system of environmental risk management. Risk

management is based on the following question: At what point does the effort devoted to correcting an environmental hazard exceed the threat posed by the contamination?

As increasingly smaller concentrations of contamination are removed from the environment, there is often a disproportionate increase in the incremental cost of contaminate removal. Therefore, as costs of corrective action continue to increase and incremental benefits in contaminate reduction decrease, the critical issue is to determine at what point corrective action achieves effective environmental protection.

A. THE OBVIOUS ENVIRONMENTAL PROBLEMS HAVE BEEN ADDRESSED

The overall success of the state and federal environmental regulatory programs has been mixed. There has been a lot of progress in the last few years during which environmental regulation has addressed the obvious environmental contamination issues. Most of the waste water generated is treated before discharge and most air pollution discharges are addressed through a variety of permits. Lakes and rivers now have fish where there were none before. When I first went to work in the Chicago Loop some twenty years ago, the air smelled bad and looked worse. While not yet clean, the air currently over Chicago, and in many other parts of the country, is a vast improvement over the way it was just a few years ago. Over the last twenty-five years, new laws and regulations have been passed and old laws and regulations have been amended to broaden authority for environmental protection. As a practical matter, the obvious environmental problems have been addressed. However, we have not addressed a large number of the less obvious problems and more technically difficult materials and site specific conditions that continue to present an environmental threat.

B. TRADITIONAL GOALS ESTABLISH IMPRACTICAL STANDARDS

Pursuit of a pristine environment has resulted in standards that are generally very conservative and often prove impractical. Generic standards often drive up the cost of corrective action. They assume an environmental threat exists without evaluating the risk presented by the site. Some sites are, as a result, perceived as severely damaged while many others go unaddressed due to resource constraints.

When restoration is the goal, regulators often attempt to characterize and remediate all detected chemical compounds. As science and technology improves, our ability to detect contaminants from parts per million (ppm) to parts per billion (ppb), and even smaller fractions, increases. With restoration as a primary goal, the cost of clean up will increase, often

without a proportional improvement in the level of environmental protection. As a result, over the past twenty-five years regulatory "hoops" have been created that have become higher and smaller as technical capability improves.

C. TRANSITION PERIOD

Increasing corrective action costs with decreasing benefits have caused many of us in the environmental protection profession to reconsider restoration as our ultimate goal. The traditional focus on engineered and technical solutions has resulted in secondary consideration being given to the practical issues associated with the implementation of environmental protection. The technology driven process has had limited success in the past, and I do not think it is going to be much more successful in the future. We are now, i believe, at the beginning of a transition period during which what is meant by environmental protection is being re-evaluated. The current focus on detecting and removing all contaminants at all costs should be, I feel, re-evaluated. We must reconsider existing tools and develop new ways to reduce environmental risk to a protective level in order to conserve resources which can then be used at other problem sites. This re-evaluation should be broad in scope and will, I believe, ultimately result in a more efficient and more pragmatic approach.

Superfund has spent billions of dollars, cleaned up a few hundred sites, and in the process we have learned a great deal about how to do corrective action. The RCRA Hazardous Waste Program has been ongoing since 1984 with limited success. It currently may take the RCRA Hazardous Waste Program over ten years to complete corrective action at a site. In Region 5 (which covers Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin), RCRA has 1,050 facilities that may require some kind of corrective action and only about 250 sites are receiving such corrective action. I feel overall environmental protection would benefit from a re-evaluation of the way we set priorities and allocate resources. As a result of the restoration concept for corrective action accountability, the cost of environmental protection continues to rise. We are, unfortunately, not always concerned about the cost effectiveness of corrective action. When the goal of a pristine environment is funded by the polluter, a thorough clean up is often expected regardless of efficiency or cost.

A more practical, more effective approach is needed that will save public and private resources as well as protect the environment. I feel that a more efficient risk based management process can save resources such that the resulting savings can be used to address other problem sites and result in a consistent level of environmental protection.

Over the last twenty-five years, the means to achieve a pristine environment have been focused primarily on technical or legal solutions to our environmental problems. While many of those techniques may be conceptually desirable, they do not always result in practical solutions. Over the past few years, I have tried to look for remediation alternatives that are more pragmatic and practical in their approach. That is what I am calling risk management.

III. RISK MANAGEMENT

A non-degradation policy for all aspects of environmental protection is simply not practical. True environmental protection comes from prevention. In a perfect world nothing "bad" would be released into the environment and, therefore, the environment would always be protected. However, the reality is that the release of at least some environmental pollution will be with us for the foreseeable future. All contamination can never be completely preventable regardless of the efforts involved. As long as we meet the demand of a growing population insisting on lifestyles that create potential environmental hazards, contamination will occur and the associated risk will have to be managed.

Risk management should not be perceived as the process of performing only a risk assessment at the associated site. Risk assessment only addresses the health risk aspect of a site. Risk management should instead be implemented on a much broader basis to determine how much corrective action is necessary to protect human health based on the specific conditions of the site.

The most effective form of environmental protection is release prevention. The primary reason that most environmental regulations are enacted is to ensure prevention. However, popular attention is generally focused upon high visibility programs, such as the Superfund or the Leaking Underground Storage Tank (LUST) program, because environmental concern is at its peak following an environmental incident when the objective is determining accountability. The RCRA program is primarily a preventive program. The Underground Storage Tank (UST) program is primarily intended to be a preventative program. Effective risk management, therefore, should be and is based on prevention. Nevertheless, if a chemical release occurs, good risk management choices should fashion corrective action solutions based on how "clean" is clean enough for a particular site. The goal of risk management is to identify and implement decision that result in practical and effective environmental protection.

A. HOW "CLEAN" IS CLEAN? A CHANGING PHILOSOPHY

I have often heard opposition to the concept of addressing problem sites to an acceptable risk level as opposed to the traditional goal of cleaning a contaminated site to background or pristine levels. The philosophy of how "clean" is clean enough, however, is evolving. Congress and the EPA are looking into this problem carefully. There is a growing sentiment toward more practical and more cost-effective corrective action programs.

As previously mentioned, the optimum level of environmental prevention has been traditionally defined as "any contamination is too much." What I am suggesting is a fairly radical philosophical shift in thinking, especially for a regulator. I feel we should determine how "clean" is clean enough based on the risk presented by each site as a basis for protecting human health and the environment. In other words, assess the risk to human health and the environment that the contamination presents and respond accordingly. Environmental protection is evolving from primarily the application of the best available science and technology at all sites, to problem solving using environmental risk management.

The "polluter pays" concept holds the polluter responsible for actions that have resulted in environmental contamination. However, it often separates the cost of cleanup issues from the regulator. This, in conjunction with the restoration goal, has often resulted in inefficient site remediation. Financial Assurance requirements in the UST program resulted in more than forty states establishing a petroleum clean up fund. Many of these funds are having financial problems, and some are insolvent because of the high cost of clean up. As a result, cost efficiency has been brought home to many state and federal regulators because government has become accountable for the cost of corrective action. Also, the private sector has become more vocal about its concerns for more cost effective corrective action. As a result, government is re-evaluating the corrective action process and is searching for more cost effective tools. In addition, we are looking for more realistic, more practical solutions to identified environmental problems.

A change in philosophy is needed toward environmental corrective action and toward environmental clean up based on the individual risk presented by the site in question. There is a strong mixed reaction concerning the notion of Risk Based Corrective Action (RBCA) and its premise of an "acceptable" level of contamination remaining after an environmental clean up. Some people love the idea; some people hate it. People who love it are often site owners with contamination facing millions of dollars in corrective action costs and they are optimistic of the potential cost savings. People who hate it tend to be groups that believe any level of contamination is unacceptable. Environmental regulators advocating such

a philosophy have been accused on occasion of "selling out" the environment. This characterization is an unfair because cost effective risk management provides a more practical point of view that can benefit more people and a greater number of affected sites.

A new environmental paradigm based on a pragmatic approach to environmental risk management presents an overall benefit to environmental protection and prevention. Comprehensive risk management will streamline efforts, improve corrective action processes, and provide widespread cost savings as well as environmental benefits.

The answer to the question how "clean" is clean cannot be effectively answered. The time has come for a change in philosophy to how "clean" is clean *enough* based on the individual risk presented by the site in question and focused upon effectively protecting human health and the environment. With the application of this concept, the actual implementation of a technical corrective action has changed very little. However, the change from a philosophical point of view will be huge.

B. RISK MANAGEMENT

Risk management is a comprehensive approach. It considers not only the best available science, engineering practices, technologies, and the toxicity of the chemical of concern (COC) at the site, but also the potential risk presented by the COC(s) to human health and the environment. The greater the risk to human health and the environment, the more comprehensive the management effort will need to be to prevent the COC's harmful impact on human health and the environment.

The key to environmental risk management is to determine how much risk is presented by the various chemicals of concern and then to estimate the point at which these constituents present a hazard to human health and the environment. Over the last ten years, the tools of risk management have been developed and are continuing to be refined. Each year, risk management decisions are based on better toxicological and ecological data and better and more refined use of fate and transport models (analytical or numeric models which estimate the decay of a COC or its transport through the environment) are established. As a result, we have better tools to help make appropriate risk management decisions related to effective environmental management. When conservatively and consistently applied, risk management processes can provide the tools to effectively manage environmental risk.

All affected parties should start using risk management tools as soon as a problem is identified. If the site is an industrial site and is expected to remain an industrial site, risk management decisions should be based on that

scenario because that is the site's future use. If future use is going to change, however, then the risk management scenario should similarly change. Property owners will need to have an overarching approach that applies to their sites from a managed risk point of view. That does not mean an owner can avoid the site characterization, the engineering, or the legal aspects of a site, but it should help to re-evaluate their point of view and should help refocus efforts in a more efficient and cost effective way.

C. PRIORITIZING RISKS

Not all sites present the same level of risk. An Underground Storage Tank site with only soil contamination, for example, may be much less risky than a refinery or a chemical plant. The range of risk associated with a site depends upon how long the site has been contaminated, what COCs were handled at the site, the geology, and a variety of other site conditions including the potential affect on ecological and off site receptors.

A goal of risk management is to define and use information to prioritize environmental risks. For an underground storage tank owner owning one retail service station that has one leak, prioritization is not important because there is only one problem to address. However, an owner of multiple facilities or multiple releases at one facility can determine which site or portion of a site presents the worst problem, identify the corrective action required, and attack that problem first. The emphasis now need not be on achieving a pristine level of corrective action, but an acceptable level.

Because there are limited resources to fund corrective action, prioritizing risk and expanding the clean up to additional contaminated sites will result in the most effective overall environmental solution. Even the federal government, perceived as having billions of dollars to address corrective action problems, must prioritize risks and use limited resources effectively. Those responsible for problem sites should take the resources allocated for corrective action and apply it initially on the worst problem, address that problem, and then go to the next priority control that source (a concentration of COCs) so it does not cause additional harm. Prioritizing resources to those portions of the site that are creating the greatest risk will result in more effective environmental protection.

Risk management involves making complex and sometimes difficult choices using a consistent process to determine the potential exposure to a COC. Risk management is not just about assessing human health and ecological risks. It involves the desire to manage the risk associated with COCs using risk decision tools that are gaining attention and support across the country.

IV. SPECIAL CONCERNS IN THE RISK MANAGEMENT PROCESS

A. RELEASE AFTER RISK ASSESSMENT

Some people fear that risk management will be used as an opportunity to pollute the environment to the acceptable level of COCs calculated by the risk assessment. Performing a risk assessment does not confer a license to contaminate. It is important to note that risk assessment will not solve all environmental problems; it is not designed to risk problems away, but to make effective risk choices. All potential pathways and receptors must be considered once the release of contamination has been discovered. For some pathways and receptors, the estimated risk may fall within acceptable levels for human health and ecological protection. However, other pathways and receptors may still be negatively affected. Even if the risk assessment and risk management choices define one's corrective action liability, other liabilities independent of human health and ecological risk may arise, such as property devaluation, which must be considered.

B. THE ROLE OF ENVIRONMENTAL GROUPS AND NATURAL RESOURCE DAMAGE GROUPS IN RISK MANAGEMENT

As we move toward voluntary clean up and Brownfields redevelopment, concerns may be raised that we are abrogating our responsibility to protect human health and the environment. Expression of these concerns is critical in ensuring that environmental programs and regulators are aware of the concerns of environmental groups and the public. Nevertheless, such groups tend to be very conservative and less amenable to new processes that advocate environmental clean up levels that fall short of pristine.

Environmental groups may be reluctant to buy into the concept of risk management because if they recognize it, they may lose some leverage in their position. The EPA has a public participation process which advises environmental groups at every opportunity concerning the risk assessment and risk management procedures it is implementing. The EPA also encourages environmental groups to participate in the rule making process at early stages in order to ensure that their suggestions and concerns will be addressed. Providing the environmental groups information and an opportunity to be heard will hopefully diminish future challenges to the risk management concept.

There appears to be some conflict between environmental groups advocating conservatism and industry and public's desire for an efficient way to address environmental problems. Regulators will and should err on the side of conservatism, but I also feel that there should be more movement

toward the center in an effort to establish a consensus that protects the environment as well as allows more efficient and cost effective corrective action.

C. ECOLOGICAL RISK AWARENESS

The last ten years have seen great improvements in identifying tools and processes to perform risk assessment for human health. As a result, one who completes a standard risk assessment process using existing guidance can be successful in convincing a regulator that the risk assessment was accurate in determining contamination levels which are safe for human health. The key weakness of risk assessment today is not so much in the area of human health, but ecological risk. It is much more difficult to gauge an ecological risk at this point.

The ecological risk portion of the risk management process can increase clean up costs. Effective risk management evaluates both human health and ecological risk. When conservatively and consistently applied, risk management can provide an effective tool to characterize and clean up a site.

Ecological risk factors have become a difficult decision area for corrective action primarily because we know less about it than we know about human health risks. For example, if there is a situation where a site condition is surrounded by residents and there is a release, one can easily estimate the human health impact. Estimates of a certain level of risk can be generated on which most experts will agree. But when there is a threatened ecosystem, for example, there is rarely enough data on the toxicological impacts of a particular chemical for that system. All one knows is that the system needs to be protected, but to what extent? The answer has been to protect it to background levels. This is appropriate because it is not known what it will take to protect that particular ecosystem. The human health risk is often quantifiable, but the ecological risk is more subjective. We must continue to look for effective and consistent alternatives.

D. DEVELOPING HARD TECHNOLOGY AND PROTOCOLS AS PART OF THE RISK ASSESSMENT PROCESS: ALTERNATIVE SITE CHARACTERIZATION

One encouraging development in the risk management process is the use of alternative site characterization methods. There remains a tendency to use "traditional" methods to gather site data such as mobilizing a drill rig and drilling a series of holes in the ground to retrieve data. The samples are then sent to a fixed lab for analysis which may take two weeks or longer for

the results to be returned. For example, a retail service station site I was involved with in the UST/LUST program evinced a worst-case scenario in the use of traditional characterization methods. The service station had over fifty monitoring wells on an area no bigger than a residential lot. There was no room to put in another well; the owners punched every hole they could. More is not always better, sometimes it is just more. The primary questions following this characterization was whether the data was effectively gathered and whether there were alternatives to traditional characterization.

In searching for alternatives, we found that direct push technology such as geo-probes, hydro-punches, and cone penatrometers can generate real time, accurate and cost effective site information. This is often done with field analytical instruments or in conjunction with a mobile lab. To optimize the characterization of a site, one should mobilize once, use real time site characterization by taking samples, and perform analysis throughout the process. As a result, the site is characterized and decisions can be made more efficiently and cost effectively. There are alternative ways to perform site characterization that generates data that is as good and can be more useful than "traditionally" gathered data because it provides information in a more timely manner. Alternative ways of site characterization will accelerate the process and provide defensible data that is in some cases more accurate than "traditional" methods and is often more cost effective.

CONCLUSION

There are no perfect answers to the problems of environmental protection and regulation. However, one thing is clear. Too much time and money has been spent in order to achieve perfection in the way sites are remediated. While contamination under many circumstances can be harmful, not all contamination at all sites under all circumstances is necessarily harmful.

In talking to a variety of people within the EPA across the country, I have learned that our guidance is moving toward more efficient and pragmatic corrective action. Before too much longer, risk management tools will be readily available to everyone. Whether it is the RBCA process or some other risk management tool, the ability to perform effective risk decision making should start driving the manner in which corrective action is dome. That is true of Superfund, it is true of RCRA, and it is true of the State voluntary clean up programs.

Risk management means making complex and sometimes difficult decisions involving calculated risks in a consistent way. Prompt and

effective risk management will result in making environmental decisions that will provide better environmental protection. Without a method of making environmental choices, even the best science and technology producing the best data does little to resolve environmental contamination. We can no longer afford to study sites looking for the perfect corrective action. We have spent too much time and too much money striving for perfection at one site while contamination at other sites is ignored.

Risk management should not become the end of the corrective action process. Risk management should be the comprehensive process that is used to protect human health and the environment, but in a timely and cost effective manner. It should aid in making the most productive, timely, and cost effective decision possible. Early and appropriate action to the release of a COC must be our goal. Prompt action based on an effective risk management process should result in prompt decision making which is critical if we are to protect human health and the environment. If these risk management tools are used wisely and carefully, human health and the environment will be protected.