13th Pacific-Rim Real Estate Society Conference

Fremantle, Western Australia, 21 to 24 January 2007

Valuation of Impaired Land: Greenfield Advisors Experience with Contaminated Sites

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January, 2007

Abstract

This paper reviews issues related to estimating property value effects from contaminated sites. Industrial economies release millions of chemicals into air, soil and water with adverse effects on human health, other species, future community economic development and private property values. Hundreds of thousands of parcels are damaged by contamination in the United States. Both private property rights and public goods are affected. Greenfield Advisors (formerly Mundy Associates), a Seattle based appraisal, specializes in assessing damages to real estate values resulting from contamination, often serving as expert witnesses in litigated cases. These valuations may require both cross sectional spatial analysis of contamination effects and time series analysis to assess how contamination and stigma play out over time. Cases begin with science respecting the environmental fate and remediation of particular contaminants and their human health consequences and effects on air, soils, water and living organisms. Class action treatment of cases where many properties are affected, environmental laws and regulations that determine "responsible parties"—in some cases with joint and several liability for any party in the chain of title—and foundation property rights principles (laws forbidding nuisance, trespass and unjust enrichment) play important roles in recovery of damages in such cases. Limited or incorrect information and beliefs may cause market prices to deviate from values that assume knowledgeable buyers and sellers.

Keywords: contamination, damages, property rights, appraisal, valuation, externality, mass appraisal

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Outline of the paper

The main source for this paper is the experience of Greenfield Advisors (formerly Mundy Associates), an appraisal firm that has worked on a wide variety of site contamination valuation cases throughout the U.S.A. since its founding in 1976. The firm has been involved during that time with cases including the Exxon Valdez oil spill, a decommissioned nuclear power plant, a hurricane Katrina oil spill and a variety of legacy contamination problems such as leaking underground storage tank (LUST) cases, arsenic, lead and other metals from refinery operations, toxic organic chemicals such as dioxin, creosote, vinyl chloride and many others. The firm also undertakes other kinds of challenging valuation and real estate consulting including market and feasibility analyses, valuation of trophy properties, valuation of conservation easements and valuation in takings (condemnation or resumption) cases.

First, the paper briefly summarizes the scope and range of contaminated site problems, focusing on the United States. This section points out that the property value issues begin with understanding of science questions such as the health and other impacts of contamination, the environmental fate of contaminants, various strategies for remediation and their cost and effectiveness. This foundation of "facts" (albeit often controversial, disputed, uncertain and poorly and inconsistently understood by market participants, appraisers and the courts) influences market behavior, assessment of damages to property values and appropriate legal remedies. A second point is simply that there are surprisingly many contaminated sites and their remediation costs can be large, adding substantial undefined risk to brownfields real estate investments.

Next the paper touches upon USPAP requirements for contaminated site valuations, then on an important aspect of Civil Procedure, class treatment of claims. This is important as a practical matter regarding both obtaining compensation for damages to property values and the valuation methods used in assessing damages.

The paper then proceeds to the nature of damages that may occur, citing several illustrative cases, as well as the valuation methods appropriate for quantifying damages. Professor Throupe refers to this as "forensic valuation" in that the issues are sometimes not immediately apparent and sleuthing is often required to arrive at a reasonable estimate of property value effects of contamination.

Survey research methods to reveal contingent valuations ("stated preferences" as opposed to "revealed preferences" of transactions data) assume an important role for several reasons. First, to help establish legal causation—that is, to document the reasons for diminution of values that may be revealed by correlations between contamination and price effects in transactions data. Second, to establish the state of knowledge of contamination in the minds of market participants—information moves markets and is part of many jurisdictions' "market value" definitions. Surveys can help establish whether transactions prices reflect an adequately informed market versus buyers lacking information necessary to determine market value. Last, if contamination has resulted in a complete shutdown of a local market—that is, if no one is willing to buy—contingent

values may be the best available evidence of property value damages in the absence of transactions data.

Finally, the paper ends with more general questions on the role of information and expectations in price determination and appraisals. "How much knowledge to be considered knowledgeable?" is an issue of key importance for all valuers, not just those concerned with contaminated properties. Do observed market prices represent functioning of an efficient market or a market distorted by misinformation?

Origins, types, extent and consequences of contamination

The anti-regulatory stance of some "pro-business" state and federal governments almost certainly ends up costing the economy and businesses more in the long run than a well-designed regulatory program. In general, it is far cheaper—probably typically by one or two orders of magnitude, that is up to more than a hundred times less costly—to use a "closed" process that does not permit contaminants to escape into the environment, than to clean up pollutants once they have dispersed widely into soils, air, groundwater or surface waters and living organisms. "You can't put humpty dumpty together again." The nature of contamination means some releases cannot be cleaned up for any price. Where remediation is technically possible, it is often expensive and time consuming, leading to open ended liabilities that deter or delay redevelopment of affected sites. The second law of thermodynamics says entropy (disorder) increases and energy is required to reduce disorder. A child's room gets messy without any conscious effort, but restoring order requires a clean up. Widely dispersed contaminants require expensive processes to re-collect toxic materials or may even be beyond the capabilities of technology to accomplish.

Where property owners, whether corporations, individuals or governments are affected, recourse for damages can be pursued through the courts. Even in the absence of regulations, property rights are protected by Constitutions and Common Law. But recovery through the courts is an inefficient and uncertain process that occurs only after the damage has occurred. Tort actions involve large costs for legal fees, expert witness fees and court costs, as well as a degree of risk and uncertainty.[3] Outcomes are a lottery, ranging from cases being dismissed, to large actual and punitive damages awards plus monitoring and remediation requirements. Managements of polluting companies often vigorously defend their shareholders' interests by delaying tactics or by shifting assets so that plaintiffs end up with a claim against a bankrupt shell company without sufficient assets to pay damages owed. Large punitive damages—for example, $5 billion in the Exxon Valdez case—are justified as helping prevent further occurrences by demonstrating that firms may face serious consequences if they act irresponsibly. But, seventeen years after the oil spill, Exxon still was contesting the punitive damages award and was able to get a court to recently reduce the punitive award to $2.5 billion. By

[3] Greenfield Advisors has prospered due to lack of adequate environmental regulations and poor industry practices, of course, since our fees are a part of these transactions costs.

throwing up long and arduous defenses, defendants may deplete plaintiff's assets and "win" by outlasting their opponents.

Why are there so many contaminated sites? One factor certainly is changing standards over time. It was not recognized that many chemicals had negative effects on health or the environment in some cases until decades or even centuries after materials were first used and released. Creosote, used to treat wood to prevent rotting, is a good example. Before it was known that creosote contains a range of carcinogens, wood was treated in pits dug in the ground, releasing toxins into air, soil and groundwater. Smelting of metals ores containing lead, arsenic and other metals took place for thousands of years before harmful effects to human health, fish and other organisms were understood. For example, in Montana, legacy arsenic deposits are now being cleaned up in sediments more than a hundred miles downstream from the mining operations that originally created the problems over a century of mining that ceased twenty five years ago. There are many other examples where standards have changed as human and animal health effects became better understood. Although practices later improved, the former old careless practices left a legacy of contaminated sites.

In other cases, new products were introduced that at first seemed environmentally acceptable and with considerable advantages over previous technology, only to later prove to have dangerous effects. PCBs (polychlorinated biphenyls) were relatively inert and fireproof, so seemed ideal for use in transformers. Later it was discovered that they were toxic, persistent in the environment, tend to bio-magnify up food chains, resulting in human health risks including cancer. Polar bear fat and mother's milk and great lakes fish all contain PCBs due to global airfall dispersion of this pollutant.

CFCs (chloroflourocarbons) were excellent and widely used refrigerants. The world was fortunate that scientists monitoring stratospheric Antarctic ozone were able to connect destruction of ozone to catalysts associated with escaped CFC gasses. An international treaty was quickly negotiated to phase out CFCs. Had that not been done the consequences would have been extremely serious, perhaps even threatening to human survival—crop damage, skin cancer, blinding of bees that pollinate crop plants.

A third example of "new technology" that has given rise to many contaminated property problems is MTBE (methyl tertiary-butyl ether). Ironically, this chemical was added to gasoline as an oxygen source to reduce carbon monoxide and other pollutants from car exhausts. Unfortunately, gasoline was stored in underground steel tanks, many of which (especially in acidic soils) rusted and leaked. MTBE, benzene and other harmful components of gasoline then polluted groundwater and residential water wells. A 2002 Government Accounting Offices (GAO) report on MTBE refers to 416,702 inventoried LUST (leaking underground storage tank) sites in the U.S.A. Federal Law passed in 1985 mandated cleanup of hundreds of thousands of sites, better testing for leaks and eventual replacement with double walled and non-corrosive tank materials.[4]

[4] http://www.gao.gov/new.items/d02753t.pdf p. 10

Another factor leading to releases of contaminants is that in the absence of regulations and enforcement, cost pressures force firms to seek inexpensive waste disposal methods in order to remain competitive, motivating them to impose waste disposal costs on others or the environment, so long as these costs remain external to the firm. These pressures are stronger in a global economy because competitors overseas may face little environmental regulation. If a competitor simply dumps waste from an outfall pipe into a river or into the atmosphere from a smokestack, a firm may not be able to stay in business using a more expensive environmentally responsible waste treatment technology. Firms cannot maximize short run value by internalizing costs that other firms are able to impose on others or the environment. Environmental regulation enforced everywhere on the planet could help level the playing field by forcing all firms to be more responsible about releasing materials that may harm others. We can hope that with efficient regulation and vigorous enforcement of environmental laws, more firms will adopt more efficient "closed systems" processes with zero environmental emissions. These closed systems are clearly a more efficient long run solution in comparison to after-the-fact clean-up and litigation. Technology to capture and recycle potential contaminants can in some cases reduce costs of production processes by salvaging valuable materials for re-use.

The Chemical Abstracts Society (http://www.cas.org/New1/casinfo.html) has inventoried over 30 million chemical compounds. Most of these are harmless, but some classes of chemicals, notably the heavy metal elements (lead, arsenic, cadmium, etc.), chlorinated hydrocarbons (PCB's, DDT, dioxin, lindane, etc.), polycyclic aromatic hydrocarbons (PAHs) and others are toxic to human health and other life. Assessment of health risks evolves over time, with some new concerns discovered over time and others determined to be less serious. Some chemicals naturally break down in the environment, often "eaten" by bacteria, while others, such as radioactive by-products of nuclear power generation, persist for hundreds of centuries in some cases. Conditions such as presence of oxygen, moisture, etc. may determine whether or not some contaminants persist and for how long, while having no effect at all on others. Regulation and prevention of contamination are complicated by lack of global institutions—a portion of American air pollution now comes from China—and by changes in technology such as the synthesis or discovery of new compounds.

Other pollutants may be merely annoying or noxious—such as odors from rendering plants, noise, or visual pollution that obscures views. Some contaminants, the gasoline additive MTBE for example, may be only mildly harmful at low concentrations, but certainly imparts a bad taste to contaminated groundwater that may be objectionable to property owners and so may affect property values.

Risk assessment is complicated by varying susceptibility of individuals and species. A chemical that causes cancer in rats may not cause cancer in humans and vice versa. So studies using animal models may not be conclusive, although they are often good evidence of similar human health effects. Moreover, risks may be in terms of a few cases of cancer, say, per million people exposed, some of the risks result in infrequent damages. The Reagan administration attempted to balance costs versus benefits of reducing risks by environmental remediation by requiring economic analysis of

remediation actions. Scientists are used to the provisional nature of all conclusions, courts tend to demand certainty, at least to a "reasonable man" standard. This means that risks that have not been fully studied as yet may tend to be dismissed until retrospectively it turns out negative effects have occurred.

Often expensive monitoring and analytical studies are required to determine the extent to which contamination has spread through downwind plumes in the case of air pollution, or underground groundwater plumes that require monitoring wells to identify. Estimating the future spread of contamination may or may not be easy to determine by hydrological studies and modeling of rates of flow and contamination levels. This modeling of the future environmental fate of contaminants adds further complications to determining the timing and extent of property damages. Some volatile contaminants evaporate and dissipate quickly, others may be broken down by bacteria or other natural processes over varying periods of time. But some remain in soil, air and water for very long periods or permanently.

In America there are large numbers of known contaminated sites. State Departments of Environment inventory and manage cleanup of such sites. For example, New Jersey lists 14,000 known contaminated sites.[5] Sixteen hundred sites are listed on a Federal "National Priorities List" of contaminated sites slated for cleanup under the "Superfund Law", a law that makes all owners in the chain of title jointly and severally liable for cleanup costs. Unfortunately, the Superfund (CERCLA) process has led to many delays as parties litigate to determine responsible parties and otherwise attempt to avoid or postpone cleanup costs. And CERCLA funds are not adequate to cover costs. Costs of cleanup at some of the major contaminated sites runs into hundreds of millions of U.S. dollars.[6] For example, Messer et al (2005) cite a Los Angeles landfill that is expected to take as long as 45 years and $600 million to clean up. Probably the country's most expensive cleanup is the multi-billion dollar Hanford Nuclear reactor site clean up in Washington State. An EPA website lists the year 2002 caseload of known leaking underground storage tanks (LUST) at 136,000.[7]

Clearly contamination is a major problem and since the contamination may not be obvious, may emanate from offsite, yet have major implications for property values, contaminated sites are a major headache for property owners, developers, appraisers and governments. Often these sites get "stuck" so that redevelopment cannot occur for long periods of time because lenders and insurers are unwilling to take on the open ended risks of potential large cleanup costs or legal liabilities to injured parties.

Many contaminated sites affect multiple properties, often hundreds and sometimes thousands of properties. For example, a Maryland LUST site probably has affected about 300 homes water supplies in a rural area where a crossroads gasoline station tank leaked over an extended period of time. An Arizona groundwater pollution case discussed below

[5] http://www.state.nj.us/dep/srp/kcs-nj/

[6] http://cfpub.epa.gov/supercpad/cursites/srchrslt.cfm?start=1&CFID=23303&CFTOKEN=39518719&jsessionid=3630a02ab2193d43b2a5TRf4308c303630

[7] http://www.epa.gov/region09/waste/ust/calaccelcleanup.html

affected 85,000 properties. It is not uncommon for thousands of properties to be affected by a single industrial pollution source.

Remediation efforts may be expensive, marginally effective and require a long time to solve the problem. For example, pumping, cleaning and re-injecting of water at a New Mexico site where an important aquifer was contaminated by a petroleum refinery is expected to continue for a decade. In addition to health and property damage costs, there are costs of remediation, monitoring, litigation and enforcement.

Beyond the United States, there are even more serious contamination problems, in countries with corrupt governments or lack of environmental regulations. China, Nigeria and Russia are examples of countries with very serious contamination problems and few institutions to prevent contamination from getting worse.

The above is intended to give just a flavor of the origins and economics of contamination problems and why they are of such concern to property owners and appraisers. It is important that the eventual costs and risks of contamination are often uncertain or unknown. This motivates buyers to avoid contaminated properties, damaging their market value. Even nearby unaffected properties values may be affected due to proximity to blighted properties or due to risks that the contamination may spread. This has led to the concept of "stigma" whereby even remediated and nearby unaffected sites may suffer property value damages due to perceptions of risks by market participants.

Markets have great difficulty functioning efficiently in the face of the information problems inherent in contamination. In the first place, firms will often attempt to minimize or even cover up the extent of contamination. In an Alabama decision, a judge held that plaintiffs had no standing because even though Olin Corporation denied that there were contamination problems, according to the judge's decision the plaintiffs had not believed the company after 1999 and hence had failed to file suit in timely fashion to comply with the three year statute of limitations. In this case the company seems to have been allowed to pollute with impunity and falsely deny they were doing so, and thereby to deny the plaintiffs access to the courts for a remedy.

Scientific evidence is often contradictory, uncertain, incomprehensible to lay persons, or missing entirely. Experts can often be produced by opposite sides in such cases who will, with more or less credibility, come to very different conclusions. Responsible experts may have to admit to some scientific uncertainty about the extent of contamination or its health effects. Appraisers might have some difficulty in building a case for the effects of contamination on property values, particularly where there are long term effects or where the market has dried up due to pollution so few transactions exist to show effects on prices. In such circumstances it may be difficult to define "arms length" transactions. In some cases, polluters intervene to prop up market prices until litigation has been completed, masking the effects of pollution until courts have "resolved" the case.

There are occasional cases where experts were later proven wrong. Messer et al. (2005) include a list of errors by government, scientific and industry experts that have eroded

public faith in experts and point out that for many health issues contradictory information is common. They cite Fischhoff (1989 who noted that "the pronouncements of a few scientists are unlikely to change risk beliefs determined largely by media stories and perceptual cues."

Moreover, even when experts are in substantial agreement, mass media are liable to emphasize disagreements. Messer, et al. conclude that residents living near contaminated sites "construct their own subjective risk beliefs, which are likely based on perceptual cues (i.e. odors, tastes of water, etc.) and media coverage." (Messer, et al. p. 304) Actions taken to reduce risks, such as warning signs, fences, guards, or monitoring, may reinforce perceptions of risk. (Messer et al. p. 305)

Literature

Kilpatrick (2006) in a chapter on "Valuation of Brownfields Properties" in *Brownfields Law and Practice* (Gerrard, ed.) surveys application of real estate appraisal methods to contaminated sites. He cites the important case Daubert v Merrel Dow (1993) that established a standard for admissibility applicable to expert testimony. To meet this standard, experts must propose scientifically testable propositions with known or potentially known rates of error and general acceptance by the peer group of experts in the field. Federal statutes require in addition that valuation methods conform to USPAP (Uniform Standards of Professional Appraisal Practice) as promulgated and periodically updated by the Appraisal Standards Board. (p. 29-4) Kilpatrick emphasizes the need to use valuation methods beyond those adequate in less difficult appraisal problems including contingent valuations based on surveys, statistical modeling and case study meta-analysis. Even traditional approaches to value need to be modified to reflect the effects of stigma and additional risk related to contaminated sites. Moreover, highest and best use and ability to redevelop sites may be affected by contamination and those issues also are relevant to valuations.

Robert Simons (2005) book *When Bad Things Happen to Good Property*, gives the interested reader an overview of the legal and valuation issues related to contaminated sites. Simons outlines "forms a loss can take" including:

- Reduced use and enjoyment
- Realized capital loss
    - Sale below market price
    - Delayed sale
    - Property cannot be financed
    - Seller financing
    - Default risk
- Unrealized loss for unsold property
    - Reduction in net worth
    - Loss of liquidity
    - Risk of capital loss if property were sold
    - Change in discount rate (due to perceived risk)

Simons distinguishes between temporary and permanent damages and damages due to stigma (market reaction to perceived problems) and remediation and clean-up costs. Medical monitoring, treatment and damage to health or loss of life do not fall under property value damages, but certainly the risk of health effects contributes to property value damages.

Richard Roddewig (2002) edited a reader on *Valuing Contaminated Properties*, published by the Appraisal Institute. The Appraisal Institute continues to publish numerous articles on contamination valuation issues and other journals include articles on valuation of contaminated properties and related issues.

John Carruthers and Bill Mundy (2006) edited a reader on *Environmental Valuation* focusing on hedonic price modeling and public goods aspects of contamination. Their analysis includes attention to the urban and regional impacts of environmental amenities and disamenities.

The *Appraisal Journal* and other journals have published numerous articles on value effects of contamination and other positive and negative externalities affecting property prices. It may be fair to summarize by noting that findings vary from large effects to no effects depending on types of contaminants, methods used to assess damages, extent of remediation, perceived health risks and other factors. As with all efforts to determine the effect on values of a single factor, there are difficulties in sorting out effects of other variables that may tend to push prices up or down independently of the extent of contamination. In other words, supply and demand forces or hedonic factors other than contamination may tend to mask or exaggerate contamination's effects on values. Anderson, 2001 describes a "detrimental conditions matrix (table 1)

Table 1 Simplified Version of Detrimental Conditions Matrix Analysis

	Assessment	**Repair**	**Ongoing**
Cost	Cost to assess	Remediation cost	Monitoring & maintenance cost
Use	Utility loss and use restriction while assessed	Utility loss and use restriction while under remediation	Ongoing utility loss and use restriction
Risk	Discount when extent unknown	Risk during repairs	Residual stigma risk

The questions, "What did the market know, when did they know it, and how did they interpret what they knew?" are highlighted in some papers. For example, Decker, et al. (2005, say that "It appears that buyers to not have sufficient information or the inclination to distinguish between pollutants with differing impacts on human health and the environment." (p. 183) That finding implies markets are irrational, because health risks and persistence vary greatly for different contaminants. Winson-Geideman (2005) comments in an article on choosing comparable sales for environmental case study approaches to valuation, "The central message is that if buyers of comparable properties

have no knowledge of contamination, use restrictions and maintenance procedures associated with contaminated land, the case study approach could produce invalid and unreliable results." (p. 288)

Roddewig (1997) gave markets more credence, "Scientific conclusions about persistence of contaminants do not necessarily correlate with the marketplace's conclusions about the duration of economic impact on real estate." (quoted by Anderson, 2001, p. 323) One should perhaps be a bit uncomfortable with the notion that scientific experts are "wrong" and "the market" is right regarding contamination's effects on site utility. The market's evaluation depends not only on (possibly incomplete) knowledge, but also preferences.

In addition, "framing" can be important. Is contamination framed as a small acceptable risk present to some extent everywhere and an unavoidable side effect of employment, or as a serious health risk that responsible people will avoid at all costs? Same contamination, different interpretation, different value impact.

Institutions also matter—even a buyer who may personally not consider contamination risk important may be constrained by regulations, deed restrictions, or inability to obtain financing or insurance, or the perceptions of others that contamination matters, the latter affecting investment results expectations.

Legal and Regulatory Framework

Several laws affect the use, cleanup requirements and legal liability for contaminated sites. The 50 states have environmental protection laws and agencies that take a large role in inventorying, regulating and cleaning up contaminated land. At the federal level the so called CERCLA (Superfund) Law provides a mechanism for funding cleanup of the worst sites. State Voluntary Clean-up Programs have gained importance as a quicker and less litigious means for remediation. Leaking underground storage tanks are addressed by a different federal law and regulatory process (RCRA).

Federal and state health authorities determine maximum allowable standards for air and drinking water of many known hazardous substances such as heavy metals, pesticides and organic solvents. Once land is remediated by removal or treatment of hazardous substances, a state may issue a "no further action" letter, giving some comfort to the responsible parties that the brownfield site is ready for re-use, possibly with some limitations on use if the cleanup is not complete. Much effort goes into determining responsible parties and attempts to prevent firms from escaping liability have the unintended side effect of sometimes delaying re-use of land since buyers may wish to avoid the possibility of being held liable for existing conditions. Therefore, checking for contamination has become an important aspect of due diligence in property acquisitions.

USPAP Requirements

USPAP Advisory Opinion AO-9 concerns appraisal of contaminated properties. It mentions assessments of risks due to:

1) the nature and extent of the contamination;
2) estimates of future remediation costs and their timing;
3) potential for changes in regulatory requirements;
4) liabilities for cleanup (buyer, seller, third party);
5) potential for off-site impacts; and
6) other environmental risk factors, as may be relevant.

USPAP defines stigma as:

"An adverse effect on property value produced by the market's perception of increased environmental risk due to contamination."

A key issue for appraisers is often to assess damages to property values. USPAP's Advisory Opinion AO-9 defines damage assessment process as follows:

Impaired Value: The market value of the property being appraised with full consideration of the effects of its environmental condition and the presence of environmental contamination on, adjacent to, or proximate to the property. Conceptually, this could be considered the "as-is" value of a contaminated property.

Unimpaired Value: "The market value of a contaminated property developed under the hypothetical condition that the property is not contaminated."

Diminution in Value (Property Value Diminution): The difference between the unimpaired and impaired values of the property being appraised. This difference can be due to the increased risk and/or costs attributable to the property's environmental condition.

http://commerce.appraisalfoundation.org/html/2006%20USPAP/ao9.htm#Relevant

One of the troublesome question open to interpretation in the above concerns the definition of "market value" in the case of both the impaired and unimpaired cases. In the unimpaired case, obviously assumptions will have to be made about comparable or "control" properties that accurately reflect the hypothetical value of the subject property and the value of any differences between subject and control sites (whether these differences are manifested in assumptions and data used in direct sales comparison, cost, income or other approaches to value).

For the impaired or "as is" value, the appraiser will have to determine whether to accept transactions (actual or inferred by comparison to comparable transactions or stated values) versus making some adjustment for imperfect information.

There is, of course, much more included in AO-9 and other relevant USPAP standards and opinions, but in the interests of brevity and to focus on the "knowledge as determining market value" question, these are omitted here. Interested readers can obtain more details by consulting USPAP's website.

The importance of the information issue can be illustrated by the following simple thought experiment: Suppose there is a condition on the site that is so hazardous it will kill all inhabitants of the site for the next 2000 years, but that this contaminant is tasteless, odorless, invisible and today its harmful effects totally unknown to the market.[8]

Would it make sense to argue that on the day before the contaminant is revealed there is no impairment, assuming the market price falls to zero the next day when the problem becomes public? Can the values on both days be "market values" based on definitions of value including the phrase "knowledgeable" buyers? Would it make sense to argue that a person who did not believe the report on the dangers and paid the full (day before) price for the site paid market value? Alternatively, if it turned out that the market was wrong to believe the report, so that in fact the contamination was harmless, would the fact that the market price had temporarily and incorrectly gone to zero mean that the site's market value was in fact zero?

When do we accept the market's perceptions as indicating "market value" and when do we say market value is not equal to current prices because the market is misinformed? We will return to this question below, to argue that the fundamental question is not about market sale prices, but about justice and deciding who pays the costs of pollution.

Class versus Individual remedies

As mentioned above, it is often the case that multiple parcels are affected by a pollution source. Moreover, the costs of documenting pollution may involve expensive monitoring and chemical analysis while the costs of cleanup may be considerable or cleanup may not be feasible if restricted to a single parcel. For example, if a contaminated groundwater plume affects a well, it is likely that the most efficient clean-up method will be to go back to the source of the contamination rather than cleaning a single site.

Therefore, as a practical matter, pollution cases are often treated as "class actions" under state and federal rules for litigation processes. Rule 23 of the Federal Rules of Civil Procedure states that the prerequisites of a class action include:

> One or more members of a class may sue or be sued as representative parties on behalf of all only if (1) the class is so numerous that joinder of all members is impracticable, (2) there are questions of law or fact common to the class, (3) the claims or defenses of the representative parties are typical of the claims or

[8] If this seems like a far-fetched example, consider the 1950's cigarette ads featuring doctors talking about the health benefits of smoking. There are cases, such as Woburn, MA, where by the time real estate markets realized there were health problems, children were dying.

> defenses of the class, and (4) the representative parties will fairly and adequately protect the interests of the class.

Essentially class actions aim to save the time and resources of the courts by preventing repetitious cases covering the same ground. Once a judge has certified a class after reviewing appropriateness of class treatment, members of the class are all covered by the settlement or decision when the case proceeds to the merits phase where damages will be determined, unless they specifically opt out in writing. Therefore, the class action also has some benefits for defendants in that it can put the matter to rest for all of the affected plaintiffs. The defendant will not, unless plaintiffs opt out, be harassed by repeated suits nor bear the costs of repeated defenses.

Nevertheless, some defendants feel they are better off with individual actions where their superior size and resources give them an advantage. (Think Exxon versus a poverty stricken grandmother in poor health due to drinking contaminated water. With the many delays common in civil suits, the plaintiff would probably not live long enough to enjoy an award.) The damages for an individual, say, for example 10% damage to a house worth $100,000 or $10,000, might not be sufficient to pay the costs of bringing a suit and collecting evidence. It might take several hundred thousand dollars to collect evidence of water pollution and to document the extent of its spread through a groundwater plume, for example, or to analyze soil samples for traces of toxic heavy metals.

In 2005 the business-friendly Republican Congress passed tort reform legislation aiming to reduce “frivolous” class action lawsuits, by making it more likely they would be removed to Federal Courts, deemed to be less swayed by local considerations and working with rules less friendly to plaintiffs. This legislation was justified as necessary to prevent rapacious trial lawyers from abusing class actions in order to earn large contingent fees.

The relevance of the rules of civil procedure to valuation issues is that using mass appraisal methods or a pricing model that provides estimates of values for hundreds of properties at low cost may make assessment of damages more efficient and affordable for the parties. Moreover, conventional appraisal methods have a problem if they seek to use a few nearby properties as comparable sales because it is likely that all properties in an area will be affected. Therefore, looking at larger samples of properties and appropriate control areas using mass appraisal methods will often be better suited for assessing damages where there is class treatment in the legal process.

Case studies and further issues

Case study examples, some of which read like movie script proposals, illustrate additional issues related to valuation of contaminated sites and legal resolution of claims for damages.

The Exxon Valdez Oil Spill

In March 1989 the tanker Exxon Valdez struck a reef in Alaska's Prince William Sound, spilling of 11 million gallons of crude oil, affecting 1300 miles of coastline extending 470 miles from the spill site. Exxon spent $2.1 billion and four years cleaning up oil, but oil still remains on some areas. This case raised major valuation issues and led to changes in Federal NOAA "Yellow Book" appraisal standards (Federal Register 63).

Among the issues was how to define the damaged area. Exxon, the defendant, claimed the effected area was essentially the few feet of beach covered with oil. Plaintiffs, that included nearby communities, Native American tribes and fishermen, contended that larger areas were affected, both inland and encompassing surrounding waters whose animals, sea life and birds were affected. To a considerable extent, Exxon was successful in limiting the definition of the affected area. Greenfield Advisors (then Mundy Associates) argued unsuccessfully, that an ocean beach adds value to parcels to a considerable distance inland. In a key ruling favorable to Exxon the judge held that only parcels actually touched by oil could have their values affected.[9]

Another major issue was definition of the affected values. In Prince William Sound, surrounded by wilderness areas, clearly many of the values affected were public goods including fisheries, wildlife and unspoiled nature. To a large extent these wilderness values and public goods were not explicitly considered in the $900 million settlement. The larger question for contamination cases in general concerns methods for valuing and legal means for recognizing these public goods. Most contamination because it affects soil, water and air, has public good impacts. It would seem reasonable that the public, through government, should recover for these damages.

Another interesting aspect of the Exxon Valdez case was the range of interests affected, from local economies damaged by effects on fisheries, to Native cultural sites damaged by the spill. The latter, certainly provide a challenge to real estate appraisers. How much would it be worth to Christians to avoid polluting the place Jesus was born? Natives might have asked similar questions from their cultural viewpoint.

This case put contingent valuation methods to the forefront, due to the importance of the public (non-traded) goods affected. Survey research methods were used (and developed) to try to assess property value impacts related to public goods such as wilderness values. However, much of this testimony that most economists would probably judge to be relevant, was excluded as legally inadmissible due to precedents emphasizing

[9] Many of the key decisions about real estate valuation methods have been made by judges who have no training in real estate valuation methods, but nevertheless create binding precedents regarding valuation methods. This strikes us as being similar to having lawyers instruct medical doctors or plumbers or cooks how to do their work. The lack of appropriate expertise shows in that the results are often not good. How would judges feel about getting binding advice on their decisions from, let's say, movie actors. A better way to promulgate methods would be for judges to delegate decisions about valuation methods to panels of valuation experts or the professional appraisal bodies. It is especially ironic that appraisers are then legally and professionally responsible for the mistakes caused by faulty methods.

transactions values. This is an example where law does not necessarily conform to accepted economic analysis.

Where transactions reveal preferences, that is the preferred way to assess values, but with public goods or in the absence of transactions (as with tribal lands not normally traded in property markets, but held in perpetuity by the community) it may be helpful to survey "stated preferences" in the form of "contingent valuations." Willingness to pay questions ask how much the respondent would pay to preserve the wilderness, for example, while willingness to accept questions ask how much the respondent would pay to give up the non-traded asset. Questions such as "existence values" (what is it worth to you to know that an Alaskan wilderness exists?), potential for recreational development of lands affected on such a massive scale (and timing based on market absorption rates), and the extent and duration of stigma as well as a number of economic impacts on tourism, fishing and local economies all were part of the complicated and massive Exxon damages claims.

Mundy & Associates performed highest and best use studies as part of this exercise, to determine which parcels indeed had their highest value as wilderness or undeveloped natural areas.

An initial decision imposed heavy punitive damages on Exxon for their negligence, $900 million in actual damages and about $5 billion in punitive damages. Punitive damages are supposed to warn companies to not repeat behavior, serve as an example to others and ensure that the behavior that causes damage to the public and/or other private landowners is not in fact profitable even when actual damages are paid. This was appealed and a much smaller eventual settlement agreed to by the parties.

As with most contamination cases, all of the parties were probably losers, once the ship hit the reef and oil began to escape. Perhaps the most positive outcome for the long run was improvements in tanker safety including requirements for double hulled tankers.

Motorola Case

This case involved contamination of underground aquifers in the Phoenix-Scottsdale, Arizona area. Eighty-five thousand properties were affected. There were 100 defendants whose industrial solvents had been released into the environment. Of major concern was TCE (trichloroethylene) a degreasing solvent that persists in groundwater. The Federal Department of Health and Human Services Agency on Toxic Substances and Disease Registry posts the following information (excerpted here) on TCE health effects:

How can trichloroethylene affect my health?

Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.

Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and

liver damage.

Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9th Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is “reasonably anticipated to be a human carcinogen.” The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is “probably carcinogenic to humans.”
http://www.atsdr.cdc.gov/tfacts19.html

This language in the Federal TCE data such as “reasonably anticipated” raises important questions as to how the scientific, medical and legal areas intersect. The ATSDR website quoted above continues:

Is there a medical test to show whether I've been exposed to trichloroethylene?

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.
http://www.atsdr.cdc.gov/tfacts19.html

With relatively low exposures through drinking water contaminated, for example, with a few times the Federal TCE standard, certainly not every person exposed will get cancer, in fact, cancer risk may be only slightly increased. Yet, for those who do die, the damages could not be larger.

In assessing damages, courts seek a standard of proof that may be difficult to establish in individual cases, although there may be a very high degree of statistical certainty that ill effects have been substantiated in some members of a population exposed. Property value damages may often be easier to prove since these may affect an entire area as people seek to avoid the health risks and investment risks of owning contaminated property. Buyers aware of such risks will naturally avoid purchasing property that entails risks to health.

Businesses may be even more averse to acquiring impaired sites as the Superfund law creates "joint and several" strict liability for anyone on the chain of title. This was designed to avoid firms avoiding liability by selling contaminated sites to "shell" firms that could then go bankrupt without paying damages claims or cleaning up the site. Difficulty obtaining insurance and financing also inhibits re-use of brownfields sites.

In some cases, there is genuine scientific uncertainty about the degree of risk. Animal studies cannot necessarily be generalized to humans since effects do sometimes differ between species. On the other hand, knowledgeable scientists, when they use the term "probably carcinogenic" are using cautious language but implying a high degree of certainty, to support a conclusion based on considerable convincing evidence.[10] TCE, for example, is in a class of compounds called chlorinated hydrocarbons, many of which have been found to cause cancer and other serious health effects. A chemist would suspect TCE of being a carcinogen, just from its chemical composition and membership in a group whose members have been implicated in many studies. Studies with animals would add additional evidence. Human health statistics add still greater certainty. The whole picture adds up to a "guilty as charged" verdict.

Nevertheless, self-interested litigants can often find "experts" who will testify as to inconclusive results, uncertainty regarding damage to health or find fault with studies showing ill-effects. Tobacco companies still sell a product proven to cause disease and death and for decades recruited experts with viewpoints stressing scientific uncertainty.

In Phoenix, plaintiffs were incurring large costs for health monitoring, water testing and real estate appraisals. Part of Motorola's strategy was to try to starve out the plaintiffs by delaying the process. So, when a small defendant would offer to settle, Motorola would agree to take over their liability. This kept the law firms pursuing the case from getting

[10] Formally speaking, scientific method is based on "inductive logic" meaning reasoning from examples to generalizations. Therefore, scientists always remain "uncertain" in the sense that a future counterexample could refute a generalization. So a true scientist would say he is only "reasonably certain" the sun is likely to continue rising in the east, but open to evidence that it might not do so in the future (say after a major collision with an asteroid that could change the direction of the earth's rotation. But for practical purposes, when the scientist says "reasonably certain" you can bet your money on the conclusion.

resources needed to pursue the case further. The defendants knew that if they could exhaust the plaintiff's resources, they would win by default.

In response to the discovery of TCE in aquifers, Phoenix shut down wells and developed alternate water supplies. Scottsdale, however, chose to treat water to get it below the Federal Standard (5 ppb for TCE). However, Scottsdale had a private lab doing water analyses quality control for its treated water. A small local paper's reporter (shades of Erin Brockovich) found out the lab was falsifying results by using a deceptive method. There were spikes in TCE way above the 5 pbb mandated safe maximum level. At that point, Scottsdale was sued in a separate action and immediately agreed to settle, which provided the resources to pursue the rest of the case further.[11]

A local appraiser, had a large property database. Don Dorchester, a nationally known appraiser, performed a mass appraisal using this data and concluded there was no impact on value. Mundy was able to obtain this database through the "discovery" process whereby litigants are obliged to reveal their sources relied upon and evidence to the other side. Plaintiffs hired Peter Colwell of the University of Illinois, a well-respected academic researcher and former AREUEA president, who re-examined the Dorchester pricing model. Colwell found there were significant value effects and that defendants' experts had deleted a key location variable in their analysis.

As the case progressed, a judge split it into three class action cases comprising three different affected areas. Local lawyers handling the plaintiffs' case called in Goldberg-Persky from Pittsburgh, who had handled many successful asbestos cases, to assist with the litigation.

Motorola's attorneys objected to Mundy's survey work and managed to exclude it and even his discussions with local appraisers confirming comparable sales. Bill Mundy feels this was bad law made by a judge with little understanding of appraisal methods that would normally include such discussions to confirm the circumstances of sales and the state of buyers' market knowledge. Colwell's model did make it in and Colwell testified. Key arguments were the extent of the geographical area affected and the types of property to be included. Case, Colwell, Leishman and Watkins published a paper based on this data in *Real Estate Economics*. (Case, et al. 2006)

The judge decided to hear the Scottsdale area case first. The jury in this first trial (there were separate trials for the three affected areas) concluded that Motorola was liable, but there was no property damage. Plaintiffs appealed. The defendants, having been found liable, cut deals with plaintiffs in the remaining two areas. The settlements provided enough to pay for medical monitoring and there were some payments to property owners. Lawyers recovered 80% of the fees they felt they were owed.

Bill Mundy felt that if the Marysville area trial had been first, the plaintiffs would have recovered much more since there were cancer hotspots in that area and more property value damage. Moreover, the first area was an upscale area and the jury was drawn from

[11] Source: Bill Mundy

poorer parts of Maricopa County. They didn't have much sympathy for owners whose values were high and going up due to growth in the area, but not as rapidly as unaffected property values.

In addition to having all the elements of a movie plot, this case demonstrated that expert appraisers could differ in their assessment of damages. It also demonstrated the importance of the judge's decisions on what evidence of damages is admissible.

As a comment, note that real estate appraisal is one of the few fields of expertise where binding Common Law precedents regarding technical issues (i.e. in this case whether contingent valuation methods offer useful information) are made by persons (judges and juries) without specialized competence in the appraisal profession. Judges making decisions about appraisals strikes us as no more logical than say, accountants making decisions about medical surgery methods or military strategy being decided by politicians. Where laymen decide technical issues in a field where they lack expertise, the results are prone to mandating incorrect theories and incomplete analysis or methods. Appraisers who know these methods are wrong are then required to use them because the Common Law says that is how appraisals must be done.

Other cases briefly noted

In order to keep this article from expanding to book length, we will merely mention a few more cases briefly. Obviously, the accounts of the Exxon-Valdez and Motorola cases outlined above could have been expanded greatly as the records of these cases were voluminous and the issues complicated and diverse.

Brief mention should be made of a case that did not involve extensive litigation and delay and where the polluter acted with praiseworthy energy and intelligence to minimize the actual damages to the environment and other parties, rather than focusing, as in the above cases, major efforts on reducing monetary costs to the polluter.

A Union Pacific railroad car loaded with drums of herbicide pitched herbicide off an improperly loaded train into the Sacramento River. UP decided to settle, got a class certified and settled in a month with resorts and landowners. They also treated river water with borrowed fire trucks to aerate water so as to get rid of volatiles, even over objections of California's EPA permitting authorities, because it was the best way to cure the problem and prevent further damage. In other words, the company did the right thing and took care of its liability quickly. This was wise in terms of minimizing cost to the company as well as damage to the river, and saved costs relative to fighting what would certainly have been a losing case. In firms where "triple bottom line" accounting has taken root, this reaction to pollution incidents, as well as stronger preventative measures may become more common.

An ASARCO lead smelter case in Tacoma led to an interesting settlement regarding future damages. In many pollution cases, the property value effects play out over a period of time—often decades—as the pollution occurs, becomes known, is remediated and then

market perceptions or "stigma" fades over time. The damages to property owners may be realized and therefore permanent, if the owner sells during the time values are affected, or temporary if values eventually fully recover. It may often be the case, that what is affected is the rate of appreciation relative to other unaffected areas. In the ASARCO case the judge ruled that appreciation rates would be compared ten years after the date of an initial award for damages to that point in time to assess differences in subsequent appreciation rates between affected areas where the airborne plume deposited lead and arsenic contamination, versus nearby unaffected but otherwise similar "control areas." The last of these cases was recently arbitrated according to a procedure set forth in the initial decision ten years ago, and a landowner was indeed able to prevail by showing additional damages through the slower appreciation rate of an affected property.

An interesting "stigma" case involved Mississippi timberlands where an underground salt dome had been leased by the Federal government for an underground nuclear test. The test generated more than expected explosive force, shattering the concrete plugs in test boreholes that had been drilled into the salt dome. Resulting radiation killed vegetation in a small area around the test site. However, Mundy was able to document that fear of radiation would cause timber buyers to reject timber from the entire property, thereby documenting substantial economic damage, standing timber being classified as real estate. No doubt in some embarrassment about the failed test and not anxious for a public trial, the government agreed to settle.

A Louisiana case, still in litigation raised property rights issues related to trespass and underground storage. This case underlines that the legal responsibility and damages payable depend on property rights laws that can vary from state to state, particularly with respect to water rights and underground mineral rights or other subsurface issues.

A pending Kansas case raised issues related to secondary economic effects or multiplier effects on a small town economy where pollution motivates relocation of local employers (jobs lost) or local businesses choosing to expand elsewhere (jobs foregone), with the effects of reducing property values throughout the community, as well as public sector property tax revenues.

Our property rights system protects landowners from externalities caused by toxic substances, but does not protect owners from losses in value due to plant closures or other negative externalities. On the other hand, property owners do not owe compensation to firms whose developments increase values in a community by adding employment, for example. The majority of spatial externalities appear to fall under the heading "location factors" in real estate analysis, and, positive or negative, require no compensation. However, at times the boundary may be unclear between non-compensable externalities versus nuisances and negative health effects that should result in compensable property damages.

An Oregon, uranium mine tailings dump near a small community, resulted in a cancer hotspot discovered later by university medical researcher's statistics. This became the second Superfund cleanup site in the nation. However, the Reagan Administration was

not enthusiastic about administering the Superfund Law, and the cleanup was botched. Trucks hauling the tailings to a new site for burial turned over and dumped tailings into a stream from whence they found their way to dairy farms. Herds with radioactive milk had to be destroyed. Moreover, the pit dug to contain the tailings proved to be too small, resulting in cost overruns. In this case the government ended up buying affected farms for full unimpaired value, a way of setting a maximum limit on property damage awards. However, non-compensable business or going concern values were probably not paid, so the farmers probably felt they had not been made whole in this fiasco.

A creosote wood treatment operation in Mississippi raised information and stigma issues. Mundy staff asked owners if they could smell the pollution—probably as good a way as any to measure awareness of the problem. However, in a low income neighborhood of poorly educated homeowners, one might doubt whether market information was sufficient to fully reflect the pollution damages in property transaction prices. Moreover, in communities where employment depends on the polluting industry, not only local governments, but also local residents may have incentives to minimize the effects of pollution. This raises the question, "If people don't want to know about the damages, are they still real?" Another depressing point is that if every nearby location suffers some kind of impairment—air pollution, water pollution, noise pollution, visual pollution—what can we use as a control area to measure the value of unimpaired sites? Lack of market response to impairment may conflict with market value definitions that refer to parties acting prudently and with informed self-interest.

Summary

The above overview should leave the reader feeling daunted by the complexity of valuation issues confronting appraisers of contaminated sites. To summarize main points:

a. In the absence of regulation or when regulations fail, the courts provide remedies to protect property rights from pollution and to motivate responsible behavior by polluters who would otherwise be tempted to avoid costs of containing pollutants by imposing external costs on others.
b. The science of pollution determines the real extent of health and environmental effects, extent and dispersion of pollution, monitoring and remediation costs. Environmental fate, effects and remedies vary for each type of pollutant. Often this science involves uncertainty about the future environmental fate and effects of particular toxic substances.
c. Legal processes, particularly the state and federal rules of civil procedure related to class action treatment of tort claims, play a role in determining the appropriate valuation methods. And valuation methods influence the appropriate legal procedure through the "common issues of fact or law" required for class treatment. "Common issues of fact" may include valuation methods such as pricing models and contamination effects common to a class of properties.
d. With limited sales evidence and lack of market information, survey methods (so called "stated values" or "contingent valuation methods") can be used to enhance

understanding of effects on property values and to demonstrate more clearly the relationships between pollution and market behavior.

e. Where knowledge of contamination, or evaluation of contamination effects is faulty, courts may validly adjudicate based on reasonable standards of justice, based on assessments of how better informed ("knowledgeable") markets might react to contamination.

To expand briefly on the last point, much discussion has occurred over a long period of time in the appraisal literature regarding the appropriate definition of market value. Specifically, does market value equal current transactions prices?

Where an efficient market operates with frequent transactions, well informed buyers and sellers and transparency that provide good information, most economists doubt that anything other than transactions prices gives the best evidence of value. In other words, in an efficient market, value equals price.

Some real estate professionals, including the authors of this paper, believe that at times in real estate markets, we observe cycles (bubbles and busts) and other evidence of mispricing. At least in hindsight, markets are sometimes wrong, and markets sometimes overreact. So, in principle, there are times when it would be a useful function for appraisers to report their opinions about whether current market price overvalue or undervalue properties. During the 1980s office market over construction cycle, it would have increased market efficiency for appraisers to point out that impending oversupply was likely to increase vacancy rates, reduce rents and therefore reduce future prices. Value in 1988 was probably less than market prices in many markets. After the office markets collapsed, some properties' values probably exceeded the prices lenders were getting for the properties they had acquired when borrowers defaulted. Similarly, those who warned homeowners in hot markets during 2005 that current high prices might reflect a bubble would have done a service to clients. The issue here is whether when buyers are ill informed about contamination and its effects, courts should be willing to decide, in pursuit of justice, that efficient market property values and market prices can diverge.

The current USPAP definition of value is:

MARKET VALUE: a type of value, stated as an opinion, that presumes the transfer of a property (i.e., a right of ownership or a bundle of such rights), as of a certain date, under specific conditions set forth in the definition of the term identified by the appraiser as applicable in an appraisal.

> Comment: Forming an opinion of market value is the purpose of many real property appraisal assignments, particularly when the client's intended use includes more than one intended user. The conditions included in market value definitions establish market perspectives for development of the opinion. These conditions may vary from definition to definition but generally fall into three categories:
>
> 1. the relationship, knowledge, and motivation of the parties (i.e., seller and buyer);
> 2. the terms of sale (e.g., cash, cash equivalent, or other terms); and

3. the conditions of sale (e.g., exposure in a competitive market for a reasonable time prior to sale).

This rather open definition allows appraisers to choose from a variety of definitions appropriate in particular circumstances, so long as the key assumptions regarding circumstances of sale are stated explicitly and communicated to the client.

The GAO U.S. government definition of value more closely resembles earlier Appraisal Institute definitions of market value:

"Market value is the amount in cash, or on terms reasonably equivalent to cash, for which in all probability the property would have sold on the effective date of the appraisal, after a reasonable exposure time on the open competitive market, from a willing and reasonably knowledgeable seller to a willing and reasonably knowledgeable buyer, with neither acting under any compulsion to buy or sell, giving due consideration to all available economic uses of the property at the time of the appraisal. (Yellow Book, Page 13, Section A-9)

An earlier version of USPAP defined market value as:

"The most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition are the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:

1. buyer and seller are typically motivated;
2. both parties are well informed or well advised, and acting in what they consider their best interests;
3. a reasonable time is allowed for exposure in the open market;
4. payment is made in terms of cash in **United States dollars*** or in terms of financial arrangements comparable thereto; and
5. the price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale."

The origin of the GAO and earlier USPAP market value definitions can be traced back to Court decisions in condemnation (involuntary takings) cases, where land was being acquired from an unwilling private party by a public agency for a public purpose. In these cases, the seller was under compulsion and in fact did not wish to sell, but could not prevent the taking by the government. In these circumstances, courts sought to imagine the circumstances that would result in a sale at a fair price. The Australian "Spencer Case" of 1902 explicitly includes language similar to "we conceive the sale to have been consummated as if" then listing the above sorts of "no compulsion, well informed parties" efficient market assumptions. So, interestingly, the market value definition used for a century had its origins in non-market (public taking) transactions, or rather court's attempts to define conditions whereby a fair price could be determined.

It seems to us that contaminated sites cases provide the courts with a similar challenge. The owner did not ask to be polluted. The circumstances may include elements of compulsion (unless one considers selling to avoid negative health effects on one's self and family to be a voluntary transaction). The parties may have very unequal bargaining power—the world's largest corporations versus poor homeowners whose net worth is insufficient to pay a fraction of the costs of litigation. Information is often limited, regarded as untrustworthy (remember the Alabama case where owners did not, according to the judge, believe the corporate assurances that there was no problem), and hidden. It is these circumstances that compel parties to resolve their differences in courts of law rather than through voluntary bargaining.

And in these circumstances, courts should revert to the involuntary takings definitions of value that require assumptions of knowledgeable parties and lack of compulsion. It may be that in some circumstances markets will have overreacted so that current transactions are below a reasonable fair market value based on full information. More frequently it is probably the case that the full extent of market value damage has not appeared in market prices because parties are ill informed or unwilling to admit the full extent of property value damages.

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