An Evaluation of Public Preferences for Superfund Site Cleanup

VOLUME 2:

Pilot Study

by

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VOLUME 2

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Chapter 1

OVERVIEW AND EXECUTIVE SUMMARY

Cleaning up abandoned hazardous waste sites under CERCLA (the Comprehensive, Environmental Recovery, Compensation, and Liability Act) has proven to be a difficult task since the law was passed in 1980. The remediation process for cleaning up many sites has been delayed by costly litigation and has led to public frustration. The process of site remediation works in the following way. Initially, a site is brought to the Environmental Protection Agency's (EPA) attention by state or other Federal agencies, or the public. EPA then makes a determination of whether or not an imminent risk exists at the site and a time-critical removal is necessary. If so, EPA oversees an immediate cleanup. If not, an assessment of the site is conducted to determine the possible extent of contamination and populations potentially exposed. The site is rated on a scale that measures, among other things, the potential for, and possible magnitude of, health risks caused by the release of hazardous substances. If the site ranks high enough on the Hazard Ranking System (HRS) scale, it is placed on the National Priorities List (NPL) for cleanup which allows Superfund moneys to be spent on site investigation and cleanup. If a site is targeted for remediation, the EPA, or in some cases the state, directs the cleanup process. The EPA or states may try to recover costs from the Potentially Responsible Parties (PRPs) and get the PRPs to clean up sites themselves, often causing delays in the cleanup process. One major issue that needs to be resolved is determining the appropriate level of cleanup of hazardous substances at sites currently listed on the NPL.

One difficulty in resolving this issue is that, although many experts believe that NPL sites pose little immediate threat to the public, people living near such sites believe they are at serious risk. In Volume I of this report, the available literature was summarized on preferences for cleanup of Superfund sites including evidence on (a) what determines public risk beliefs and (b) how much the public values cleanup of Superfund sites. In particular, it was concluded that the beliefs of the public can result in real

economic losses for residents living near hazardous waste sites (in terms of lower property values), and that it is the subjective beliefs of the public, not the subjective beliefs of experts, that should drive the decisions regarding cleanup. Further, evidence suggests that remediation of about 20% of sites would generate more than 80% of the benefits. These high benefit sites are situated in areas that have a high population density within a one-mile radius of the site.

In this volume, we present the detailed technical results of a pilot market research study that was conducted to determine preferences for the specific type and level of cleanup desired by the public at Superfund sites. The study evaluates both a market research approach and the contingent valuation method (CVM), as an alternative, to find out the level of cleanup that individuals prefer. The market research methodology, although rarely used to value environmental commodities, has been fully developed in the literature (see for example The Journal of Business supplement-- *Interfaces between Marketing and Economics* 1980, esp. McFadden, 1980). One advantage of using a market research choice based approach is that values can be obtained for several alternative levels of cleanup using one survey, whereas, in the CVM, several separate surveys must be administered to evaluate a variety of cleanup alternatives. Thus, a much larger sample size is potentially needed for the CVM which substantially increases implementation costs.

The focus of this volume is on the market research approach using a choice methodology for obtaining implied values. Contingent valuation (CV) surveys were also developed in conjunction with the choice surveys. The CV surveys were developed as a backup methodology in the event that the conditional logit model was unable to extract meaningful willingness to pay estimates for each option using the market research approach (i.e. the price of cleanup was insignificant in explaining choices in the econometric model). If the choice methodology had been unsuccessful, the CV surveys would then have been developed to find values for all of the various cleanup options. In fact, as is shown in Chapter 5, the choice model was able to produce reliable willingness to pay estimates and therefore the CV surveys were not pursued.

A CVM willingness to pay (open ended bid) survey version was administered as part of the pilot study, and additional sessions would have

been scheduled if the market research approach had been unsuccessful. The sample size of 41 CVM respondents is too small to make a statistically valid comparison between the market research and CVM results (for sample size requirements in comparisons across surveys see Schulze, et al. 1990). A CVM referendum (dichotomous choice) survey was also developed as a part of the verbal protocols, but was not used in the pilot study. These alternative valuation methods are further discussed in Chapter 2 and verbal protocols used to provide guidance in design of the surveys are presented in Chapter 3.

Table 1.1 summarizes the different survey versions that were developed for the verbal protocols and pilot study. Twenty respondents participated in verbal protocols which tested survey information, context and choice valuation questions. The verbal protocols utilize a one-on-one setting that reveals individual problems with the survey design. More than 250 respondents participated in the pilot study which relied on the surveys developed from the protocols. Appendix A contains the six final versions of the full information/full context surveys while Appendix B contains the first three verbal protocol surveys (the fourth is not presented in Appendix B because no further modifications were made as a result of the fourth round of verbal protocols so this version appears in final form in Appendix A as the Landfill Choice Version 2 survey). The first final survey version describes a hypothetical abandoned industrial facility and asks the subject to choose from a range of cleanup alternatives. Four survey versions follow which describe a hypothetical abandoned landfill site rather than an industrial facility. These surveys ask the respondent to choose a preferred level of cleanup, but the four different versions describe alternate cost and health risk schedules for the cleanup options. Two health risk schedules were developed (column 3 of Table 1.1) and three cost schedules (column 4 of Table 1.1). The final pilot study survey is the landfill CVM-WTP version.

TABLE 1.1 SUMMARY OF SURVEYS:

Site Type	Valuation Method	Health Risks*	Cost**	Number of Subjects
Verbal Protocols-				
INDUSTRIAL	CHOICE	**1** †	**A**	5
LANDFILL	CVM-WTP	**1**	**B**	5
LANDFILL	CVM-Referendum	**1**	**B**	5
LANDFILL	CHOICE	**2**	**B**	5
Pilot Study-				
INDUSTRIAL	CHOICE	**1** †	**A**	46
LANDFILL	CHOICE	**1**	**B**	62
LANDFILL	CHOICE	**2**	**B**	41
LANDFILL	CHOICE	**2**	**C**	40
LANDFILL	CHOICE	**1**	**C**	37
LANDFILL	CVM-WTP	**1**	**B** ††	41

*** Health Risk Schedule (deaths per year):**

Cleanup Option	**1**	**2**
No Action	2.1 in 10 million	2.1 in 10 million
Institutional Controls	0.1 in 10 million	0.1 in 10 million
Soil Cap and Water Filtration	none	none
Soil Cap and Groundwater Barrier	none	none
Complete Cleanup	none	0.1 in 10 million (over 10 yrs. only)

† In the Industrial version the small off site health risk (0.1 in 10 million) is described to be from windblown contaminants and thus involuntary. In the Landfill versions the small risk is from recreating in a contaminated creek (a voluntary hazard).

**** Cost Schedule (dollars per household per month for 10 yrs.)**

Cleanup Option	**A**	**B**	**C**
No Action	$0	$0	$0
Institutional Controls	$1	$1	$5
Soil Cap and Water Filtration	$4	$4	$8
Soil Cap and Groundwater Barrier	$8	$8	$12
Complete Cleanup	$12	$25	$50

†† In the Contingent Valuation Survey the cost of Complete Cleanup was not provided. The subjects were asked to give Willingness to Pay bids for Complete Cleanup.

This Volume is organized as follows: Chapter 2 provides a detailed description of the survey instruments used in the pilot study. Chapter 3 describes the verbal protocol procedure used in designing the survey instruments. Chapter 4 describes the recruiting protocols for the participants in the pilot study, the descriptive results from the pilot study, and reactions of participants to the survey. Chapter 5 estimates a model of cleanup options using conditional logit and then estimates the willingness to pay for each cleanup option. Chapter 6 presents conclusions.

Chapter 2

DESIGN OF THE SURVEY INSTRUMENTS

2.1 SURVEY DESIGN OVERVIEW

Several alternative survey approaches were examined to obtain the preferences and values held by the public for alternative remedial actions at USEPA designated Superfund sites around the nation. These alternative instruments reflect differences in the valuation framework employed in the survey as well as differences in general site characteristics. The objective of the design of the instruments was to:

1) Develop prototypical survey instruments that could be easily transferred to specific sites, and

2) Provide insight into appropriate and useful valuation and preference formats for use in these surveys.

As discussed in Chapter 1, there are substantial costs associated with the Superfund program and growing public frustration associated with the pace of cleanup activities. One issue responsible for some of the delay in cleanup activities (but not the only issue) concerns the level of cleanup that should be achieved at Superfund sites. Some scientists maintain that actual health risks at many of these sites are small. However, there is a discrepancy between the risk beliefs held by experts and the risk beliefs held by the public, who tend to believe that substantial health risks from these sites exist. Substantial welfare gains may exist if the public would accept less than complete cleanup. Currently applied valuation frameworks, such as property values or the CVM, are not entirely suited to address the issue of choice of the most desirable cleanup level. Thus, we initially examined several possible valuation frameworks, including a discrete choice-based framework, an open-ended CVM, and a referendum (dichotomous choice) CVM.

Although each Superfund site has site-specific characteristics which affect remedial decisions, there are some elements that are generally common to certain site classifications. Three variants of the survey were initially created based on general characteristics typical of certain sites. These common site classifications included characteristics typical of

1) industrial facilities,
2) landfill sites, and
3) mining sites.

However, based upon an examination of the NPL database, it was concluded that mining sites represent a very small fraction of the total number of Superfund sites, and therefore mining based variants of the survey were eliminated from further design consideration. In the following sections we describe each of the major variants of the survey.

2.2 GENERAL ISSUES IN THE DESIGN OF THE SURVEY

Variants of the survey were developed to explore differences in general site characteristics, the valuation format, associated risk levels with cleanup options, and costs of the cleanup options. With respect to differences in general site characteristics, two primary variants of the survey instrument were developed. The first variant considered the issues and remedial actions associated with an abandoned industrial facility, whereas the second variant focused on an abandoned landfill. The process of developing these two variations involved research to generalize typical problems at each type of site and to characterize the types and ranges of remedial alternatives available to address problems at each site.

In order to develop pilot survey instruments that minimized scenario rejection and to facilitate the design process, fictitious descriptions of each of the two types of sites that represent the most common kinds of hazardous waste sites were developed. Information on the most common types of sites and descriptions of sites were obtained from USEPA records and feasibility studies for specific sites. Site descriptions will be discussed in more detail below. The survey was designed to flow from general issues concerning hazardous waste problems and the Superfund program in the U.S. to increasingly narrower issues pertaining to site-specific problems and remedial activities.

Each version of the survey instrument followed a consistent framework for presenting information and asking questions. The parallel structure of the surveys is readily apparent (see final pilot study versions in Appendix A). Each survey described a fictitious site that had recently been added to the Superfund list of sites and for which there was no longer a responsible party that could be held liable for site remediation and cleanup. Each site was described as being in a community of 80,000 households (about 200,000 people) and that each community would be responsible for funding cleanup at their site -- and their site only.[1] The survey added that nearly all other communities in the nation each had hazardous waste sites which its citizens were responsible for cleaning up. This information was designed to give the respondent a feeling of "fairness," that everyone would have to contribute to cleaning up the site closest to or within their community.[2]

To mitigate against information and context biases that have plagued survey researchers for many years, cognitive psychologists have been actively researching survey design strategies. This research has been applied both in market research and in the CV literature (see for example Lazo et al., 1992). Survey design begins with the development of a prototype instrument that conveys a complete context and provides full information to the respondent. Testing of the prototype instruments by conducting verbal protocols (see Chapter 3) and then a pilot study (Chapter 4) provides insight into wording problems, scenario rejection, and which information is important to the respondent in making decisions and answering questions. Reductions in the survey length can then be considered with a minimum effect on the information needs of the respondent. This systematic methodology in survey design can result in instruments that are carefully tested and suited to the objectives of the study.

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[1] A community of 80,000 households was chosen because it is approximately the number of households in the U.S. per currently listed NPL site.

[2] Although this scenario does not reflect actual CERCLA provisions and regulations concerning site remediation and liability, it provides a convenient context from which we can assess public values without significant scenario rejection bias.

The remainder of this chapter is organized as follows: one variant of the final pilot study survey instrument is described in detail, specifically, the variant describing an abandoned landfill site using a choice-based valuation framework with an additional health risk in the complete cleanup option. It is followed by a discussion of the different survey versions, including the valuation formats used in the surveys, a description of the site variants, and finally, modifications of the cost schedule associated with alternative cleanup options.

2.3 SURVEY DESIGN - THE *ABANDONED LANDFILL* SITE SURVEY USING A DISCRETE CHOICE VALUATION FRAMEWORK

In this section we describe the format, information, context, and remedial alternatives associated with the landfill version of the survey. This version of the survey describes the characteristics associated with an abandoned landfill site using a choice-based valuation framework with an additional health risk incorporated in the complete cleanup option. This survey design was the final version tested in the verbal protocols and no changes in the text were found necessary (see Landfill Choice Version 2 in Appendix A page A-3.1). The choice framework is described in detail because it is our recommended approach. However, much of the survey design is common to all versions. Variants of the survey will be discussed in section 2.4.

Survey Cover:

The front cover is titled "What Do You Think Should Be Done About Hazardous Wastes? The Case of the GCR Landfill." The site was given a specific name to personalize it to respondents. The cover includes a map of the United States that identifies how USEPA designated Superfund sites are distributed by state across the country (see Figure 2.1). The purpose of the map is to show respondents that every state has sites and, therefore, cleaning up hazardous waste sites is an issue that affects and will impose costs on everyone.

Figure 2.1

Survey Cover

2.3.1 SURVEY INTRODUCTION

The first section of the survey focuses on general awareness and attitudes about hazardous waste sites and the Superfund program in the United States. The introductory questions are straightforward, making it easy for the respondent to begin the survey (Dillman, 1978). The first question investigates familiarity with hazardous waste sites in the respondent's own community. It explains the Superfund program, how sites qualify for the National Priorities List (NPL), and refers to the map on the cover of the survey showing where these sites are located by state. Respondents are told that these sites have been abandoned and that there is no responsible party in existence to clean them up. Although this statement is false, it was included to overcome scenario rejection in the pilot study. Surprisingly, none of our more than 250 pilot study subjects challenged the accuracy of the statement. The second question asks if the respondent supports Federal efforts to clean up or reduce risks from hazardous waste sites. The next question is intended to make respondents think about why it is important to them to clean up Superfund sites. The last question in the section recognizes that the cleanup of hazardous waste sites is only one issue facing local citizens. It requires the respondent to consider the importance of cleaning up these sites relative to other issues. The intent is to diffuse any prominence bias that may result from receiving a survey on a specific topic, as well as to obtain a general understanding of how important residents feel it is to clean up hazardous waste sites.

2.3.2 ENVIRONMENTAL EFFECTS OF AN ABANDONED LANDFILL

In this section, some general background information is given about both the benefits and costs that have resulted from these sites. Benefits from landfills include a convenient place for communities to dispose of unwanted garbage and refuse, while the costs include the potential release of hazardous substances into the environment. Individuals are reminded that regulations and technologies were different when these sites were built than they are presently. The purpose of this information is to reduce or eliminate any beliefs that a "bad guy" should be held responsible and pay for cleanup. Two questions are asked in this section. The first queries if the respondent has ever knowingly thrown out hazardous materials with

their regular household garbage, and the second asks if the respondent is aware of any hazardous waste problems in his or her own community that are associated with landfills. These questions were designed to get the respondent thinking about how they have contributed to landfill problems and also to give an opportunity to the respondent to think if he or she is personally affected by a landfill.

2.3.3 AN ABANDONED LANDFILL IN YOUR COMMUNITY

In this section, a hypothetical scenario describing one abandoned landfill is constructed for the respondent. The respondent is told that the site is fictitious, but that the descriptions of characteristics and alternative cleanup options are typical of abandoned landfill sites around the country that qualify for the National Priorities List (NPL). The respondent is told to imagine that the community in which they live has about 80,000 households (for reasons discussed in section 2.2). The survey goes into detail describing physical characteristics of the fictitious site, its history, and the hazardous substances contaminating the site. The description was designed to be as realistic as possible. The information used to construct site characteristics was obtained from various Records of Decision (RODs) describing particular landfills that are currently on the U.S. EPA's NPL and also from initial work performed by Industrial Economics Incorporated (IEC) on site characterization. For example, hazardous substances that are common to landfill sites are included in the description of the site. The survey then goes on to explain how the contamination affects various natural resources in the community. Two types of contamination were chosen to characterize the abandoned landfill, groundwater contamination and surface water contamination. Information on each resource describes what the resource is, provides a scientific explanation of how it can become contaminated, and how it affects the community. A figure illustrating the process of contamination is included with this general science information, along with scientific (expert) estimates of the risks associated with exposure to the contamination. A risk ladder is presented which compares the expert estimate of the level of risk from exposure to contamination at the site with other more familiar risks (such as cigarette smoking). This section concludes with a question asking how accurately the respondent thinks scientists can estimate risks from hazardous wastes.

2.3.4 COMMUNITY OPTIONS FOR CLEANING UP HAZARDOUS SUBSTANCES AT LANDFILL SITES

In this section, five separate cleanup options are presented to the respondent. They are: no action, institutional controls, landfill cap and water filtration, landfill cap and groundwater barrier, and complete cleanup. The options begin with a “no action” scenario and progress until they develop into a “complete cleanup” option, thus covering a broad spectrum of cleanup options. Each option includes the expert assessment of the risk that would be eliminated after the cleanup option was implemented and also the risk that would remain. This variant of the survey includes an expert assessment of a slight health risk which is associated with the "complete cleanup" option. This risk is intended to reflect health risks resulting from the removal and transportation of hazardous substances. The health risk is described as one death in ten million people per year for a period of 10 years caused by exposure to windblown soil and transportation risks caused by removal of hazardous substances during the cleanup process. The risk was included because there has been some evidence that risk created during the cleanup process can drive people away from choosing "complete cleanup" over other cleanup alternatives (Bernstein, 1991). The additional health risk is shown in Figure 2.2.

The cleanup options were developed from feasibility studies conducted at specific sites and are typical of cleanup actions performed at landfill Superfund Sites. After each cleanup option, there are two questions (see questions 11 - 20 in Appendix A, Landfill Choice Version 2). The first of the questions asks if the respondent is satisfied with the option (in a --Yes/No/Not Sure-- format) and the second question asks the respondent to rate on a one to ten scale how well he or she thinks that the option solves the contamination problem at the site (we call this the respondent's ‘Cleanup Rating’).

Figure 2.2

Additional Health Risk in the "Complete Cleanup" Option

However, during the 10 year period of complete cleanup, the movement and transportation of landfill wastes will result in some windblown releases of hazardous substances as well as some small possibilities for transportation accidents. Nothing can be done to completely eliminate these risks which scientists estimate will expose the average person in your community to a risk of one death in ten million per year (equivalent to letter b on the Risk Ladder in Figure 3) for ten years. That is, cleanup activities will result in a 20% chance of one death during the 10 year period in your imaginary community of 200,000. Actions associated with the implementation of the COMPLETE CLEANUP option are estimated by scientists to have the following effects on risks:

2.3.5 COSTS OF CLEANUP ALTERNATIVES AT THE GCR LANDFILL

In this section, for the choice versions of the survey, the costs of the cleanup programs ranging from "no action" to "complete cleanup" are stated. The survey asks if the respondent would be willing to pay for each cleanup program on a monthly basis for the next 10 years in a close-ended, yes-no format. A summary of the action that would be undertaken for each option, along with the cost of the option, is presented as a reminder of the characteristics of the option that the respondent is choosing. The respondent is told how much the remedial program would cost per month for the next 10 years, as well as the total cost of the program. The purpose of this section is not to obtain willingness to pay estimates, but rather, to get respondents thinking about costs associated with cleanup.

As previously mentioned, individuals are less likely to scenario reject if they believe that the payment program is fair. For example, an individual may have a positive willingness to pay to have a hazardous waste site cleaned up, but feel that industry should be responsible for paying for the cleanup and therefore state a $0 willingness to pay. This survey attempts to overcome scenario rejection by informing the individual that everyone will have to pay for cleanup of the hazardous

waste site in their community and that all sites will be cleaned up to the same level.

2.3.6 CHOICE

The choice part of the survey follows the cost information section. The market research, choice-based approach elicits the most preferred level of cleanup from respondents. In this version, a summary of all the options are presented with the costs included (see Figure 2.3). The respondent is asked to select his or her most preferred option. The respondent is then asked to make a second choice in case for some reason his/her first option is not possible. Using data obtained from first and second choices, it is possible to estimate a conditional logit model to predict choices as a function of the characteristics of the choice and of the household. It is also possible to estimate willingness to pay for each choice relative to another choice (see McFadden, 1976, 1980).

2.3.7 RESPONSIBILITY

After the choice (or valuation question in other variants), a follow-up question asks respondents how responsible they feel they are to help pay for cleanup of contamination from hazardous substances in their community. In a prior CVM study, respondent responsibility level was found to be an important determinant of the reported WTP amount (McClelland et al., 1992). For example, respondents who feel that the "responsible party" should pay completely for the cleanup are likely to reject the WTP question or provide $0 values. Protest $0 responses can be partially detected through the evaluation of written comments and other survey data.

Some respondents who reject responsibility may still report positive WTP amounts, but these amounts may be less than their maximum WTP for the remediation. Such responses may reflect a willingness to cooperate, but a resistance to pay the most it is worth to them because they feel they should not have to pay anything at all. Failure to accept responsibility to pay for environmental improvements is a scenario design limitation that biases the CVM valuation toward lower values. The choice format may partly avoid this problem. In the choice format, because the costs of the options are fixed, the respondent could only decrease their implied bid by

Figure 2.3

Choice Question

Your imaginary community **must** select one of the cleanup options. Even if none of the options are very attractive, one must be chosen. Note that everyone across the country will pay the same amount for cleanup of their own sites since one level of cleanup will be chosen for the nation. Of all the options listed below, please circle the **one** option that you would want your community to adopt assuming that all other communities across the nation adopt the same level of cleanup. Cleanup will actually be funded out of federal taxes so everyone will contribute. In making your choice, be sure to consider your satisfaction with (a) how well the problem is solved by the option compared to other options, and (b) how much the option costs your household.

Q25 Please select the cleanup option you **most** prefer. (circle preferred option)

A. NO ACTION
- No action by the government.
- No cost to your household.

B. INSTITUTIONAL CONTROLS
- Replace contaminated water with clean water.
- Fence built around site, signs posted and site monitored.
- Direct access to site limited, however, access to the creek is not restricted.
- No future uses of the site are expected to be permitted.
- Cost of $1 per month for 10 years or total of $120 to your household.

C. LANDFILL CAP AND WATER FILTRATION
- Build a central treatment plant to filter contaminated water.
- Installation of a 1 foot clay cap to prevent the movement of water through contaminated waste.
- Digging at the site is prohibited, however, limited future uses of the site are allowed.
- Cost of $4 per month for 10 years or total of $480 to your household.

D. LANDFILL CAP AND GROUNDWATER BARRIER
- Installation of a 1 foot clay cap to prevent the movement of water through contaminated waste.
- Digging at the site is prohibited, however, limited future uses of the site are allowed.
- Subsurface barrier built to contain contaminated groundwater.
- Replace contaminated water with clean water.
- Cost of $8 per month for 10 years or total of $960 to your household.

E. COMPLETE CLEANUP
- Removal of all contaminated waste and garbage.
- Extraction wells built to treat contaminated groundwater & re-inject it into the underground water table.
- Replace contaminated water with new wells during cleanup.
- The site is restored and suitable for future redevelopment.
- Cost of $25 per month for 10 years or total of $3000 to your household.

choosing a cheaper cleanup option (lower level of cleanup) than they desired. If the respondent does this however, they are choosing a cleanup option that they do not in fact desire. The opportunity to avoid responsibility is limited by the choice question, in comparison to a WTP question for a fixed level of cleanup.

2.3.8 DEBRIEFING QUESTIONS

In this section, respondents were asked to go back through the survey and answer questions concerning the usefulness of the information and context presented in the survey. Questions D1 through D10 were thus designed to obtain information about what materials in the survey the respondent felt were useful and informative for making a decision about the choice of cleanup option at the hypothetical landfill site. The questions were designed to find out if respondents thought the site description was adequate and believable, and if individuals answered as if they really did live near the site. Questions were also asked to find out how the information on the contamination of natural resources by hazardous substances, the figures, information on expert estimates of risk levels and the risk ladder, and information on alternative options were used in the choice process. The responses to these questions can be quite useful for revising the survey design based on the material respondents actually use in decision making.

2.3.9 ABOUT YOU AND YOUR HOUSEHOLD

The final questions (H1 through H12) request standard demographic information that is useful in statistical analysis and can be compared to population data, including length of residence, age, gender, employment status, household size, recycling behavior, membership in environmental organizations, education, and income.

2.4 SURVEY VARIANTS

In this section, we discuss the changes made to the survey design presented in section 2.3 for the different versions. In particular, the valuation framework, the site characteristics, and different cost schedules are examined.

2.4.1 VALUATION FRAMEWORK

Variants of the survey are based on differences in the choice/valuation format presented to respondents in the survey. Two of the variants use different contingent valuation formats to assess the maximum willingness to pay of individuals for complete cleanup rather than the market research choice-based approach. In both of these versions, respondents are presented with information on alternative cleanup options and costs for options one through four just as in the previously described survey, but are not given costs for the complete cleanup option. Each of these variants are described in detail.

Contingent Valuation Using a Willingness to Pay Question:

The first contingent valuation variant (see Figure 2.4) asks individuals their maximum willingness to pay for complete cleanup at a hypothetical hazardous waste site in their community (see for example Brookshire et al., 1982). Respondents are given a summary of what actions would be undertaken at the site for complete cleanup, but are not given information on the cost except to say that it is unknown. Individuals are told that the money will be collected by increasing federal taxes. Special emphasis is placed on the fact that everyone will contribute to the cleanup program since most communities have sites that need to be cleaned up and that all sites will be cleaned up to the same level. The information is given so that a notion of fairness is instilled in the respondent. The question is structured to be incentive compatible (so that people have no incentive to strategically bias their stated willingness to pay). This follows the recent public goods literature using a provision point (see for example: Bagnoli and Lipman, 1989; Bagnoli and Lipman, 1992; Bagnoli and McKee, 1991; Isaac, et al., 1985; Isaac, et al., 1989; Palfrey and Rosenthal, 1984). This part of the question is phrased as follows:

> "If the program turns out to cost less than people are willing to pay, each household would only pay a share of what it costs. If it turns out to cost more than people are willing to pay, the program would not be carried out."

Figure 2.4

Contingent Valuation Method Using a Willingness to Pay Question

)24 Suppose that the **complete cleanup program** described above could e achieved in your imaginary community. What would **complete cleanup of he GCR landfill** be worth to your household? In answering, you should ssume that:

- The money would be used only in your hypothetical community for COMPLETE CLEANUP.
- If the program turns out to cost less than people are willing to pay, each household would only pay a share of what it costs. If it turns out to cost more than people are willing to pay, the program would not be carried out.

low, what is the most your household would be willing to pay each month in ddition to your current federal taxes for the next 10 years for the **complete leanup of the GCR Landfill**? (Circle the best response.)

$0	$1.50	$4	$10	$30	$75	$200
0.50	$2	$5	$15	$40	$100	$500
$1	$3	$8	$20	$50	$150	MORE THAN $500

The question then asks what is the most the respondent's household would be willing to pay each month for 10 years for complete cleanup of the site.

A period of 10 years was selected to minimize the impact of one-year income constraints on ability to pay and also to more realistically reflect the pattern of payment for cleanup. In a study on oil spills (Rowe et al., 1991), results were obtained from separate samples for a lump sum payment approach and for an annual WTP over a five year payment approach. The lump sum value was 2.75 to 4 times larger than the annual payment. These two results are very comparable, with the difference attributable to discounting of future payments, as well as uncertainty about remaining in the study area.

The valuation question is followed by a question to identify embedding problems. It asks respondents to consider whether their WTP responses were entirely for the described cleanup, partly for cleanup, or for other reasons. Respondents who say the response is not "just for complete cleanup at the site," are then asked "what percent is just for the stated complete cleanup at the site?"

This approach follows the design in prior work (Chestnut and Rowe, 1990 and Rowe et al., 1991) in which extensive survey context was found to be insufficient for fully eliminating potential embedding (or part-whole) biases in the reported WTP amount and where a follow-up question was useful in addressing, and at least partly correcting, any remaining embedding bias. To adjust WTP for complete cleanup to correct for embedding, the reported percentage for cleanup of the site only is used to compute the adjusted WTP.

Contingent Valuation Using a Referendum (Dichotomous Choice) Question:

This variant of the survey contains the same information that was presented in the CVM approach. However, in this version, individuals are asked to vote on a program that would completely clean up the hazardous waste site (see Figure 2.5). For an application of this approach see Cameron (1987). The referendum question is stated as follows:

> "Suppose that the complete cleanup program described above could be achieved in your imaginary community. At present, government officials estimate the complete cleanup will cost your household a total of $ X. This amount would be spread over 10 years in payments of $ Y per month for ten years. Would you vote for the program or against it?

Four proposals are made in which the cost of the program increases each time. After each proposal, any respondent who voted against it is asked why. This last question is included to identify individuals who scenario reject from those who legitimately think the program is not worth the cost.

Figure 2.5

Contingent Valuation Using a Referendum (Dichotomous Choice)

Question

Q24 Imagine that the **complete cleanup program** described above could be achieved in your imaginary community. Suppose that it will cost your household a total of $600 for complete cleanup of the GCR site. This amount would be spread over 10 years in payments of $5 per month as part of your federal taxes. If the program cost your household $5 per month for ten years would you vote for the program or against it?

1. FOR ----- GO TO Q25
2. AGAINST ----- GO TO Q24B
3. NOT SURE ----- GO TO Q25

Q24B Did you vote against the program because you can't afford it, because it isn't worth that much money to you, or because of some other reason?

1. CAN'T AFFORD IT
2. ISN'T WORTH THAT MUCH
3. OTHER REASON (SPECIFY)

_____

_____

_____

Q27 If, instead, the final cost estimate showed that the COMPLETE CLEANUP of the site would cost your household a total of $6000 over a ten year period -- $50 per month for ten years -- would you vote for or against the program?

1. FOR ----- GO TO Q28
2. AGAINST ----- GO TO Q27B
3. NOT SURE ----- GO TO Q28

Q27B Did you vote against the program because you can't afford it, because it isn't worth that much money to you, or because of some other reason?

1. CAN'T AFFORD IT
2. ISN'T WORTH THAT MUCH
3. OTHER REASON (SPECIFY)

_____

_____

_____

2.4.2 ABANDONED INDUSTRIAL FACILITY

In this survey version, a scenario that is typical of an abandoned urban industrial facility is developed. Thus, numerous modifications were made regarding the context of the survey, but the basic structure remained the same. This section will focus on the context and information changes that resulted from using an abandoned industrial facility rather than an abandoned landfill site.

The survey begins with the same general introduction on hazardous waste sites and exactly parallels the information that is provided in the landfill version of the survey, except that the details are now tailored to an abandoned industrial facility. The information was obtained from various RODs describing specific industrial facilities and from initial work performed by IEC on site characterization.

In the GCR Manufacturing Site scenario, the natural resources being contaminated by hazardous substances are groundwater and soil (rather than groundwater and surface water). Thus, the cleanup options differ in this version of the survey, although the level of cleanup remains the same. The cleanup options in this version of the survey include: no action, institutional controls, soil cap and water filtration, soil treatment and groundwater barrier, and complete cleanup. One difference between the survey versions is that, although the expert quantitative risk level remains the same, the qualitative nature of the risk varies. In the industrial facility version of the survey, the risk remaining after institutional controls are put in place is involuntary (exposure to windblown soil), while in the landfill version, the risk is voluntary (access to contaminated surface water).

2.4.3 DIFFERING COST SCHEDULES

The choice-based versions of the survey for the landfill scenario were used to establish a large enough sample to allow estimation of a conditional logit model. The landfill choice versions also varied the costs associated with the remedial alternatives, using a LOW cost and a HIGH cost schedule in different versions. This provides increased variation in costs in order to more easily test the impact of price on choice of cleanup option.

Chapter 3

VERBAL PROTOCOL TESTING OF THE SURVEY INSTRUMENTS

3.1 INTRODUCTION

Draft versions of the full information/full context surveys were completed after several in-house revisions. The next step, following a cognitive survey design strategy, was to test the survey design and context using verbal protocols.

Verbal protocols are a method of testing the survey instrument in a one-on-one setting with respondents who are representative of the sample population. In our case, we used Denver, Colorado area residents who lived outside of the city of Boulder[1]. The Denver area has six very well known Superfund sites.

In a verbal protocol, a respondent is instructed to "think aloud" as he/she reads and answers the survey questions. By getting subjects to think aloud as they go through the survey, researchers can observe respondents' thoughts for each question and their reactions to the information provided in the survey. These reactions often indicate where changes and improvements are needed in the survey and they can indicate where there is a divergence between the perceptions of the respondent and the intent of the researcher. In this chapter we report on the verbal protocol testing of the survey instruments and the subsequent refinements made to the survey instruments prior to conducting the self-administered pilot study described in the next chapter.

Five verbal protocols were conducted for each of four survey versions. Combinations of context (type of site and health risk information) and different valuation questions were tested to cover the full range of surveys that might be used in the study. Verbal Protocols 1-5 were conducted using the industrial facility context and a choice format.

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[1] Boulder residents were intentionally avoided due to the generally high level of education in the community.

The remainder of the protocols used the landfill context. Protocols 6-10 tested the CVM willingness to pay question, while protocols 11-15 tested the CVM referendum question. Protocols 16-20 utilize the choice framework and added an additional health risk associated with the complete cleanup option. The surveys used in the verbal protocols are summarized in Table 3.1. Since the context and information presented on the different sites does not change across alternative valuation approaches, these parts of the survey were refined continuously over the 15 verbal protocols used to evaluate the landfill site survey. In addition, the non-site specific information and context underwent continual refinements through all of the protocols. The three surveys for protocols 1-15 may be found in Appendix B. The survey for protocols 16-20 is the Landfill Choice Version 2 in Appendix A.

3.2 VERBAL PROTOCOL METHODOLOGY AND BACKGROUND

Survey researchers have long recognized the importance in the wording of questions. Information, context and the framing of survey questions can have dramatic consequences on the responses. Verbal protocols are an innovative tool in cognitive survey design which can identify problems with unintentional bias and misunderstanding as well as framing problems.

Often in the design of a survey instrument, difficulties with information, context, and framing of questions are obscured by the proximity of the researcher to the issues and objectives of the study. These difficulties may persist through many iterations of the survey design because of familiarity with the subject. This familiarity can result in "design flaws" that are often not recognized -- if they are recognized at all -- until after the survey has been administered. These design flaws can lead to bias in the interpretation of the results and may lead to inaccurate conclusions. Verbal protocols can be invaluable in identifying such design flaws before significant effort and resources are expended.

Consistent with Ericsson and Simon (1984), verbal protocol responses were conducted by recording (1) the spoken and written responses and thoughts of the subject during the administration of the survey, (2) the responses to a debriefing questionnaire, and (3) the observations made by the investigator of the respondent while taking the survey.

Table 3.1 Summary of Verbal Protocol Surveys

Protocols	Type of Site	Type of Valuation	Health Risk Schedule*
1-5	Industrial	Choice	1†
6-10	Landfill	CVM-WTP	1
11-15	Landfill	CVM-Referendum	1
16-20	Landfill	Choice	2

*** Health Risk Schedule (deaths per year):**

Cleanup Option	1	2
No Action	2.1 in 10 million	2.1 in 10 million
Institutional Controls	0.1 in 10 million	0.1 in 10 million
Soil Cap and Water Filtration	none	none
Soil Cap and Groundwater Barrier	none	none
Complete Cleanup	none	0.1 in 10 million (over 10 yrs. only)

† In the Industrial version the small off site health risk (0.1 in 10 million) is described to be from windblown contaminants and thus involuntary. In the Landfill versions the small risk is from recreating in a contaminated creek (a voluntary hazard).

The debriefing section of the survey (described in Chapter 2) consists of ten retrospective questions that ask the respondent to reflect back on specific parts of the survey and comment on the adequacy and relevancy of the information provided. The survey responses to the questionnaire and the information from the debriefing questions provided the basis for improvements and refinements in subsequent revisions in the design of the survey. Specific revisions and the evolution of the survey design are presented later in this chapter.

In addition to the oral and written responses, observation of each subject during the verbal protocols can provide immediate insight into survey instrument deficiencies and can reveal visual and/or emotional responses that may not be apparent from the audio and/or written record. To aid in the timely redesign of the survey, notes were kept by the verbal

protocol administrator on key aspects of each subject's response to the survey. Audio tapes, recorded during the administration of the survey, provide a complete record of each of the verbal protocols. Transcripts of each of the verbal protocols are provided in Appendix C. Excerpts from the verbal protocols regarding major themes that were apparent in the instruments are provided in Appendix D.

Three investigators conducted the verbal protocols using a consistent format. Individual subjects were greeted and brought into the examination room.[2] The subject was seated at a table and a brief description of the study was provided. A tape recorder was present on the table and the subject was given instructions to read and complete the survey while speaking out loud into the tape recorder. They were instructed to "think aloud" as they read and answered the survey questions. Prior to beginning the survey, in order to familiarize each of the subjects with the process of responding and expressing their thoughts out loud, each subject was given the following warm-up task which is commonly used in verbal protocol studies:

> "How many windows are there in your parents house? Don't respond too quickly and talk out loud as you determine your answer."

This question provided the subjects with a problem for which they would not immediately know the answer and that required them to go through a visualization exercise to determine the correct answer. This initial questioning allows them to become accustomed to the process of verbalizing their thoughts and responses. Virtually everyone answers the question by mentally walking from room to room. If respondents do not express such a process verbally, they are given additional encouragement to think aloud by reporting everything they visualize.

Participants were instructed to respond honestly and openly to the survey questions and that there were no right or wrong answers. They were instructed to talk continuously and if they were silent for any

[2] The examination rooms consisted of a classroom for the first five subjects and a researcher's office for the last fifteen subjects.

extended period of time, they were reminded to speak out loud. The following sections describe the verbal protocols obtained for each of the four survey designs.

3.3 ABANDONED INDUSTRIAL FACILITY -- CHOICE VERSION

A choice based survey of an abandoned industrial facility was the first survey version to undergo verbal protocol analysis (see Appendix B for a copy of the survey). Five individuals participated in this round of verbal protocols. Each was compensated with $40 for their time and effort for participating in the verbal protocols. In this section we present some of the key findings from the first round of verbal protocols and discuss the significant changes made to the survey.

Several themes were common to all five of the verbal protocols performed on this version of the survey. Foremost amongst these themes was the universal dissatisfaction with Q16. Q16 was intended to provide information, independent of cost, about the degree to which the respondent believed the intermediate alternatives (i.e., institutional controls, soil cap and water filtration, and soil treatment and groundwater containment) "solved the problems" at the site relative to the "no action" alternative on the one hand and "complete cleanup" on the other. One respondent did not understand what was meant by "solve the problem." This was not defined in the question, intentionally leaving this to the subjective interpretation of the respondent. By this point in the survey, respondents had been provided with descriptions of what the relevant problems were at the site and details concerning each of the remedial alternatives. Respondents were largely unable to understand this intent from the wording of the question. Many subjects wanted to know how this question was different from the questions asking about the level of satisfaction which were asked as part of the alternative descriptions. One respondent even began to hypothesize about the relative costs associated with the remedial alternatives and thus contaminated his response with ideas of cost prior to being presented with the cost information. Adjustments were made to this question in an effort to clarify what was being asked. In the next round of verbal protocols, bullets summarizing the details of each alternative and a statement asking the respondent to ignore costs were included in this question.

Several respondents indicated a desire to see the site risks shown on the risk ladder. In general, the subjects all related better to the risk information when it was presented in "community relevant" terms (i.e., X deaths in your community over Y years) rather than in probabilistic terms (i.e., 1 death in 10,000,000). Some adjustments to the risk ladder, including the addition of the site risks, were made; however, these adjustments were not finalized in time to be included in the Round 2 verbal protocols.

The risks presented in the survey were selected to portray the magnitude of actual risks typical of many Superfund sites. A number of comments were made by respondents regarding the risks. For example one respondent commented:

> *I chose a less complete cleanup ... If I had not been aware of the risk, I would have assumed that it was one in a hundred ... I would've gone for a more complete cleanup, but because of the risk (presented) I chose a less complete cleanup.* (protocol #3, D5)

However, another respondent felt overwhelmed by the risk information and commented:

> *It's so much information you're asking me to absorb in one survey! (*protocol #5, Q8).

Responses to the presentation of risks in the survey were mixed. Some of the respondents were not troubled by the discussion and presentation of the expert risks. However, many respondents did not accept the objectivity of the risk estimates. In response to the statement in the survey that, "health risks to humans are usually described by scientists as very small," one of the skeptical respondents commented:

> *That seems like bullshit to me ... Even though they may say that it's true ... I wouldn't want to be living next to three mile island ... I wouldn't want uranium in my water ... it just seems like that doesn't seem true (said of the risks).* (protocol #5, Q5)

Responses such as this one indicate that respondents cannot be expected to react to the information in the survey in an uncritical manner. This demonstration of skeptical criticism indicates that many readers are subjecting the survey instrument to tests of critical reasoning and to cautious skepticism. The respondent's own beliefs may clearly override contrary information presented in a survey or, for example, presented in a newspaper article in the “real world.”

In response to comments and confusion over the meaning of several words used in the survey, several wording changes were identified in this round of verbal protocols.

(1) Two subjects indicated that they did not know what was meant by an "aquifer." This word was replaced with a descriptive statement in subsequent versions.

(2) To clarify the wording in Q6, grammatical changes were made.

(3) The word "remedy" was replaced with "cleanup" in the preamble to Q5.

(4) In Q3, a category for "other reasons" was added to provide subjects with the opportunity to express other sources of concern.

Two respondents felt that the description associated with the "no action" alternative was inadequate. In response, the description was supplemented to provide a greater description of site conditions and the future potential for land use at the site. An additional change was also made to this question to aid in the presentation of the risk information. The relevant health risk information was abstracted from the text and presented separately for the "no action" alternative (in round 3 this change was done for all of the remedial alternatives).

An additional change was made to the questions concerning satisfaction with the various remedial alternatives (Q11 through Q15). Rather than ask respondents to rate their level of satisfaction with the various alternatives on a 7-point scale, the question was rephrased simply to ask whether or not they were satisfied (i.e., YES/NO). This change was

made in conjunction with the changes to Q16 so as to reduce confusion and apparent redundancy to participants.

Reactions to the choice question format for eliciting preferences were generally favorable. None of the subjects demonstrated any hesitancy or lack of understanding concerning what was being asked of them. Every subject appeared to understand the nature of the economic tradeoffs presented to them between their satisfaction with the remedial actions and the associated cost. There was no evidence of "scenario rejection" with respect to this format.

3.4 ABANDONED LANDFILL SITE -- CVM-WTP VERSION

Verbal protocols were next obtained for the landfill version of the survey with a CVM-WTP valuation question (see Appendix B for a copy of the survey). Five new individuals were selected to answer this version of the survey. Although the survey involved a different site (i.e., a landfill rather than an industrial site) the surveys were designed in parallel and many of the question and wording changes that were identified from the first set of verbal protocols were relevant to this survey. This version of the survey incorporated many of the pertinent changes based on the observed difficulties and wording problems from the first round of verbal protocols.

In spite of the changes made to the survey, there were several lingering problems that persisted into the second round of verbal protocols. Q16 continued as a source of confusion to the respondents. Again nearly all (four out the five) found it difficult to understand exactly what was being asked. Given the importance of this question in determining relative satisfaction levels, it was clear that a different framework was needed from which to ask the question. It was originally thought that it was desirable to place the question after respondents had read about all the remedial alternatives but prior to giving them information concerning costs. Rather than having the respondent rate the intermediate alternatives relative to the two extreme actions it was decided that for purposes of clarity a variant of the question should be asked after each cleanup option, separately. Thus, the question about how well the action "solves contamination problems at this site" was rewritten for future survey versions, so that it would be anchored on a ten point

scale from "does not take care of problem at all" to "completely takes care of problem." This question was then presented after each alternative was initially described.

Several additional wording changes were implemented after the second set of protocols were administered. For example, language was added to clarify that "the contaminated creek water" was in fact contributing to the community's water supply.

Additionally, both rounds of verbal protocols had revealed that participants were misreading (and perhaps confusing) an important word in the survey. Respondents were consistently mis-reading the alternative "LANDFILL CAP AND GROUNDWATER CONTAINMENT" as "LANDFILL CAP AND GROUNDWATER *CONTAMINANT*." Therefore, in subsequent revisions, the word "containment" was replaced with "barrier" to reduce this confusion.

Subjects responded favorably to the separation of the risk information from the text in the "no action" alternative. Based on this response, further changes were made in the presentation of the alternatives to make the text easier to read. The risk information for each of the alternatives was separated into two categories: risks eliminated, and risks remaining. In subsequent versions of the survey, the appropriate risks from the site were added to the risk ladder.

Several participants expressed irritation in response to one of the CVM valuation questions. Although the first question in the series emphasizes that the amount that the respondent is willing to pay for complete cleanup was to go only for complete cleanup, the next question (on embedding) implies that the dollar amount may have been offered for other reasons. Several respondents were annoyed by this, saying "they just told me the money was only going to go to cleanup of this site." Our previous research suggests that embedding is an individual difference: some respondents embed their values and therefore provide values for activities that go beyond the stated problem; some embed a little; and others do not embed at all. This last group is undoubtedly annoyed when they reach the disembedding question (as are many economists who read this question!). In this group of verbal protocols only one individual (out of five) indicated that their value was not just for the stated problem. Our

past experience suggests that between 20% and 50% of respondents will admit to embedding.

To illustrate the mental process that respondents engage in when attempting to value complete cleanup, consider the following remark:

> *Well, now we're talking economics as per my household's income ... my thought process is to go back to the page before where I was answering the questions for the approximate costs. $8/month ... when I think about this and the other responsibilities that I have, so, I have a number and it probably means that I would have to eliminate cable TV for a number of years, but that is something that I would be willing to do so I'm gonna circle $15/month. (protocol #9, Q20)*

One respondent provided the following comment when addressing the question concerning the extent to which the respondent felt responsibility for the cleanup of the site (Q23):

> *Wow, that's a tough one because you're not the one that contaminated it, because when you purchased the house or the property that you're living on, no one told you that you're going to have to clean this up ... but you're gonna have to accept certain responsibilities when you buy in an area ... You don't just buy it because it's a corner lot on a road that's an easy access to the shopping center. You consider your job, accessibility to your career, accessibility to maybe open space or things like that, your general environment. So, I believe you have to accept quite a bit of responsibility. (protocol #9, Q23)*

One of the issues that is central to the determination of appropriate cleanup levels concerns the sensitivity of the benefits to the costs of cleanup.

> *The cost information was largely unimportant to me, because the cost that they're using, they mean direct monetary cost. They're not talking about future cost, the cost of health, the cost of future cleanup that may absolutely become necessary. See, we're assuming that if we don't clean it up, it's not necessary to clean it up as long as you don't drink your water, but what if this site blows up in 20 years like landfills did 30*

years ago when the methane backed up and they had health hazards of a different kind. (protocol #9, QD9)

Overall, these responses suggest that there was little difficulty in understanding the CVM framework and that there was again little "scenario rejection."

3.5 ABANDONED LANDFILL SITE -- CVM REFERENDUM VERSION

In the third set of verbal protocols we pretested the referendum valuation format using the landfill site (see Appendix B for a copy of the survey). Five individuals were selected to complete the survey as described in Section 3.2. Based on the previous verbal protocols, wording in several sections had been revised. The revisions improved the readability and understandability of the survey.

Movement of the "how-well-is-the-problem-solved" questions to just after the alternative description finally appeared to solve an ongoing design problem and the question was now understood by all respondents in this group. Placing this question after each alternative appears to improve the respondents' ability to answer because effects of the particular remedial action are fresh in their minds.

A few words still appeared to present some difficulties in understanding. In particular, the word "refuse" was often read as "refuge." Other word difficulties were associated with "leachate" and "implementation." In response to these difficulties, changes were made in the text to replace each of these words.

One respondent had difficulty believing that the tax assessment for the selected cleanup option would end after ten years. However, this apparently did not dissuade the respondent from answering the valuation questions as asked. Most respondents did not question the validity of the payment mechanism and therefore no changes concerning the payment vehicle were made in spite of this comment.

Several respondents made comments concerning the veracity of the scientists in assessing the risks. When asked about the assessment of risks by scientists, one respondent commented:

This is really ambiguous. What scientists? Well, I think you could probably answer any of these depending on your political view. If you listen to Rush Limbaugh, you would probably say they greatly overestimate. My opinion is that some scientists don't bother going to the extent (required) ... I don't know. I think that some underestimate and some overestimate ... I don't know. (protocol 13, Q10)

Little could be done in response to such views beyond including the question asking if respondents trusted scientific expert risk assessments. One of the respondents who commented on the scientists' assessment also asserted a belief that the health risks were greater under the "LANDFILL CAP AND WATER FILTRATION" option than under the "LANDFILL CAP AND GROUNDWATER BARRIER" option even though the risks, as presented, were identical. This reflected a belief on the part of the respondent that the risks associated with continued movement of groundwater away from the site would be inherently greater, perhaps because of the increased likelihood of incidental use sometime in the future that was not reflected in the description of the risks. The lesson here is, once again, that respondent choices and values will reflect their own views and not necessarily the information presented in the survey.

3.6 LANDFILL/CHOICE BASED SURVEY WITH ADDITIONAL HEALTH RISK

The final round of verbal protocols was performed using a modified version of the landfill choice survey. This version of the survey incorporated all of the previously identified changes and modifications and included a further modification that described the presence of health risks associated with "complete cleanup" activities. No further modifications were suggested by this set of verbal protocols (see Appendix A Landfill Choice Version 2 for a copy of the survey). The following additional text was added to the description of "complete cleanup":

However, during the 10 year period of complete cleanup, the movement and transportation of landfill wastes will result in some windblown releases of hazardous substances as well as some small possibilities for transportation accidents. Nothing

can be done to completely eliminate these risks which scientists estimate will expose the average person in your community to a risk of one death in ten million per year (equivalent to letter b on the Risk Ladder in Figure 3) for ten years. That is, cleanup activities will result in a 20% chance of one death during the 10 year period in your imaginary community of 200,000.

Risks Remaining:

(4) 1 death per year per 10 million people from off-site exposure to windblown soil and transportation risks for the 10 year duration of complete cleanup (a 20% chance that 1 person will die in your community during this cleanup period).

This text creates a countervailing risk associated with complete cleanup that might reduce the share of respondents selecting "complete cleanup" as their preferred alternative if some respondents see the risk as significant in spite of the expert assessment presented in the survey.

One respondent who chose the "landfill cap and groundwater barrier option" over "complete cleanup" did so because she felt that the "complete cleanup" option was relocating the hazard rather than solving the problem.

Well, now they've added 1 death per year per 10 million people for the stuff blowing around...I say no because where on earth in this whole United States are you going to find...I mean, aren't you just moving it from one space to another? Unless you're going to put it in some kind of lead lined vault someplace, and I can't even imagine where, in the middle of the desert someplace. You know, this just seems like you're robbing Peter to pay Paul. (protocol 16, Q19)

In the next chapter, the final changes in survey design based on these verbal protocols are described, along with the design and implementation of the pilot study.

Chapter 4

THE SELF-ADMINISTERED PILOT STUDY

4.1 INTRODUCTION

This chapter presents the self-administered pilot study. We describe the protocol used to recruit participants for the study, the study procedures, overall results, and reactions of participants to the survey.

4.2 RECRUITMENT PROTOCOLS

The 267 participants in the self-administered pilot study were professionally recruited from the Denver area by a market research company (Information Research Inc., Aurora, Colorado) that regularly performs a variety of such studies. A screening instrument was constructed to aid in assembling a group of individuals with a varied mix of characteristics such as age, education, and income. The screening process eliminated individuals that:

- were under 18 years of age,
- were currently or had family members who were currently working for "a marketing research firm, an advertising agency, an environmental, governmental, or legislative group,"
- had ever participated in a questionnaire on a related topic, or had participated in a market research study within the past three months.

Having satisfied these screening requirements, potential subjects were then presented with an invitation to participate. This invitation was as follows:

> *We are in the process of conducting a very special type of study in which we are inviting selected individuals like yourself to participate in completing a questionnaire that will focus on issues concerning hazardous waste cleanup for a research group at the University of Colorado.*

This will take place at our main office facility in Southeast Denver, 10650 E. Bethany Drive and will last approximately 1 1/4 hours. At the conclusion of the session all participants will receive $30 to help cover the costs of attending.

We would like very much to have you attend and share your opinions and experiences with us. Do you think you could help us with this project?

Prior to administering the survey, investigators briefed the participants by introducing themselves as representatives of the University of Colorado who were investigating public opinions concerning the cleanup of hazardous waste sites. Participants were told that the study was funded by the USEPA and that the study was intended to provide EPA with guidance concerning the level of cleanup at hazardous waste sites that is desired by the public. In addition, investigators gave the following instructions to the participants:

- They were free to leave at any time, however, to receive the compensation they had to provide a completed survey.
- There were no right or wrong answers to the questions and their honest and candid responses were what was desired.
- If they had any questions or difficulties with any of the questions they were asked to contact the proctor.

Upon completing the survey, participants were instructed to exit the room and proceed to the lobby where one of the investigators would review the survey for completeness and provide the promised compensation.

4.3 OVERALL DESCRIPTIVE RESULTS

Six survey versions were administered to the group of 267 individuals as a self-administered pilot study (the surveys can be found in Appendix A and each survey's frequencies and means of the responses are in bold print next to each question). This section examines the descriptive statistics generated by this study. The results provide both a preliminary understanding of the issues and will guide future survey design and

research. It should be noted that the survey participants do not comprise a random probability sample of the population. However, as it is discussed in the conclusion, such a sample may still be useful in terms of a broad understanding of factors which affect public preferences for cleanup. Chapter 5 presents a more detailed analysis of these preferences by estimating a conditional logit model of cleanup choices for care of a landfill site. Table 4.1 summarizes the survey variants that were administered in the pilot study.

4.3.1 CHOICES AND CLEANUP RATINGS

INDUSTRIAL CHOICE survey was administered to 46 individuals. It asked individuals to choose which level of cleanup they would most prefer at the hypothetical abandoned industrial facility described in the survey. Table 4.2 shows the response frequency to this question as well as the response to the second choice for cleanup, the average cleanup rating with the option, and the cost per household per month for that option. The option that was most preferred by the pilot study subjects was "complete cleanup" with 60.87% choosing complete cleanup as their first choice. The frequency of first choice for cleanup responses and the average cleanup rating of each option are also presented graphically below the table.

The column AVERAGE CLEANUP RATING reports the mean responses from questions 12, 14, 16, 18 and 20 in which the subject was asked to provide their cleanup rating for each option on a one to ten scale. Assuming that the subjects ignored the cost of cleanup (as they were instructed) in forming these cleanup ratings, the numbers can be thought of as a scalar measure of the perceived level of cleanup associated with each option. It is interesting to note that option D seems to receive a relatively low rating. This pattern is observed in all of the CHOICE surveys, and suggests that since option D and E receive similar ratings that one of them might be dropped from consideration in future research.

Table 4.3 presents the summary statistics from the LANDFILL CHOICE VERSION 1 variant of the survey. A total of 62 subjects completed this version. In this survey the health risks are identical to those in the industrial survey, except that they are incorporated into a larger site with a more expensive "complete cleanup" option ($25 per month versus $12

TABLE 4.1 SUMMARY OF PILOT STUDY SURVEYS:

Survey Version	Health Risks*	Cost**	Number of Subjects
INDUSTRIAL CHOICE	**1** †	**A**	46
LANDFILL CHOICE 1	**1**	**B**	62
LANDFILL CHOICE 2	**2**	**B**	41
LANDFILL CHOICE 3	**2**	**C**	40
LANDFILL CHOICE 4	**1**	**C**	37
LANDFILL CONTINGENT VALUATION	**1**	**B** ††	41

*** Health Risk Schedule (deaths per year):**

Cleanup Option	**1**	**2**
No Action	2.1 in 10 million	2.1 in 10 million
Institutional Controls	0.1 in 10 million	0.1 in 10 million
Soil Cap and Water Filtration	none	none
Soil Cap and Groundwater Barrier	none	none
Complete Cleanup	none	0.1 in 10 million (over 10 yrs. only)

† In the Industrial version the small off site health risk (0.1 in 10 million) is described to be from windblown contaminants and thus involuntary. In the Landfill versions the small risk is from recreating in a contaminated creek (a voluntary hazard).

**** Cost Schedule (dollars per household per month for 10 yrs.)**

Cleanup Option	**A**	**B**	**C**
No Action	$0	$0	$0
Institutional Controls	$1	$1	$5
Soil Cap and Water Filtration	$4	$4	$8
Soil Cap and Groundwater Barrier	$8	$8	$12
Complete Cleanup	$12	$25	$50

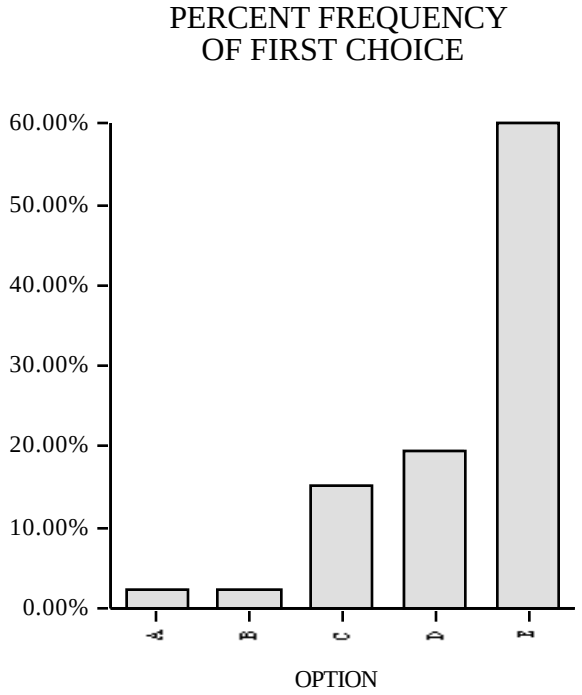
†† In the Contingent Valuation Survey the cost of Complete Cleanup was not provided. The subjects were asked to give Willingness to Pay bids for Complete Cleanup.

TABLE 4.2 INDUSTRIAL CHOICE

OPTION	FIRST CHOICE		SECOND CHOICE		Average Cleanup Rating for the option	Cost per household per month for 10 years
	number	percent	number	percent		
A	1	2.17%	0	0.00%	2.70	$0
B	1	2.17%	0	0.00%	3.35	$1
C	7	15.22%	10	21.74%	6.41	$4
D	9	19.57%	27	58.70%	7.02	$8
E	28	60.87%	9	19.56%	8.89	$12
total	46	100.00%	46	100.00%		

OPTIONS **Health Risk (deaths per year)**

A: NO ACTION **2.1 in 10million**
B: INSTITUTIONAL CONTROLS **0.1 in 10million**
C: SOIL CAP AND WATER FILTRATION **none**
D: SOIL CAP AND GROUNDWATER BARRIER **none**
E: COMPLETE CLEANUP **none**



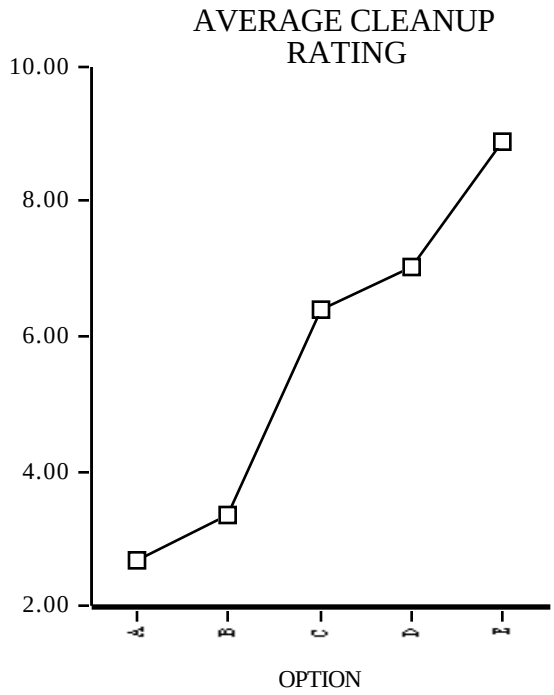
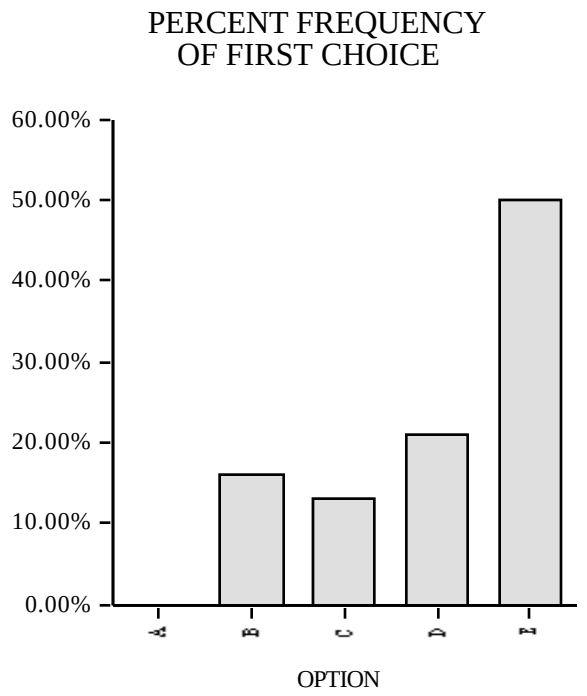
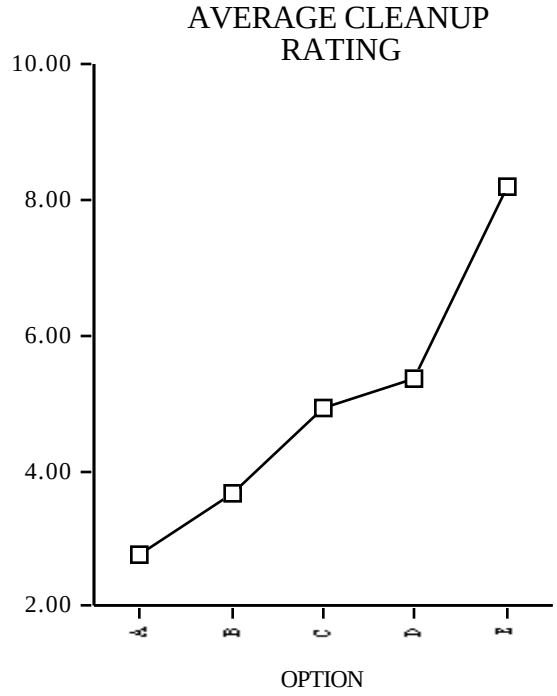


TABLE 4.3 LANDFILL CHOICE VERSION 1

OPTION	FIRST CHOICE		SECOND CHOICE		Average Cleanup Rating for the option	Cost per household per month for 10 years
	number	percent	number	percent		
A	0	0.00%	2	3.22%	2.77	$0
B	10	16.13%	6	9.68%	3.68	$1
C	8	12.90%	17	27.42%	4.95	$4
D	13	20.97%	27	43.55%	5.37	$8
E	31	50.00%	10	16.13%	8.21	$25
total	62	100.00%	62	100.00%		

OPTIONS	**Health Risk (deaths per year)**
A: NO ACTION	**2.1 in 10million**
B: INSTITUTIONAL CONTROLS	**0.1 in 10million**
C: SOIL CAP AND WATER FILTRATION	**none**
D: SOIL CAP AND GROUNDWATER BARRIER	**none**
E: COMPLETE CLEANUP	**none**





per month for the industrial site). This might account for a lower percentage of the subjects (50%) choosing "complete cleanup" as their most preferred option.

An important difference between the industrial and landfill surveys is that, although the risks are presented symmetrically in terms of risk of death per ten million people, the small risk (1 death per year per 10 million people from off-site exposure which is eliminated in options C, D, and E for both surveys) is involuntary for the industrial site and voluntary for the landfill site. The risk in the LANDFILL CHOICE versions is explained to arise from people recreating in a contaminated creek. Alternatively, the risk in the INDUSTRIAL CHOICE survey is explained to result from contaminated soil blowing off-site. This may explain the relatively small increase in the average cleanup rating when moving from option B to option C in the landfill surveys (e.g. Table 4.3) as compared to moving from B to C in the industrial choice variant (Table 4.2).

Table 4.4 summarizes the data generated from the 41 subjects who took the LANDFILL CHOICE VERSION 2 survey. This survey was the same as Version One except that the context was changed to incorporate a small health risk for the "complete cleanup" option over the 10 years that the site would be cleaned up. The health risk was explained to result from the excavation and transportation of hazardous materials from the site. This is a real characteristic at many Superfund sites. The results of the LANDFILL CHOICE VERSION 2 survey show a lower average cleanup rating level for "complete cleanup" (7.85 in VERSION 2 versus 8.21 in VERSION 1), and a lower percentage of people who chose "complete cleanup" as their most favored option (41.46% in VERSION 2 versus 50.00% for VERSION 1). This suggests that subjects do respond to health risks associated with cleanup by having a lower rating for (and fewer people choosing) complete cleanup.

The LANDFILL CHOICE VERSION 3 not only included the health risk for "complete cleanup" but also a higher cost schedule. The results from the 40 subjects who completed VERSION 3 are presented in Table 4.5. The percentage of subjects who chose "complete cleanup" as their most preferred option fell to 32.50%.

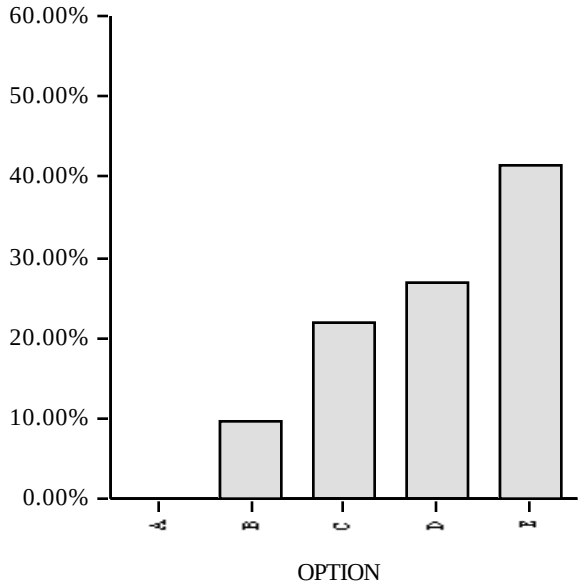
TABLE 4.4 LANDFILL CHOICE VERSION 2

(health risk associated with complete cleanup)

OPTION	FIRST CHOICE		SECOND CHOICE		Average Cleanup Rating for the option	Cost per household per month for 10 years
	number	percent	number	percent		
A	0	0.00%	0	0.00%	2.46	$0
B	4	9.76%	6	14.63%	3.63	$1
C	9	21.95%	13	31.71%	5.34	$4
D	11	26.83%	19	46.34%	6.24	$8
E	17	41.46%	3	7.32%	7.85	$25
total	41	100.00%	41	100.00%		

OPTIONS	**Health Risk (deaths per year)**
A: NO ACTION	**2.1 in 10million**
B: INSTITUTIONAL CONTROLS	**0.1 in 10million**
C: SOIL CAP AND WATER FILTRATION	**none**
D: SOIL CAP AND GROUNDWATER BARRIER	**none**
E: COMPLETE CLEANUP	**0.1 in 10million** **(over 10 yrs.)**

PERCENT FREQUENCY OF FIRST CHOICE



AVERAGE CLEANUP RATING

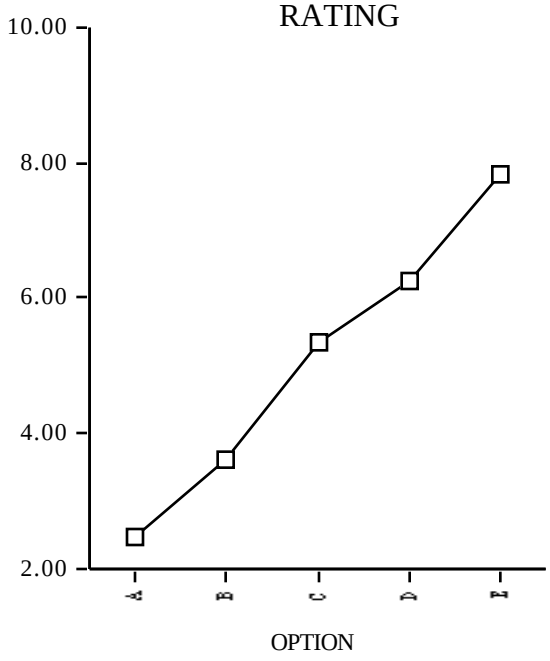
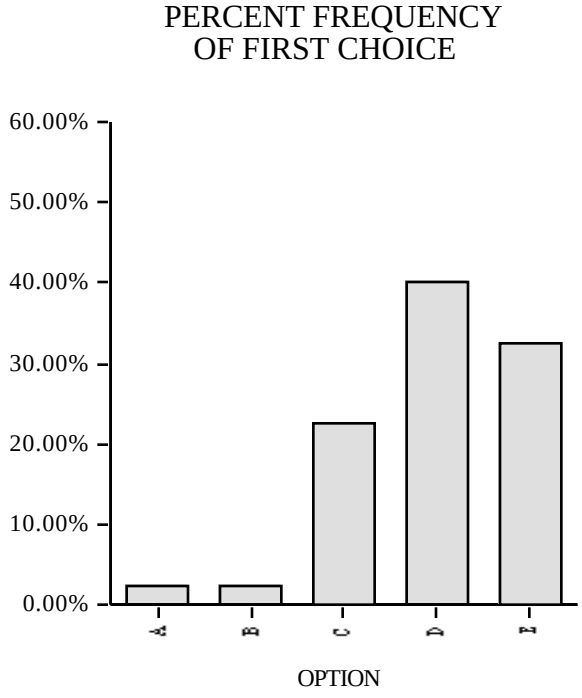


TABLE 4.5 LANDFILL CHOICE VERSION 3 (higher costs and health risk associated with complete cleanup)

OPTION	FIRST CHOICE		SECOND CHOICE		Average Cleanup Rating for the option	Cost per household per month for 10 years
	number	percent	number	percent		
A	1	2.50%	0	0.00%	2.83	$0
B	1	2.50%	8	20.00%	3.58	$5
C	9	22.50%	8	20.00%	5.50	$8
D	16	40.00%	15	37.50%	6.05	$12
E	13	32.50%	9	22.50%	8.05	$50
total	40	100.00%	40	100.00%		

OPTIONS	Health Risk (deaths per year)
A: NO ACTION	2.1 in 10million
B: INSTITUTIONAL CONTROLS	0.1 in 10million
C: SOIL CAP AND WATER FILTRATION	none
D: SOIL CAP AND GROUNDWATER BARRIER	none
E: COMPLETE CLEANUP	0.1 in 10million (over 10 yrs.)



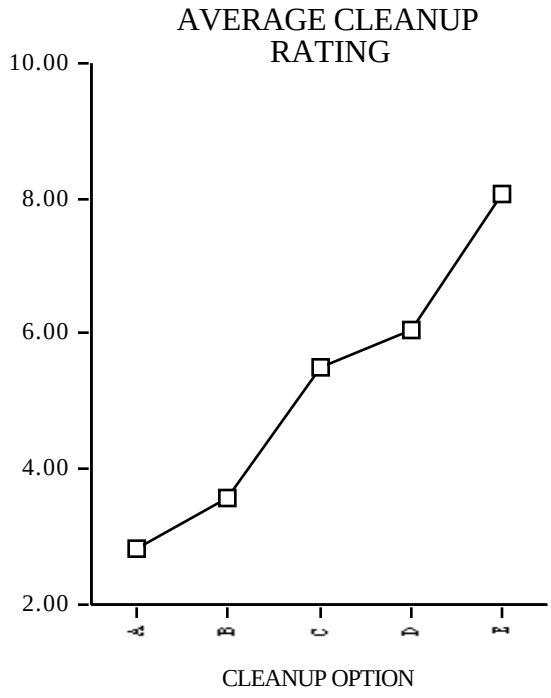


Table 4.6 presents the results for LANDFILL CHOICE VERSION 4. In VERSION 4, the 37 subjects were presented with the higher cost schedule, but there was no health risk associated with “complete cleanup." This version shows the response to increased cost independent of the effect of a health risk associated with “complete cleanup." The average cleanup rating of 8.81 is high relative to the versions with the health risk for “complete cleanup”, but the percent of the subjects that chose complete cleanup as their most preferred option is low (35.41%) relative to the versions with the lower cost schedule.

The sixth survey version that was administered as a part of the pilot study was a contingent valuation (CV) survey. As noted in the introduction, this survey was included as a backup methodology in case difficulties arose with the more informative market research approach. Since, as we have shown above, the choice approach showed sensitivity to risks and cost in the expected way, we discontinued pretesting the CV variant after the first group of 41 respondents completed the survey. The results generated by these 41 respondents are presented in Appendix E.

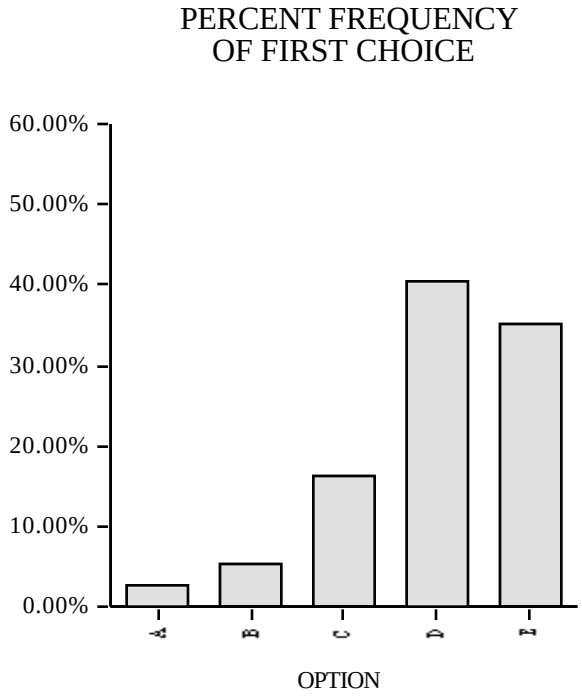
4.3.2 REACTION TO THE HEALTH RISK INFORMATION

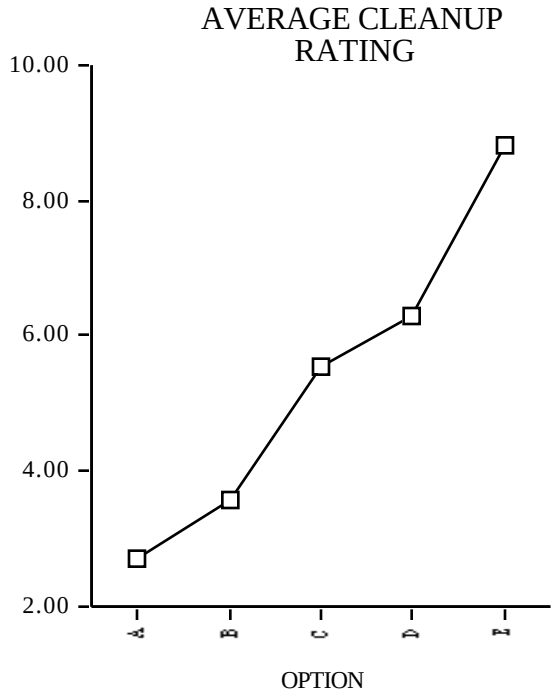
For all of the choice surveys it is interesting to note that the elimination of the large scientific estimate of health risk (two deaths in a million people per year) in going from option A to B seemed to have a relatively small impact on the subjects, as compared, for example, in going from B to C (one death in 10 million people per year) even though respondents stated that health risk was a very important consideration in their cleanup rating and choices. In the graphs depicting average cleanup rating, there is a relatively small jump in the rating from option A to option B (institutional controls), which eliminates the large health risks as compared to other increases across options. Since health risk at Superfund sites is generally the attribute that is of greatest concern to individuals, the elimination of the risk would be expected to greatly increase an individual’s relative rating of the option. For example, question 3.A asks the subject to rate, on a one to seven scale, how important the reduction in health risk to their household is for cleaning up Superfund sites. The mean response was 6.38 (standard deviation = 0.94) for the four LANDFILL

TABLE 4.6 LANDFILL CHOICE VERSION 4 (higher costs)

OPTION	FIRST CHOICE		SECOND CHOICE		Average Cleanup Rating for the option	Cost per household per month for 10 years
	number	percent	number	percent		
A	1	2.70%	0	0.00%	2.70	$0
B	2	5.40%	2	5.40%	3.57	$5
C	6	16.22%	17	45.95%	5.54	$8
D	15	40.54%	12	32.43%	6.30	$12
E	13	35.14%	6	16.22%	8.81	$50
total	37	100.00%	37	100.00%		

OPTIONS	**Health Risk (deaths per year)**
A: NO ACTION	**2.1 in 10million**
B: INSTITUTIONAL CONTROLS	**0.1 in 10million**
C: SOIL CAP AND WATER FILTRATION	**none**
D: SOIL CAP AND GROUNDWATER BARRIER	**none**
E: COMPLETE CLEANUP	**none**





CHOICE surveys. The other surveys had similar means (the means are presented in the individual surveys in Appendix A). Additionally, the importance of reducing the health risk to others (question 3.B) was also rated very important by the subjects (mean = 6.29, standard deviation = 0.99 for the LANDFILL CHOICE surveys).

One possible explanation for the discrepancy between the concern for health risk and the relatively modest reaction to the elimination of the large expert estimate of health risk is that the subjects may have largely rejected the magnitude of the expert risk information offered in the survey. The response to question 10, in which the subject is asked if they trust the estimates of health risks made by scientists, indicates that a large number of subjects did not find the estimates believable. It is likely that many respondents replaced the numerical estimates provided in the survey with their own subjective risk assessments. The distribution of responses to question 10 for the LANDFILL CHOICE surveys are as follows:

Scientists...

1	greatly underestimate the risks	16.2%
2	moderately underestimate the risks	16.2%
3	are reasonably accurate in estimating the risks	24.6%
4	moderately overestimate the risks	12.8%
5	greatly overestimate the risks	3.4%
6	scientists really do not know the actual health risks	26.8%

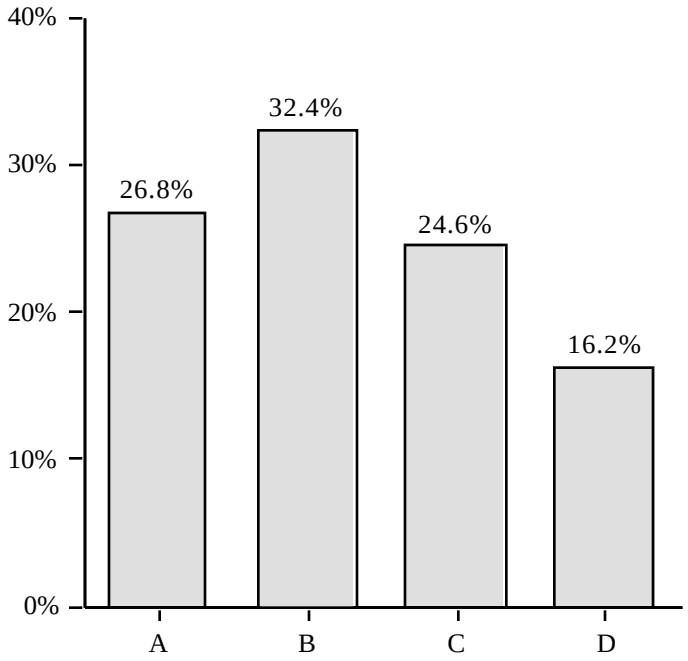
Summing options one, two, and six indicates that 59.2% of the respondents felt that scientists either underestimate risks or simply do not know the actual risks. This implies a significant rejection of the quantitative risk information. Figure 4.1 presents a graph which summarizes the answers to this question.

4.4 DEBRIEFING QUESTIONS

A number of the debriefing questions asked the respondent to report whether or not he or she found specific information and context useful in deciding on a level of cleanup. Table 4.7 summarizes the responses to these questions for the 180 Landfill Choice respondents (for responses to

FIGURE 4.1 RESPONSE TO QUESTION 10 (Landfill Choice All Versions)

"In your opinion, when scientists estimate the human health effects of hazardous substances, they..."



A REALLY DO NOT KNOW THE ACTUAL HEALTH RISKS
B UNDERESTIMATE THE RISKS
C ARE REASONABLY ACCURATE IN ESTIMATING THE RISKS
D OVERESTIMATE THE RISKS

TABLE 4.7 SELF-REPORTED USEFULNESS OF CONTEXT (percentage of the Landfill Choice respondents)

QUESTION	Information was useful	Information was not useful
D1--Site Description	88.3%	11.7%
D4--Scientific Risk Assessment	69.3%	30.7%
D5--Risk Ladder	58.3%	41.7%
D7--Illustration of Site (see Fig. 2 in survey)	70.6%	29.4%
D8--Description of Cleanup Options	87.2%	12.8%
D9--Description of Costs of Cleanup	68.3%	31.7%

specific landfill versions, the Industrial Choice, or the Landfill-CVM survey see the data within the surveys in Appendix A). The other debriefing questions (not included in Table 4.7) also asked how useful the information was, but in a slightly different way. Question D3 (and D6) asked how the description of groundwater contamination (surface water contamination) changed the level of cleanup that the respondent preferred. For question D3, 24.6% of the Landfill Choice respondents reported that the information had no effect on their preferred level, whereas 63.1% reported that they chose a higher level of cleanup and 12.3% reported that they chose a lower level. The responses to D6 were very similar. Question D2 asked if the preferred level of cleanup would be different if the respondent actually did live near the described site: 75.4% of the Landfill Choice respondents reported that it would not be different.

4.5 REACTIONS TO THE SURVEY INSTRUMENTS

Most participants completed the survey in under 1 hour. However, several took about an hour and a half. Participants apparently had little difficulty with the information and questions provided in the survey. There were no substantive questions asked of the researchers relating to understanding of the survey, and, upon the conclusion, nearly all of the surveys had been completely answered. One exception, however, was a gentleman who was 80 years of age. Upon finishing the initial sections of the survey he found it too difficult to answer the debriefing questionnaire, saying he was fatigued and had a headache. He was graciously thanked for his time and participation in the survey and given his $30.

Many individuals expressed thanks and commented that they found the survey to be both informative and interesting.

Chapter 5

ESTIMATING A DISCRETE CHOICE MODEL OF CONSUMER PREFERENCES

5.1 INTRODUCTION

This chapter first describes estimation of a conditional logit model of consumer preferences using data from the four landfill choice surveys. We then show how this model can be used to estimate willingness to pay for each of the cleanup options. A similar discrete choice based analysis has been used before in estimating environmental values. First, Rae used a related technique to examine the value of visibility (Rae, 1981). Second, Desvousges et al. used an ordered logit approach to estimate the value of water quality (Desvousges et al., 1983). Surprisingly, the methods used in these early studies have not been widely used in environmental research, however, they have been used in market research. A recent exception is a study of recreation values by Adamowicz et al. (1994) who used both revealed and stated preference models to estimate recreation site choices.

5.2 THE CONDITIONAL LOGIT MODEL

Our choice-theoretic framework follows standard lines (McFadden, 1976). Suppose that individual i chooses Superfund clean-up level j, where the utility of option j to individual i is

$$U_{ij} = \beta' X_{ij} + e_{ij} \tag{1}$$

and where X_{ij} is a vector of attributes of individual i and alternative j, β is a parameter vector and e_{ij} denotes an error term induced by excluded or improperly measured attributes or random tastes. The individual, by choosing clean-up level j, reveals that his or her utility from alternative j is higher than from any other alternative. That is, we observe that $U_{ij} > U_{ik}$ for all $k \neq j$. Hence, the probability that individual i selects j is

(2) $$\Pr ob[i \text{ selects } j] = \Pr ob[U_{ij} > U_{ik}, \text{for k} \neq j].$$

Suppose that the random components of U_{ij}, e_{ij}, are independent and identically distributed with a Weibull distribution. It can be shown (Maddala, 1983) that

(3) $$\Pr ob[i \text{ selects } j] = \frac{e^{\beta' X_{ij}}}{\sum_{j=1}^{J} e^{\beta' X_{ij}}}.$$

This forms the basis for our estimation.

Because each survey participant listed a first and second choice for cleanup level, we are able to effectively double the sample size (Chapman and Staelin, 1982). We know that the participant prefers his or her first choice to the other four alternatives, and that the second choice is preferred to the remaining three. If we view the participant's second choice as the favorite alternative in the absence of a first choice, we can include it in the conditional logit estimation.

We present two specifications. In specification 1, utility is assumed to be a linear function of the actual characteristics of the cleanup alternatives. These characteristics are the expert estimates of health risks, which are measured by estimated deaths per 10 million residents; the existence of unpleasant odors after cleanup is completed; the price of the alternative; and a general variable called cleanup rating, which indicates the participants' perception of the completeness of the option. Table 5.1 details the characteristics of the cleanup options for each survey version.

For specification 2, we include information on the characteristics of the household. Notice that equation 3 shown above is homogenous of degree zero in characteristics, therefore we cannot directly estimate customer-specific effects. Two standard methods are used to include customer characteristics in the model (Greene, 1990, p. 696). The first method involves interacting the customer characteristic with a characteristic of the cleanup alternatives, while the second method involves multiplying the customer characteristic by alternative specific

Table 5.1

Characteristics of Alternative Cleanup Options By Survey Version

Alter-native	Cleanup Option	Price ($/month)		Risk (Deaths / 10 Million)		Odor*
		Survey Versions 1-2	Survey Versions 3-4	Survey Versions 1,4	Survey Versions 2-3	
A	No Action	0	0	2.1	2.1	1
B	Institu-tional Controls	1	5	0.1	0.1	1
C	Cap & Filtration	4	8	0.0	0.0	0
D	Cap & Barrier	8	12	0.0	0.0	0
E	Complete	25	50	0.0	0.1	0

*Odor = 1 if an odor pervades and 0 otherwise.

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variables. An alternative specific variable is one which takes the value of one for an alternative and zero otherwise. In specification 2, we include the number of children in the household and yearly household income interacted with alternative-specific variables. We hypothesize that households with children tend to choose higher levels of cleanup, since parents are concerned with not just their health, but also with the health of their children. We include income to test the hypothesis that participants' income is positively associated with the level of cleanup. The use of individual characteristics is appealing since it allows the researcher to extrapolate the results of the statistical analysis beyond the sample data to analyze sites which may have a different mix of households as defined by income, number of children, etc. Table 5.2 presents summary statistics for survey participants' individual characteristics.

Table 5.2
Summary Statistics for Individual Characteristics

Variable	Mean	Standard Deviation
Number of Children	0.60	1.30
Years of Education	14.00	3.06
Income ($)	33,830.40	25,864.06

Table 5.3 shows the results of the two specifications.[1] Table 5.4 defines the variables used in the analysis. Specification 1 indicates that all of the attributes of the Superfund sites have the expected sign and are statistically significant at the one percent confidence level. Utility rises with cleanup rating, while it falls with price, risk and odor. In Specification 2 we test the effect of number of children and household income on participants' choice of cleanup level. Coefficients for number of children for alternatives D and E are significant at the one percent confidence level and all coefficients are increasing in cleanup level, indicating that participants who choose higher levels of cleanup tend to have more children. Most likely, individuals with children are more sensitive to risk, and consider not only the risk to themselves, but also the risk to their children.

For income, there is no discernible trend. The coefficients of income for cleanup levels B and E are significantly negative, while the coefficients for cleanup levels C and D are insignificantly negative. This indicates that

[1] Specification tests were conducted to test the assumption of independence of irrelevant alternatives (IIA). Specifically, a Hausman test was conducted on each alternative. For each test, an alternative was deleted and the model was reestimated to test if the parameter estimates changed significantly. The test statistic is $(\beta_u - \beta_r)'(V_r - V_u)(\beta_u - \beta_r)$, where β is the parameter vector, V denotes the estimated covariance matrix, r denotes the restricted model and u denotes the unrestricted model. The test statistic is distributed Chi-square with degrees of freedom equal to the rank of the covariance matrix. We could not reject the IIA assumption for three of the five alternatives. One approach to avoid the IIA assumption is the nested logit model (See Maddala, pp. 67-70). The methodology presented in this chapter can be generalized to accommodate this approach.

Table 5.3

Results of Discrete Choice Model

	Specification 1	Specification 2
Number of Participants	171	171
Sample Size	342	342
Log-Likelihood	-393.7496	-377.1825
Log-Likelihood (0 slopes)	-512.2702	-512.2702
Chi-Squared	237.0413	270.1754
Variables	Coefficient	Coefficient
PRICE	-0.0216 (-3.52)	-0.0156 (-1.74)
CLEAN	0.2619 (5.41)	0.2680 (5.13)
RISK	-1.0772 (-4.069)	-1.4632 (-4.43)
ODOR	-0.69696 (-3.489)	-0.2076 (-0.68)
ALT2 x KIDS		0.2885 (1.60)
ALT3 x KIDS		0.3961 (1.93)
ALT4 x KIDS		0.7272 (3.53)
ALT5 x KIDS		0.8720 (3.86)
ALT2 x INCOME		-0.2631E-04 (-2.09)
ALT3 x INCOME		-0.1903E-04 (-1.73)
ALT4 x INCOME		-0.1456E-04 (-1.32)
ALT5 x INCOME		-0.2915E-04 (-2.21)

Note: t-statistic for H_o: $\beta = 0$ are in parentheses.

Table 5.4

Glossary of Variables

Variable Name	Variable Definition
KIDS	Number of children under the age of 18.
ALT2	1 if option equals B; else 0.
ALT3	1 if option equals C; else 0.
ALT4	1 if option equals D; else 0.
ALT5	1 if option equals E; else 0.
PRICE	Price of cleanup ($ per month).
CLEAN	Cleanup rating for cleanup option (1 to 10, 10 highest rating).
INCOME	Annual income ($'s).
RISK	Risk of cleanup alternative (e.g., deaths per 10 million).
ODOR	An indicator variable for the presence of an unpleasant odor (1 = odor, 0 = no odor).

people with higher incomes tended to choose the two clay cap options, while people with lower incomes tended to choose the two extremes: institutional controls or complete cleanup.

5.3 WILLINGNESS TO PAY ESTIMATES

Using the parameter estimates in Table 5.3, willingness to pay estimates can be constructed for each cleanup option. The willingness to pay is the maximum amount a consumer is willing to pay to achieve a given level of cleanup. Mathematically, we compute the dollar amount which leaves the average participant (defined by mean income and number of children) indifferent between no cleanup and the particular option under consideration. Equation 4 shows the calculation for the willingness to pay for full cleanup under specification 1.[2]

(4)

$$WTP_{AE} = \frac{\beta_3(CLEAN_E - CLEAN_A) + \beta_4(RISK_E - RISK_A) + \beta_5(ODOR_E - ODOR_A)}{-\beta_1}$$

Table 5.5 presents the willingness to pay for each cleanup level and all specifications and Figure 5.1 shows these results graphically. Note the WTP estimates were made setting the health risks associated with option E at zero (no health risk with complete cleanup option).

Note that the increment in willingness to pay from option A to B is very high relative to the others. This could be explained by the fact that the institutional controls effect the largest incremental drop in health risks of all alternatives. To the extent, though, that the participants were told that institutional controls were currently in place, this high number could reflect a preference for the status-quo, with losses valued more than gains (Kahneman and Tversky, 1979, and Hartman, Doane, and Woo, 1991).

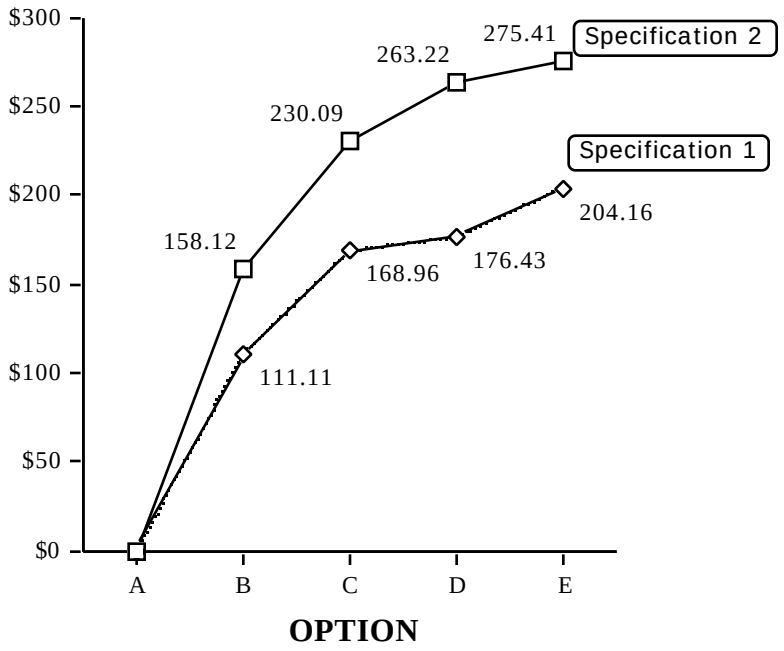
[2] We do not show the calculation for other cleanup levels and specification 2, as they are similar.

Table 5.5

Willingness to Pay

Option	Willingness to Pay ($ per month)	
	Specification 1	Specification 2
A	0	0
B	111.11	158.12
C	168.96	230.09
D	176.43	263.22
E	204.16	275.41

Figure 5.1 WILLINGNESS TO PAY FOR CLEANUP OPTIONS



5.4 CHOOSING A LEVEL OF CLEANUP

The results of the discrete choice analysis can be used to examine public policy decisions related to Superfund cleanup investments. The discrete choice methodology provides a convenient way of analyzing public welfare under the various cleanup alternatives. Table 5.6 shows the frequency with which each cleanup alternative was chosen by the participants.

The willingness-to-pay estimate provides a dollar estimate of the total benefit from a cleanup level. However, each cleanup alternative has an associated cost. Consumer surplus is defined to be the difference between the benefits and cost. The optimal option is then the cleanup level which maximizes consumer surplus. Table 5.7 shows the high cleanup cost estimates used in the surveys (which are not unrealistically high) and Table 5.8 shows consumer surplus (willingness to pay minus cost) for all specifications.

Notice that our results are robust to specification changes. In both specifications the consumer surplus is highest for option D (cap and groundwater barrier). For specification 1, the next highest is option C (cap), followed by option E (full cleanup). For specification 2, the next highest is option E (full cleanup), followed by option C (cap). These tests indicate that the average participant prefers a dense clay cap with a groundwater barrier. The implications of the discrete choice analysis presented here are discussed below in the concluding chapter.

Table 5.6

Summary of Participants' Cleanup Choices

Option	Number of Times Alternative Selected as First or Second Choice	Percent of Times Alternative Selected as First or Second Choice
A	4	1.2
B	37	10.8
C	85	24.9
D	126	36.8
E	90	26.3
Total	342	100.0

Table 5.7 Costs of Cleanup

Option	Total Monthly Cost ($ per person)
A	0.00
B	5.00
C	8.00
D	12.00
E	50.00

Table 5.8

Comparison of Cleanup Costs and Willingness to Pay

	Specification 1		Specification 2	
Option	Willing-ness to Pay	Consumer Surplus	Willing-ness to Pay	Consumer Surplus
A	0	0	0	0
B	111.11	106.11	158.12	153.12
C	168.96	160.96	230.09	222.09
D	**176.43**	**164.43**	**263.22**	**251.22**
E	204.16	154.16	275.41	225.41

Chapter 6

CONCLUSIONS

The purpose of the pilot study was to identify a methodology for eliciting public preferences for Superfund site cleanup. The discrete choice approach drawn from market research appears to offer substantial advantages as compared to other methodologies.

First, the methodology allows a natural and realistic survey design in which actual cleanup options can be presented to households affected by Superfund sites.

Second, by asking for a first and second choice respondents must consider tradeoffs between options. For example, the fact that more complete cleanup may be desirable in the long run, but costs more and imposes some short run risks, is highlighted by an evaluation of the choice between complete cleanup and a lesser option such as providing a cap and a groundwater barrier.

Third, the discrete choice approach allows estimation of willingness to pay for each of the cleanup options presented in a survey. The property value methodology only provides an approximate value for complete cleanup, not cheaper alternatives (see Volume 1, Chapters 4, 5, and 6), while the contingent valuation methodology becomes awkward and expensive for valuing multiple options. Thus, the discrete choice approach easily allows the analysis of the relative desirability of alternative cleanup options as shown in Chapter 5 of this Volume.

Fourth, by estimating a conditional logit model of preferences as a function of site and household characteristics, the EPA can gain insight into the appropriate level of remediation for the large range of NPL sites, some of which support extensive cleanup, some of which do not, from the perspective of public preferences. It should be noted that this modeling approach does not necessarily depend on estimation based on a large random sample of NPL sites. For example, to estimate the effects of the number of children in a household on the parents' cleanup preferences, it

is useful to have a non-random sample. This sample would ideally include an over-sample of households with few and with many children. Similarly, it is not clear that a biased sample will necessarily bias the coefficients of a model such as the one estimated from pilot data in Chapter 5. Thus, limited sampling of a carefully chosen set of NPL sites (which characterize the range of characteristics of these sites) may be sufficient to estimate a useful model describing public preferences. This model can help to assist in identifying problem sites and in assessing the appropriate aggregate scope of cleanup but, of course, cannot replace public participation in the process leading to choice of remedy at particular sites.

Fifth, as shown in Chapter 6 of Volume 1, the estimates of willingness to pay for complete cleanup (relative to institutional controls which are in place at most sites) obtained from the market research pilot study are consistent with observed property value losses near Superfund sites. In other words, residents living near a site would presumably be willing to pay an amount similar to their property losses to have the site completely cleaned up. This, of course assumes that property values will recover after cleanup or even when cleanup is anticipated -- which has been shown to occur (see Chapter 5 of Volume 1). Thus, the market research, choice methodology appears to predict values consistent with observed property market data. That market data, however, is unable to predict the values for partial cleanup options which are easily obtained by the market research approach tested here. Both the discrete choice approach used here and the closely related methodology, conjoint analysis, have received wide acceptance by industry in performing market research.

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APPENDIX A

PILOT STUDY SURVEY INSTRUMENTS

(The response frequency and mean data are presented in bold type next to the questions)

APPENDIX B

VERBAL PROTOCOL SURVEYS

APPENDIX C

VERBAL PROTOCOL TRANSCRIPTS

Protocol 1

Q1 I don't remember specifics, I'll say 3 just to be safe. Yes, I know Rocky Flats of course.

Q2 Yes.

Q3 A. Number 7
B. 7
C. Yes, Number 7

Q4 Ah, improving goes along with changing, I will go with 7.
These are pretty decent, I go with 5.
I know that's not a big concern of mine, nature does its own thing, I put 4
I don't think that's a big deal , number 4, too many theories on that one.
Not as important as reducing the waste, number 5.
That would be number 5
I put 7
Ah 7.

Q5 Un, No I haven't, not that I know of.

Q6 Yes, I have.

Q7 Yes, I do. I do not see an alternative.

Q8 If I didn't know, I probably wouldn't be as worried, I put 6.

Q9 If it's one person in 50 years I put 4, I would not be very concerned.

Q10 I'm gonna go with 6 because I think that's closer than any of the others.

Q11 I lost the gist of it I think. They're asking me to rate how satisfied I would be with the solution and the solution is no action. Hmmm. I'd be middle of the ground here, I'd put number 4.

Q12 It's much better than none at all, number 5.

Q13 I go with 5 again.

Q14 Well, is there any way of looking at this besides being happy with ??? I not extremely disappointed with what they did. Nothing is not best, but, I'm not seeing...there's a lot of money and a lot of effort in public awareness and all that it's gonna do more than all of the ideas I've heard so far. *So you're saying, between the options that you've looked at before and this one, that you don't see a lot of difference? Is that what you're saying? I'm* saying I'm seeing a difference, I'm just saying the difference between no action with public awareness and all these millions of dollars spent on cleaning up, you're gonna get more per dollar than just trying to clean this up. So, I'm not gonna get real excited about any of these options.

Q15 Huh, with the words that are here, ...once the cleanup is complete there will be no remaining health risks. That's extremely optimistic and I don't believe that scientists will be able to do that so I would sit on 5 for that.

Q16 *Do you understand that question?* I'm rating institutional controls...hmm...something's not clicking... *That's OK, that's what we want to find out.* Can you explain? *Ya, what we're trying to get at here is that on one end you've got this scenario....on the other end you've got this last scenario And then you've got these other options...where in that middle ground In other words, is institutional controls...* It's still not clear to me. *That's fine.* I'm rating... *What we're trying to get at with this questions, obviously we need to work on it, is how extensive do*

you think this clean up is. Not how satisfied you are, but how, just from the cleaning up the problem, how extensive. Well, each one is a bit more accurate, so theoretically from science, each one of these is better. *So where...do you think institutional controls is closer to no action or do you think it's somewhere in the middle here, or do you think it's closer to complete cleanup, as far as we're talking about this being how extensive the cleanup is.*
Institutional Controls talked about national ordinance? That's basically don't touch. That is going to do something...let's see...about 2
Soil Cap and Water Filtration...reviews, previous page? To me it sounded like each one is one step better...4
Soil Treatment and Groundwater on 6.

Q17 Yes I would.

Q18 Huh, I would, but they would have to convince me that it's gonna work.

Q19 I

Q20 I'm not gonna say No, but huh...

Q21 No action seems a little bit naive, so I'm gonna go with soil cap and water filtration...I like letter B....

Q22 Second choice is going to be more expensive...it's going to be C.

D1 Yes I do. It talked about the people... *Would you write that in there where it says why or why not?* (Didn't speak much while he wrote) Sure.

D2 No.. Because I do.

D3 No.

D4 Yes I did.

D5 Yes it was compared...

D6 No.

D7 ??

D8 Yes, the information was ...

D9 I would probably pay more money than I wrote down, but...

D10
A. It's up there...maybe 6
B. That'd be 5.
C. That's 6.
D. I'm gonna go with 4 on that I think mother earth does really well if we leave it alone.
E. ....6....

I've got a couple questions...when you were reading the different cleanup options that start on page 12...do you think there was enough information or do you think that when you got to reading this kind of stuff it was too much or too little an amount of information for people to read? ...long winded, but it is more important for the point to be made...so just for the sake of argument I'd leave it there. *On page 18 when you're looking at the cost of under question 17, for example, it says "institutional controls"...and then it gives a description? Is that obvious that obvious that that's just a reiteration? It's meant* It didn't talk about cost here *Right*. You should flash back and *But does that help sort of Hmmm...do you have any questions?* The longer it is...the more...do you think the survey...

One final question...in the beginning of that section ...you began when we got to that section about how satisfied would you be you indicated a level 4. You feel... Like I said...nothing is going to get me real excited about....

Protocol 2

Q1 Hummm...2. Yes, in my state.

Q2 Yes, number 2.

Q3 A. Five.. Fairly important. It's not clear whether I should put an x on the line or circle the numbers or what. *Probably circle the numbers.* OK, 6. I'm circling 6.

B. It seems like it's pretty much the same issue as question A I put 6 again.

C. I think that's probably more important than the other two so 7.

Q4 I'm just going down to see what's coming next. OK, improving the education system I think is very important, I'd circle 7. Improving public roads and highways I don't consider as important...I would probably put it as , well I'm debating between two and three...hmmm....probably 2. Saving endangered species..hmmmm...5 Reducing global warming, 7 Promoting recycling, 6 Reducing Taxes, let's see, reducing taxes, do I consider that important, no, 3 Reducing the national debt, 4, to me it seems like there are issues that are both pros and cons to that issue. Cleaning up Superfund sites, 6.

Q5 Let's see...probably I would say I don't know.

Q6 Yes, number 2. Do I need to expand on that? *No.*

Q7 Hmmm...number 2, yes. I'm looking at figure 3 now...

Q8 Hmmm...I don't consider that to be very important at all...I'm debating between 2 and 3 again. From just what I've read before I'm going to put down a 2. More from previous material that I've read and not from what I've read in here. I would put a 2.

Q9 Well, probably 2 again, even though it seems that the percentage is much less than what it was posed in question 8, it still seems about the same to me.

Q10 I can only circle one...probably 4, moderately overestimate the risks. I just want to go back and look at this paragraph again. "The effects, not associated with hazardous waste, on the environment from the industrial facility..." ya, that sentence right there? I'm not quite sure what that's getting at. *I think what they're trying to do in this whole section is that even if hazardous waste was not deposited or left on the site, you would still have the effects of human occupation such as roads, and buildings and stuff like that.* Alright. *But that's a little confusing.* To me it's, ya the effects not associated with hazardous waste hmmmm *We don't talk about what those are.* Ya, and the sentence previous/the sentence exactly before talks about having no hazardous substances released at all. *Right I understand what you're trying to say.* Anyway... *No, that's the kind of information we want.* OK, so I'll just go on.

Q11 [After reading question 11] I didn't see the question...in there. *OK, there's something missing there. It should say right then "How satisfied are you with this option?"* How satisfied am I with No Action. *Yes.* In this case I would say it's between a 4 and a 5. I'd put it at 4.

Q12 [While reading question 12] Just a second I have to read this part again. Well, it looks like it's putting in the minimum requirements. it's almost like it almost appears to be a politician idea. Probably 5.

Q13 [While reading question 13 rereads "This along with the removal of the buildings and tanks eliminates the risk of 10 deaths in 10 million of death..." It just seems to be worded different than previously. See...of death...that one preposition right there...]

Hmmm...this looks like the complete package. You know? More complete a way of dealing with the site. I guess I should go with 6.

Q14 Well, it seems to do about the same as the plan in question 13, so, I don't know, 6 again.

Q15 [While reading question 15 rereads "...water will be provided from the other uncontaminated..." Water will be provided to who? *I believe that's the residences and businesses around the GCR site.]* Hmmm...ya, it looks like this is the more complete than anything I've seen. I'm debating between 6 and 7. I'll go with 7.

Q16 It's not quite clear. I understand the circle the numbers, but I don't see how circling the numbers now on the scale and the questions I've done previously... *How they're different? OK. What I've sort of noticed comments as we've gone through you've said, this one seems to be more than this other one. And so what we want to do is assess in your own words. We offer the No Action option, which is nothing...absolutely nothing, and then on the other end of this 10 pt scale is the complete cleanup which is the last option that you just read about and then in between you have these other options. And what we'd like you to tell us is where do you think they lie as far as the completeness of cleanup in relationship to No Action and Complete Cleanup.* So how does institutional controls compare to No action and Complete Cleanup. *Right. Where is it in between those in all that ...??? And if you need to go back and look a little bit more, just let me know.* Hmm, ya, I'd better flip back to see. OK, ya it makes sense.

A. So for institutional controls, I consider that to be about 5. Considerably better than no action.

B. Soil cap and water filtration, probably 6.

C. Soil treatment and groundwater containment...between 6 and 7. I just don't see a lot of difference as we go into more quality options. I don't see there's much difference except the expense so, I'd say probably 6 again.

Q17 I'd better read that again..."The NO ACTION option is not presented because INSTITUTIONAL CONTROLS are already being paid for at the rate given below." Now I'll go on. *Does that make sense?* I understand the last half of that, but again I'd census the no action option is not presented. *Why* Because it sums up ???
[reads the question]
Yes.

Q18 Ya, I would think so. Sure, why not.

If you're not, definitely put that down.

It just doesn't seem real to me. If the situation were real, I think I would. *What doesn't seem real?* Well, it said that the GCR site is imaginary or something like that. If it were real, I would say yes.

Q19 Probably no.

Q20 Probably no.

Q21 Personally, I think there should be a ??? on the overall economic impact of all people in the U.S. To be consistent I would probably choose C, soil cap and water filtration.

Q22 Well, I would think, considering those options (a) and (b) on previous page, I would probably pick B Institutional Controls.

D1 Yes, I believe the description was adequate, sufficient. It was sufficient mostly because of the description gave details about the site...mumbled. specific dates. The description was sufficient in that I read about a situation like this before.

D2 Probably not. I think the decision wouldn't change because the choice was sufficient and I was also sort of biased by the statistics and how they followed the .... it would have been... *Biased in what way* Well, it just seems that I don't know if bias is the right word, but just no argument from the ...how likely it would've been for other things to have happened to risk to die...

D3 OK, so, did reading this information lead you to change your decision... I'm choosing number 1 ...would I change my decision, no. I wouldn't change my choice because I was already informed of the information

D4 To be honest I don't remember what the risks were in particular. They said the contaminants were... but I don't recall it saying if you were ....with these contaminants, there was this chance that you would die. Yes...I found this information useful. I like statistics.

D5 Yes. Because

Protocol 3

Q1 Yes, in my county, city, or community I have.

Q2 Yes.

Q3 A. reread question. Yes, I would circle number 6. *Does it make sense what we want you to do?* Yes.

B. Circle number 6.

C. Still number 6.

Q4 Improving the education system... Well, we're getting into an issue for me. I think education should be more involved with family, but improving the educational system I would say is very important, I would put a number 6 right now.

Improving public roads and highways...Number 4.

Saving endangered species...Number 6

Reducing global warming...Well, let's see...I don't know that much about global warming, so, *Would you like it if there was a don't know response?* Yes. I would like that. Well, I'm going to leave that blank. *Well, why don't you write on the side, don't know.* OK. *So we know you probably would if you had that option.*

Promoting recycling...I would say that is a very important issue.

Reducing Taxes...that is most important.

Reducing the national debt...most important

Cleaning up Superfund sites...most important

Q5 Answer is NO.

Q6 Yes, number 2.

Q7 Yes, I do. *Asked where the risk ladder was. That's amazing! Peanut Butter?!? Peanuts that cause cancer? That's amazing!*

Q8 Well, I still would be concerned though, I would still want it to be picked up. Actually it doesn't really matter. Anybody can die an unneeded death. It still should be cleaned up, so I would put it at ...plus there's animals... I would put it number 6. Is that really true statistics? *Yes. It's not made up.*

Q9 I would not be concerned about that. I mean I would put that like at number 1 or 2.

Q10 So, you circle one that you feel that scientists do... I would say that they are reasonably accurate in estimating the risks.

Q11 Reread "For example..." part twice. I would be satisfied. *Does it makes sense?* Yes, it makes sense. In other words, the government wouldn't do anything, but if you take into account the risk of death from these things, if they didn't do anything, what could you do as an individual. I would be satisfied with that...number 6...that would be a fair thing for people to do.

Q12 I would...I would...I wouldn't be very...what did I...(looked back)...huh, that's an interesting question. *What are you thinking about?* Well, I'm thinking about how I answered the other question and huh, I like the idea of people being responsible, but you know what? In this question...it's explained that the tanks containing the hazardous waste and the ground water will... in other words, they wouldn't clean up any of it. *And that's not clear in the first one?* Well, it is clear, huh, but... *But it's not really explicitly stated, is it...in the No Action option?* No it's not. *OK.* Cause I would not be satisfied with that. If someone said, "Look we're going to take...we will get rid of the waste that is in the sites, we will put a fence around the thing to keep people out. We're going to get rid of the waste that are in the storage tanks. So at least what is there, is contaminated, we can't do anything about that, but we will prevent it from doing any more." Then I would say, Ya, OK, then we'll be responsible for cleaning up the water ourselves. But to leave it in there I would not be satisfied with that. *So, what I'm getting from you is that the No Action alternative, the way it was written, it wasn't clear to you that that was going to be the situation.* That's right even though it says in here under this option.....repeats part of question... *I guess what I'm getting at is would you answer this differently...* I would answer this differently if this "in addition the tanks containing hazardous waste are left on site and the ground water contained would be..." if that were on there I would answer this question differently. *Well, that's what's implied, so why don't you go back and think about that question and tell me...* Well, I would not be at all satisfied. *OK, why don't you go ahead and modify your answer in the light of understanding exactly what it's supposed to be about.* OK,

Q12 I would not be satisfied with leaving the waste in the storage tank left to contaminate the water again. I can understand about the soil. If soil contamination by air is one in 10 million, I would accept that risk. Even though the risk, 10 deaths in 10 million people...I just don't like the idea of it being left there.

Q13 Huh, I huh, that would be great...I don't know if a person can afford to do that...I would be satisfied with that option. I don't want to pay for it. *Well, we want to know your satisfaction.* Oh ya, that'd be great!

Q14 Well, I would be extremely satisfied. That...*Excuse me?* Well, question 15..it says complete cleanup. I assumed that that was a complete cleanup.

Q15 Well, I would be extremely satisfied.

Q16 Reread question...*Does this make sense?* Reread again. No. *OK, what we're trying to get out of here is that...as you mentioned earlier these vary in sort of the extent to which they clean up the problem...in other words, the amount of work that's done. And no action...although it wasn't obvious, you figured out that under No Action, they don't do anything to the site. and complete cleanup, they do pretty intensive like to restore the area and the environment. And what we want to know is...there's three other options that were presented, the institutional controls, the soil cap and so on. I want to know on this scale, where in the relationship to these other to these two options do these lie as far as how close it is to being as extensive as complete cleanup or how close it is as being like to no action.* How close it is to what? *How close the amount of cleanup is...* ...to what I would think would be acceptable? *No. Hmmmm...we're trying to get a feel for the relative amount of cleanup that sort of each of these solutions has in them. Some are more extensive than others.* Oh, ya. *So, how extensive is the institutional controls in relationship to no action and complete cleanup. Where does it lie along this continuum as far as the amount of cleanup or effort or ... restoration that's going on.* Oh, I see. ya, you've got three cleanups here. Which one of them comes up the best. *No.* No, no, no, no, no, Let me guess again. *Well, you read about institutional controls?* Ya, putting a fence around it? *Right. So institutional controls is the cleanup option where they put the fence around it and they monitor the site and* Ya and .....*Now in relationship to no action on one end of the continuum and complete action, how extensive do you think that clean up is. Not how satisfied are you with it, but how complete a solution is it. How well do you think it solves the problem. In other words, you've got this contamination, do you think it takes care of the contamination well or not?* OK. So for institutional controls,

how well does the institutional controls that you described take care of the problem. *How complete is it in relationship to these other options.* Well... *Does it not makes sense?* No. *Not at all.* (chuckling) Well, you've got three different cleanup solutions...*And I want you to answer about each one separately.* OK, so you don't compare them. *No, no, no. How extensive is institutional controls in and of itself to these two options.* OK. *So it would be this one by itself.* So how well does it do the job? *Right.* And it doesn't have anything to do with how I would be satisfied... *Right all I want to know after having read that description, and you've got this contaminated site and you've read this description about what we would do if we were would do if we would do this institutional controls cleanup package. How well would that take care of the problem?* Oh, ok..Well, soil cap and water filtration, I think that would really take care of the problem. *OK* I'd keep that in mind. Soil cap and water filtration, that would be a complete cleanup. *OK.* And the institutional controls? I wouldn't like that. That wouldn't do a very good job of cleaning up I would give that like a 3. *So does it make a little more sense..what we're trying to get out of that?* Ya, now I understand.

Q17 Yes. I would.

Q18 Yes. I would.

Q19 Yes. I would.

Q20 Hmmm. $1400 is a lot of money over 10 years. I would be willing. I just would. It's a lot of money, but $12 a month isn't that much. I would say yes. See, if it were $2000 per person per month, I wouldn't do that, you see.

Q21 Huh, let's see...huh, let me read number C again. (reads it) Huh, I most prefer C myself. I think that that significantly reduces the risk. And at $4, I mean it's not. I don't see that complete clean up seems to be...I don't know it just seems enough...soil cap and water seems to be enough.

Q22 Huh, well, let's see. If it was unexpected cost for soil cap and water filtration...soil treatment and ground water treatment is going to be more expensive. So my second choice is going to be institutional controls. because as I recall, lets see...actually they don't do very much, do they. I guess I'd have to go up. Soil treatment and groundwater containment.

D1 Yes, the description was sufficient for this reason. Why or why not? It was sufficient.

D2 No. No difference for this reason.

D3 Huh...Yes, I chose a less complete cleanup for this reason because I remember the risk involved. *So, the level of risk induced you to downgrade your...* Yes, because of the risk. If I had not been aware of the risk, I would have assumed that it was one in a hundred, you know. I would've gone for a more complete cleanup, but because of the risk I chose a less complete cleanup.

D4 [reread D4] Yes, you bet it was.

D5 Yes, the risk ladder was useful for this reason.

D6 Yes, I chose a less complete cleanup for this reason. *Was it the same reason?* Yes, it was the same reason. *The risk?* Uh huh.

D7 [reread D7 and looked back at figure 2] No. This illustration was not useful for this decision. *Can you tell me why?* Because there's...huh...it doesn't tell me about the risk that's involved. It's very good in understanding how the contamination takes place, but it doesn't do anything telling me what sort of risk I would be taking.

D8 [reread D8] Yes, *Does it make sense what we're asking?* Yes.

D9 Huh, no, the cost information was largely unimportant in my choice for this reason because there wasn't that big of...hummmm....I associated the cost of $1/month with doing nothing at all. So, I didn't think the cost was extraordinary. *So, would you mind marking down there what you just told me?* What did I just tell you? *That the cost in general were not that great.* What I'm writing is the cost that general were not extraordinary. OK.

D10 A. It was extremely important. *Does it make sense what that question is about?* Ya, it does.
B. It's extremely important
C. It's extremely important
D. That really wasn't very important. I would say number 2 or 3. No I'll put 4.
E. The costs were somewhat important.

Please explain: The cleanup to my family, the community, and future generations was very important, but I took into account the risk. The cleanup of mother earth, even if people are unaffected was of average importance to me. And cost was extremely important only in the sense that I didn't think the cost was all that great, even for the time frame. *So why would that make it extremely important? Oh, I see*. If it were $300/month per household for the total payment and it were $20/month for the next one down, it would make a difference to me. *But what we wanted to know here was how important was that in your decision you made in the survey.* Oh, it was very important. I would put number 4. *What you're saying is, is that cost is an important issue. What we're really asking about is when you made your choices, how much did it influence your choices?* Oh, it wasn't that important.

When you were reading through the survey when you read the information about the different cleanup options...when it described them? I know we already discussed that under the no action it was not real apparent to you but, the storage tanks were still leaking and all that sort of thing, but hmmm, the other ones, was there too much information, was there enough information, was it clear what we were trying to do? The other ones were clear. *Did you think that we should add more information or take any out?* Nope. Except for that one it was very concise. *Now, I think this is something that we discussed a little bit too, when you were doing this, but with the cleanup options the first one you respond to is no options. And when you originally did it you answered 6. And then you got to the next one, and what I thought but, having answered 6 you sort of constrained your options for answering the other. It was so high on the scale, that it sort of constrained your options for responding to the other ones. Did you feel that it did at all?* I'm not really...I mean I follow your question, but I don't remember. No action, no I changed it to not at all satisfied. *So, you don't feel that starting with no action affected how you responded to any of the other questions?* Oh ya, if there was no action...I still don't understand your question. I would not like to have no action taken. See, I answered number 6 to begin with because I guess I didn't get a mental image of what was...I didn't realize that the contamination in the storage tanks would remain. *Let's see. The other thing that I wanted to ask you was...you seemed to like that risk ladder, thought that was pretty helpful. But this figure didn't help all that much?* Well, it was helpful in understanding how contamination takes place, so I think it was helpful to the survey. *I guess that's all I really wanted to ask you. The other problem that we all know is with that one question, question 16, and that was the one about the extent of cleanup. And that was confusing to you on page 17. It just didn't really make sense what we were really asking? If we were going to change anything or do anything different in this survey, what would you suggest?* I'd change that. *Change that question?* Ya, I would word it differently. *How do you think we could get that information across with what we're trying to do.* Well, redo the question. *What could we say to make you understand what the issue we're trying to get at. Because I think what ended up happening is that I finally said, "how well does it take care of the problem" and at that point you seemed to have a little bit more understanding.* Ya. *Did that make it better?* Ya, just say that. *OK.*

Protocol 4 VERY DIFFICULT TO HEAR!!

Q1 Yes, Rocky Flats.

Q2 Yes, I do.

Q3 A. (couldn't hear)
B. 6???
C. 7

Q4 Improving the education system - most important, 7

Improving public roads and highways - that would be slightly less important so 6.

Saving endangered species - that's pretty important too, ??? 6

Reducing global warming - well, I'll.....6??

Promoting recycling - My husband....6??

Reducing taxes - More money in my pocket...7

Reducing the national debt - Hmmmm, 6

Cleaning up Superfund sites - 6

Q5 Yes?

Q6 Yes

Q7 Yes, I do.

Q8 Well, actually, there's fewer deaths than I thought there would be. Probably 6. Mumbling/reading the risk ladder.

Q9 Hmmm...every 50 years...I'd say 5 on this one.

Q10 I don't know how they come up with it, but I would guess that they moderately underestimate the risks.

Q11 Well, I have boys and they never do what you tell them and I have a filtration system so I would worry about this. My little girl stays a little closer to home so I would do a 5. *Well, this question wants to know how satisfied you'd be if...* Oh, I would not be satisfied at all.

Q12 It's better than nothing so I'll go with number 2.

Q13 Let's see. I don't know. 'Cause whatever they test in the lab doesn't always turn out the way it should so I'll say 4.

Q14 Well let's see here. It's still trapped there and people could still sneak in there and kids like to drill holes, so I'm going to say 5.

Q15 I'm not sure. They're saying that there are no chances, so 6.

Q16 A. I'm not sure I understand. She explains.

Q17

Q18

Q19

Q20

Q21

Q22

Protocol 5

I want to know what GCR is. I want to know what Superfund is. This map, Figure 1 is unclear to me. Now does it mean there are 79...this is an unclear graphic. Are there 95 superfund sites. I don't know what superfund is and I don't think this map is really good. *OK, you'll read about the superfund sites if you'll continue.* But I might not continue if I got this in the mail and I didn't know what you were talking about. *OK.*

Q1 Maybe the map would be better closer to here. finished reading. Yes. That just seemed a little redundant to me "these sites are.. these sites are.... just the way it's written is kinda redundant. But that's OK.

Q2 Yes. I don't understand. Circle number of best response is not worded clearly. You don't even need to have that, do you know what I mean you don't even need to have that I don't think. *Maybe circle one?* Well, you have that in the first one and do you know what I mean like after the first set of instructions and circling, I don't think you need to have it. It's like a waste of my time to read that.

Q3 I don't even know that you need to keep saying Superfund. Superfund just sounds... *Well, we want to make it clear to you that this survey is about superfunds.* Oh, OK.

A. 6, extremely important

B. What's the difference...the first one's about me and the second one's about the environment? *The first one is supposed to be about you and the second one is supposed to be about others.* OK, well, it's important also, 6.

C. 6

Q4 Improving the education system - that's a 4 for me.

Improving public roads and highways - that's a 2 for me

Saving endangered species - is a 6

Reducing global warming - is a 7

Promoting recycling - is a 7

Reducing taxes - is a 4, it's not that important to me because we need taxes to do the rest of these things

Reducing the national debt - I don't know, it doesn't directly affect this, that's a 3

Cleaning up Superfund sites - is like a 6.

Q5 To remedy? To fix. You don't know you could be speaking to a moron. Some how it seems to me that were not adequately disposed of would cover that. These are wordy questions a little bit? *Sometimes hazardous stuff, since it's stored on these sites, but sometimes they've treated them to sort of take care of them? But at the time, they may not have had the technology, so they're trying to cover everything, but I understand what you're saying.* "health risks to humans are usually described by scientists as very small." That seems like bullshit to me. Like, that seems like not true. Even though they may say that it's true, it seems like...I mean I wouldn't want to be living next to three mile island or you know I wouldn't want uranium in my water, or do you know what I mean? It just seems like that doesn't seem true.

Yes.

Q6 Paragraph before Q6, you told me that before. Yes.

Q7 It just seems really wordy. Like, it just seems like there could be half as many words there. I don't know that I'd read this whole thing. *Well, that's one of our goals...is to find out where we can cut it down.* I don't think you need to repeat things, like even the word community was like 10 times. It could just be really abbreviated. Cause someone might not read this, so you might lose someone by the end of this. Yes.

Q8 To me, to read that is such a mouthful. If you're going to make up a fictitious name, it could be a lot shorter than that. "In other words what the effects would be if Superfund did not exist." That comes out of left field. Cause you've been talking about this GCR Manufacturing site and all of a sudden you throw this guilt trip. In other words, this is what would happen if you don't approve this superfund thing. *OK.* I don't know if you need these subheads that don't say anything different than the first line. Like, you could make this first sentence bold and I wouldn't be reading this twice. Cause usually your subhead is the same exact thing as the first five words of the sentence. Using the subhead is redundant. What's an aquifer? Is that a waterway? *An aquifer, if I understand it correctly is what they've tapped into in the ground water. So it's just like a pool of ground water that they've tapped into.* I don't know what that is. *You don't know what ground water is?* No, you've explained to me, but I don't know what an aquifer is, so maybe that's not a good word. *I've had other people who didn't understand what that was either, and I don't really understand it that well either, so I agree.* Also, by your community and farmers are you implying that the farmers are going to be using this to water the food and the food is going to be toxic? You know what I mean, like, by your community is enough because I either live near farmers or I don't and if I do I either know that the products, I eat them, I don't know. I have to reread this if I want to know what this is all about. So, half comes from ground water and half comes from surface... *Right.* And the ground water is taken by wells and only 4 of these wells. So like 4 out of half of these well...That to me is confusing. *Is it too much technical information?* Ya. It's like you could just say some of the ground water in your community comes from wells that are contaminated, period, but I don't need to know 10% or 2% and... *What they want you to understand there is that there're 4 wells near this GCR manufacturing site that are contaminated*. But that's enough to say. You know what I mean, 4 out of 20 wells in the community... *Right.* I don't need to know the percentages cause if 1% hit me I wouldn't want it. *Right.* So I'm looking at this map and this is the pump that takes the water out and to me the wind is blowing it off the surface to populated areas. *Well, I think what they're trying to show there is something that we haven't discuss yet.* Right. So to me, you only have this map on this page. *So we should just show the ground water stuff because that's what we're talking about.* Ya there's a pump and an abandoned facility and you don't really need three arrows even. If you wanted 3 arrows you should draw it like, this is year 1, year 2, but not this curving thing? *It's just trying to show that the groundwater is seeping under across the water table.* OK. *That's what they're trying to show.* I would just like to, you know, use the other half later. Somehow I think you could have one big swishing arrow instead of these three arrows, you know? f would be.... this is not...the tables need work. Not clear enough. *Does the risk ladder make sense to you?* It's so much information you're asking me to absorb in one survey that I would never do this! You'd have pay me to send it to my home. And I'm a thinking person, but it's just, like, I think it could just be simple like, 4 wells out of 20 wells are contaminated, this means one person would die every 5... all the rest of the, I don't think you need to say in your imaginary community of 200,000 people, but I've already bought in that two pages ago. To me, one of these paragraphs is overwhelming to even look at, but that's just me. *So you're saying that* bold subheads and bullets points almost. 4 wells out of 20 affected, 2 people will die in this time...turn to page 3. I also think that it's asking too much not to put the charts on the same page. I think figure 2 should be with a question that says about figure 2. *It will on the final, unfortunately...* Unfortunately I'm a designer, so ... *That's OK, that's good. That's really good. So, with the risk ladder, would you collapse some of the information there?* You know, I didn't even get there yet. I want to look at the thing underneath it, you know? Like, if you actually lived in this situation how concerned would you be with... I would be 7. I would be concerned because I would think you're lying to me.

I would think you were lying to me that one person would die every 5 years. *Actually, that's absolutely true.* I mean, I believe you, but that to me is such a low statistic. Why are you sending me this thing if that's really true? I wouldn't want my children drinking this water.

Protocol 6

Q1 Ya, Oh I have to circle it.

Q2 Of course.

Q3 A. Circle 6.
B. Circle 6.
C. Circle 6.

No other reasons.

Q4
Improving the education system	5
Improving public roads and highways	5
Saving endangered species	4
Reducing global warming	6
Promoting recycling	7
Reducing taxes	7
Reducing the national debt	4
Cleaning up Superfund sites	6

Q5 Yes I have.

I will need you to read a little bit louder because this is going to be transcribed. Are you kidding? Oh my...

Q6 Yes.

Q7 Yes.

Q8 *You know what?* What. *They forgot to put the risk ladder in. Darn. Well, forge ahead...* OK, well, I would be very concerned. Number 7.

Q9 *It's called leachate (pronunciation trouble), does it make sense?* It sure does. *OK.* Extremely concerned.

Q10 I would say 3.

Q11 No.

Q12 (Pause) No.

Q13 No.

How are you doing? Oh, bored, but...

Q14 (Long pause) *Did it make sense...what it says there?* (Mumbles) *Pardon?* I'm trying to decide if I'm satisfied... *But did it make sense what we were going to do in this option?* Ya. Hmmmm. No.

Q15 (Typo) Hmmm. Yes.

Q16 *Does it make sense what we're asking in this question?* No. *We've been trying to improve it and we've had a difficult time wording this section so that it's understandable. What we're trying to get at, is that when you read through all those different options, the No Action was the first one that you read where we just didn't do anything, and the last one you read was the Complete Cleanup, where we did everything we could possibly do. And then in between you read about institutional controls and soil cap and water filtration...and what we're trying to*

get at in this question is compared to no action on one end and complete cleanup on the other, how extensive do you see these other types of cleanup. How well did it take care of the problem? Does it makes sense? It's kind of a tough question. So what we're trying to get at is, how extensive a solution do you think institutional controls is. Does that sort-of make sense? Cause if it doesn't, let me know and... No. *Well, we've got this scale with no action on one end and complete cleanup on the other and then we gave you the alternative of institutional controls where they're gonna put the fence around the site and limit direct access, things like that and then we're gonna replace the contaminated water with clean water. And so I guess what we're trying to get at here is that sort-of the amount of effort or the amount of cleanup that's going into that, is that close to No Action or closer to complete cleanup. How close do you see it to No Action as opposed to complete cleanup. Does that make sense at all?* Ya. I think these are good, but I think these... *What do you think we should... So do you think if we did..* How about good or bad or adequate or something. Let's see. If you replaced contaminated water with clean water... That's like adequate. *OK, so maybe we could have like...you don't like the endpoints on the scale is what you're saying.* Ya, like no action could be ... I guess, because what I want to do is each of these, but I don't, maybe that's not what you want. *What do you think that..* Well, like, replace contaminated water with clean water, OK, I want to rate that. But see that's not what you're asking. *Oh, well what these are supposed to be, and I think what the problem is, is that when you were reading through on the...back here on the cleanup options, the first one you read the title that we gave it was No Action and then the next one you read was Institutional Controls and what this was supposed to be is sort of a synopsis of what we were going to do in the institutional controls option. Is that not obvious?* It's not obvious at all. *OK. Well, that's what we're trying to find out when we're doing these protocols. OK..* Because why didn't you start with, oh, I see... (shuffling paper to look at previous descriptions) OK, so what this is No Action..Institutional Controls. *Well, what we're trying to use is the No Action alternative as the endpoint on the scale, and in comparing institutional controls to no action and complete cleanup, where does it lie in the middle.* OK, no action says that nothing will be done. *Right, and we're not...we don't have no action in here. But we're trying to use it as a scale endpoint. It doesn't make any sense, does it?* Well, I mean no action nothing happens. *Right, exactly, so this is saying at this point of the scale nothing happens, at this point of the scale everything happens. So rather than saying No Action, we should say do nothing...do everything or something like that.* No, I don't understand...replacing contaminated water with clean water. That obviously isn't no action, that is some type of action. *Right, cause that's under institutional controls. I think I've got you really confused. I didn't do a very good job of explaining this at all. Hmmm.* Ya, see if you build a fence that's some kind of action. *Right, because remember the first option that you read about was no action, but the second one you read about was labeled institutional controls and these are the things we did under institutional controls. Now under institutional controls, what you're saying is that that's more than no action.* Ya. I guess it would be down here at 2. *OK, that's exactly what we're trying to get out of it. How much more is it than no action.* That would be way down here. *OK, great, then that's what I'm trying to get at and then the next one is the next one that you read about which was the landfill cap, and that's where we don't let people dig at the site, we're gonna put those filtration plants in to remove...* so that's obviously some action. 4. *Great.* And the next one is even more action. 6. *So, I think we need to work on that question. Because it's not...without a lot of explaining...in other words, if we put this question in the mail survey, I don't think we're going to get much response on it.* Is that you're idea? You're going to put this in the mail? *This whole survey will eventually be a mailed out survey, so we have to...* You know, if I got this? I wouldn't respond. *You don't think you would?* Maybe I would go through short questions. Especially if I got it through the mail. *Well, I think..* But then I'm pretty bad because I've been known to throw rent checks away so... *OK.* I'm probably not a good example there. *Well, you know I'm sure there are other people like you out there, so...* ...that just don't want, you know, you get all this stuff through the mail and just throw it away. *Well, eventually I think we'll try to make this as short as possible because we've done this before and people were saying that people don't want to answer.* Unless you have a real selective audience that you want... *What we really want is it to be cross section of the whole nation. You don't think that's gonna happen...* Not this one. I'll continue? *If you're ready, sure.*

Q17 Yes. I'm not going to get through the rest of this in the next 10 minutes. *What time is it?* It's 10 to 10.

Q18 Yes.

Q19 Yes.

(next questions misnumbered Q11 - Q15)

Q20 (long pause) Probably $30.

Q21 *Oh, I'm sorry I think this isn't clear on question 12? This one here? We just want you to tell us which of these you think that your money will be going to. So, you just gave us a dollar amount that you'd be willing to pay for complete cleanup and do you think that the money would go just for the cleanup programs...* well, didn't it state that here somewhere? *Yes, it does.* It says in addition to the cleanup taxes. So what did you want me to circle? *Hmmmm. What it's trying to get at is do you think that this money that you would pay out on a monthly basis, do you think it would go just for the stated problem? Or would you want it to go some for this problem and other environmental causes, or would you want it to be a contribution to all environmental causes.* Well it says right there in addition to environmental causes. *So this question isn't...* Reading it so slowly I can't really think about the questions because my mind doesn't work that way. It really wanders when you read aloud. *so by the time you get to it you're trying to figure out what in the heck you...* Ya, you have to mentally go out and reread it because when you read for ... I'm more concerned about how my voice projects and stuff like that rather than understanding the question. *So why don't you go ahead and go back and reread that question...* This one right here? *No, that one.* 1.

Q22 *Oh, what did you answer in...you answered 1?* Uh huh. *You only answer 13 if you answered 2, 3, 4.* Where does it say that? *That's what that arrow is supposed to be for.*

Q23 7.

D1 Yes. Why or why not? *If you have anything to add, put it there, if you don't that's fine.*

D2 Yes. (heavy sigh) *Does that make sense? I think what they're asking here is would you have been willing to pay a different amount for the complete cleanup.* No.

D3 No.

D4 Yes.

D5 (didn't have the risk ladder)

D6 No...(hard to hear)

D7 No.

D8 Yes.

D9 No.

D10
A. Extremely Important.
B. Extremely Important.
C. Extremely Important.
D. Very Important.
E. Cost. mumbled...number 3.

Protocol 7

Q1 No.

Q2 Do I support it? Yes I support it. Stupid question.

Q3 A. That's extremely important.
B. Is equally important.
C. Equally important.

All of them are equally important. Any one is enough.

Q4 Improving the education system Probably most important because everybody else is smarter than us.
Improving public roads and highways ...stuff they're doing here in Boulder. I'd say 5.
Saving endangered species 6
Reducing global warming 5 I think the planet will take care of itself.
Promoting recycling That's important. 7
Reducing taxesI couldn't really care less, but let's go for 3.
Reducing the national debt Very important otherwise we're going into bankruptcy.
Cleaning up Superfund sites I'd say hmmm, well, depends, whether they're going to clean it up and then change the policy on how to dispose of stuff and it's important if they're gonna waste the money cleaning it up and not do anything else. But I'd say it's important.

Q5 Yes.

Q6 Yes.

Q7 Yes.

Q8 I'd be extremely...oh, almost extremely concerned, especially since this is supposed to be informative and they're not giving me any information about other health risks.

Q9 mumbling, adds up deaths... Pretty close to extremely concerned.

Q10 Oh, I'd say they're probably pretty close as far as they know, but I don't think we really know as much as we'd like to think we do.

Before we go on do you feel comfortable going on or do you want to take a break, or huh I'm alright, this is kind of pretty stupid the way they go through, I mean it gives you all this information, but it doesn't draw any conclusions. It doesn't really tell you what's going on.

Q11 No Action. I don't need to read it. I am not satisfied with it.

Q12 Hmmm...it's not really any better. It doesn't do anything for the environment, it doesn't do anything long term, it just short term and eventually that stuff is going to get in other water if it keeps moving. mumbled something about it not being very good.

Q13 Ya, that one's alright.

Q14 Yes, it's better than the other one I guess.

Q15 I'll tell you right now I'll be satisfied with ... What do you mean eliminating from the site, where are you gonna put it? (goes back and reads about hazardous waste facility) oh, OK.

Q16 A. That's just minimal. That's what people do when they want to take no action, so 2.
B. mumbled something...4.
C. That's a 6.

Q17 Yes.

Q18 Yes.

Q19 $8 a month, that's getting up there. mumbled... Yes.

Q20 So, all of these times 12. Does a lot of math mumbling... $15.

Q21 Probably 1.

Q22 All of it.

Q23 If I was living there I'd probably feel responsible, 6 or 7, probably 6.

D1 Yes, it was. *If you could, in this section please ...* Ya, ya. *If you could read that response out loud...* Ya, I've seen the Boulder landfill so it was easy to picture what it would look like. This one is smaller.

D2 Yes. Only slight since the order would actually ...

D3 Yes, I chose a more complete. Because ground water has long term effects and it effects the environment more.

D4 Yes, I did. It's too difficult to draw your own conclusions unless you have information. I didn't know what the problems were.

D5 Yes. But more information on diseases as well as death is needed.

D6 Yes, I chose a more complete cleanup because surface water is immediate as a problem, and any contamination of any kind will call for a more complete clean up.

D7 Not really, because the written description was enough.

D8 Yes, it allowed you to see which problems each option solved.

D9 No, not really, as long as I can afford it, I think complete cleanup is the only option.

D10
A. Very important
B. Very important
C. Very important
D. Very important
E.

They're all very important and they're all equally important. *Did you read the last one, Cost?* Yes.

Protocol 8

Q1 Yes, state.

Q2 Yes.

Q3 A. Very important.
B. Very important.
C. Very important.
To preserve the world for the future generations so that everyone is able to enjoy the same sights as the past.

Q4
Improving the education system	Extremely
Improving public roads and highways	mediocre
Saving endangered species	a little more than mediocre
Reducing global warming	little under ???
Promoting recycling	definitely
Reducing taxesnot that important	
Reducing the national debt	important
Cleaning up Superfund sites	important

Q5 No.

Q6 No, not really.

Q7 Yes.

Q8 Number 5.

Q9 Very.

Q10 I don't think they know the actual health risks.

Q11 No.

Q12 No.

Q13 Ya.

Q14 Huh, not sure.

Q15 Ya.

Q16 A. Not really? (hard to hear)
B. It's better, not great.
C. That's better.

Q17 Yes.

Q18 Yes.
Q19 Yes.

Q20 $0, no...let's see...$20 bucks.

Q21 Huh, I'd say all environmental causes.

Q22 Huh, 90%.

Q23 Very...extremely responsible.

D1 Yes. The reason I feel that it was an accurate description is that is showed all types of contamination that is in reality.

D2 No. I feel that all problems will affect everyone someday.

D3 No. No change because of this reason. I already understood the way groundwater is effected.

D4 No. I don't think that we know what really will be the problems in the future. We can never project the problems.

D5 No. The risk ladder was helpful only to put other risks in comparison to what has been discussed, but not to affect decision.

D6 No. I feel that we need to take care of all the problems now so that they don't cause greater problems in the future.

D7 Yes. This figure puts into a visual aspect which may not be so easy without it.

D8 Yes. This shows the alternatives to complete clean up, if complete is not a feasible option.

D9 No, it didn't affect my choice, but how it affects my values is that money cannot replace the earth, so if we don't spend the money now, we will not have an earth to live on.

D10
A. Somewhat important
B. Important
C. Real important
D. Real important again
E. Somewhat important

I feel that if we don't watch out we will not have an environment to enjoy but just exist in.

Protocol 9

Q1 I'm wondering what they mean by near, because Rocky Flats, while it is adjacent somewhat to our community, is a distance away, when I think in terms of my personal community. I don't know of any that are like, exactly in my neighborhood, I don't believe that we were built on any kind of a landfill or anything like that. There's the Marshall Landfill down the road. In my county, city, or community, Yes. Should I go ahead and circle? *Yes, please.* I would say yes, for county, city, or community, at least for the first two.

Q2 Yes.

Q3 A. That would be extremely important. I'm circling. *I just noticed that you said it was extremely important...* and I marked the wrong end, so I wanna go to 7. And write not applicable on the first one.
B. That would be extremely important too, and I can mark the same number for all four answers? *Oh sure, absolutely.*
C. Probably the most important.

Other reasons: Well, I think those are about the 3 most important reasons. The only other reason that I can think of would be for economic feasibility in the area, in other words to make the place reasonable. Economic environment also. Should I write that down? *That would be great, yes.*

Q4 OK, one is least important, I have to remember this. I have to reread this. OK, so I'm circling the importance on this graduated scale, but I'm keeping in mind that I'm comparing it to the importance of this cleanup. *The last one on this set of* is the cleaning up of the Superfund sites, OK. *So basically, what we want to know is just how important it is to you and then you're also going to do this on superfund sites, so we'll get a relative assessment.* So, circling 7s all the way would also be acceptable. *Oh sure. You're gonna rate each one in and of itself, so in other words, it's not a rank ordering. You know what I mean?* Uh huh, I understand. *Are you laughing at me?* No, I'm kind of laughing because there's not many of these that I don't think are important. *That's OK.* Without being able to explain my answers I'll just circle them, OK? *That's OK.*
Improving the education system would rank very high, I'll give it a 7.
Improving public roads and highways While that's important I don't feel that it's quite as important
Saving endangered species I would also give a 7.
Reducing global warming I haven't really found the evidence to compel me that it's that bad, so I'll put it just above roads but below education.
Promoting recycling is necessary
Reducing taxesis very necessary
Reducing the national debt and
Cleaning up Superfund sites all get 7s.

Q5 Huh, let's see...I would have to say yes, I've knowingly done that. I don't think that I necessarily knew just what effect if might have.

Q6 Yes.

Q7 Yes.

Q8 OK, I'm looking at Figure 2. I'm considering the risk ladder.
Huh, let's see, I would still be extremely concerned.

Is it pretty obvious to you, what's going on there? The only thing I don't see right off is the level of where you would put your possible health risk from this ground water. *What we have here is letter f. Would it be helpful to have like a little box?* Ya, like, you are here. *Right, we're gonna put one of those on. So eventually we're gonna have a box that says this is the risk,*

but it is right here compared to all these others. OK, Ya, once that's like, readily available to your visual... Average consumption of peanut butter is this risky? *Isn't that interesting?* Yes it is, but my concern would still be that I can choose to eat or not eat peanut butter. *Right.* I have to drink water.

Q9 *Does it make sense what leachate is?* Ya, I'm familiar with what the leaching process is. *I just want to make sure.* It's just not a word that I come across when I'm reading very often. OK, I'm making sure that we're talking about the same risk ladder in figure 3. *Yes.* OK. While I would be concerned, I don't think I would be as concerned as I would be with ground water, unless my community was using the surface water for drinking water also. *Hmmm.* It says for recreation. *You're right, we don't explicitly state that this contributes to the drinking water. I think what we want it to say is that it does.* OK, if it does, then I would again be extremely concerned.

Q10 I have to reread the question, because... let's see at this point I believe that they're becoming reasonably accurate because the science itself is becoming more accurate because they know what they're looking for. In the beginning I would say that they underestimate because they don't know what they're looking for, so *Oh, I see what you're saying. This is a well developed science.* Right. If we're talking about specifically these superfund waste sites I believe at this point now they are reasonably accurate in estimating the risks. *I think they really want to know about toxic...substances, so let's just ...* OK, I say reasonably accurate.

Q11 No.

Q12 No.

Q13 We're getting closer, but not quite.

Q14 No. Because we're not considering cost. *Not yet, we will.* OK.

Q15 Yes.

Q16 OK, we're ignoring cost, complete cleanup alternative...I'm not sure I understand what they want. *OK, what we're trying to get at and this is sort of what's been going on...the no action alternative that you read about earlier, we would do nothing at the site.* And leave it like it is. If that's acceptable to me then I should circle a 1. *No, what we're doing OK, that's the no action, and then on the other end of the scale is the complete cleanup. So, that's sort of a scale and we're trying to anchor on that scale is the extent to which we take care of the problem. Under No Action we don't do anything to take care of the problem and under complete cleanup we're doing everything. Then when you were reading about these alternatives, you read about institutional controls like...and what we're trying to get out of this questions is, relative to these two alternatives,* where would this fit in. In other words I'm comparing institutional controls to these other two, no action and complete cleanup. *Right, where does it lie in between as far as how extensive the cleanup is. Does that make sense?* That makes more sense.

A. It's better than no actions, but not nearly as good as clean up, so I'll give it a 3 because it's got a good beat.
B. That's a little bit better. I'll go with a 5 because that's about midway.
C. That's almost like the complete cleanup.

Q17 Yes.

Q18 Yes.

Q19 Yes.

Q20 Well, now we're talking economics as per my household's income. Hmmmm, so my thought process is to go back to the page before where I was answering the questions for the

approximate costs. $8 a month. Well, keeping this in...I have to include my own economic situation. *That's what we want you to do.* when I think about...and the other responsibilities that I have, so, I have a number and it probably means that I would have to eliminate cable TV for a number of years, but that is something that I would be willing to do so I'm gonna circle $15/month.

Q21 Well, going just off of the way that the question is state on the preceding page, I was only considering the cleanup of the program. So, I will circle 1. *And what it should say there is, if you circled one, go to question 15.* OK.

Q22 skipped

Q23 Wow, that's a tough one because you're not the one that contaminated it, because when you purchased the house or the property that you're living on, no one told you that you're going to have to clean this up, so...but you're gonna have to accept certain responsibilities when you buy in an area because you're buying...you're laying out the convenience of the area, along with the ambiance of the area when you buy. That makes it attractive to you. You don't just buy it because it's a corner lot on a road that's an easy access to the shopping center. You consider your job, accessibility to your career, accessibility to maybe open space or things like that, your general environment. So, I believe you have to accept quite a bit of responsibility. I don't know if extremely responsible is the word that I would use, but I would feel responsible, and on a scale of 1 to 7 I'd think that I would have to...my feelings would be that I would be responsible to a higher end but then if this survey goes into effect, my taxes are gonna go up because they're gonna hit me for this one. This is one that I think I'm gonna have to stay about midway on. Not necessarily for myself and the community, but because other people that are trying to buy into the community may quite practically be financially bust, trying to reach for a little bit more of the brass ring than maybe they should have? But purchasing that property and then suddenly finding out that essentially, for all intents and purposes, there is a $150 to $200/yr surcharge, if we just went by the numbers that I put up that quite frankly might put them out of the ability to meet their tax obligation for other considerations. Say county assessment or something like that.

D1 Yes. *Now on this, Michael, it says why or why not. If you have something that you want to put there, fine, if you don't... you know you don't have to try to think of something..* OK, I'm gonna say yes and just leave the why or why not blank because it was, just enough for me to picture.

D2 I would have to say that, that, no, my value would not be different because I'm thinking more of raising my children in an area that would not poison them, and having them be able to raise their children while I'm accepting... OK, why or why not. *So, you don't...* What I'm saying here is that if I really did live near this GCR site, my value would not be any different. That I would have to give 'til it hurt. *So you did answer..* Right. I would have to give 'til it hurts for two reasons 1) because of my children but also 2) because the economics of any area is highly dependent upon us getting the earth cleaned up so that future generations can...Love Canal cannot be sold or bought by anybody now because of the condition it's in. They were big losers. If they could've paid $50/month, gotten it all cleaned up, to this day they might've been able to recover all that money. Being a business person, that's how I think.

D3 Yes, I chose a more complete cleanup for this reason.

D4 For me personally, no, the risk information was useful because it was so low it didn't matter to me. I think that's what I'm trying to say. I think I'm gonna circle one on that because the risk information wasn't really useful when you're talking one out of 10 persons, it makes it sound so low, but one death is not acceptable just because we have a dirty environment.

D5 I don't know if I used the risk ladder because I think I'd already made up my mind. So I think..well, I think it was useful because it gives you an idea of where peanut butter ranks as

opposed to where hazardous waste ranks, but I don't think that it had just because the risk factor was f, which made it appear very low on the ladder, didn't make any difference to me. It needs to be cleaned up. So, I guess No would be the proper answer. *There's sort of two questions in here. Was it useful and does it affect your value.* Right, it was useful, but it didn't affect my value.

D6 No.

D7 I have to go back, I've forgotten what figure 2 was. Yes, it was.

D8 I believe that that was helpful. Yes, it was very helpful because it explained things step by step.

D9 The cost information was largely unimportant to me, because the cost that they're using, they mean direct monetary cost. They're not talking about future cost, health, the cost of health, the cost of future cleanup that may absolutely become necessary. See, we're assuming that if we don't clean it up, it's not necessary to clean it up as long as you don't drink your water, but what if this site blows up in 20 yrs like landfills did 30 yrs ago when the methane backed up and they had health hazards of a different kind.

D10 A. Well, that was extremely important.
B.
C.
D. I feel that that's unimportant
E. Well, the cost is mildly important because you can't go broke doing it, but it's not as important.

Well, I think that a lot of people that are in communities, especially the developments that are built on these landfills, tend to be of the middle class housing developments. These people are American dreamers, as it were, so they're taking a 30 yr mortgage and because of that the dollar amount is greatly considered when people think about cleanup, the cost. They talk in terms of resale value. The one cost that a lot of people forget about is overall economic environment, and that, I don't think is mentioned in this. Rocky Flats, for instance, in this area, is going to have to be cleaned up. The arsenal is going to have to be cleaned up, even the Marshall landfill is going to have to be completely cleaned up. If it's not, what happens is as the population grows, the available resources for someone to become gentry or landowner are going to be greatly reduced. It's gonna drive prices up and it's gonna price people out of the market. Or out of Boulder.

Protocol 10

Q1 Yes. 3. *Could just actually circle the number?* Actually do something in writing? Yes.

Q2 Yes.

Q3 Just naturally I read through everything before I make a decision, so... OK, my one question is, am I comparing these? Or am I *No, we want you to rate each one as an individual.* As an individual, OK.
A. Hmmm, I would probably put down a 5 or a 6, so I'll put down 5 just because there's a certain point that I don't think that to preserve...I don't think that they can clean it up completely.
B. Again 5 for the same reason.
C. Hmmm, if they're still there. So I put 4.

Q4 Improving the education system 7, just 'cause that's where I work.
Improving public roads and highways 4
Saving endangered species 4
Reducing global warming 7
Promoting recycling 7
Reducing taxesmumbled something so I put 5.
Reducing the national debt 5
Cleaning up Superfund sites 5

Q5 I always think, which scientist and who paid for it, you know?

You bet. Of course.

Q6 Yes.

Q7 Nationally? Or is this just stream consciousness. I just always worry about east coast vs. west coast... *I'm not sure what you're asking.* Well, you know, in the east coast the landfills have been around a lot longer than they are out here and they've been here longer than they have in the middle of Wyoming. *I see what you're saying.*

Ya, why not. Somebody's gotta pay for it.

Q8 Uphill or downhill? *I don't know.* Seriously. That would have an affect on anything... *Let's see, I think on the next page we show a figure of it. It doesn't look like...* Ya, but I always wonder the way it creeps, you know what I mean? *Oh, I see what you're saying.*

Do I have to say GCR every time? *No.*

Q9 (laughing at picture) Come on, don't you guys have...? *This is last minute.* Oh, I'm sorry, you can do better. "risk ladder presented in figure 3" should be on the same page. *Yes.* So it's the same as getting a little bit more risky than flying on an airplane. Mumbles about risk ladder.

Well, I look at this and to me it doesn't look that risky. There's a heck of a lot more that I expose my family to...and myself, so I would say 3. Cause having x-rays when you go to the dentist is more risky, and I do that more than once every 5 years.

Some confusion about how the survey is written and mixed up numbers. Mine is fine.

A lot more than I was before. As I look back...I'd probably move it up. Can I say 4 1/2? *Sure.*

Q10 My first thought is who funded the survey. *You mean when they estimate things you want to know who employs the scientists?* Ya. *So you have suspicions about...* how they secure their

data. I had a niece you had leukemia and it was quite possibly caused by ??? and live in a neighborhood with lot of cancer victims. It's an area back east. They don't live there now, and...??? And I don't think they really know the long term health risks. I mean, the thing with peanut butter and cancer, and mushrooms and cancer. And until 2 yrs ago they didn't say that anybody who had cancer who worked at Rocky Flats, was caused by Rocky Flats. My sister in laws father died 10 yrs ago. *Did he work out there?* Ya, brain cancer. So, I don't like this. *You don't like this question?* No because it doesn't say...I want to know who funded it. *So you really don't have enough information.* I can't make a judgment there, you know what I'm saying? Because some scientists are gonna say, ya, Clyde worked at Rocky Flats, he was exposed, that caused his cancer, but the scientists at Rocky Flats or the federal government or Dow chemical say, no, it's just purely coincidental. Perhaps in his family there was a high risk or vulnerability anyhow, so who's paying them to say that.

Q11 "if hazardous substances had not been released." I'm having a hard time reading that. *Is it a confusing...* I need to read it again. *OK.* So, it's just as if it hadn't existed at all. *What we're trying to get at there is that even if the landfill hadn't existed, it wouldn't be pristine ...* Oh, OK.

No, I don't like that one.

Q12 I'm satisfied. The person who died... *What they're saying is that the rate of contamination is such that there would be one person in 50 years whose death it would directly cause...* Ya.

Q13 So everything's being eliminated, are you satisfied? Sure.

Q14 This is different, "a wall of dense clay..." What happened to the wells? Nope. Don't like it, cause they don't tell us what happened to the wells. *You're right. It doesn't tell us that. Actually, I think what they're trying to get at is that I don't think anything's done to just the wells, but they provide residences with this as an alternative.* Ya, but nothing happens to the wells and there's no charcoal...I don't like it.

Q15 Yes, do I have to read it? "Once cleanup is complete..." Sounds good to me!

Q16 A. Probably not great, 3.
B. I like that one better than the one after, so I'll do that as 7.
C. And the next one 3.

Wait, where's the complete one? *It's not on there. What we're trying to do in this question, and I'm not sure it's clear, is we're trying to get an assessment from people as to how sensitive...and what we're using as our anchors is No Action and Complete Cleanup, so we didn't think we could have complete cleanup on here since it's being used as an anchor.* OK.

Q17 Sure I'd be willing. Ya, sure. A dollar isn't that much.

Q18 Ya, sure. That's not much.

Q19 Well, $8 a month isn't bad, but I didn't like that one. It didn't do anything about...I just didn't like that one at all because...I don't like that one because, it's containing it, but what about the water that also is in the wells and everything else. *So maybe it would be good to have an option on here that says like...I'm unwilling to pay for this option?* Ya, I don't like this one. This option is just not a viable one for me.

Q20 "...answers to next questions are very important." Well, were the other ones not? Sorry. *They're all important.* If it costs less than we're going to be charged less. *Right.* $10, probably, just looking at the other prices. I mean, the others seem in line, but more than $500? I don't have $500 a month, I mean, unless they pay me to do it. (confused by the arrow)

I would say it's just for the complete cleanup...period.

skip Q21

Q22 Responsible at 5.

D1 No. Because I didn't know how much rain there was a year. I didn't know anything about the site... if I lived near the stream, if I live up stream, if I lived downstream do I need to write this down? *Just some of it, yes.* OK, rainfall, something about the soil, upstream, downstream, closeness to.... is it in the suburbs, is it in the boonies, the economic situation in the area, the job situation, is it a wealthy area...

D2 Maybe. Ya, it would've been different, of course. Just because that's the way things are.

D3 Yes, I chose a more complete cleanup for this reason.

D4 Ya, that makes a difference, ya.

D5 Yes, of course it was. No doubt about it.

D6 Probably yes, I chose a more complete cleanup for this reason.

D7 Yes, it was, of course it was. And it really helps to look at a picture.

D8 Yes, because it gave me a lot of the options and variations.

D9 Yes. *I think what they're trying to get at here is, did the cost...* affect whether or not you wanted a complete cleanup? Sure it would because if it's out of hand, I wouldn't want it.

D10
A. Important, 6
B. 6
C. I'm going to say 5.
D. Hmmm. It's not as important, but how not important...I'll go down to 3.
E. 5.

Protocol 11

Q1 Yes, number 3.

Q2 Number 2, yes.

Q3
A. I think it's extremely important, number 7. Not especially for myself because of my age, but for the rest of my family.
B. I think it's extremely important, number 7.
C. Hmmm...I probably would rate that about a number 6, I don't think that's quite as necessary the health of people.

Q4
Improving the education system — I think that's extremely important. The reason being that I don't think that kids get the education they used to get and I don't feel that some of the schools are as interested in kids as they used to be. Their whole object today is just to get 'em in and out.
Improving public roads and highways — I'd rate that a 5, I think it's important.
Saving endangered species — I think that that would rate a 6, it's important to me.
Reducing global warming — I read so many conflicting articles on this, and, huh, I really don't think that it's quite as important as they're making it out to be. I'd probably rate it about a 2, because I read too many conflicting articles.
Promoting recycling — I think that promoting recycling is a really good idea if they find a place to dispose of the things that we are recycling. I would probably rate that a 5.
Reducing taxes — In view of Clinton's latest news here and the retroactive tax we have, huh, I think that that's important to have our taxes reduced. I'd rate that a 6.
Reducing the national debt — I'd rate that a 6 because I think that is important.
Cleaning up Superfund sites — I'd rate that, huh, probably a 5. I think it's important but I think there's a few other issues that probably need to be taken care of at the same time.

Q5 No. I'm sure I did, years ago, but at the time they weren't rated as hazardous materials, 40-50 yrs ago.

Q6 Yes, number 2.

Q7 My answer would be yes.

Q8 Where is the risk ladder? *Two pages ahead. pause Is that pretty clear to you?* That's pretty clear. One out of two people who climb Mt. Everest die, but not many people try to climb Mt. Everest. OK, I think that this is all pretty clear. *OK.*

If I lived there at my present age I wouldn't even be concerned about it, but if my grandson was living there I would be concerned, probably about a level 6, so I think that's what I should check.

Q9 Hmmm, there again, I probably wouldn't be concerned very much about myself. For other members of my family I'd rate it a 4.

Q10 Hmmm, I would be inclined to think that scientists really do not know the actual health risks because it has been so recently most of these hazardous substances have come into play. I think they probably moderately overestimate the risks, I'd circle 4, though I think that 6 would apply also.

Q11 Well, I would probably be satisfied with the option. B, ya. Up here where it says question 11 and then it runs on down, I was looking for some answer sooner than this. I think maybe this Q11 should be moved down here by this No, Yes, and Not Sure.

Q12 I'd say probably about a 5. mumbled something...

Q13 I'd say yes.

Q14 I'd say about a 3. It doesn't take care of the problem very well. I would think that if I lived in the area or my family did and you were getting other water as it said you would have...a different water source and all...I don't think I'd want to drink the water, I'd certainly keep my family out of the creeks.

Q15 Well, I'm really not sure that I'd be satisfied with that. I would be if they weren't going to develop on top of it because there's always going to be somebody that's going to dig, even though it's prohibited, so I'm not sure I'm satisfied with that.

Q16 I'd probably rate it about an 8. I do have one thing I wonder about. And this is the repetition of landfill cap and water filtration, which the statistics are the same on each of these. *What are you say? I'm not sure.* Well, the risks eliminated. It's the same on each of these and I'm wondering if that could be put in so that you wouldn't have to read the same thing too many times. *Well, what we're trying to show, and we're trying this new, so this is good feedback, in this case two of the risks are eliminated and one remains. And in this case, they're all eliminated and none remain. So, we're trying to show...* There's no risks remaining. *But if that's not obvious we'll have to work on this.* Well, it's obvious to me where it says risks remaining, no risks remain, what I think is that the repetition of the problem here is huh, if it were in there once, these risks remain, I would remember it all the way through, but of course other people may not. *So rather than...so you'd rather see something...she mumbled.* I think that if you put this in here and had risks remain, then you'd have the remaining risks if the site were left as it is. And I think that I would remember that that was risks remain clear through all of the different options. And then all you'd have to do is have the risks eliminated after each section. *Oh, I see what you're saying.* You'd know that the risk is there all the time, but then this would give you the other option each time and you wouldn't have to read the same thing over and over. *OK.* I don't know. *No, that's the feedback we want..*

Q17 Hmmm, I'd say yes. I guess I'd be satisfied with all of them.

Q18 I'd rate it about an 8. Don't think there'd be any problems with that. I don't know that you would have to...the last option to me would about do it without having to go clear down to solid rock layer.

Q19 I wouldn't be sure about that because I think there's a lot of...course they told me not to worry about expense, we'd get into that later, so I guess I'd have to say yes.

Q20 I'd say it completely takes care of the problem.

Q21 I would be, but I don't think in 10 years it would go off, because I've never seen anything, any tax or anything else, I know they tell you it's goin off, once they have the money. In 10 yrs time it'll probably go up another dollar.

Q22 Well, I really don't know about that. I'd have to know a little more about it, I guess, and huh, I'd probably pay it. Not for myself, but for my family and grandchildren and everything.

Q23 I wouldn't be willing to pay the $8 on that, so I would check no. I guess that it's because of the policy, the water and everything's going up already. I would hope that they would find a better solution, cutting some government spending on some other things to spend it on something like this where I feel it's needed.

Q24 I would vote for it, number 1.

Q25 I'd vote against the program.

Q25B Well, it isn't worth that much. I guess it is worth that much probably, however, I think that if it's going to cost $10 a month I think the government can find a way to cut some of their other spending on some of the other programs that they have and get some of the fat out of the government and actually, I think they could pay for the program and it wouldn't cost anybody anything. I'll check this that it isn't worth that much. *OK.*

Q26 We all know how I'm gonna answer this. It would be the same answer as the one before.

Q27 We're back to the same answer as before, I think it wouldn't be worth that much.

Q28 I'd rate that about a 5 because I think everybody is going to have to pay for it. I huh think that probably somehow it is going to cost all of us, so everyone is going to be responsible for paying.

D1 Yes. *Ross, if you have something you want to add, that's great, if not, that's OK.*

D2 Hmmmm, I don't think there would've been any difference. My opinion would be the same because as I said I wouldn't be so concerned about myself at my age, but I would be concerned about my kids or the rest of my family if they lived there.

D3 No, it didn't.

D4 Yes. I thought the chart was a good chart.

D5 Yes.

D6 Yes. Oh, there're two yes answers. I probably chose a less complete cleanup, because if you had everything cleaned up, I'd keep my kids out of the groundwater, I guess. If you were getting clean water to drink it wouldn't matter.

D7 Yes, it was.

D8 I think it was useful.

D9 Yes, it did affect it. I think that a complete cleanup is the thing, but as I said before, I think that the government needs to find some way to help defray part of the cost theirself.

D10
A. I'd rate that a 6.
B. Well, if it's important to me it's important to the other people in the community too, so I'd rate that a 6.
C. I think that that is important, probably extremely important.
D. Well, if people are unaffected, it's probably not extremely important, I'd probably rate that about a 5.
E. I think that cost is important, I'd rate that a 6.

Protocol 12

Q1 Yes, in my state.

Q2 Yes.

Q3 A. Probably 6, no extremely important.
B. Extremely important. 7
C. Extremely important.

Q4 Improving the education system 6
Improving public roads and highways 6
Saving endangered species 7
Reducing global warming they can't really do that, can they? *I don't know, I haven't really thought about it. So you're saying I can't answer this question...if we could.* If we could? It would probably be a 5.
Promoting recycling A 6.
Reducing taxes7.
Reducing the national debt 6.
Cleaning up Superfund sites 7.

Q5 No.

Q6 Is Rocky Flats one? *Rocky Flats is a government nuclear production facility. A landfill's like a dump.* mumbled. Don't know.

Q7 Yes.

Q8 6.

Q9 6.

So is this the ladder they were talking about? *Does it make sense to you? The way it's laid out?* Ya. So it's pretty low. You have a better chance of dying just riding in a car.

Q10 long pause...I think, 2, moderately underestimate the risks.

Q11 Not sure.

Q12 A3.

Q13 Yes.

Q14 4????? very soft!

Q15 Yes.

Q16 I'd say 6.

Q17 Yes.

Q18 Probably a 7, cause they do block off the ground water and everything.

Q19 Yes.

Q20 8.

Q21 Yes.

Q22 Yes.

Q23 Yes.

Q24 So would they take more taxes away from us? *Pardon?* If they do this would your federal tax go up? What they take out? *I think what they're trying to say here is that yes, this would be something on top. So what we're talking about is would you be willing to pay this amount in addition to what you pay now.* OK.

For it.

Q25 For.

Q26 Against.

Q26B Can't afford it.

Q27 Against.

Q27B I'd say it isn't worth that much. That's a lot of money.

Q28 Probably 6.

D1 Yes.

D2 No.

D3 So if you say... *I guess what this is trying to get at is when you read about that groundwater and it talked about the contamination and stuff, in learning about how the ground water is contaminated ... did that have no affect on how you voted, ...* I guess it would be yes, I chose a more complete cleanup for this reason.

D4 Yes, the risk information was useful for this reason.

D5 Yes, the risk ladder was useful for this reason.

D6 Yes, I chose a more complete cleanup for this reason.

D7 Yes, this illustration was useful for this reason.

D8 Yes, this information was useful. I'd say explaining how the water is contaminated. What affects it has on the community.

D9 Yes, the cost information was an important factor in my decision. Those were the questions where I put $5 and stuff? It tells you how much more they're going to take out of your taxes.

D10
A. 5
B. 5
C. 6
D. 6
E. 6

My only question is where are we gonna move them all and if they move them will the land still be contaminated where it was? *When they move the landfills?* If they move the landfill hills, after they move them will the land still be contaminated? *So really you're asking about whether the soil.* Mmmhmmm, cause if it's contaminated now, how would they prevent it from not being contaminated.

Did the cleanup options make sense to you? Ya, they were pretty explanatory. *Did it give you enough information?* Mmmmhmmm. (positive)

Protocol 13

Q1 Yes, in my county, at least, I think it is. Do you want me to circle 2? *Circle whichever one...* ...it is circled. Yes, in my county, city, or community.

Q2 Yes, clean this shit. Clean it, clean it, clean it.

Q3
A. That's important, I'm gonna circle 7.
B. Are these not the same? (rereads it) Alright, I think that's important. I think that's extremely important.
C. Yes, I think that's extremely important as well.

Q4 Improving the education system Well, I think that that's important. Do you know what I hate about this? I hate one to seven. It's very important, of course it's important, so what's the difference between a 5 and a 7? I don't know if that's what you want me to be saying. *Hey that's great.* I don't like rated surveys. You know I could put 6s, what's the difference between 6 and 7? I don't think there's much. So I put 7.

Improving public roads and highways Ya, well that's important. Is it a 4 important or a 5 important? I'll put a 5.

Saving endangered species That's a 6.

Reducing global warming I won't comment on that because I'm not sure I understand global warming completely. So that's gonna be a question mark, I'm beside a 1 or a 7, I'm wishy washy.

Promoting recycling Yes, that's extremely important. There are enough idiots out there that throw glass away.

Reducing taxes You know what, I'm right in the middle on that. I'd like to be a pig and keep all my money, but I like some of the benefits we get from our taxes, so I'm right in the middle.

Reducing the national debt I don't know if that's gonna happen. I don't know if that's that important, so I'm gonna go around 2.

Cleaning up Superfund sites That's pretty important...I'm gonna put a 7. You've said it enough in this survey that I feel that I should put a 7.

Q5 Knowingly, yes, I have...before I saw the light I did.

Q6 Am I aware of that? No, yes, and Don't know. What is the difference between No and Don't know? That's what I'm thinking. I don't know...if I'm aware, it's either yes or no. I don't think Don't know actually is a viable answer. You either know or you don't know, it's either yes or no.

Q7 You see now...this is where I don't know should be, I think. And Landfills? It kinda reminds me of things like, I think there's a problem with insurance and government being around hazards and natural disasters. It's an unnatural disaster, but I will give you an answer. YES.

Q8 There's a LOT to read here.. Well, it was a good verbal description...what you have here. Where's Figure 3...next page? *Actually, it's two pages.* letter f...I'm looking.

If I had to live there and I had to drink the water there I'd probably filter my water to a certain extent and if I had children we'd always have bottled water, so I'd be concerned, but I wouldn't be extremely concerned, cause it would be one of those things that you just kinda live with. I'd be medium concerned, so I'll put an x at 4.

Q9 "leachate" it looks like a word I don't know, a fancy word for white goo.

Well, I'm starting to get a little more concerned, so I'm gonna go up to 5.

Q10 This is really ambiguous. What scientists? Well, I think you could probably answer any of these depending on your political point of view. If you listen to Rush Limbaugh, you would

probably say they greatly overestimate. So I don't know how I'd answer this. My opinion is that some scientists don't bother going to the extent of... I don't know I think that some underestimate and some overestimate. So what I think you ought to do is keep on reading... So I will just say I don't know.

Q11 "restricting use of contaminated wells." I'm instantly thinking about the movie It's a Wonderful Life, because if he hadn't been born the world would've been horrible, so... No, I'm not.

Q12 Doesn't take care of the problem at all, actually.

Q13 No, I'm not. I'm not. I'm not.

Q14 I don't think it takes care of the problem at all.

Q15 I'm not...it's in between yes and no. As a solution, it might not be the ultimate solution, but it's better than the first two. I'm gonna put not sure. I'm not asked to compare this solution to the other ones, so I'm just gonna put not sure.

Q16 It's taking care of it so I'll go 5, I'm right in the middle.

Q17 Now we're getting there. I'm getting there so I'll put a yes, I'm satisfied, but there's another thing that they might be able to do.

Q18 Solves it pretty well, jumped up two points to a 7.

Q19 Yes, I'm satisfied.

Q20 I think this solves them. Sounds like it's taken care of.

Q21 Sure. That's not a lot of money.

Q22 Sure I'd go with that. Why not? I'm rich, this is a survey, they don't know how rich I am.

Q23 Sure, I would be willing to pay that. It's getting better...and more expensive.

Q24 "these questions are very important" The other ones weren't. These are the only important questions.

I'd vote for it. *Go to question 25.* I will do that.

Q25 I think I'd vote for it. I still don't think that that's a lot of money. *Go to 26.*

Q26 Well, I would probably vote for it but I'd say why don't we do it over 20 yrs instead. So I'm gonna say For. Do I go to 27?

Q27 Well, that's $50 now. Now we're talking 50, so I'd say not sure.

Q28 Do I feel responsible? I'd say I feel 5 or 6, even though that's not a great indication of how I feel.

D1 Yes, I think it is very well described. *Hmmm, there's a why or why not?* Oh, yes, the description was sufficient for this reason. Oh, I see...I think it's pretty realistic, especially if you're here in Boulder. I can relate, I can sometimes smell some of the waste sites around here, and I lived in various locations that huh, maybe 2 hills was a little excessive, but I can imagine one hill and we can smell garbage in this area, so...it's a real life experience for me. Is that adequate? *Ya, that's great.*

D2 I don't know. I think if I really did live near a GCR site I would be working my ass off at getting away from the GCR site, so not to say that I wouldn't... If I had to live there I would certainly be more concerned. Case in point, I used to live in CA, water problems were a lot worse than here and we just watched everything we did with out water, so... I think when you live in a community that has a problem, you certainly do try to improve it. I certainly do. No.

D3 No it didn't. I...do I have to tell why? Yes. It didn't affect my answer because I had an idea of what ground water was before. But I appreciate just in case I didn't know what it was.

D4 Let's see...ya, I guess it was. It was useful basically because it was, perhaps, arbitrary scientific, but it gives you a base to dive into... So based on the information gave, I would say I assessed the problem with this information.

D5 No, it wasn't. Maybe if it was on the same page, or if it was on a separate page where I could look at it while I was reading, it would be. I think that any time that there is a risk of death to a family member or community member, you're gonna try and eliminate that risk regardless of having a graphic, although some people do like graphics, and I appreciate that. So I would say, it wasn't that it wasn't useful, but I just didn't use it, so I put no.

D6 No. Just cause if we're gonna clean up, let's clean up.

D7 Yes, it was useful. It wasn't instrumental, but it was useful.

D8 Well, I don't know. I think they were and they weren't. I think that I would like a complete cleanup and it just built...you could see that it was going from a shoddy cleanup to a complete cleanup and yes, it would be nice to get a completer cleanup, but I would say, yes, it was useful, but it wasn't the reason why.

D9 No. For the same reasons as the other. If you want to cleanup, let's cleanup!

D10
A. That would be extremely important.
B. That's important.
C. Important.
D. I'd say that's important.
E. I'd say that's important as well.

I believe they're all important because I figure...I think taking care of the planet and ourselves, is all important.

Protocol 14

Q1 Yes, in my state. mumbled something

Q2 Yes.

Q3 A. I'd say 7.
B. I'd say probably 6.
C. Ya, 7.

Q4 Improving the education system I would say 4.
Improving public roads and highways That's more important, so that's 5.
Saving endangered species 7
Reducing global warming 7
Promoting recycling 7
Reducing taxesis huh, I don't know...do I have to circle all of them? OK, I'd say 3 then.
Reducing the national debt Also 3
Cleaning up Superfund sites 7

Q5 No.

Q6 No.

Q7 Yes.

Q8 Where's figure 3? Now, let's see, f. 7.

Q9 7.

(checks out the risk ladder) *Tell me what you think of the ladder.* It doesn't look like a... it doesn't look like it's too serious at this point, but...I don't know.

Q10 Let me see, moderately underestimate.

Q11 (Confused about where the question actually is.) Absolutely not.

Q12 Does not take care of the problem at all.

Q13 Not really.

Q14 I would say 5...it's kind of in the middle. Still not good enough though.

Q15 Hmmm...huh, not sure.

Q16 I'll say 7.

Q17 I'm still not sure I'm satisfied with it.

Q18 I'll put an 8 on that.

Q19 Yes.

Q20 I'll say 10 on that.

Q21 Which option was that? You're not gonna tell me. I'm looking back...I'm cheating. *That's not cheating.* Is this the no action one, cause if it's the no action... *In the paragraph above, you misread, the no action option is not presented...* Not presented, OK, good, then yes, I would. I would pay a dollar a month.

Q22 Sure.

Q23 Ya.

Q24 For. *Go to question 25*. Because the other one didn't get rid of it, this one does.

Q25 I'm not sure on that one. I don't have a lot of money.

Q26 I'm still not sure, because that's still a lot of money.

Q27 Against.

Q27B 1. Cause I couldn't afford it.

Q28 I'd say 5.

D1 Yes. It was sufficient.

D2 I'd say, yes, but we do live near a landfill don't we?

D3 Hmmm...No. I would've said the same thing even if...mumbled and background noise.

D4 Yes.

D5 Not really. Why or why not? I don't know. I'll look back at it. It doesn't make the risks look very good.

D6 Ya, I guess so.

D7 mumbled..but I'll say yes.

D8 Yes. Why? I don't know. Let me think. I don't know I'm going to skip that question.

D9 Yes, this cost information was an important factor in my decision and the reason is, I'd ... have it cleaned up to a certain point, depending on how much it costs.

D10
A. Extremely important.
B. I'd say that's extremely important also.
C. Extremely important.
D. Extremely important.
E. Ya, extremely important.

Protocol 15

Q1 OK, yes, in my county, city or community.

Q2 Yes, I do. Because it seems to be personal.

Q3 A. Oh I would have to say it's about a 5 to 6.
B. 6.
C. 5.

Q4 Improving the education system Extremely important, 7.
Improving public roads and highways Hmmm, 5.
Saving endangered species Oh, 5.
Reducing global warming 4.
Promoting recycling 6.
Reducing taxes5.
Reducing the national debt 6.
Cleaning up Superfund sites 5.

Q5 No.

Q6 Yes.

Q7 Oh, yes.

Q8 Looked at figure 2. Reads the risk ladder. 4.

Q9 6.

Q10 6.

Q11 No.

Q12 Does not take care of the problem at all. Number 1.

Q13 No sure.

Q14 Probably around a 4.

Q15 Isn't there a park...mumbled. I am satisfied with this option.

Q16 About...between 6 and 7, I'd say 7, I guess.

Q17 Yes.

Q18 8.

Q19 Definitely, yes.

Q20 10.
Q21 Yes.

Q22 Yes, I believe I would.

Q23 I don't know. It would depend on what my financial status is.

Q24 "...you are asked to vote on." I still don't understand that. *Ya, that's a little confusing. I think you have to read it from "In making your decision..."* Does. *Maybe go on to the question 24 and it will be clearer.* OK.

Again, I'm not sure, depending on my financial status. I would like to vote for it. Even though $5 doesn't seem like that much, it might be a lot.

Q25 Not sure. Again, it would be nice, but...

Q26 Again, I'm not sure. It's hard to say, well, it's easy to say, hard to do.

Q27 Against.

Q27B I think a combination of 1 and 2.

Q28 So that would mean, would I accept the responsibility or if I voted in such a way. How responsible would I feel if it happened? I'm not sure on that one... *That's worded badly. The way it should be is, if you lived in such a community with a landfill...* Do I think I should take the responsibility? *Ya, would you feel responsible for helping to clean up such a health risk.* Oh, 4.

D1 Yes. I just think it gave me a picture of a relative number of how many deaths. To put a death factor in it kind of made me interested.

D2 Yes. I think it did make a difference, because we do live near a site.

D3 I'm really not sure. I think I was already aware of being affected by contamination, so I really don't think that it made much difference, but it probably would for somebody else. It didn't make a difference in my answer, but I think it would for somebody else. Should I pick an answer or just put both or... *Ya, you can pick either one and then put why or why not. That's actually a really good point, because this question is worded in a way that you don't know what we're trying to answer.* I don't think it made any difference...mumbling and writing. *So, what you're saying is that it didn't make a difference for you, but it's still relevant material for the survey.* Yes.

D4 Yes I did. Because it gave me a real sense of how at risk I am.

D5 Hmmm, I'm not sure that it was useful on my voting, but I think it was very interesting and very useful on giving me a perspective of how at risk I really am and the dangers involved. (mumbled and wrote)

D6 Yes. I chose a more complete cleanup for this reason. Because again it puts you in perspective because some day I want to have kids and kids seem to be all over the place and to have them running around near this contaminated water, kind of gave me a sense of fear, I guess.

D7 No, I don't think it was, because I was already aware of that kind of information. But, to somebody else that might be... So, I think that information can be used by others.

D8 Yes. Well, I think all of them were useful because it gave you a, from the ground up perspective of just how clean you can get them. The different options and what effects the different options will have on the community that surrounds the landfills.

D9 Yes, it did. Because not all the time, it's not easy to come up with money all the time. Especially now with my situation with tuition. I'm having...it's probably taking my personal view and probably affecting my decisions here. So, depending on my financial status...

D10 A. 6

B. 6
C. 6
D. 4
E. The same.

Well, I would like everybody to be healthy, but I also need money to live.

Protocol 16

Q1 Hmmm, yes in my state I guess. I've heard about Rocky Flats...I don't know what I've heard about. I know Rocky Flats is there I don't know how much contamination. I know the people who live down there are more concerned than I am all the way up in Boulder.

Q2 Ya, that seems reasonable.

Q3
A. It's like...not something that I think about all the time, but I think intellectually I do think that if we don't do something about it, down the road my kids or my grandkids are gonna be sorry, so I'll say 5 which is nearer extremely important than not important at all.
B. Hmmm, 4, which is sort of in the middle.
C. I think that's probably a 5 too, because even if no one uses them, if you start mucking up the water and killing fish and things like that, it doesn't seem like it would be very good for humans, I think they're kind of interdependent.

Q4

Improving the education system — I'm kind of ambivalent on that one. My kids are almost out of school, my daughter's in college and my son's a jr. in high school. I don't know if he'll be going on to higher education or not, but I do think that the kind of education they're getting is no where near the kind I got. Now granted, I went to a private school, but I think even the public schools back then were...I don't know I think maybe we need to go back to reading, writing, and arithmetic because I find my daughter who got 3.5s all through high school was really struggling in college. And I can't even imagine what the kids do that are just barely getting by. I just don't think they're getting a very good foundation for their future lives. So I'm gonna say 5.

And I'm one of those people who kind of uses the middle of the road, so my answers will probably be in the middle range as opposed to on either end.

Improving public roads and highways — Well, I think that's something we have to keep doing all the time. It's kind of a catch 22, if you build more highways then more people will come, but I do think that we need to maintain what we have and particularly in Colorado the weather seems to be very, very bad on them, so I think I'll give that a 4.

Saving endangered species — Hmmm, a lot of these I'm gonna be kind of waffling on because I just don't know how much time and energy and money should go into these, but I do think it's important for humans not to wipe out everything on earth, so probably a 4 on that.

Reducing global warming — That one I'm not...I don't know how we can do that if that's like the ozone layer and all that, hmmm, what we can do about that. I'm gonna put 3.

Promoting recycling — We probably really have to start recycling more, I do recycle some, but I think that hmmm, I just can't imagine where we're going to put all this stuff, we generate so much trash, I'm gonna say 5.

Reducing taxes — Hmmm, sure I'd like to have less taxes, but if it means the roads aren't good and all these other things that we want to have, we have to pay for them somehow. So I guess that's not as important to me, 3.

Reducing the national debt	Again, I think that's something that is probably something we should do. I don't know how high of a priority it should be. I think I'll give that one a 4.
Cleaning up Superfund sites	Hmmm, Again I think I'm gonna give that a 4.

I think you'll find that I'm pretty much on the middle of the road on a lot of stuff.

Q5 Not knowingly, I'll say no. It's possible I might've thrown paint or something which may or may not be hazardous material, but I certainly didn't do it on purpose.

Q6 I'm not aware of them, there probably are, but I'm not always the most aware person.

Q7 Well, if not the government, who? I mean, where's the money gonna come from? I can't imagine some anonymous benefactor just saying, here's a million dollars, let's clean up that site. So I'll say yes.

Q8 Well, maybe you say this later on, but you're talking about deaths, now, but I'm not too concerned about dying about it if it's...I mean, I could be struck by lightening too and I'm not going to walk around worrying about that, but what other health affects are there. If I'm going to live a less than healthy life with headaches or other types of things going on because of this, then I would be more concerned, but dying from it, I'm not very concerned. I think I'll say 2.

Q9 So, if I lived there, one death every 5 years...like I said, if it was causing people to die, one death every 5 yrs isn't a great amount, but how many other people are not having a good quality of life. I think I would be 6, almost to the max of extremely concerned.

Q10 I'm gonna say 6 because, think about Hiroshima and the atom bomb and we didn't know that in 20 yrs kids and stuff would be dying from leukemia.

Q11 Well, I could be satisfied if that's the only option there was. If somebody else was going to clean it up, that would be good, but if you're just asking me if that option would work, I would say... If treating the water would work, I would do that for my family and I would certainly not swim and stuff like that so I'm gonna say yes, but you know, I think a better option would be to clean it up.

Q12 It doesn't take care of the problem at all. That's kind of a stupid question. How can you say it takes care of the problem at the site when it doesn't. It just takes care of your problem in your family.

Q13 No because..now see, I probably should've answered the previous question no about my house, but this really doesn't do anything for the long term problem. It doesn't do anything for the water that's getting into the earth and moving along at 100 ft per yr. So I'm gonna say no.

Q14 Well, how does it solve the contamination problems at this site. Well, it helps, but it's not very...I'm gonna say 2. I think if you're gonna deal with this problem at all you're going to have to...I guess I'm not exactly sure what you have to do, but I guess you have to get it out of the groundwater or there's almost like, no point.

Q15 Recaps for herself. Well, if they say no risk remains, then... OK, I'm gonna say yes, if they say no risks remain.

Q16 I don't see any reason why.. you know if you've got dirt on top of everything and people aren't going to dig, it seems like it's good, so, I'm gonna say 9.

Q17 Well, since I said yes to the other one I would have to say yes to this one, it seems like it's even better...

Q18 I'm gonna say 10, now if there's anything else. If there are any other options, then I've run out of numbers.

Q19 Well, now they've add 1 death per year per 10 million people for the stuff blowing around... I say no because where on earth in this whole United States are you going to find...I mean, aren't you just moving it from one space to another? Unless you're going to put it in some kind of lead lined vault someplace, and I can't even imagine where, in the middle of the desert someplace. You know, this just seems like you're robbing Peter to pay Paul.

Q20 Well, at this site it takes care of the problem completely, like I said you're just putting the problem somewhere else.

Q21 Maybe you deal with this later on, but what if you live in apartments or you move around a lot or, are these just people that have houses, what about the people that rent? Or is it just people in general, no matter where they live? So, that's $12 per year. I'm going to say no and it's certainly not because of the $12, I just don't' think that's...that does any good. I mean that's not even dealing with the whole problem, so why spend any money on it. So I'm saying no.

Q22 I'm gonna say no, because again, it's not the money, if this was the only option this would be the option, but I think the next one, the landfill cap and... I'm trying to remember how I rated these. But I think this one would be better than nothing, but I think if this was all we could get by because people wouldn't pay any more then...

Q23 I'm gonna say yes, and again I think this is important that this gets paid by everybody, it seems that middle class, which I am rapidly hardly becoming a member of, I was thinking of the lower class. The middle class ends up paying all these taxes, and the rich people and the retired people who cruise around in their Winnebagos end up not having to pay anything because they've got big lobbies and those of us who're trying to work and raise kids and we don't have time for all that lobbying and everything and so we end up getting stuck with all that cost, so if this was something that everybody was going to pay, then yes, I would pay my fair share. I don't like paying for more than my fair share.

Q24 I'm gonna say no because remember I said that I didn't like that option of taking our dirt out of my backyard and putting it in somebody else's back yard.

Q25 Well, I don't think people pay equal taxes. I feel like I pay, at my lowly little salary, pay a lot more money than a lot of people do. I'm gonna do D, the landfill cap and groundwater barrier.

Q26 Landfill cap and water filtration.
Q27 I'm gonna say 4, just because I'm just not really sure that it's equal on this. I know you say it's supposed to be, but I don't know...

D1 Yes, now I have to go back to question 7 or what? Hmmm, do I have to write it down or just talk it. You talked about the run off, talked about it affecting the run off from the top so it affected the people swimming in the creek and the plants and animals and you talked about the run off underneath which affected the wells and maybe long term groundwater movement. And you talked about the deaths and then the ladder you gave and the people per million per year, huh, was good because I thought it was about the same as my chances of getting struck by lightening. So I think it was sufficient.

D2 No, I think I imagined it. You said to imagine it like you really did and that's what I think I did.

D3 I'm not sure if I chose the option I chose because of the groundwater or it...I think it was just one of the reasons. I think we need to not just do superficial things, if at all possible we need

to really understand how, if contaminants are in the water, they're in our earth, they're in the food that we grow. So I don't think that that particular groundwater paragraph was the deciding factor, so I'm gonna say... OOPS tape ended.

D4 Again, I'm not sure if I'm reading too much into these questions or misinterpreting them. I'm gonna say no because the information was useful so that I knew what the risks were, like I said I equated it with me getting struck by lightening, but that's not the reason I chose the option that I chose. I chose the option that I chose because it was the best option to choose. So I put no.

D5 Again, the risk ladder was useful, but it was not useful in me deciding which cleanup option I preferred. Because it showed that really there was not a lot of risk to me personally, but if we're talking about long term and environment, I don't think we have any clue of what this kind of crap is gonna do to our earth in 50 yrs. So again I'm saying no, because even though I like the risk ladder, it just provided me more information to make my whole choice.

D6 Well, if I'm gonna be consistent I'm going to have to say no again, because I think all of the information was useful, but I don't think any one of them...I just think the one I chose was the most reasonable one, intellectually with all the information that was provided.

D7 It was useful in my overall understanding of the problem, because I wasn't clear where the water table and how it got into wells and stuff, but again I'm saying that, well, I'm gonna write down, the figure was useful for my overall knowledge in determining the option I chose, but it was not the main reason I did it.

D8 Yes, this information was useful. I don't like the way that question is worded. Do you mean please describe what information's on the options were useful? The options themselves weren't really useful. Again, how can you make an informed choice without the information, so I say yes, the information was useful. And I'm writing down, because you need information to make an informed choice.

D9 No, how did the information affect my value? I don't understand the question, it was informative, but given the information, and I already made the choice, it wouldn't be realistic to go back and say, well, I suppose if my choice had been $10,000 a month I would've said no I can't do that, but given that it was just a few dollars a month I think that was reasonable. But I don't understand...how did the information affect your value. I don't like that word value so I'm not writing anything else down.

D10
A. Now I'm assuming that we're answering as if we were living in one of those communities. I'm gonna say 4 because I'm not sure we can judge what the risk to future generations is gonna be. And, you know, if we get just, real well, this isn't bothering right now so we're not gonna do anything about it and stick our head in the ground, I think that's probably why we're in the situation to begin with, so I don't think the risk to me and my family right now is real key, but I do think it's important down the line.
B. Again, if we're assuming that I lived right on one of these sites I'm gonna say 4. Here I am back to my middle of the road answers again.
C. I think now we're getting more up into maybe 6.
D. I don't think people can be unaffected when you're dealing with Mother Earth. We live on this earth, how can we not be affected. I'm gonna say 6.
E. Not important at all, no I already, huh, I'm gonna say 2 because I'd already determined like I said if it ended up being $10,000 I probably woulda changed, but...

Protocol 17

Q1 Yes, I have. In Colorado we have, huh, Rocky Flats and I think it's terrible that we would even, hmmm, have a place like that in Colorado that jeopardizes the people around. Mainly because we can't see, hear, touch, or feel the affects of it until years go by.

Q2 Yes, I do. Mainly because...save the earth.

Q3
A. I think it's extremely important.
B. I think it's extremely important, mainly because our kids need to be protected for the future here.
C. I think it's extremely important, mainly because of the beauty and so we can have a place to go relax and enjoy.

Q4
Improving the education system — I think number 6. I think we do need to be educated more in regard to how it's really affecting the environment.
Improving public roads and highways — I think it's really important, like when you're traveling across the country it's important to have good roads. I think that's probably number 5.
Saving endangered species — I think it's important just because of the basic econological reasons so I'll say 6.
Reducing global warming — I think that's extremely important because we can see what's in the last years that I've been here in Colorado how the winters and the summers and all that have been up and down and all around.
Promoting recycling — I think that's like huh, number 5. I think it is important, but I don't think it's like, huh extremely important.
Reducing taxes — I think that's extremely important.
Reducing the national debt — That's extremely important.
Cleaning up Superfund sites — That's extremely important, mainly because once you contaminate an area, it costs billions of dollars to clean it back up again, so why even start it in the first place.

Q5 Yes, I probably have, I've probably thrown away gas cans and repellent and huh, you know, things that help the garden grow better and things like that. Yes, I have.

Q6 Yes I am. Rocky Flats is a prim example, but there are many other ones too, just like up there in Eldorado Springs where they're taking away the mountain and stuff like that. That can't be good for the erosion for one thing, but then the plants and animals are dying off as a result of it.

Q7 Yes and no. But probably more yes. I think that we're all responsible in some form or another. I think we all contribute to huh, you know, to destroying our environment, so ya, I think we should.

Q8 I would say that I would probably be, ooooh, not extremely concerned, but huh, probably like number 4. Mainly because we live in a society that you have to take risks. There are certain risks that you have to take every day.

Q9 I'd say I wouldn't be 7, extremely concerned, but maybe 6 in that there's lots of things that kills us every day, but why should we be knowingly exposed to something that we know can hurt us.

Q10 (after reading number 6) That's what I think. I think it's conjecture on their part, but they're pretty close with their estimations.

Q11 No because any time something is destroyed, it should be cleaned up, it should be taken care of, and it should be put back to the way it was originally.

Q12 I think number 7 because I don't think you can clean it up to the point where it would be back to where if the site hadn't been there in the first place.

Q13 No I'm not satisfied with it because it shoulda never gotten that way in the first place. I don't understand how people can buy land for let's just say some of these chemical plants can buy land and just because there's some water flowing through it they can use that as their source of energy and whatever and be able to get by with that without some kind of ban on usage, you know, how much they can and how much they can't use it. I think it stinks.

Q14 I would say it doesn't take care of the problem at all.

Q15 Again, no I'm not and the main reason is because why, I mean I understand that people have destroyed these areas, buy why shouldn't they have to pay to clean it up in the first place instead of doing it superficially.

Q16 I think it kinda was superficial. I'll say 3.

Q17 He got confused and I got lost and I think he skipped 17.

Q18 I don't. I say 2.

Q19 Yes I am. It seems like everybody takes a risk and in order to clean up a situation, sometimes there are going to be lots of risks and I think one death every 50 yrs in your community is pretty small compared to letting the site be comparable and look nice again so you could look at it and say, ya, we cleaned it up.

Q20 I think it completely takes care of the problem and I like the option.

Q21 Ya, I think I would. And the reason why... mainly because I like to have clean water.

Q22 No.

Q23 No.

Q24 Hmmmm, I don't know. I really don't know. I'd have to think about that one.

Q25 I think complete cleanup. And the reason why is, there's no substitute for making the environment the way it was before.

Q26 Let me look back at that again...probably Landfill cap and groundwater barrier. That would be D.

Q27 Probably be in-between. Probably 4. I don't feel totally responsible, but yet I do, because I've done things that probably would require some risk too.

D1 Yes, I think it was, I think it made me more aware of what's really going on, with what true contamination really does with an ecosystem.

D2 Hummmm, yes I did.

D3 I think it's 2, yes, I chose a more complete cleanup for this reason. And the reason why is because, like I said before and I'll say it again. There's no excuse for any contamination period and it's too bad that we were let go for so long for our society to make contaminants that do kill and do all these things to our environment.

D4 Yes I did. I think the information given was pretty accurate and pretty down to earth and I could see how it would affect us all.

D5 Yes I did.

D6 Yes I did and the reason why is like I said before, it gives you, you know, when you start seeing it in black and white and you start seeing the health risks and all the things that go with it, ya, it's gonna make you make a good choice.

Skipped questions D7 and D8.

D9 Yes it was, mainly because, what really makes you angry is that all of us are having to clean up sites that people, you know companies have come in and created the contamination and they go bankrupt and we're caught holding the bag. I really don't like it and would probably pay my share and yet at the same time I don't think that I would completely, I wouldn't want to pay $3,000 over a 10 yr period to clean something like that up either.

D10
A. I think it's extremely important.
B. I think it's extremely important too.
C. I think that's extremely important.
D. I think that that's important too.
E. Well, when it comes to your pocketbook, I think it's pretty hard to...when it starts coming out of your own pocket you kinda question what's going on here.

Protocol 18

Q1 No I haven't.

Q2 Yes.

Q3
A. That's extremely important. Do I have to give like.. *You could elaborate a little.* Well, because it would make it a lot nicer and healthier to live in.
B. Yes, extremely important for the same reasons.
C. Definitely, because I think nature is very important.
D. Other reason? That would pretty much be all could think of...nature, humans, all that kind of stuff.

Q4

Improving the education system	Oh, extremely important. I think education is a top priority. We need to educate people for them to understand anything.
Improving public roads and highways	Hmmm, I don't know, I would probably say about a 2. It's not that important. We have fine roads. Until they are super bad and people start having accidents I don't think they need any help.
Saving endangered species	I'd put 6, I think that's pretty important. With all the stuff going on and killing all those animals.
Reducing global warming	I'd say it's very important, number 6 again, it's another problem.
Promoting recycling	...is extremely important. It would cut down on a lot of waste and stuff.
Reducing taxes	Hmmm, I'm just gonna put a 4 because I don't really know how important that one is or how unimportant it is. It depends on what the tax is being used for and such.
Reducing the national debt	I'd say 3. I don't know why, I don't really care much about that stuff.
Cleaning up Superfund sites	I don't know too much about it, but from what I've read already I'd say it's very important, number 7.

Q5 I'm not positive, but I'm sure I must have. I don't know.

Q6 No, I don't know that there are any, but it seems like there probably would be.

Q7 Ya, I do because the site has probably been accumulating trash and stuff from the people who live there. So I think government should pay for part of it and I think the community should try and help pay for it, just because it's their waste too.

Q8 I'm gonna say 6, which is very concerned because the thought of drinking contaminated water and other people in my community drinking it, I mean, you could die from it. Scary.

Q9 I would say very concerned, number 6. It's disturbing to know that so many animals and people and everything are being subjected to this, and most of them don't even know it.

Q10 I'd say they probably moderately underestimate the risks, just because I would assume they don't want to freak people out...

Q11 No, not at all because chances are that a lot of people don't even know it or aren't willing to go to the trouble of filtering the water or telling others not to go around areas.

Q12 It doesn't solve the problem at all. It's still a problem, people are probably just...the only reason I can think people would do that is just to save money. It's not a good option.

Q13 Hmmm, I'm not satisfied with that option, but if they're not gonna do anything else, if they're not willing to do anything else, I'd say that's at least a start.

Q14 It still a problem, I'm gonna put 2, but at least it starts to inform the people of the community to at least understand the risks by living there and not taking action any further than that.

Q15 Hmmm, ya, I think it's pretty...it's a lot more steps taken than the last one. It doesn't' seem to eliminate much risk, compared to the last one, but at least they're trying to do something about it.

Q16 Well, I'd say about a 4 maybe, because it is...the clay prevents it leaking into the groundwater and creek and it's being filtered, ya, it's a pretty good idea, but maybe they could do something else though. Ya, I think that's a pretty good idea.

Q17 Ya, I am, because it prevents the leaking of the contaminated groundwater, but I don't know, I don't understand how come the risks that the scientists estimate are the same as for this one.

Q18 Hmmm, it sounds pretty good if it's gonna keep the contaminated groundwater from leaking, it could be used for a park or something. I'd say 8, it's a pretty good solution.

Q19 Ya, I am because it eliminates a lot of the...all of the trash from the houses and everything. But the only problem that I'm having is all the estimated deaths are the same for every option. But the last one at least leaves space uncontaminated and everything.

Q20 Well, it sounds like it completely takes care of the problem. It eliminates the problem I guess.

Q21 Sure. Ya I would.

Q22 Ya, wait...ya I think that's be fine...that'd be good.

Q23 Ya I would just to prevent the contaminants to ??

Q24 I really don't know. But I think that since the estimated deaths are the same for every option and the complete cleanup option begins another estimated death for someone during the cleanup, I would say it probably would be better, just more cost efficient and easier to handle, take less time to do the landfill cap and water filtration. Although complete cleanup would be a good idea too, I just don't know how...

Q25 Hmmmm, I think I like the landfill cap and groundwater barrier because it barriers off the groundwater, replaces the groundwater with clean water and they can use the site. And that way, some people can't afford $25 a month just for the best.

Q26 Hmmm, looks back...I would probably go with landfill cap and water filtration just for pretty much the same reasons I chose the landfill cap and groundwater barrier in the first place. I think the complete cleanup is a great idea, but it's just that I don't think everybody can afford that.

Q27 I would feel pretty responsible. I'd put a 6, just because I think everybody needs to help out. Everybody's contributing to the problem.

D1 Ya, definitely. Because...because...hmmm...it gave me information on the risks of the GCR site and helped me think of it as my community.

D2 No. No I don't because if there are as many abandoned landfill sites as I read in here, than it's not so far off for me to be in a situation like that, or maybe I already am and I don't know.

D3 Yes, I chose a more complete cleanup for this reason, because it informs people of the dangers and the risks of a contaminated site that they probably wouldn't normally consider it because you don't see it.

D4 I'd say ya, it's useful to get scientific information. It depends on how people value scientific assessments or whatever because, well, I don't know, ya, I think it's good. Some people base a lot of judgments on scientific information.

D5 Let me look at it really quick. Ya, I do because it helps you see just how many people are at risk. It helps you visualize and it lets you compare to other instances. What was I saying? Oh, it lets you see how many people are affected by the water supply contamination from the creek, the water supply contamination from the well, and then direct exposure. And at the same time it also, I mean, people ride in cars every day and more people think about it and stuff and you can see that the risks of some of that stuff, even a lightening strike is higher than the direct exposure to the creek and so that might might negatively influence some people and influence them how much they want to spend. And at the same time it's really good to show that.

D6 I don't think there would be much of a change with this reason, because I just assume that surface water is affected by the GCR site, but it's good for some people who wouldn't even think of that maybe. So no, no change for this reason because I'd already thought about it.

D7 Ya, probably because it helped me to visualize it and understand completely the problem that was occurring, that is occurring.

D8 Ya, I think it was really good. I like the way how you didn't want us to consider cost at first because that way you can just take in the information and figure out what you think would be best and then worry about cost later. So, rereads something (couldn't hear) OK, I think at first, before I considered the cost I thought that the landfill cap and groundwater option and the complete cleanup option was the best, so.... mumbles and writes... OK, I think they're the best because they take care of the contaminated groundwater seeping through. It either isolates the problem or it gets rid of the problem. And the information that I read on it was good information and it helped me understand exactly what they were going to do to take action...

D9 Yes, the cost information was an important factor in my choice. In considering the cost... The higher costs might not be affordable to everyone and since the estimated risks and deaths stayed the same, I would say I would rather choose a strong plan that solves the problem that takes care of the problem but also doesn't get too high in cost.

D10
A. I would say are extremely important even though the risks don't sound all too high yet.
B. Are extremely important.
C. Very important, I put 6.
D. I think that's extremely important, number 7.
E. I would say, I put right in the middle because it's pretty important but it's not important at the same time. I would love to say clean up everything and do everything you can no matter what the cost, but the problem is that not everybody can help out with the cost, not everybody can afford it.

I think protecting or helping out myself and my family and others of today and of future generations along with the earth is very important, and although I'd like to say cost doesn't matter, it just has to be because of people's different financial situations.

Protocol 19

Q1 Oh, excuse me, yes, in my county, city, or community.

Q2 Yes, for number 2.

Q3 A. Hmmm, I would have to say, number 6, towards extremely important.
B. I'd say 6 also, towards extremely important.
C. Hmmm, that would also have to be 6, towards extremely important.
To reduce contamination to the air I would have to say. Pretty much the environment.

Q4 Improving the education system I would have to go to 6.
Improving public roads and highways I would have to lean towards a 4, hmmm, ya.
Saving endangered species That would also have to be a 4.
Reducing global warming I would have to say up in the near 6 area.
Promoting recycling Hmmm, I would have to give that a 5, pretty important thing there.
Reducing taxesI'll give that a 4. I'm not too upset about what I'm paying right now.
Reducing the national debt I'd say that's a 5, it's gotta be done. It has to be done.
Cleaning up Superfund sites I would have to say 6, definitely pollution affects us all.

Q5 I would have to say yes I have in terms of bottles that have non biodegradable chemicals in them.

Q6 Actually, no I am not. I have only been in Boulder about a year and I haven't heard a whole lot of stuff about it, although when I lived in Wisconsin we dumped out garbage regularly, at a weekly rate for 10 yrs, at the same garbage dump...every single week. So ya, I can imagine.

Q7 I would have to say yes. You know, it has got to be cleaned up. That's just a reality. We can't continue to pollute like that.

Q8 I would be extremely concerned. No doubt about it. Anybody who wouldn't be is...whatever.

Q9 Definitely extremely important, I mean, one death every 5 years, I mean, that one person could be a little kid, that's just incredible.

Q10 Hmmm, I would have to say they moderately underestimate the risks. I think there's a lot they don't know. I think there's a lot they do know that some of us will never know about hazardous waste because of the government trying to hold things from us. It's a messed up situation.

Q11 I don't think that is a thorough enough situation. I think it needs to be a little more seriously dealt with.

Q12 Hmmm, I don't think it really takes care of the problem. It takes care of some parts of the problem, but you need to get to the real part of the problem, which is cleaning up the stuff. You can't just clean up the water...it's the whole thing...

Q13 Noooo. It has to be cleaned up. That's all there is to it.

Q14 Well, I think there again it takes care of a little bit more, but it doesn't take care of the whole problem. I'm sorry, but that is the truth that you need to look at, is not the immediate future, but the long term future. Which means you have to quit dorking around.

Q15 I'm really not quite sure. I don't know if that's even as thorough as it can be.

Q16 It's hard not to sometimes, but, no where near the amount of risks remain, but the garbage is still there so I'll say the problem is not completely solved, it's still gonna affect our earth in the long term future, but I'll say a 7.

Q17 I still think there are future risks involved, but... Hmmm, I'm not sure either, I don't know enough about it, but I still think...

Q18 I think there again it solves a lot of them but it doesn't solve all of them. The long term future is the thing that I'm really concerned about.

Q19 Well, I would have to say, let's see here, that's definitely the best cleanup situation that I've read about in this so far and huh, I think that is pretty obvious though. Yes, I am, although I would like to know more about the licensed hazardous waste facilities that these places are going to. Are they really... what's the big difference between them I'd like to know.

Q20 I think there it solves it. I think right there, as long as they're not ruining another site to clean up this site. I mean, where are we putting this garbage? What can we do? Recycling is the way to go, but anyway...

You get tongue twisted when you keep reading aloud like this...this is crazy!

Q21 I'm not sure at this point that I would be willing to, so I put I don't know.

Q22 At this point I don't know either. I don't know what my finances look like as a citizen at this point, so I don't know.

Q23 Again, I don't know at this time. Yes, I would say that I would in the future depending on my financial well being and where I lived and what my risks were personally. Would definitely include in that.

Q24 Yes, I would pay for that, but at this point, I can't say where I'm at..if I could afford a cost like that, but hopefully in the future I could contribute to that.

Q25 My option, I would say for me personally, we would move out of the area to a place that's not contaminated. That is reality, I think that is what I would do, but on the other hand, I would say the complete cleanup...I would think that would affect the entire economy at one point, but I also think it would bring together some kind of togetherness in our country...we're all doing something, we're all making an incredible effort. Although I'm still wondering where the garbage goes...what kind of site that is.

Q26 I would have to say D would be my second choice.

Q27 I would feel pissed off, excuse my language, due to the fact that it shouldn't happen in the first place, but if I wanted to live there the rest of my life and everyone else wanted to put in and help, I would feel extremely responsible.

D1 Yes it was because I am familiar with sites like that, I know what they look like, I'm writing this down on the thing right now. I've worked with chemicals and I know what they look like and I know what they smell like etc., etc.

D2 No. There would've been no difference. It needs to be cleaned up.

D3 Hmmm, yes I did. I chose a more complete cleanup for this option. That is water that we drink and it just has to be cleaned up. It's almost like it's so obvious, it's so right in front of your face...

D4 Hmmmm, it was and it wasn't so I'm gonna circle both here. Because, you know, it's not...risk is to everybody, it's not who is that one person. Who is that one person gonna be? Is it gonna

be my little brother or is it gonna be my son, or my dad or my neighbor, my best friend, his family, I think everybody in a situation like that is definitely at risk.

D5 Hmmm, yes and no again. I preferred the explanations but I used all of them in choosing my cleanup options. That no action option…I wonder if there really is an option like that because if there is that is the most ridiculous bunch of crap I've ever heard.

D6 Of course, I mean, you know, once again an obvious thing. We drink it, we touch it, we swim in it. It can't be contaminated or we can't enjoy it, you know? It's gotta be cleaned.

D7 Yes it was. All information is useful and you have to use all the information you can be presented with to make a sound decision.

D8 This information was useful. It's good to know all your options. You should be able to make a decision for that...your own decision. Or at least be able to know what kind of decisions are being made that you can't be a part of.

D9 Not necessarily, because it had to be cleaned up. Cost isn't/shouldn't be a factor. I'm trying to write as fast as I'm talking and I just can't do it.

OK, we're almost done here and I'm getting pretty excited, to tell you the truth.

D10
A. Extremely important
B. Extremely important
C. Extremely important
D. Extremely important
E. Is important, we need to know what we're doing, but it's an impact on everything. You can't just look at one thing, you have to look at the whole spectrum. See the whole spectrum of people and land and years to be affected.

Protocol 20

Q1 Yes. mumbled

Q2 Yes.

Q3 A. Both things are extremely important, 7. There we go.
B. Well, yes, I mean, I guess me and my family might be a little more important, so I'll pick 6.
C. Yes, we'll go with a 6 on that because, you know, you can't do everything.
Well, everything is for the child. And that is why we want to do this. To preserve for the next generation.

Q4 Reads over list. It's extremely important on all of these. I'm gonna give them all a 6. Because everything is super important, but there is a little bit of leeway.

Q5 That's a good question. Well, I mean, if an old can of Raid is hazardous, then I don't know. I don't know, but never intentionally.

Q6 Well, it's like yes, but where...I don't know, so I don't really know if it's in the community. But what's the name of that place in Golden? I can't remember the name of the place.

Q7 That's a good question. My immediate reaction is yes, I mean, where else is it gonna come from. Yes is the answer. Somebody's gotta do it.

Q8 Well, I would not be very concerned, but then I don't like to put extra pressure on myself so we'll give it a 2. I'm sure I would occasionally think about it, but not loose any sleep. But then again, I choose to fly in an airplane and I choose to have problems like that.

Q9 Well, it's going to be number 2 again and I know exactly why, because as we sit her and talk out loud I smell the chlorine in my water that I drink and I have been told that they pour Clorox in our water and I think, my gosh, if I can't drink water, then my gosh.

Q10 Well, in my opinion as I get to talk out loud, I think it depends a lot upon who is paying these scientists and where they're coming from and what kind of answers are wanted. I think risks are always underestimated simply because we do not know where things can lead. Well, I pick 1 and 6, guys. Well, moderately underestimate might be a better way, but they really do not know. OK, I think they really do not know...oh I don't know. I'm gonna pick moderately underestimate...

Q11 No.

Q12 It does nothing. It does not take care of the problems at all. 1.

Q13 No.

Q14 It does not take care of the problem at all. 1.

Q15 I don't really know. I really don't know...that's why my reading is slower. That's why I think, OK this is introduced to me, but I just don't know. I don't know about all this stuff. Ideally great change would happen, but.... So, not sure.

Q16 Well, how well. Well, it does help some, but huh, let's give it a 4.

Q17 Again I'm not sure, simply because I don't... I mean, all we're doing is dealing with what we do. That's what I'm thinking.

Q18 Well, it doesn't solve them at all, it just controls them. We'll give it a 4 again. We could give it a 3 1/2, but we'll give it a 4.

Q19 I do not know. I am not sure. You know... Unfortunately life is terminal.

Q20 Well, I think it basically said it takes care of everything, right? Rereads. Well, I'll just, I give it a 9. I can never be completely sure.

Q21 Of course I would, yes.

Q22 Well, I'd be willing if it ends up being the right solution. Yes I would, if this is the way to go, so I'm gonna put a yes, however, I kind of don't know also. And it's not the money it's is this the right thing to do?

Q23 If it is the right thing to do. I don't know, but I'm gonna put yes. Yes, if it's the right thing.

Q24 Well dear, if it's the same answer, yes, but yes, if it's the right thing. I'll tell you what I'm thinking here. Do we want to sit here and spend all of our money and time and effort cleaning up or do we simply want to stop doing what we're doing and find another way of doing it.

Q25 I'm reviewing here. Of course I pick complete cleanup. And as far as all this stuff, I think all these people who commit crimes and do all this stuff should be educated to be a part of it and should be paying for it.

Q26 Well, the next closest, D.

Q27 Well, that's a good question. How responsible do I feel? Well, I mean, it just depends on what side of the bed you're on. I mean, extremely responsible because it's me and I'm not doing it for anybody else, but then again, I didn't do it. However, I think we'll give it a 5. Well actually, I think we should sue all the big companies. OK, what's in the middle. I'll give it a 4. It would either be a 4 or a 5, but I'm gonna give it a 4 right this second.

D1 Yes, absolutely. Reason...well, the reason was, I've imagined it, there was a movie about it and I've read about it. I feel like I've thought about this before.

D2 No. Absolutely not. There it is. Reason....I'm a socialist at heart.

D3 Well, ya. Yes, 2, I chose a more complete cleanup just because it was better described. Because I was better verbally, word-wise educated.

D4 Well, no, not really. No I didn't because they make it sound like nothing. The reason is because the risks sound like nothing now, but they will become quite devastating for my grandchild.

D5 Well, no. I just want the best.

D6 Well no. For the same reason as before. I'll just put ditto mark. I just want the best. Same as above. I'm just into the best. I'm an idealist. A socialistic idealist, yaaaaa.

D7 No, I just want the best, but I do like all these illustrations. I'll put ditto marks here. The same as before.

D8 No. Again, I just want the best, but all of the information is interesting.

D9 Well, I guess I need to choose an answer and I'm going to choose no. But again, I want the best, but I also want to know that we're doing the best. Like, do we need to go around

cleaning up all these little potholes or should we just change the way we live. And I can't write all this down...this is way too long and it whipped through my mind already.

D10 A. Extremely important, 7.
B. 6.
C. Now, 6 1/2...I'll give it 7.
D. Well, that makes no sense whatsoever, I mean, we're going to take this D and toss it because how could mother earth not affect anybody? Well, it's either at one end and I don't know what to put on this one, it seems ridiculous.
E. The cost gets a 5.

APPENDIX D

SELECTED QUOTES FROM THE VERBAL PROTOCOLS

I. Valuation

"$1400 is a lot of money over 10 years. I would be willing. I just would. It's a lot of money, but $12 a month isn't that much. I would say yes. See, if it were $2000 per person per month, I wouldn't do that, you see." **Protocol 3, Q20**

"Well, it isn't worth that much. I guess it is worth that much probably, however, I think that if it's going to cost $10 a month I think the government can find a way to cut some of their other spending on some of the other programs that they have and get some of the fat out of the government and actually, I think they could pay for the program and it wouldn't cost anybody anything. I'll check this that it isn't worth that much." **Protocol 11, Q25.**

"The cleanup to my family, the community, and future generations was very important, but I took into account the risk. The cleanup of mother earth, even if people are unaffected was of average importance to me. And cost was extremely important only in the sense that I didn't think the cost was all that great, even for the time frame." **Protocol 3, D10.**

"Well, now we're talking economics as per my household's income. Hmmmm, so my thought process is to go back to the page before where I was answering the questions for the approximate costs. $8 a month. Well, keeping this in...I have to include my own economic situation. When I think about...and other responsibilities that I have, so, I have a number and it probably means that I would have to eliminate cable TV for a number of years, but that is something that I would be willing to do so I'm gonna circle $15/month." **Protocol 9, Q20.**

II. Credibility of the GCR site

"What I'm saying here is that if I really did live near this GCR site, my value would not be any different." **Protocol 9, D2.**

"I would be concerned because I would think you're lying to me. I would think you were lying to me that one person would die every 5 years. I mean, I believe you, but that to me is such a low statistic. Why are you sending me this thing if that's really true? I wouldn't want my children drinking this water." **Protocol 5, Q8.**

"It just doesn't seem real to me. If the situation were real, I think I would (vote for the landfill cap and water filtration option). It said that the GCR site is imaginary or something like that. If it were real, I would say yes." **Protocol 2, Q18**

"I think it is very well described. I think it's pretty realistic, especially if you're here in Boulder. I can relate, I can sometimes smell some of the waste sites around here, and I lived in various locations. Maybe 2 hills was a little excessive, but I can imagine one hill and we can smell garbage in this area, so...it's a real life experience for me." **Protocol 13, D1.**

"If I had to live there and I had to drink the water there I'd probably filter my water to a certain extent and if I had children we'd always have bottled water, so I'd be concerned, but I wouldn't be extremely concerned, cause it would be one of those things that you just kinda live with." Protocol 13, Q8**.**

III. Scientists Estimates of Risk

"I would say that they are reasonably accurate in estimating the risks." Protocol 3, Q10.

"I don't know how they come up with it, but I would guess that they moderately underestimate the risks." **Protocol 4, Q10.**

""health risks to humans are usually described by scientists as very small." That seems like bullshit to me. Like, that seems like not true. Even though they may say that it's true, it seems like... I mean I wouldn't want to be living next to three mile island or you know I wouldn't want uranium in my water, do you know what I mean? It just seems like that doesn't seem true." **Protocol 5, Q5** .

"I would be inclined to think that scientists really do not know the actual health risks because it has been so recently most of these hazardous substances have come into play. I think they probably moderately overestimate the risks." **Protocol 11, Q10.**

"This is really ambiguous. What scientists? Well, I think you could probably answer any of these depending on your political point of view. If you listen to Rush Limbaugh, you would probably say they greatly overestimate risks. So I don't know how I'd answer this. I think that some underestimate and some overestimate. So I will just say I don't know." **Protocol 13, Q10.**

"I think it depends a lot upon who is paying these scientists and where they're coming from and what kind of answers are wanted. I think risks are always underestimated simply because we don't know where things can lead." **Protocol 20, Q10.**

IV. How Cost Information Affects Decision making

"Yes, the cost information was an important factor in my choice. In considering the cost... the higher costs might not be affordable to everyone and since the estimated risks and deaths stayed the same, I would say I would choose a strong plan that solves the problem that takes care of the problem but also doesn't get too high in cost." **Protocol 18, D9.**

"The cost information was largely unimportant to me, because the cost that they're using, they mean direct monetary cost. They're not talking about future cost, health, the cost of health, the cost of future cleanup that may absolutely become necessary. See, we're assuming that if we don't clean it up, it's not necessary to clean it up as long as you don't drink the water, but what if this site blows up in 20 years like landfills did 30 years ago when the methane backed up and they had health hazards of a different kind." **Protocol 9, D9.**

"Well, I don't think people pay equal taxes. I feel like I pay, at my lowly little salary, pay a lot more money than a lot of people do. I'm gonna do D, the landfill cap and groundwater barrier." **Protocol 16, Q25** .

V. Satisfaction of Cleanup Levels

On Institutional Controls-

"It's not really any better (than no action). It doesn't do anything for the environment, it doesn't do anything long term, its just short term and eventually that stuff is going to get in other water if it keeps moving." **Protocol 7, Q12.**

"Well, it looks like it's putting in the minimum requirements. It's almost like it almost appears to be a politician's idea." **Protocol 2, Q12.**

"I would not be satisfied with leaving the waste in the storage tank left to contaminate the water again. I can understand about the soil. If soil

contamination by air is one in 10 million, I would accept that risk. Even though the risk, 10 deaths in 10 million people...I just don't like the idea of it being left there." **Protocol 3, Q12.**

On Landfill Cap and Water Filtration-

"Huh, that would be great...I don't know if a person can afford to do that...I would be satisfied with that option. I don't want to pay for it." **Protocol 3, Q13.**

"I most prefer C myself. I think that it significantly reduces the risk. And at $4, I mean, it's not... I don't see that complete clean up seems to be...soil cap and water seems to be enough." **Protocol 3, Q21.**

"Well, I'm really not sure that I'd be satisfied with that. I would be if they weren't going to develop on top of it because there's always going to be somebody that's going to dig, even though it's prohibited, so I'm not sure I'm satisfied with that." **Protocol 11, Q15.**

On Landfill Cap and Groundwater Barrier-

"I would (pay for it), but they would have to convince me that it's gonna work." **Protocol 1, Q18.**

"I think I like the landfill cap and groundwater barrier because it barriers off the groundwater, replaces the groundwater with clean water and they

can use the site. And that way, some people can't afford $25 a month just for the best." **Protocol 18, Q25.**

On Complete Cleanup-

"I think complete cleanup. And the reason why is, there's no substitute for making the environment the way it was before." **Protocol 17, Q25.**

"My only question is where are we gonna move them all (contaminated hills) and if they move them will the land still be contaminated where it was?" **Protocol 12, D10** .

VII. Sensitivity to Risk Information

"It seems like everybody takes a risk and in order to clean up a situation, sometimes there are going to be lots of risks and I think one death every 50 years in your community is pretty small compared to letting the site be comparable and look nice again so you could look at it and say, ya, we cleaned it up. **Protocol 17, Q19.**

"I chose a less complete cleanup for this reason because I remember the risk involved. If I had not been aware of the risk, I would have assumed that it was one in a hundred, your know. I would've gone for a more complete cleanup, but because of the risk I chose a less complete cleanup." **Protocol 3, D3.**

"Well actually, there's fewer deaths than I thought there would be." **Protocol 4, Q8.**

"I think it was useful because it gives you an idea of where peanut butter ranks as opposed to where hazardous waste ranks, but I don't think that it had just because the risk factor was f, which made it appear very low on the ladder, didn't make any difference to me. It needs to be cleaned up." **Protocol 9, D5.**

VIII. Whose Responsibility

"Wow, that's a tough one because you're not the one that contaminated it, because when you purchased the house or the property that you're living on, no one told you that you're going to have to clean this up, so... but you're gonna have to accept certain responsibilities when you buy in an area because you're buying...you're laying out the convenience of the area, along with the ambiance of the area when you buy. That makes it attractive to you. You don't just buy it because it's a corner lot on a road that's an easy access to the shopping center. You consider your job, accessibility to your career, accessibility to maybe open space or things like that, your general environment. I believe you have to accept quite a bit of responsibility. I don't know if extremely responsible is the word that I would use, but I would feel responsible, and on a scale of 1 to 7 I'd think that I would have to...my feelings would be that I would be responsible to a higher end but then if this survey goes into effect, my

taxes are gonna go up because they're gonna hit me for this one. This is one that I think I'm gonna have to say about midway on. Not necessarily for myself and community, but because other people that are trying to buy into the community may quite practically be financially bust, trying to reach for a little bit more of the brass ring than maybe they should have? But purchasing that property and then suddenly finding out that essentially, for all intents and purposes, there is a $150 to $200/yr surcharge, if we just went by the numbers that I put up, that quite frankly might put them out of the ability to meet their tax obligation for other considerations. Say county assessment or something like that." **Protocol 9, Q23**

"I don't feel totally responsible, but yet I do, because I've done things that probably would require some risk too." **Protocol 17, Q27.**

IX. Passive vs. Active Risk

"My concern would still be that I can choose to eat or not eat peanut butter, but I have to drink water." **Protocol 9, Q8.**

X. Survey Information

"It's so much information you're asking me to absorb in one survey that I would never do this! You'd have to pay me to send it to my home. And I'm a thinking person, but it's just, like, I think it could just be simple." **Protocol 5, Q8** .

APPENDIX E

THE LANDFILL CONTINGENT VALUATION SURVEY RESULTS

The sixth survey version that was administered as a part of the pilot study was the LANDFILL CONTINGENT VALUATION survey. The survey parallels the LANDFILL CHOICE VERSION 1 except that instead of asking the subject to choose a cleanup option the subject is asked how much they would be willing to pay for complete cleanup.

Table E.1 summarizes the statistics that were derived from the 41 subjects that were administered the LANDFILL CONTINGENT VALUATION survey. The second table gives the responses to the valuation question. The raw mean is presented as well as two additional adjusted means. The first adjusted mean simply eliminates extreme bids. This statistic is the mean excluding the three zero bids and the three highest bids. Although this is an inexact exclusion, it does give some idea of the character of the bids.

The other measure of average willingness to pay is the 'geometric mean.' This is formed by taking the natural log of the bids, averaging those values and then taking the exponent to return the number into dollars. This transformation is used to correct for the highly skewed distribution that is common when asking for a positive bid. The specific model that is assumed is:

$$\mathbf{ln\ B = ln\ W +}\ \varepsilon$$

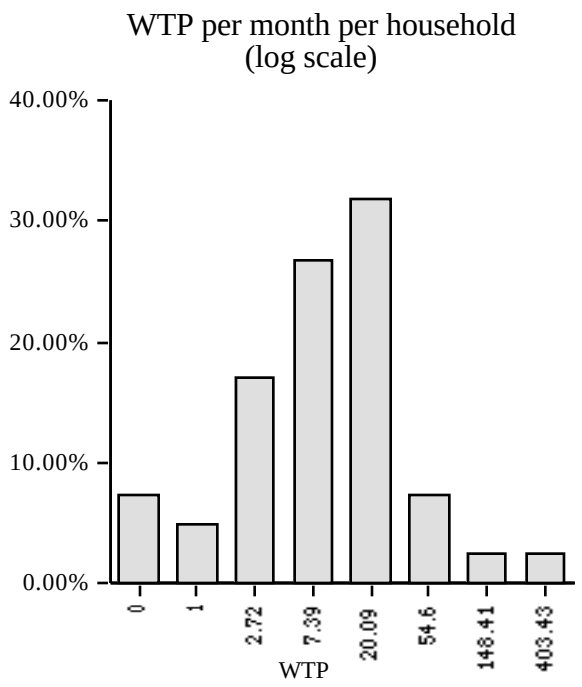
TABLE E.1 LANDFILL CONTINGENT VALUATION VERSION

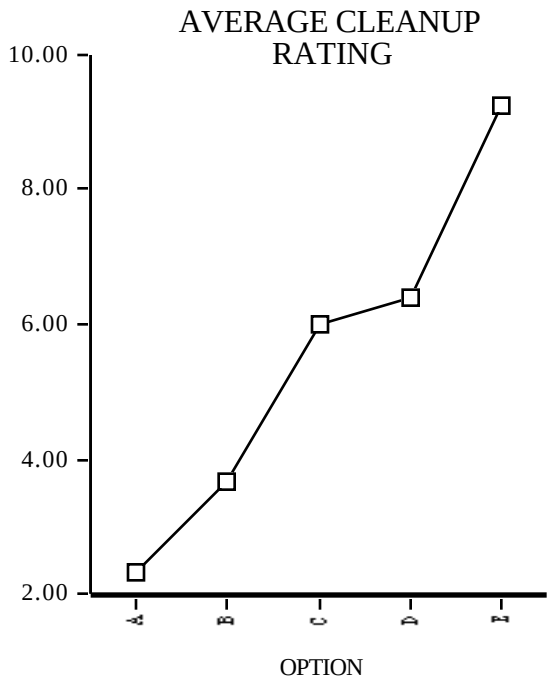
OPTION	RESPONDENTS THAT WOULD BE WILLING TO PAY FOR OPTION		Average Cleanup Rating for the option	Cost per household per month for 10 years
	number	percent		
A	----	----	2.34	$0
B	31	75.6%	3.66	$1
C	32	78.0%	6.00	$4
D	20	48.8%	6.41	$8
E	----	----	9.24	----

SUMMARY OF WILLINGNESS TO PAY FOR COMPLETE CLEANUP STATISTICS.
Note that for all of the calculations, the one individual that bid "MORE THAN $500" per month was assigned a WTP of $501. The total number of respondents was 41.

	Raw Mean (std. deviation)	Mean excluding extremes*	Geometric Mean	Median	Mode
WTP	$39.63 (107.22)	$17.83 (12.70)	$14.12 (3.43)	$10	$20
WTP minus self reported embedding	$29.52 (81.94)	$13.13 (11.87)	$11.23 (3.47)	$10	$20

*For this calculation six observations were excluded: the three highest bids and the three bids of zero.


WTP per month per household
(log scale)
40.00%
30.00%
20.00%
10.00%
0.00%
0
1
2.72
7.39
20.09
54.6
148.41
403.43
WTP


AVERAGE CLEANUP
RATING
10.00
8.00
6.00
4.00
2.00
A
B
C
D
E
OPTION

where B is the reported willingness to pay, W is the subjects true willingness to pay, and ε is a measurement error, assumed to be distributed normally ($\varepsilon \sim (0, \sigma^2)$). Actually, a Box-Cox transformation (Box and Cox, 1964) that compromises between the linear and natural logarithm transformation, is more general, but impossible with this small of a sample. Of the 41 subjects three bid zero. Since the natural log of zero is negative infinity, these observations were dropped in calculating the geometric mean. Another possible correction would be to assign the zero bid some fractional positive value. A graph in Table E.1 presents the frequency distribution of WTP bids on a log scale. The log scale on the horizontal axis illustrates the reduction in skew associated with applying the log transformation.

A major concern in any CV survey is the issue of embedding. Following the methodology developed in the Denver Air Quality study (Schulze, et al. 1989), a disembedding question follows the valuation question. This self-reported embedding question (questions 25 and 26) allows the subject to fit their own "mental model" to the valuation context. The second row of Table 5.4 reduces the subjects stated bids by the percent of self-reported embedding. The total value of willingness to pay for COMPLETE CLEANUP that was lost by asking this disembedding question was 25.5%. This is comparable to the 25% level reported in the familiar "Brown Cloud" commodity of the Denver Air Quality study (Schulze, et al. 1990), but somewhat higher than the 20% level achieved in the Groundwater CV study (McClelland, et al. 1992). The level of embedding does compare favorably, however, with the unfamiliar commodity studies on Visibility in National Parks: 38% (Chestnut and Rowe, 1990) and Oil Spills: 50% for

Medium Size Oil Spill version (Rowe et al. 1991). This does indicate that the LANDFILL survey provides enough information and is specific enough to familiarize the subjects with Superfund cleanup and thus minimize the embedding problem.