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**The Brownfields Phenomenon:
Much Ado about Something
or the Timing of the Shrewd?**

Kris Wernstedt, Lauren Heberle, Anna Alberini,
and Peter Meyer

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Abstract

This paper provides an overview of the cleanup and redevelopment of contaminated properties known as “brownfields.” It has three principal parts. First, we introduce the brownfields phenomenon and its drivers, drawing on the body of available empirical evidence to discuss characteristics of individual brownfield redevelopment projects. Second, we present findings from a recent study we have conducted that examines the relative attractiveness to private developers of public interventions to promote brownfields redevelopment. Third, we briefly summarize some of the problems with brownfields development and policy and propose an approach to promote wider societal benefits of brownfields development. We conclude with several broad questions about brownfields policy and practice.

Key Words: brownfields, contamination, economic development, infill

JEL Classification Numbers: Q24, Q28

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Kris Wernstedt, Lauren Heberle, Anna Alberini, and Peter Meyer¹

1. Introduction²

Critics argue that traditional federal regulatory approaches have discouraged private parties from becoming involved in properties that are perceived to be contaminated. These so-called “brownfields” number in the hundreds of thousands nationwide. Owners of the properties and prospective buyers, fearing liability for expensive cleanups, often opt not to develop them, yet left unattended such sites may pose threats to public health and the environment and depress the economy of local neighborhoods. Opportunities for more sustainable communities may be ignored even as rural or greenfield (uncontaminated and undeveloped) sites attract new development, contributing to continued underinvestment in distressed areas.

In response to the abundance of contaminated sites and the problems or missed opportunities they entail, federal, state, and local initiatives to address brownfields have blossomed over the last decade. Most of these have provided some sort of public intervention or relief—direct financial support for regeneration of brownfields, easing of regulatory burdens, or reduction in the liability for future cleanups and environmental damage once certain cleanup standards are met—to public and private parties interested in undertaking brownfields regeneration. The implicit logic is that the social and financial benefits that brownfields redevelopment can provide—whether reuse of a single isolated property or a revitalization of an entire distressed neighborhood—warrant public intervention. Unfortunately, however, the enthusiasm for brownfields reuse generally has not been matched by systematic, careful documentation of actual practice at a wide range of sites. It is thus not clear whether the

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enthusiasm for brownfields and its claim of community benefits offer more than rhetorical cover for what are essentially real estate deals at a relatively small number of properties.

This paper collects evidence from a variety of sources to ground brownfields redevelopment rhetoric in actual practice. Although it stops well short of answering whether such redevelopment is a wise public goal, it does aim at documenting the reality of brownfields as a precursor to understanding how public attention to brownfields can be made more effective. We start in section 2 with a brief background on the brownfields problem; the federal, state, and local efforts that have emerged to address it; and its nexus with community sustainability. In section 3, we present five stylized myths about brownfields and draw on a range of sources to discuss these myths. These sources include several surveys we have conducted of public and private parties involved in brownfields development and other studies and reports from the academic and practitioner literatures on brownfields. We then turn in section 4 to a recent study we conducted of the relative attractiveness to private developers of public interventions to promote brownfields redevelopment. We briefly summarize the significance of the findings from our developer study in section 5, where we propose an approach that can help local communities plan more shrewdly for sustainable brownfields regeneration. We conclude in section 6 with several challenges for the brownfields community.

2. Background

Brownfield properties are not on the roster of sites cleaned up under the federal Superfund program, but it is the federal legislation that gave rise to Superfund—the 1980 federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—and related state statutes that most commentators identify as the chief culprits driving the brownfields problem. CERCLA has imposed a liability regime for the cleanup of sites with hazardous substances on a wide array of parties, including those who generated or transported the substances, as well as current and former site owners and lenders who financed activities that generated the substances. Many state mini-Superfund laws have similar features for sites that may not be of significant federal interest.

As a result of these laws, owners and prospective buyers of properties thought to be contaminated are leery of attracting regulatory attention and becoming responsible for cleanup. The parties who may have caused the contamination may be long gone or be unable to pay for cleanup, and few of the brownfield sites would qualify for public funding under Superfund and state counterparts. And by most accounts, this problem bedevils communities across the

country. The U.S. General Accounting Office (1987) has reported that the nation has between 130,000 and 450,000 potential hazardous waste sites, based on data collected from several federal agencies in the 1980s. Later estimates have placed this figure in the range of 500,000–600,000 (Simons, 1998), or even as high as 1 million sites (U.S. Environmental Protection Agency, 2004).

Federal legislative and regulatory reforms reduced the barriers imposed by CERCLA throughout the 1990s, and the U.S. Environmental Protection Agency's (EPA) Brownfields Program has supported hundreds of pilot projects that have resulted in the assessment of thousands of properties. Perhaps most significantly from the standpoint of national policy, the signing of the Small Business Liability Relief and Brownfields Revitalization Act in early 2002 has provided firmer statutory footing for expanded liability protection and funding. In 2003, EPA provided \$75 million in grants to states, local governments, and nonprofits under the new law, bringing its investment in brownfields since 1995 to over \$700 million.

In addition to federal efforts, all but a handful of states now offer voluntary cleanup programs to encourage owners and developers to come forward and voluntarily address site contamination, in exchange for less onerous requirements and certainty that state authorities will not continue to hold them liable for additional cleanup. These programs operate in a less burdensome and intrusive fashion than longer-standing enforcement-led programs under federal and state law. They typically scale back environmental requirements by tailoring cleanup requirements to the expected future use of the properties rather than requiring, for example, the same cleanup at a parcel whether it is slated for development as an industrial park or as a playground. The new programs may further provide some form of liability release upon state approval of cleanup and sometimes delegate state regulatory functions—including monitoring and oversight of cleanup activities—to licensed consultants. Many states also offer incentives to spur private investment in the inner-city communities where contaminated properties often are located.

If one compares the state of affairs vis-à-vis the redevelopment of brownfields today to that of 10 years ago, it is clear that federal and state promotion of brownfields has yielded numerous success stories of idled and underutilized contaminated properties that now house a variety of economic activities. Whether these efforts have helped to revitalize distressed areas and contribute to a more sustainable community is a more difficult question, however. Part of the problem is that it is difficult to measure revitalization and sustainability at a community level. Simple metrics such as job creation and tax revenues are useful, but when reported as gross measures they may fail to distinguish between new jobs and jobs transferred from other activities

and often obscure more nuanced issues of community vitality, social cohesion, quality of life, and environmental justice. In addition, most brownfield efforts have taken a property-by-property approach that aims at supporting the highest and best use of individual properties. Possible positive and negative spillovers from redevelopment of a property beyond that property's boundaries and such larger neighborhood issues as poor infrastructure, crime, poverty, and failing schools typically remain secondary concerns in brownfields discussions.

3. Exploring the Myths

As Eisen notes in his work on the nexus of sustainability and brownfields development (Eisen, 1999; Eisen, 2002), the remediation and reuse of brownfield sites in the United States provides an opportunity to both reverse the decay of already developed areas and slow unsustainable development trends throughout the country. Each brownfield redevelopment decision itself can trigger a variety of concerns related to the long-term vision of a community, threats to public health and nature, economic livelihoods, social equity, and public participation. Addressing these concerns in an integrated fashion at the intersection of social, economic, and environmental forces in principle would exemplify the expansive view of brownfields redevelopment as a palliative to the environmental and social stresses of urban America.

The implementation of such an integrated approach will be based on a number of premises about brownfields revitalization. These premises relate to, among other features, the nature of brownfield properties; the expectations and behavior of public and private parties involved in the development, environmental, and financial risks; the importance of subsidies; and the investment climate of host communities. Many of the premises may have a factual base, while others may be rooted in unsubstantiated assertions of mixed quality or outright misunderstandings. Collectively we will refer to these as brownfields myths. Our goal here is to explore these myths and draw on available evidence to discuss their legitimacy, thereby grounding the rhetoric of brownfields revitalization.

Existing Literature

The empirical literature on brownfields—a topic that cuts across many disciplines and scales and is open to a wide range of methodological approaches—remains undeveloped relative to its potential. The planning and economics communities have examined the intersection of contamination, housing values, political economy, and local government activities for decades (Anderson & Greenberg, 1982; Clean Sites, 1992; Gayer, Hamilton, & Viscusi, 2002; Glaser,

1994; Hird, 1994; Ketkar, 1992; Kiel & Zabel, 2001; McCluskey & Rausser, 2003; Page, 1986; Wernstedt, 2001), but this work has not focused on brownfield trends and policies to promote brownfields redevelopment. Rather, the bulk of the work in the latter realm comes from two overlapping directions.

First, much of what we know about brownfields and the barriers to their redevelopment has come from case studies of individual redevelopment projects, where public incentives to reduce regulatory and economic uncertainty have appeared critical to project success (Bartsch, Collaton, & Pepper, 1996; Pepper, 1997; Walker et al., 1998). Direct local government participation in redevelopment projects through ownership and leadership also has appeared important in these studies, although Meyer and Lyons (2000) identified one group of private sector brownfields redevelopers who largely eschew such involvement. Recent work also has explored the economics of brownfields redevelopment, suggesting that contamination may not be as significant a constraint to property transactions as the prevailing sentiment of the 1980s and early 1990s suggested (see, for example, Boyd, Harrington, & Macauley, 1996; English & Peretz, 1998; Howland, 2000; Schoenbaum, 2002). Other work on general brownfields issues has tackled a wide array of disparate topics including, among others, rural sites (National Association of Development Organizations Research Foundation, 1999), public health concerns (Greenberg, Lee, & Powers, 1998; Pendergrass, 1999), urban revitalization and sprawl (Dorsey, 2003; National Governors Association, 2000), the role of community land development entities (Leigh, 2000), decision models (Attoh-Okine & Gibbons, 2001), conversion of contaminated urban sites to green spaces (DeSousa, 2003), and environmental justice concerns (Anderson & Clemens, 1999; Engel, 1997-1998; Rowan & Fridgen, 2003).

A second line of brownfields study has emphasized pragmatic features of brownfields programs. The Northeast-Midwest Institute (NEMW), for example, has issued several guides to facilitate brownfields redevelopment, including overviews of federal brownfields initiatives (Bartsch & Dorfman, 2000), financing mechanisms (Bartsch, Undated), and opportunities for community involvement (Bartsch, 2003). In addition, the Environmental Law Institute (ELI) has issued a guidebook for property owners and others interested in redeveloping brownfield properties (Environmental Law Institute, 1999), as have a number of other entities (Davis, 2002; Green, 1996; International City/County Management Association, 2001; Meyer & VanLandingham, 2000).

In addition to these two threads of work, a small number of studies have relied on original surveys to systematically collect information on the scope of the brownfields problem, characteristics of brownfield sites, and attitudes toward and experiences with their

redevelopment. Lange and McNeil (2004a; 2004b) report survey data from nearly 160 brownfields stakeholders and project personnel from 75 federal brownfield pilot projects on the factors that contributed to success of brownfield redevelopments. They find that a host of factors related to project costs and timing, support of local leaders and the community, financing, and availability of financial incentives appear important. EPA also collects information on each site that receives support from its brownfields program—it requires that all of its brownfields pilot grant recipients report this routinely—although the database with this information is relatively new and not readily accessible to the research community. Furthermore, both NEMW and ELI regularly issue “State of the State” reports that summarize the development of state brownfield, Superfund, and voluntary cleanup programs (Bartsch & Deane, 2002; Environmental Law Institute, 2002). These latter two reports, however, target program-wide efforts and characteristics rather than features of individual sites.

For this paper, we draw principally on six additional empirical studies to describe basic characteristics of brownfields. These include:

- a survey we recently administered to 90 recipients of EPA brownfield pilot grants, which is part of our larger study of brownfield developers that we discuss in section 4;
- our earlier survey in which we collected answers from more than 250 Wisconsin respondents from the public, private, and nonprofit sectors to a range of brownfields-related questions (Wernstedt, Crooks, & Hersh, 2003); and
- our survey on the use of environmental insurance in brownfields development that includes responses from roughly 50 private developers of brownfield sites in 19 states (Wernstedt, Meyer, & Yount, 2003).

For expository convenience, we refer to these three studies in the following discussion as the “public sector,” “Wisconsin,” and “environmental insurance” studies, respectively. In addition, we draw heavily on three surveys conducted by other entities:

- an annual survey by the U.S. Conference of Mayors (USCM) of member municipalities that targets opportunities and barriers to brownfields redevelopment, with the most recent report representing responses from over 240 cities with brownfields (U.S. Conference of Mayors, 2003);
- a series of reviews of media coverage of brownfield redevelopments that the International Economic Development Council (IEDC) has conducted, the most recent one conducted in cooperation with XL Environmental (XL) and providing information on over 400 brownfield sites (XL International and International Economic Development Council, 2002); and
- a five-year-old study by the Council for Urban Economic Development (CUED)—IEDC’s predecessor organization—that examined 107 brownfield projects in 20 states to document the economic benefits of redevelopment (Council for Urban Economic Development, 1999).

We will refer to these latter three external investigations as the “USCM,” “XL/IEDC,” and “CUED” studies, respectively. We also use findings from a number of other empirical studies on brownfields to make specific points related to the myths, as described in the text.

Five Myths

Myth 1: Most brownfield sites are large properties located in economically disadvantaged neighborhoods that have heavy contamination from urban industrial activities carried out in the past century.

Many older eastern and midwestern U.S. cities hosted an array of manufacturing activities that generated wastes that were disposed of on-site both legally and illegally. As the industrial bases in these cities shrank after the mid-1900s, some of these contaminated properties were abandoned or transitioned to less intensive use. In many cases, supporting infrastructure also has deteriorated and already disadvantaged populations have been further burdened. Evidence from the EPA brownfield pilot grant program, for example, shows that the grants typically have targeted communities with higher proportions of non-white households and lower median household incomes (Solitare & Greenberg, 2002).

Notwithstanding these patterns, however, numerous brownfield sites can be found in mining areas and more generally throughout rural America (National Association of Development Organizations Research Foundation, 1999). In addition, while properties that hosted manufacturing may make up the plurality of brownfield sites, the brownfields landscape is quite heterogeneous. The XL/IEDC review reports industrial activities on about 70% of the sites it examined, with public facilities (mostly military) and commercial uses accounting for the majority of the remainder. Our environmental insurance survey of nearly 50 private developers of brownfield sites found that sites under redevelopment most commonly had hosted light/heavy industry (32%), mixed use (26%), commercial (22%), and residential (11%) activities. Many of the respondents reported multiple former uses.

The composition of areas surrounding individual brownfield projects also appears variable. The 1999 CUED study of 107 projects around the country indicates that areas within a one-mile radius of the projects tend to have higher concentrations of minority populations and households below the poverty level than statewide averages. In addition, based on data from the 2000 U.S. Census, the median household incomes of the census tracts in which the brownfield projects identified in our environmental insurance study are situated typically lie below their

corresponding metropolitan-area wide median household income (about 75% of it on average).³ However, this ranges from a low of 23% to a high of 136%. Similarly, the non-white population of the census tracts with the brownfield projects identified in the environmental insurance survey typically constitutes a much higher percentage of the total population than do the metropolitan-area wide, non-white populations (about twice the rate on average). Again, however, the ratio of the proportion of the total population that is non-white in the census tract to the analogous metropolitan-wide proportion ranges from 0.1 to almost 6. The 1999 CUED study of 107 projects around the country reveals similar patterns.

In terms of site sizes, since we lack a complete inventory of contaminated sites, we do not know the average size of a brownfield property. However, the median size of properties undergoing redevelopment from the USCM data is about 5 acres, slightly lower than the 8.5-acre median size from our environmental insurance survey. This latter figure is comparable to findings from our public sector study of EPA brownfield pilot recipients, where two-thirds of our respondents reported an average site size under 10 acres and nearly 45% of all respondents a size under 5 acres. The 1999 CUED study of 107 projects found a median site size of about 4 acres, while the more recent XL/IEDC review reports a much larger median site size of about 40 acres (largely because that study focuses on more visible sites that have received media coverage).

All of these studies likely overstate the average size of contaminated properties, however. A more intensive, geographically targeted study at Rutgers by Miller and coauthors (2000a; 2000b) of 89 brownfield sites in a dozen New Jersey municipalities—each site had either received a grant from the state’s Hazardous Discharge Site Remediation Fund or was identified by municipal officials as a property the municipality was seeking to develop—found a median site size of about one acre. Given the large number of abandoned gas stations and garages, former dry cleaning establishments, small fabrication facilities, leaking underground storage tanks, and other facilities that constitute contaminated sites, this lower estimate of average site size is more likely representative of the brownfields universe. Some municipalities that have developed parcel-based inventories of contaminated sites for tax purposes suggest average brownfield site sizes well below one acre (see, for example, City of Milwaukee Department of City Development, 2004).

³ By this we mean that if for each brownfield project in our sample we calculate a ratio that equals the median income of the census tract where the project is located divided by the median income of the metropolitan area where the project is located, the average ratio is .75.

Myth 2: Environmental requirements pose the biggest obstacles to timely brownfield redevelopment.

Brownfields are characterized in the 2002 federal brownfields law as “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.” In the absence of such contamination and the perception that it may be present, the site does not constitute a brownfield property. Thus, by definition, environmental requirements play a pivotal role in shaping brownfield possibilities. The last three years of the annual USCM survey, for example, reveal that the three most commonly cited impediments to brownfields redevelopment—the lack of cleanup funds, concerns over environmental liabilities, and the need for environmental assessments—all hinge on environmental issues. In our Wisconsin study, over 50% of respondents from the private sector noted that the high cost of cleanup is a “very important” constraint that makes it difficult for developers to redevelop contaminated properties, with the majority of the others indicating that it is an “important” constraint.

At the same time, however, many non-environmental factors clearly pose important barriers. In the 2003 USCM survey, more than 40% of respondents indicated that market conditions were one of the five most important impediments that cities encounter in redeveloping brownfields. Nearly three dozen private firms responding to a survey by Robertson (1999) ranked non-environmental factors—particularly site location, site size and configuration, building characteristics, construction cost, and access to a skilled labor force—well ahead of environmental liabilities as important final decision criteria for selecting a site for corporate relocation or expansion (although environmental liabilities may have played an important role in screening sites). In short, basic real estate fundamentals often pose more significant obstacles to redevelopment of any previously used urban land than does contamination. Small parcel sizes, the high costs of demolishing buildings or upgrading them to current standards, inadequate and deteriorating infrastructure, zoning battles, and potential litigation all can make the reuse of such land less favorable than in suburban or rural alternatives that are not yet developed (Porter, 1995).

Myth 3: The primary benefits of brownfields redevelopment relate to the improvement of environmental quality, including the reduction of sprawl.

Brownfields redevelopment has been offered as a corrective lens to the federal and state laws and regulations that many commentators believe have stigmatized properties and detracted from the environmental vitality of neighborhoods. Proponents often portray brownfields

redevelopment as a win-win endeavor, improving environmental quality through cleanup of contamination and reducing demand for undeveloped land. The U.S. Council of Environmental Quality, drawing on a report from George Washington University (Deason, Sherk, & Carroll, 2001), emphasized these benefits in a release that noted, “[e]very acre of reclaimed Brownfields saves 4.5 acres of greenspace such as park and recreation areas.”⁴ (White House Council on Environmental Quality, 2004). However, this environmental take on brownfields need qualification in two dimensions.

First, economic benefits of brownfields redevelopment often appear to be just as important a focus of brownfield projects as environmental benefits. More than 80% of the respondents to our public sector survey view more efficient use of public infrastructure, increases in tax revenues, and the creation of jobs as an important or very important reason for redeveloping contaminated property, roughly the same percentage as those who view protecting public health and protecting the natural environment in such a fashion. Our Wisconsin study shows similar results, while the three most frequently cited benefits of brownfield redevelopments by respondents in the USCM survey—increasing a city’s tax base, neighborhood revitalization, and job creation—all center on economic and social rather than environmental factors.

Second, cleanup approaches at many brownfield properties often rely on legal mechanisms referred to as “institutional controls”—such as zoning, property easements and covenants, and well drilling bans—to restrict property uses at a site with residual contamination. In our environmental insurance study, for example, 38% of the developers noted the use of one or more institutional controls, most commonly government controls such as zoning and permitting requirements. These institutional controls do not so much as enhance environmental quality through the elimination or treatment of contamination as they provide protection by limiting exposure to it.

Myth 4: Public ownership and/or financial assistance are critical for brownfields redevelopment.

In the vernacular of Superfund and brownfields, “deep pocket” parties who are involved in a contaminated site are particularly desirable since with uncertain liability and with everything else being equal, entities seeking cleanup funds or pressing damage claims are more likely to go after parties with substantial financial assets than those in bankruptcy proceedings or those with

⁴ The figure of 4.5 acres of greenspace preserved for every brownfield acre is an average. The median amount of greenspace preserved for every brownfield acre developed estimated from the same data is 1.7 acres.

more limited resources. For this reason, contaminated land that has been in public ownership often has appeared particularly attractive to prospective developers. In addition, a site under public ownership may have access to cheaper capital, be able to earn below-market rate of returns, and/or benefit from subsidies that may not be available to sites that are entirely in private ownership. However, as the brownfields market matures, public ownership and intensive involvement in redevelopments may be less critical than before. Our survey evidence reflects this ambiguity.

Less than 20% of our public sector survey respondents indicate that it is always or almost always easier to attract redevelopment to a contaminated site if the property has been publicly owned (and nearly twice as many indicate that it is never or almost never the case). The XL/IEDC report notes that private development companies by themselves were the developers of nearly two-thirds of the sites for which developer information was available, and had a role in some of the remaining one-third of sites in conjunction with local governments and redevelopment authorities. In addition, work by Meyer and Lyons (2000) indicates that many experienced brownfield specialty firms eschew municipal ownership of land because of the competitive bidding requirements, loss of privacy regarding redevelopment plans, and delays caused by public notification requirements.

In terms of more direct financial support, public financial assistance in the form of grants and loans for land purchase, environmental investigation, environmental cleanup, and the construction of the redevelopment remains essential in some situations. All of these types of assistance reduce development costs, increasing the expected rate of return on a private investment to counter the uncertain liabilities. A broad range of the studies we cite supports this interpretation. In the XL/IEDC study, for example, only 20% of the projects for which funding information is available relied solely on private funding, with the remaining 80% split roughly equally between those who relied solely on public funding and those who used a mix of public and private funding. In addition, 85% of the 260-plus representatives of public, private, and nonprofit sectors who responded to our Wisconsin survey agreed or strongly agreed with the statement that redevelopment of contaminated properties usually requires financial support from local or state public agencies. More than 85% of the respondents from the private sector indicated that they agreed or strongly agreed with the statement that more contaminated sites would be redeveloped if more public money were available for site cleanups, roughly the same percentage of respondents from the public sector who indicated this. In the CUED study of 107 brownfield redevelopments, public sources accounted for over one-fourth of total project investments.

Myth 5: Local residents typically oppose brownfield redevelopment projects.

Local hearings regarding development project plans and other input from community leaders have been viewed by some as barriers to any type of development because such input may result in requirements that cut profit margins or slow real estate deals, where timing and cash flow are critical. In the case of brownfields, public input can be particularly problematic since it also may involve issues of cleanup and environmental protection. Settings with a legacy of distrust because of real or perceived environmental injustices add further complications. Yet, at the same time, effective and early public involvement can enhance a project's bottom line, contributing new ideas to a design and garnering important support and buy-in for a reuse that local residents may believe benefits their community.

The survey findings on hand generally support this latter interpretation. Nearly two-thirds of our public sector respondents indicate that it is always or almost always beneficial to developers to involve residents and community members in designing environmental response plans, and very few of the respondents indicate that developers are highly concerned with public hearing requirements. In addition, 85% of the XL/IEDC projects for which community opinion information was available reported positive opinions, and only about one-quarter of the respondents to the USCM survey list community concerns as one of the five most important impediments to brownfields redevelopment.

In our Wisconsin study, there is little evidence of a widespread feeling that community opposition is a significant constraint that makes it difficult to redevelop contaminated properties in the state. Only 10 of the 260-plus respondents (4%) indicate that community opposition is a *very* important constraint and another 20 (8%) indicate that it is an important constraint. At the other end of the spectrum of opinion, nearly 10 times as many indicate it is not a constraint (37%) and another 80 respondents (32%) indicate it is a minor constraint. The remaining 19% of respondents indicate that it is a moderate constraint. These opinions are largely consistent across different respondent groups, although a slightly higher proportion of respondents from the private sector indicate that community opposition is a very important or important constraint than do respondents from the public or NGO sectors.

4. Brownfield Interventions

Our discussion of stylized brownfield myths highlights the variety of brownfield developments. They can be situated in diverse communities and may be large or small; reflect the legacy of a wide range of prior land use activities; be redeveloped as residential, commercial,

or industrial properties; promote both environmental and economic gains; face a wide range of regulatory and nonregulatory barriers to success; and attract both public support and opposition. Moreover, as “urban sore spots”—as President Bush characterized them in the 2004 presidential debates—they can encompass both relatively narrow, targeted real estate deals and opportunities to redress larger ills in America’s cities.

Notwithstanding the diversity of experiences across brownfield sites, a common thread in their redevelopment emerging from surveys and other studies is that the uncertain liabilities in redeveloping contaminated sites and the extraordinary (relative to a clean parcel) costs associated with investigating and cleaning up such sites can make public interventions in brownfields welcome and in some cases essential. Unfortunately, it is not clear what kinds of interventions are most valuable. According to the public sector survey, public financial support generally appears more attractive when offered as a reimbursement of environmental investigation costs rather than a subsidy to construction activities. However, the relative effectiveness of nonfinancial interventions—a change in regulatory requirements such as reducing cleanup standards or liability relief that releases “innocent” parties at contaminated sites from long-term damage claims—may be even more critical.

To bolster our understanding of what works to stimulate interest in brownfield investments, we recently conducted a mail survey of U.S. real estate developers. Our questionnaire asked respondents to consider a hypothetical scenario of a contaminated site at which the developer was contemplating a multi-unit residential development project. In addition to project financials (see Figure 1)—expected land purchase, investigation, remediation, and redevelopment costs and expected gross returns on the property—we offered a number of different public interventions that developers could choose to improve their expected return on the site. Based on analysis of the choices, we can estimate the relative value of the different incentives.

Figure 1: Hypothetical Residential Redevelopment Scenario

You are deciding whether to make a contract offer on a property. Imagine a townhouse project that your company would then lease to individual households. This project would take place under the following circumstances:

Market Condition: The project is undertaken in an area with high potential for property value appreciation that might raise return above *expected* values.*

Environmental Assessment Cost: The *expected* cost for environmental studies, including assessment, sampling, and response planning is \$100,000.

Site Remediation Cost: Based on known prior uses, the environmental engineers report that the *expected* cost for meeting state regulatory requirements is \$900,000, including protection from any cost overruns.

Land Cost: The *expected* purchase price for the site is \$6 million.

Development Cost: The *expected* development cost at the site, including construction, marketing, interest, legal and administrative fees, etc., is \$18 million (in addition to acquisition, assessment, and cleanup costs)

Revenues: The *expected* present value of the townhouse development after construction is \$30 million

*Half of the respondents received a questionnaire with high potential for market appreciation and half received a questionnaire with little potential for market appreciation. Relevant costs for the project with little potential appreciation were scaled downward but expected rate of return on investment (ROI) is 20% in both scenarios.

Figure 2: Incentives Available in Choice Experiments

1. Site assessment cost reimbursement (two values):	\$0 or \$100,000
2. Public hearing (two values):	Required or not required
3. Protection from additional cleanup cost (two values):	Available or not available
4. Protection from third-party liability claims (two values):	Available or not available
5. Subsidy for redevelopment (four values)	\$0, \$125,000, \$250,000, or 500,000

Alberini, Meyer, and Wernstedt (2004) provide more details on the instrument, but briefly our approach rests on a series of conjoint choice experiments, in each of which respondents choose between two alternative packages of interventions (referred to as attributes in the lexicon of conjoint choice experiments).⁵ The interventions that we evaluate are:

- reimbursement of the environmental assessment cost
- imposition of an additional public hearing requirement
- relief from liability for future cleanup at the site
- relief from liability claims by third parties such as site workers and adjacent land owners
- financial subsidies for redevelopment activities.

In each experiment, respondents can reject both alternative packages of attributes and choose a “do neither” option.

We assume respondents will choose the alternatives that yield the highest utility based on the financial conditions we provide and the developers’ own internal investment calculations. We model the choices with a conditional logit model, with the first four intervention attributes appearing as binary 0/1 variables (either not present or present) and the financial subsidy taking on one of four possible values (\$0, \$125,000, \$250,000, and \$500,000). This latter variable allows us to estimate the dollar value of each intervention based on the ratio of their regression coefficients (see Figure 2). Altogether with five experiments per respondent and 300 respondents, we have roughly 1,500 responses to model.

In addition to the choice experiments, we ask a number of background questions related to characteristics of the respondents and their firms and experience with redeveloping contaminated sites (see Table 1). Nearly 90% of the 300-plus respondents themselves are engaged in real estate development, and roughly the same percentage has experience with infill development. In

⁵ Conjoint choice experiments entail a stated preference survey approach in which respondents are asked to identify their preferred choice out of a limited set of hypothetical alternatives (Louviere, 1996). In our case, each alternative contains a combination of the public interventions we are interested in evaluating. Through statistical analysis of choices identified by a range of respondents—and with a range of different choice scenarios presented to each respondent—we can estimate the relative value or weight that respondents place on the different attributes. This approach can help to reduce strategic behavior (Adamowicz, Louviere, & Swait, 1998)—efforts to “game” the survey and provide misleading values—and facilitates responses since it requires simpler binary choices rather than interval-level values or even full ordinal rankings. Most simply, it imposes constraints and forces respondents to make choices and tradeoffs rather than allows them to select a wide range of features that real-world budget constraints would not permit.

addition, about 80% have done residential projects and slightly less have experience at sites with contamination. About one-fourth of those with contamination experience conduct more than 60% of their projects on contaminated sites, a group that we have called brownfield specialists. A minority of respondents have received public subsidies for either environmental work (assessments or cleanup) or construction.

Table 1: Summary Statistics

Variable	% sample (<i>n=313</i>)	Notes
real estate developer	89.2	All other respondents are construction or consultants
residential background	79.0	respondent experienced w/ residential projects
infill experience	91.9	respondent experienced w/ infill project
contamination experience	77.7	> 0 projects w/ contamination
brownfield specialist	19.0	> 60% of projects have been at contaminated sites
cleanup experience	76.0	> 0 projects w/ cleanup done
abandoned project	32.0	> 0 projects abandoned due to cleanup cost
environmental subsidy	23.0	> 0 projects w/ public assessment/cleanup \$
construction subsidy	33.0	> 0 projects w/ public construction \$
make decision	90.0	respondent partly makes investment decision
Neither choice	31.2	respondent chooses neither incentive bundle

These summary statistics are reassuring since they suggest that the hypothetical redevelopment scenario we presented (Figure 1) falls in the range of projects with which the respondents are familiar. The project as described is an expected \$30 million gross return on a \$25 million expected investment, yielding an expected net return on investment of 20%. Slightly more than half of our respondents indicated that this project was about the same scale as their projects, with the remainder split roughly equally between those who indicated they generally worked on larger projects and those who generally worked on smaller projects. In addition, the hypothetical project we presented and the choices of incentive bundles that we offered appear reasonable in light of the fact that in about one-third of the choices made by respondents, the “do neither” option was selected (bottom line of Table 1).

The coefficients from our conditional logit regression for the non-monetary attributes—public hearing, liability protection from additional cleanup, protection from 3rd party liability—were all significant at the 0.01 level, with expected signs. Dollar values calculated from these coefficients appear in Table 2. We can see, for example, that the “value” of an additional public hearing on a developer’s cleanup plan is negative (it imposes a dollar cost). In principle, as we

noted earlier, a public hearing could broaden community support for a project, but overall the developers appear to think that such a hearing could delay a project or otherwise raise its costs. In contrast, liability protection against additional cleanup requirements if standards change or if more existing contamination is discovered in the future provides a large positive gain to developers, more than three times the negative value of the public hearing requirement in terms of absolute value (i.e., ignoring signs, the value of the additional cleanup liability is more than three times the value of the public hearing requirement). This suggests that even when packaged with additional public hearing requirements, the value of liability relief for future cleanups is strongly positive. Developers appear to value protection from 3rd party liability claims by workers or neighbors even more highly; the dollar benefits of this incentive are about 40% higher than the one for future cleanup liability relief. The import of these numbers to the bottom line of the hypothetical project appear in the rightmost column of Table 2, where the proportion of profits that the values represents range from roughly 5% (negative) to more than 20%.

Table 2: Value of Incentives, All Respondents

	\$Value	% of Project Cost	% of Project Profit
Public hearing requirement	-\$212,000	0.9%	4.7%
Eliminating all cleanup cost risk*	\$702,000	3.1%	15.6%
Eliminating 3rd party liability risk*	\$969,000	4.1%	21.5%

**liability protection provided upon state approval of environmental response*

If we split the sample between the 20% of respondents with significant experience on contaminated land and the 80% of respondents with less experience, we can see some important differences in how developers view the attributes (Table 3). The experienced subsample places roughly the same value on relief from future cleanup liability as does the less-experienced subsample, but this value is roughly the same as the value these experienced developers place on 3rd party liability relief. Thus, comparing the value placed by the experienced subsample on 3rd party relief and the value placed by the less-experienced subsample on 3rd party relief yields a wide discrepancy (the ratio of the values on this incentive is 0.6). In addition, the negative value of the public hearing requirement for the experienced subsample is only about half the analogous value for the less-experienced subsample. Thus, the experienced developers do not appear to view public hearings as imposing as high a cost on a project as do the less experienced developers. And finally, although not shown in Table 3, more experienced developers placed a higher value dollar-for-dollar on the reimbursement of assessments costs than on other cash support. This reflects the fact that reimbursement would occur regardless of the final disposition

of the property, while other cash subsidies would be received only were the project to move forward. In contrast, the less experienced developers placed equivalent values on the two types of financial incentives.

Table 3: Value of Incentives, Respondent Subgroups

Experience with Brownfields	Specialists	Non-specialists
Public hearing requirement	-\$129,000	-\$237,000
Eliminating all cleanup cost risk*	\$681,000	\$727,000
Eliminating 3rd party liability risk*	\$649,000	\$1,081,000

**liability protection provided upon state approval of environmental response*

5. Future Directions: A Modest Proposal

As policy on contaminated land has evolved and experiences with reusing it have accumulated over the last decade, brownfields redevelopment has matured, become mainstreamed in many aspects, and begun to yield projects that rely less on uniquely structured deals specific to the environmental characteristics of the site and more on standard real estate practice. It stretches credulity to claim that brownfields practice has become a routine matter, yet selling brownfield properties has become more normalized as common real estate issues rather than problems related to remediation have begun to fundamentally (and, in some situations, almost exclusively) drive redevelopment at contaminated sites. The growth of the environmental insurance market has helped at many larger sites, since insurance can cost-effectively reduce uncertainties and provide the liability protection that private developers appear to highly prize.

Significant challenges remain, however, if brownfields redevelopment is to go beyond a series of real estate deals that perpetuate existing development patterns and move to be an engine of sustainable development. Significantly more public resources may be needed for assessment, cleanup, and redevelopment of the tens of thousands of properties around the country whose economics are either too dire or too uncertain to attract interest. Small tracts of contaminated land, in particular, may be unattractive to developers since transaction costs of dealing with regulatory agencies may constitute a relatively high proportion of project investments.

Tools for addressing uncertainty such as environmental insurance are generally not cost-effective for these smaller sites, so public agencies often have pursued a course of assembling smaller parcels to yield a larger site that would be attractive to private developers. This approach,

however, not only requires contiguous properties but it also may be counterproductive from the perspective of private firms who eschew such public interventions (Meyer & Lyons, 2000). To the extent that necessary legal, political, and fiscal conditions are in place, other mechanisms such as tax increment financing may be a more appropriate approach for public support. Owner-financed tax increment financing—wherein an owner rather than a municipality takes on the risk of the failure of a development to generate new taxes—also may be feasible. General bonding, which already provides brownfield funds in several states, may be an additional option. At the federal level, modest modifications or extensions of tax incentives targeting brownfields could improve brownfield project economics. Perhaps most radically, reauthorization of the currently lapsed federal Superfund tax could prove more politically palatable if a portion of the revenues were dedicated to leveraging municipal or state resources grant programs for brownfields cleanup.

More innovative approaches, however, may be needed since even under optimistic federal, state, and local fiscal scenarios, public funding is unlikely to supply more than modest assistance. In particular, to link brownfields and sustainable practice, practitioners need to move beyond a property-by-property approach and place brownfields in a larger-scale endeavor that seeks to revitalize a wider area of the community (Meyer, 1998). This may require as much an ideological shift from the current conventional practice that centers on shrewd, property-specific brownfield real estate developments to wider community concerns. Nonetheless, an areawide approach that explicitly treats multiple brownfield properties as a system and tackles them en masse rather than each in isolation could improve the prospects for community revitalization in four related ways.

First, undertaking the redevelopment of multiple small brownfield properties in a coordinated fashion can be financially attractive for both the public and for private developers, particularly for residential reuse. For the public, the cumulative effects of redeveloping multiple properties can increase property values, tax revenues, and other community benefits over an entire neighborhood depressed by a small number of contaminated sites. For private developers, increases in property values over a neighborhood may increase the expected market price for new housing to a high enough level that a developer will undertake a new project. Absent sufficiently high market rates, anticipated public benefits may justify subsidies that reduce investment risks and provide the developer with an acceptable rate of return.

Second, an areawide brownfields approach may allow larger dollar investments in cleanup and redevelopment that can take advantage either of economies of scale in infrastructure for redevelopment and in remediation or of risk-sharing opportunities across multiple sites. For

example, the cost of investigating contamination and in remediating 10 properties in a coordinated fashion may be far less than doing each one in isolation, particularly if the properties share a common environmental problem (such as underlying groundwater contamination) and can use a similar remedial strategy. Even if the contamination problems are dissimilar, when bundled as a portfolio the exceptional risk of one property encountering unanticipated and potentially costly cleanup surprises may be balanced by the unexceptional risks of the other nine properties.

Third, if multiple contaminated properties within a defined area can be put under single ownership, an areawide brownfields approach may make environmental insurance a financially critical part of a redevelopment strategy. Such insurance can provide protection against unanticipated overruns in cleanup costs, as well as provide liability protections for a wide range of risks such as the discovery of additional contamination or lawsuits by site workers or adjacent property owners for damages for personal injuries suffered as a result of the contamination. As we saw in the previous section, both of these types of protection appear to have a high value for developers. The insurance is currently unaffordable for small projects, but bundling multiple properties together could make it cost-effective.

Finally, an areawide approach can turn traditional brownfields redevelopment on its head by placing it in a comprehensive, integrated planning framework that takes advantage of the opportunities provided by brownfields. Rather than limiting the benefits of brownfields redevelopment to the sum of the benefits from individual projects, a community undertaking an areawide approach can design the redevelopments so they are complementary and synergistic such that the whole exceeds the sum of the parts.

The One-Cleanup program and areawide cleanup pilots that are part of EPA's Land Revitalization Agenda (Horinko, 2003) provide a step in the direction of areawide regeneration, but the success of the approach ultimately will rest on practice at the local rather than federal level. Such has been the case with much brownfields innovation and reform. To the extent that local efforts to promote more areawide benefits from brownfields redevelopment get off the ground, they are likely to follow the same trial-and-error experimental process that have characterized much of brownfields.

6. Final Thoughts

Even as environmental issues in the U.S. court of public opinion arguably have taken a backstage to concerns over terrorism, national security, military engagement overseas, and the

economy, the redevelopment of brownfields and other policies to reduce environmental and public health risk and restore blighted communities continues to have political traction. For example, the Congressional vote to pass the Small Business Liability Relief and Brownfields Revitalization Act in late 2001 was overwhelming and bi-partisan. More recently, the Sierra Club has attempted to draw on popular support for cleanup in its ad campaign in swing states to highlight the Bush administration's opposition to renewing the corporate taxes that support the federal Superfund program (Inside EPA, 2004a).

Numerous groups representing a wide range of interests—developers, engineers, local appointed and elected officials, lenders, regulators, and the environmental community—continue to support brownfields redevelopment and interest in brownfields continues to grow. The crowd at the national brownfields conference in September 2004, for example, exceeded 4,000 attendees. Yet, the offering at this conference of a new forum for parties to come together to craft redevelopment deals epitomizes the emphasis many give to brownfields, namely the promotion of successful real estate transactions. More deeply rooted and knotty concerns related to the revitalization of neighborhoods remain underemphasized, in our view, and critical appraisals of the reality and outcomes of brownfield redevelopments are sorely needed. For example:

- Does the remediation strategy of choice at many brownfield sites—to leave contamination in place but limit the exposure of the public to it through capping, fences, and institutional controls—unfairly or unwisely transfer risk to future generations?
- Is it appropriate to de-emphasize the “brown” in federal, state, and local brownfields programs and focus on economic development priorities?
- To what extent do the economic benefits of a redeveloped brownfield property reflect a transfer of economic activity from one part of the community or region to another part?
- How can vulnerable or distressed populations—those who often have the fewest tools and skills to make brownfields redevelopment work—keep the benefits of brownfields regeneration within their communities?
- Do brownfield programs empower communities to address their environmental and economic stresses or do they further dependencies on federal largesse?
- What should be the appropriate balance between public and private benefits of brownfields redevelopment?

Some of these questions have begun to attract discussion, as witnessed by an increasing interest in systematic measurement of the benefits of reuse of brownfield sites and tracking the outcomes of cleanup programs (Inside EPA, 2004b; www.rff.org/sitereuse). However, if the brownfields phenomenon is to be more than much ado about nothing and to achieve its enormous promise—to move well beyond rhetorical accomplishments and real estate successes of shrewd

public and private entrepreneurs—questions such as these need to be squarely faced. Resolving them can go a long way toward helping brownfields practice grow toward a healthy integration of economic and environmental policy and toward the construction of more sustainable communities.

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