

FINAL

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**CLARK COUNTY PROPERTY VALUE REPORT
ON THE EFFECTS OF DOE'S PROPOSAL TO SHIP
HIGH LEVEL NUCLEAR WASTE TO A REPOSITORY
AT YUCCA MOUNTAIN**



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Executive Summary

Stigma resulting from an amplified perception of risk has been associated with all aspects of nuclear power plant siting and operations, and stigma has been associated with a decline in property values. The United States Department of Energy (DOE) has proposed a massive, first of its kind program to transport High-Level Waste (HLW) from civilian nuclear power plants and the nation's weapons complex through Clark County, Nevada to a repository that will be constructed at Yucca Mountain, Nevada. Virtually all of the HLW resulting from this program will travel through Clark County, Nevada. This study investigates the likelihood and extent of property value diminution that may occur in Clark County, Nevada that is directly attributable to this program.

In order to evaluate the range of potential property value effects that may result from the transportation of HLW, this study analyzes the literature that documents the range and magnitude of impacts that have been demonstrated. The research literature provides insight into the range of negative environmental externalities, such as transmission lines and hazardous waste facilities that result in property value diminution. This study also details a scenario-based survey of Clark County real estate appraisers and lenders for residential, commercial, and industrial property, and reports on a survey of Clark County residents. The findings from these investigations are compared and evaluated in order to establish a credible framework of the potential property value effects that may be experienced within Clark County, if the DOE proceeds with its plans.

The research findings indicate that Clark County will likely experience assessed property value diminution ranging from \$75.2 million to \$526.5 million for three types of properties – residential, commercial, and industrial. Within this range, the projection depends on the route selected and whether the shipment campaign proceeds without

incident or whether an incident occurs but does not result in any release of radioactive material. Thus, this projection is based on only a limited number of land uses. For example, it does not include casinos, hotels, shopping centers, or a myriad of other land uses that still need to be examined. Further, although this report provides a first estimation of the level of impact that could occur in the event of a serious accident, which results with a release of radioactive material, they are not included in the range of diminution reported above.

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CHAPTER 1 INTRODUCTION

1.1 Purpose and Utility of the Study

Stigma resulting from amplified perception of risk has been associated with all aspects of nuclear energy including property value diminution (Jenkins-Smith 1999) Over the next thirty years, the USDOE proposes to ship 77,000 metric tons of Spent Nuclear Fuel (SNF) and HLW from 72 civilian nuclear reactors and five U S weapons facilities to a permanent repository at Yucca Mountain, Nevada According to the Draft Environmental Impact Statement (DEIS), if the primary mode of transport is truck, most of the HLW will be transported through Clark County, Nevada HLW has radioactive components that will remain dangerous for over 10,000 years Given the amplification of risk that has been associated with all things nuclear and the probability of an incident (even an incident with no release of radioactive material), there is a potential that Clark County may experience significant property value diminution over an extended period resulting from the DOE's proposed activities

The purpose of this study is to provide the first estimation of the range and magnitude of property value impacts that are likely to occur if the DOE proceeds with this project This study is part of an ongoing effort by the Clark County Department of Comprehensive Planning Nuclear Waste Divisions (NWD) to document potential impacts resulting from the DOE's proposed actions and to inform Clark County decision-makers as to the nature and extent of these potential impacts

Under provisions of the Nuclear Waste Policy Act (NWPA), as amended, Clark County has been designated as one of ten "affected units of local government" that is likely to be impacted from the DOE's proposed actions Accordingly, Clark County is

authorized under the NWPA to monitor the siting process and conduct its own impact studies, and public involvement program. As part of its responsibilities under the NWPA, the NWD intends to incorporate the findings from this study into a Clark County Yucca Mountain Impact Report in the summer of 2001

This paper first examines the effects of other adverse environmental conditions on property values, in order to evaluate the likelihood that adverse property value impacts may be experienced because of the DOE's proposed actions. Numerous studies have indicated that a wide range of negative externalities can adversely influence property values. These negative externalities include noxious facilities, noise, and odors among others. Further, many studies have shown that "nuclear" related facilities consistently rank among those considered most deleterious. This body of research is analyzed in order to inform us as to the nature of impacts that have been demonstrated, and the range and magnitude of these impacts.

This study also reviews and summarizes two surveys that were conducted in Clark County related to property values. The first survey describes the perceptions of Clark County residents as to the likely property value impacts resulting from the DOE's proposal to ship HLW through Clark County. The second, a scenario-based survey describes the opinions, perceptions, and beliefs of property value experts, i.e., lenders, and appraisers, as to the impacts that may be experienced under three alternative transportation scenarios. These three studies are compared and the findings are applied to various land uses within Clark County to provide a first estimation of the magnitude of impacts that may be experienced if the DOE proceeds with the Yucca Mountain transportation-shipping program.

Section 2.0 examines the challenges that are associated with estimating property value diminution from nuclear waste and summarizes the methodologies utilized in this study.

Section 3.0 reviews the significant studies that link public perceptions of risk with the effects of property value diminution. These studies explain how factors such as perceptions and distance from the source of the hazard may affect property values. The nature of stigma is described and its significance to property values is discussed. The results of a multitude of studies are compared. While there is limited experience with the actual shipment of nuclear waste, these studies clearly demonstrate that significant property value diminution could result from the DOE's proposal to ship HLW through Clark County.

Section 4.0 of the report describes the results of a survey of Clark County residents' beliefs and perceptions regarding the effects of DOE's proposal to ship HLW through Clark County on property values, especially residential property values. This survey was modeled after an earlier survey of residents of Santa Fe County, New Mexico. That survey examined residents' perceptions of property value impacts resulting from the shipment of transuranic radioactive wastes through Santa Fe, New Mexico to the Waste Isolation Pilot Project (WIPP) in Carlsbad, New Mexico. The Santa Fe survey was later referenced in a judicial decision that resulted in the State of New Mexico having to compensate for stigma-induced property value diminution. The results of the survey of Clark County residents are then applied to the appraised value of residential properties within one mile of the transportation corridor. Appendix A provides the details of the methodology used in the survey of Clark County residents. Appendix B is the

survey instrument used in the residential survey Appendix F includes tables supporting the findings from the residential survey

A second survey, the topic of sections 5.0 and 6.0 examines the perceptions of property value impacts of two professional groups in Clark County who have extensive experience evaluating property values and change resulting from environmental events Section 5.0 of the report describes the lenders' and appraisers' experience with contaminated property, and documents the level of property value diminution that these experts believe may result for three types of properties under three different transportation scenarios The rates of diminution identified by these experts then are applied to the appraised property values along the entire length of the two alternative transportation routes within Clark County that could be used by the DOE.

One of the routes described as the I-15 alternative, involves the trucks carrying HLW entering Clark County from both the North and the South The trucks proceed on I-15 until they reach the intersection of US 95 where the trucks would exit I-15 and take US 95 out of Clark County toward Yucca Mountain The second route, described as the Beltway or outer loop alternative, would also have the trucks entering Clark County from both the North and South using I-15 When the trucks carrying HLW from the south reach the Western Beltway, they would exit I-15, take the Western Beltway to the Northern Beltway, and then turn north onto US 95 toward Yucca Mountain The trucks carrying HLW from the north along the Beltway Route (also referred to as the Outer Loop Route) would follow I-15 south to the Northern Beltway At that point, they would exit I-15, follow the Northern Beltway west to the US 95 exit, and then go north on US 95 toward Yucca Mountain

The three scenarios used in the lenders and appraisers' interviews were based on the shipping campaign described in the U S Department of Energy's (USDOE) Draft Environmental Impact Statement (DEIS), and input from the State of Nevada's Agency for Nuclear Projects. Based on three transportation risk scenarios, and three types of properties – residential, commercial, and industrial – appraisers and lenders were asked for their perceptions of likely future impacts on property values in the shipment corridors. The survey was designed to measure the extent to which possible diminution effects may vary by distance from routes, type of property, and scenario. The survey results are then applied to the assessed valuation data for both routes and for each property type. This provides a first estimation of the magnitude of impacts that the experts believe may occur in Clark County.

Section 6.0 of this report applies the results of the lenders and appraisers survey to the following communities, Las Vegas, North Las Vegas, Mesquite, Henderson, and unincorporated Clark County. Specific issues related to the impacts within each of these communities are then briefly discussed. Appendix C provides details of the methodology used in the survey of Clark County bankers and lenders. Appendix D and Appendix E include the appraisers and lenders survey instruments. Appendix G includes tables supporting the results of the lenders and appraisers survey.

Section 7.0 compares the findings demonstrated in the literature with the results of the two surveys (the Clark County resident's survey and the lender's and appraiser's survey). While none of the methodologies used in this study can provide a precise estimate of the extent of property value diminution that may be experienced, the results from all three methodological approaches analyzed in this report suggest that Clark County's property values are likely to be adversely impacted as a result of the DOE's

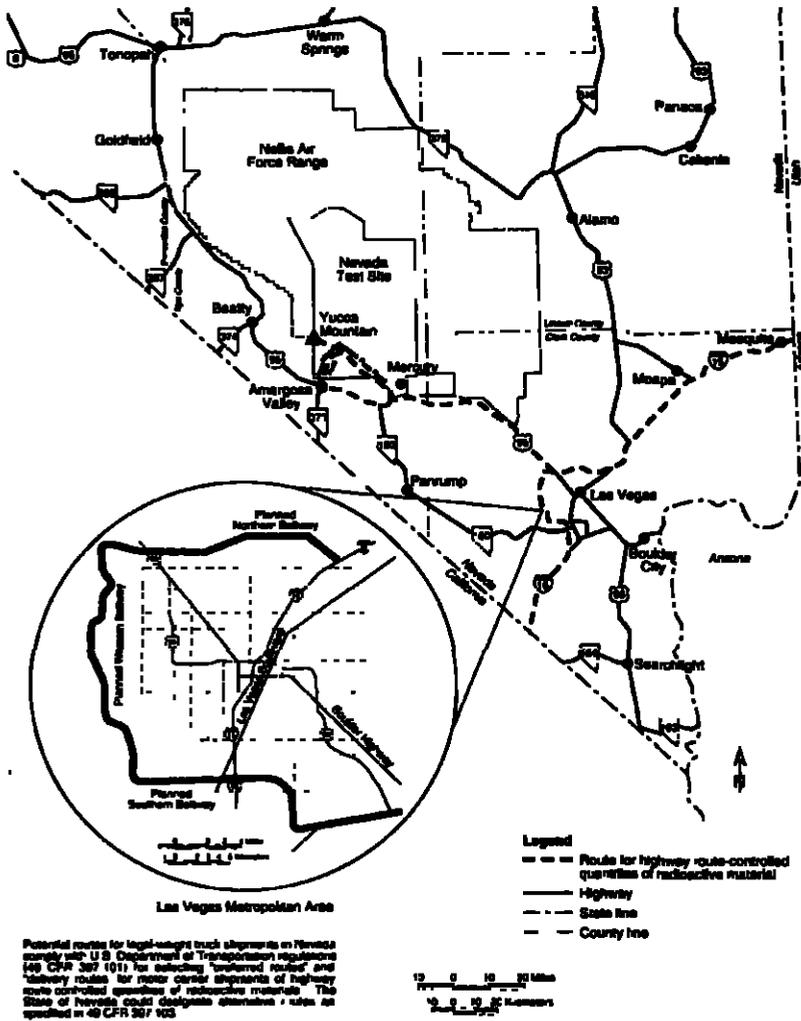
proposed actions. Further, a case is made that the estimates of impacts made by the lenders and appraisers under Scenario 2 provide the most reasonable proxy for the level of diminution that may be experienced in Clark County if the DOE proceeds with its plans to ship HLW through the County to the proposed Yucca Mountain Repository. Finally, Section 7.0 briefly discusses the implications of these findings for both residents and governmental entities within Clark County.

1.2 Background and Setting

The area known as Clark County was annexed in 1867 from the Arizona Territory to the State of Nevada as part of Lincoln County. Clark County was formed in 1909 when Lincoln County was divided. From a population of 3,321, growth in Clark County remained slow until the Great Depression when government projects such as Hoover Dam drew laborers to Southern Nevada. After World War II, legalized gaming, and the warm climate continued to draw new residents to Southern Nevada. Clark County has witnessed one of the fastest growing populations in the United States. Today, this area is home to over 1.25 million residents and hosts another 30 million visitors annually.

If the Yucca Mountain repository is constructed and primarily truck transport is used to move the waste, the majority of all of the SNF and HLW waste will travel through Clark County (Figure 1). In this region of the country, no practical alternatives to I-15 and U.S. 93/95 are available for transit from Los Angeles, Salt Lake City, Phoenix, or Reno. Thus, while the USDOE has not selected the transportation routes it will use, the Draft EIS for Yucca Mountain does identify these routes among the options they are considering. If the USDOE's proposed mostly highway scenario is selected, almost 93,000 shipments will traverse through Clark County over 24 years (Table 1).

Figure 1 Clark County Transportation Corridors



SOURCE: USDOE Yucca Mountain DEIS 1999

Table 1 Number of HLW Truck Shipments

Number of shipments per day	106
Number of shipments per week	744
Number of shipments per year	3,869
Total number of truck shipments over 24 years	92,851

Source: U.S. DOE's Yucca Mountain DEIS

1.3 Concepts and Definitions

Terms such as hazard, risk, risk perception, stigma, property value, and property value diminution, assessed valuation, and fair market value are not used consistently in the literature, especially across disciplines. For the purpose of this research, the following definitions are used. *Hazards* can be thought of as “threats to humans and what they value” (Hohenemser, Kates, and Slovic 1983). Hazards can be the result of a natural occurrence or they can originate from human activity (O’Riordan 1986). Nuclear power and its by-products are technological hazards that result from man converting a natural resource for man’s use.

Risk is the measure of both the likelihood of an event and the severity of harm. Thus, *hazards* are the source of *risk*. *Risk perception* is the “subjective value of the risk to which people react and respond” (Lobin and Montz 1997). *Stigma* is the additional risk perceived by the market associated with undesirable environmental features (Chalmers and Jackson 1996). Pijawka has noted that these features can result from an activity that the public finds repellent, upsetting, disruptive, or hazardous (Pijawka 1999).

Property values reflect the “anticipated stream of future benefits capitalized at a return necessary to attract capital to the opportunity” (Chalmers and Jackson 1996). When a property loses value because of an undesirable feature, the loss is measured by two components, the direct costs associated with eliminating or remediating the undesirable feature and stigma. This decrease in the value of the property is known as *property value diminution*. *Assessed valuation* is the value that a governmental agency places on land and buildings for purposes of computing property tax. Assessed value is usually computed as some percentage of fair market value. *Fair market value* represents “the most probable price which a property should bring in a competitive and open market

under all conditions requisite to a fair sale, the buyer and seller, each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus" (Appraisal Institute 1996) For example, in the State of Nevada property is assessed at 35% of its fair market value This means that the property tax rate for a given jurisdiction is applied to an amount that County government, in this study Clark County, has determined represents 35% of the price that a property would likely be purchased for in an open and competitive market environment.

1.4 Delimitations and Limitations of the Study

The DOE proposal to build the Yucca Mountain repository and transport HLW from 79 sites across 43 states is of unprecedented magnitude in our nation's history Thus, while there is ample experience documenting the effects of negative environmental conditions on property values, there is no directly analogous case for what the DOE proposes to do in Clark County Further, to-date, the DOE has yet to provide detailed information as to the exact nature of the shipment campaign For example, although the existing transportation system provides a set of bounding parameters, the DOE has yet to detail the mode or routes for transporting the HLW to Yucca Mountain. Thus, much ambiguity and uncertainty is associated with making any forecast as to the potential impacts from these activities Additionally, while the literature review in Chapter 3 provides a wide-ranging discussion of the factors that shape our behavioral responses that can result in stigma, we do not know what the long-term impacts on property values will be from the transportation of HLW The literature review does provide a contextual framework that allows us to understand the nature of stigma and the factors that influence its development

Finally, the property value diminution reported on in this study are not based upon a formal appraisal of specific properties but is instead based on the opinions, perceptions, and beliefs of Clark County residents, lenders and appraisers as to the effects of the shipment campaign on property values along two routes under consideration. Because of the amplified perception of risk that is associated with nuclear related activities and because of the disproportionate share of the transportation program that will be felt by Clark County, Nevada, care should be given in any attempt to generalize the results from the study reported on here to other geographic locations. Chalmers and Jackson et al have found that geographic location significantly effects lenders' perception of the additional risk (i.e., stigma) (Chalmers and Jackson 1996)

CHAPTER 2 METHODOLOGICAL APPROACH

2.1 Forecasting with Uncertainty

Mushkatel, Pijawka, and Nigg maintain that over one-half of the residents of Clark County consider the risk of an accident from the transportation of radioactive wastes to be serious or very serious (Mushkatel, Pijawka, and Nigg 1993). Despite this finding, there has been limited research into how stigma influences property values during the transport of radioactive waste. The most substantial study of these effects has been the investigation of property value impacts from the transport of radioactive waste materials from foreign reactors shipped to the Savannah River Site for storage during the mid 1990s (Gawande and Smith 1999). Gawande and Smith found that property values declined significantly along the transportation corridor for radioactive wastes in an urban county but not in two rural counties. Most other studies have probed how the perception of risk has influenced the attitudes of businesses or community residents toward nuclear facilities.

2.2 Research Design

This research utilizes a multi-method approach to investigate the extent of *potential stigma-induced property value diminution that may result from the transport of HLW through Clark County, Nevada along the routes under consideration by the DOE for shipping HLW to the proposed repository at Yucca Mountain, Nevada (Figure 2 and Table 2)*

Figure 2 Multi-Method Research Design

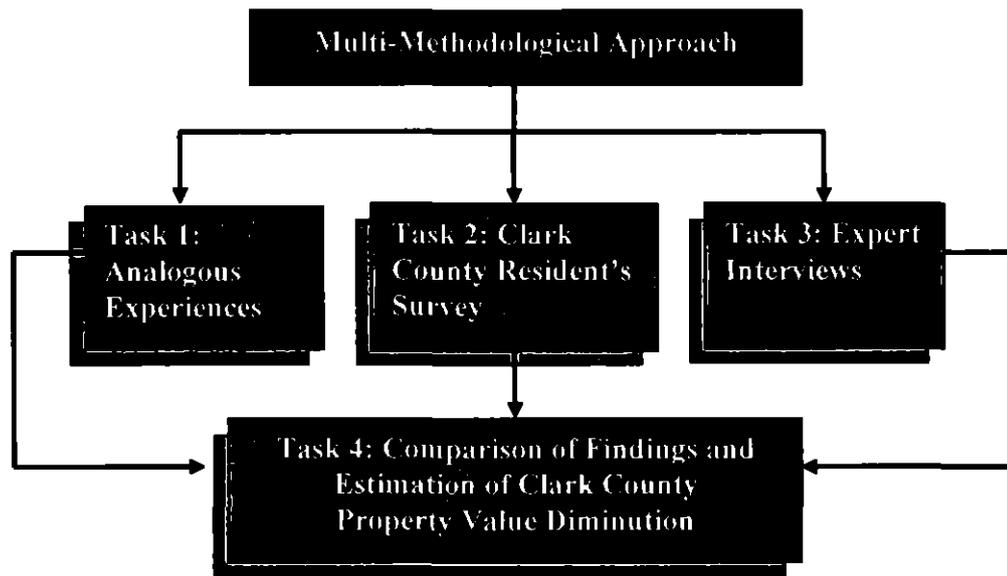


Table 2 Valuation Methods

Component	Definition of Purpose	Stakeholder		
		Lenders	Appraisers	Public
Analogous Case Experience	Document the literature to determine whether the range and magnitude of impacts that have been associated with other adverse environmental conditions are analogous to and can inform our understanding of the potential property value impacts within Clark County resulting from the DOE's proposed actions.	4	4	4
Real Estate Market Survey	Focused interviews of current and potential homeowners in Clark County to identify perceptions and attitudes about the affects on property values resulting from the transport of HLW			4
Expert Interviews	Scientific survey real estate appraisers and lenders in order to measure the affects of stigma on property values in Clark County under various transportation scenarios for SNF and HI.NW	4	4	

Source Conway 2001

The research design combines an analysis of analogous cases from the literature, a survey of Clark County residents, and scenario-based expert interviews (Figure 2 and Table 2). The rationale for using these techniques is discussed below. The details of the methodologies employed in the Clark County survey of residents are included in Appendix A. The survey instrument is attached as Appendix B. The details of the survey methodology for the appraisers and lenders are included in Appendix C. The survey instruments are attached as Appendix D and E. Appendix F and H contain tabular results from the residents' and experts' survey, respectively.

2.2.1 Analogous Case Experience

Analogous Case Experience was gathered from a variety of secondary sources including the risk perception and property value literature, Appraisal Institute text materials, expert reports, and court documents. The literature describes other more limited campaigns to transport radioactive wastes. The literature review includes some simple descriptive statistics that demonstrate the range of variances, based on research studies, that have been shown for certain types of environmentally induced property value diminution. Given the lack of direct analogous experience with a campaign to transport nuclear waste of the scope proposed by DOE, the emphasis is on providing a qualitative, contextual framework for understanding the factors that are likely to influence property values in Clark County because of the transport of HLW to Yucca Mountain.

2.2.2 Clark County Residents' Survey

Over the last 15 years, there have been a growing number of public opinion surveys addressing the intensity of concerns and public perceptions of the risks of transporting nuclear wastes on nearby routes. These surveys have typically targeted areas or regions containing proposed nuclear waste transportation routes, and the objectives of the surveys were to discern residents' concerns and, in some cases, what their likely behavior might be if these routes were selected. The DOE through the State of Nevada's, Nuclear Waste Project Office, funded a number of studies to assess how residents of the State, Clark County, and the Nation perceive the risks of transporting nuclear waste and what, if any, concerns arise as a result of the shipments.

In addition to these surveys, the opening of the WIPP near Carlsbad, New Mexico, resulted in another survey of not only the public's risk perceptions, but also the public's beliefs about the possible impacts on property values of homes and businesses near proposed routes. Concerns over property value losses by developers and residential homeowners regarding a bypass route in Santa Fe, New Mexico, to transport nuclear waste materials for disposal in the WIPP resulted in a systematic survey of people's perceptions of property value impacts from radioactive waste transportation (ZIA Research Associates 1990).

The "Santa Fe" survey is important in three distinct ways. First, it demonstrated that residents believe that the transportation of radioactive waste would adversely impact property values. Second, the survey results were important in a judicial decision demonstrating that damages in terms of devaluation of property values can be compensated because of stigma perceptions (Komis vs. Santa Fe). Third, the survey's design allows crosswalks to the survey of Clark County residents. The Komis case in

New Mexico is relevant to Clark County, Nevada, because it illustrates that residents' perceptions of property values *do matter* to the courts and that these perceptions may influence market behavior

The survey of Clark County residents' summarized in section 4.0 and detailed in the report, *Clark County Residents and Key Informant Surveys: Beliefs, Opinions, and Perceptions about Property Value Impacts from the Shipment of High-Level Nuclear Waste through Clark County, Nevada*, is the first systematic survey of perceptions undertaken to measure potential property value impacts resulting from the proposed shipments of HLW. The Clark County residents' survey employed many of the questions found in the ZIA Research Associates survey, and the results of the two surveys were compared. Although the two studies were conducted in two different geographic locales and over a decade apart, the results indicate a strong relationship among the public's perception of impacts. The similarities in these findings support the conclusion that residents believe that property values will be diminished from radioactive waste transport.

2.2.3 Real Estate Market Survey

Property value is directly influenced by the attitudes and behaviors of market participants including real estate appraisers, lenders, and owners. The first component of the research discusses actual levels of property value diminution resulting from adverse environmental conditions. The second component reports on the perceived level of property value diminution by Clark County residents. The third component draws on the experience of appraisers and lenders within Clark County. Clark County appraisers and lenders were interviewed to assess their beliefs and perceptions about the extent of

property value diminution that could occur under three different transportation scenarios for three different property types, and at distances varying from one mile to three miles along the proposed transportation routes

CHAPTER 3 EXPERIENCE WITH PROPERTY VALUE DIMINUTION RESULTING FROM ADVERSE ENVIRONMENTAL CONDITIONS

3.1 Nature of the Literature

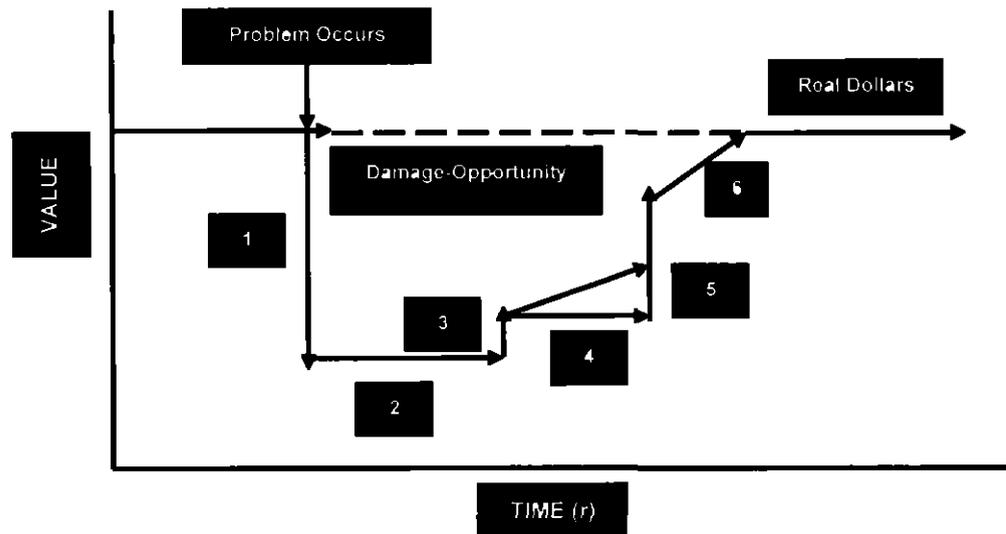
Adverse effects on property values, from a variety of environmental conditions, have been demonstrated since as early as the beginning of the last century. It is only within the last two decades, however, that social scientists, environmental planners, economists, real estate appraisers, and lawyers have begun to actively integrate how human behavior interacts with other market factors. These efforts have spawned an extensive literature that seeks to explain the factors that influence stigma-induced property value diminution.

This literature falls broadly into two categories. The first category includes the many studies that have been done linking stigma to property value diminution, while the second category focuses on developing theoretical models that describe the interactions that result in stigma-induced property value diminution (Patchin 1988; Mundy 1992, Nuestein 1992, Chalmers 1993, Chalmers and Jackson 1996, Reichert 1997).

The theoretical models developed have focused primarily on a description of the effects of stigma on marketability (Figure 3) and income (Figure 4) (Mundy 1992). Mundy argues that when an adverse environmental event occurs, the marketplace acknowledges the event by dramatically reducing the marketability of the property until the extent of damage can be quantified, and remediation undertaken. When the marketplace recognizes that the remediation is complete, the marketability of the property returns. The period between the recognition by the marketplace that an adverse environmental event has occurred and the marketplace's acknowledgement that a

successful remediation has occurred results in “damages” associated with lost opportunity costs (Figure 3)

Figure 3 Marketability Effects

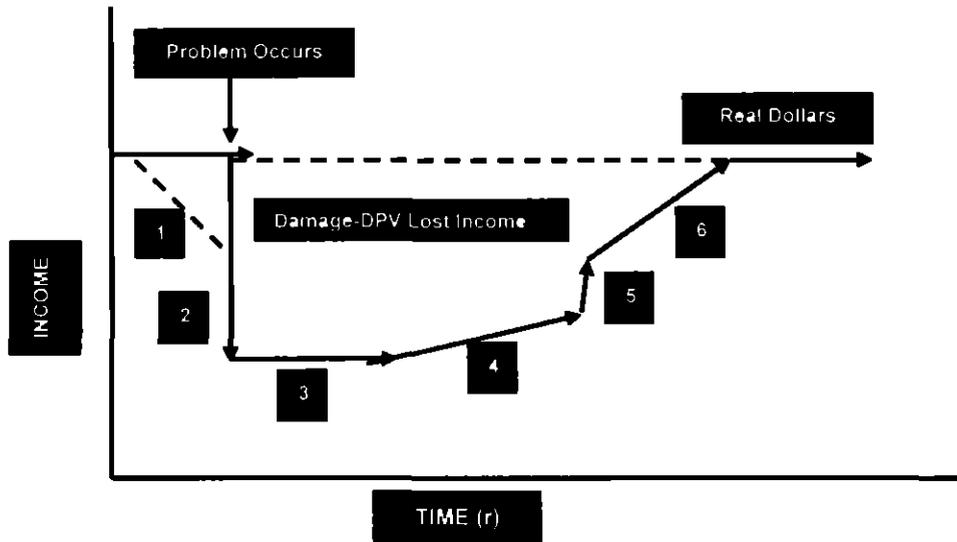


Source: Mundy 1992

Similarly, an adverse environmental event also can affect a property’s ability to generate income (Figure 4). This effect may result in a sudden downturn, for example, if a property is immediately destroyed or the effect can be gradual. Gradual income loss can occur when tenants refuse to renew their lease because of an adverse environmental event. In either case, the property’s ability to generate income will remain depressed until the market recognizes that the property has been fully remediated. The period of reduced income results in property value diminution resulting from lost income.

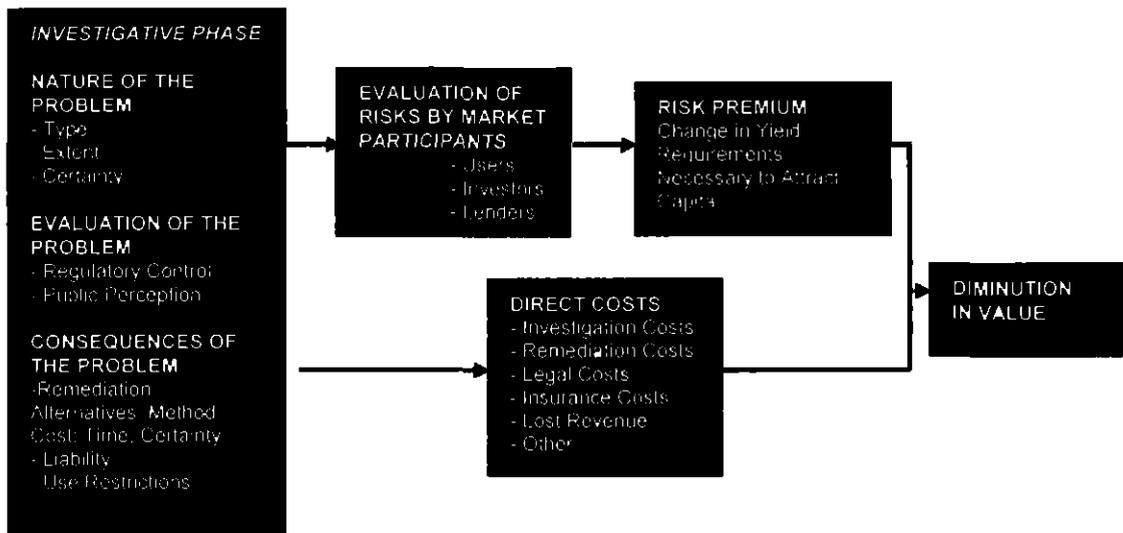
Chalmers has taken these concepts even further by establishing a conceptual framework for quantifying stigma-induced property value diminution (Figure 5). Others have focused on explaining how situational factors, such as the physical and socio-economic environment, interact with cognitive factors such as psychological variables to influence our perceptions (Tobin and Montz 1997).

Figure 4 Income Effects



Source Mundy 1992

Figure 5 Property Value Diminution Conceptual Framework



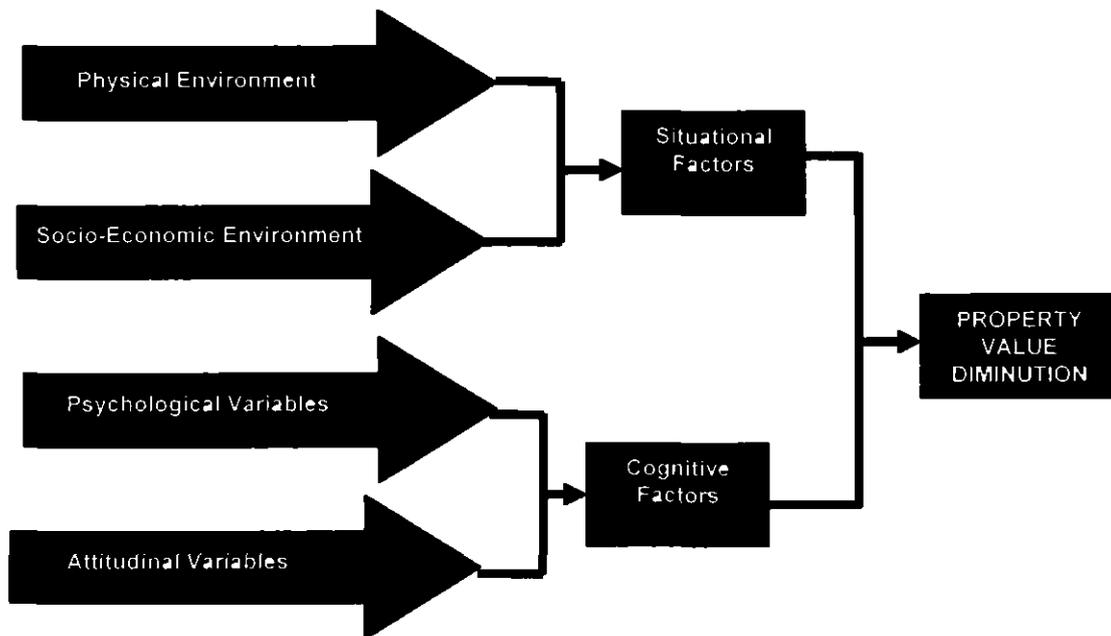
Chalmers 1996

3.2 Factors Influencing Property Valuation Diminution

3.2.1 Situational Factors Influencing Property Value Diminution

As noted above, several models have been developed to describe the factors that influence how property values vary as a function of perceived risk-induced stigma (Mundy 1992, Chalmers 1996). This investigation utilizes a modification of the model developed by Tobin and Montz to explain our current understanding of the nature of the perception of risk and formation of stigma. The model also provides a framework for synthesizing the literature on property value diminution (Tobin and Montz 1997) (Figure 6)

Figure 6 Influences on Property Value Diminution



Source: Modification of Tobin and Montz Risk Perception Model 1997

In section 3.2.1.1 and 3.2.1.2, the situational and cognitive factors that influence property value diminution are discussed. When the literature about property value diminution is viewed in this framework, it becomes evident that the value of property, like the perception of risk, is dynamic and complex involving the interaction of multiple factors.

3.2.1.1 Physical Factors

Informally, humankind has been assessing the value of land for centuries. Formal economic price theory dates back to the early 1800s when Heinrich von Thunen developed his agricultural location model. According to von Thunen's model, the value of property (bid rent) was a function of distance to marketplace in relationship to the land's utility. By the early 1930s, Walter Christaller had developed Central Place Theory, although it was not widely accepted until the mid-1950s. By then, the real estate appraisers were already tackling the methodological challenge of determining how to account for the effect of negative externalities (i.e., unintentional effects on a third party, who as a result may suffer uncompensated losses) from the siting of transmission lines across a property (Crawford 1955).

The growing environmental movement in the 1970s sparked research into the effect of pollution on property values. Initially, this work did not directly incorporate cognitive factors, but instead attempted to measure direct cost of contamination on a property. For example, Harrison and Rubinfeld investigated the relationship between the marginal value of clean air and property values (Harrison and Rubinfeld 1978). By the 1980s, a plethora of literature began to deal with the effects of risk perception on property values (Patchin 1988, 1991, McClelland et al. 1990, Smolen et al. 1992, Mundy

1992; Elliott-Jones 1992, Carroll et al 1996; Pijawka 1998, Gawande and Jenkins-Smith 1999) Property valuation studies have focused on the risk perceptions of the public, and experts that include real estate appraisers and lenders

3.2.1.1 Type of Hazard

The literature indicates that a wide variety of environmental disamenities from high-voltage transmission lines to Superfund sites and hazardous waste landfills and incinerators can result in stigma-induced property value diminution (Colewell 1990, McClelland et al 1990, Greenberg and Hughes 1991; Kiel and McClain 1995, Smolen et al 1992) In a 1978 study, Lindell et al. found that only twenty-nine percent of the public would be willing to live within 10 miles of a nuclear waste facility and thirty-two percent stated that they were unwilling to live within 100 miles of a nuclear waste facility Further, this study found that a nuclear waste repository was the least tolerable of eight industrial facility types including a nuclear power plant (Lindell et al 1978) A 1997 national survey by Flynn et al indicated that 63.6 percent of the sample agreed or strongly agreed that property values along the transportation corridor for HLW would decline Similarly, seventy percent of the respondents to a survey in Santa Fe, New Mexico indicated that property values would fall along a proposed bypass that was proposed for the transportation of radioactive waste to the Waste Isolation Pilot Project (WIPP) near Carlsbad, New Mexico (ZIA Research 1991) Sixty percent of those respondents also indicated that under *no conditions* would they purchase homes in proximity to the proposed bypass (discussed in detail in Section 4.0)

In 1999, Gawande and Jenkins-Smith demonstrated property value diminution from the transport of HLW in South Carolina (Gawande and Jenkins-Smith 1999) Using a hedonic modeling approach, Gawande and Jenkins-Smith analyzed 9,533 real estate

transactions within three counties in South Carolina where HLW was transported over a two-year period between 1994-1996. They found that although property value diminution could not be discerned in the two rural counties, property values in the urban county were substantially lowered during the period that HLW was being transported

3.2.1.1.2 Factors of Magnitude and Scale

Even small amounts of contamination have been shown to negatively affect property values (Egar 1973, Patchin 1988) In a 1991 survey of lenders, the Hanford/Healy Companies found that less than 40 percent of the banks would consider lending on a property that was contiguous to a contaminated site (Healy and Healy 1992) Bankers also indicated that they would require additional indemnification (66%), adjust the loan-to-value-ratio (46%), or require some type of other personal guarantee (60%)

Chalmers has identified that the extent of contamination as one of the four key factors effecting property value diminution (Chalmers 1993) He reasons that if the extent of the contamination is small, and is subsequently completely remediated, there may be no impact on housing prices. However, if the extent of contamination is large, or there is distrust in the degree of remediation or the entity responsible for the remediation, then housing values may be lowered significantly (Chalmers and Jackson 1996)

Research to determine whether the level of toxicity influences changes in property value diminution is ambiguous Kohlhase examined housing sales in Houston's Harris County between 1976 and 1985 He found that while sale prices were significantly lower in areas near Superfund sites, no discernable differences could be found in the sale process related to the extent of contamination (Kohlhase 1991) Greenberg had similar findings in his investigation of 77 Superfund sites in New Jersey (Greenberg 1992) These studies assume factors that may not be fully indicative of whether differentials can

and do exist based on the extent of contamination. Both Kohlhasse and Greenberg utilized the National Priorities List (NPL) ranking of Superfund sites as a proxy for extent of contamination (the NPL ranks sites according to their seriousness using a health risk index) to measure differences in the public's perception of risk. During the time period NPL sites were being studied by Kohlhasse, there was limited knowledge and understanding of the nature of the NPL among the public (Conway 1990)

3.2.1.1.3 Temporal Patterns

The influence of temporal patterns on variations in property values has been widely documented (Patchin 1988, Stock 1989, Colwell 1990, MacGregor and Slovic 1993, Kohlhasse 1991; Patchin 1991, Ketkar 1992, Chalmers 1993. Chalmers and Jackson 1996, Kiel et al 1995, Carrol 1996). Most of this research indicates that reductions in property value will rebound over time after remediation has been completed. Chalmers notes that if the remediation is perceived to be inadequate, or if there is a breakdown in trust of those responsible for remediating a site, then stigma is likely to remain (Chalmers 1993, Chalmers and Jackson 1996). Further, when Kiel and McClain used a hedonic regression model to measure how housing prices varied over time and distance during the construction and operations of a hazardous waste incinerator, they found that both time and distance were significant and dynamic factors influencing changes in property values. Even after the incinerator had been operating for 4 years, a significant diminution of property values remained (Kiel and McClain 1995).

Patchin also has found that from the time of discovery of contamination on a property to full remediation, the property may not be marketable (Patchin 1991). Further losses in property values can occur if cleanup is delayed and this loss can be substantial. In fact, Kiel and McClain argue that an economic efficiency model does not adequately

capture the equity effects that result from the distributional imbalances that occur from the time the public becomes aware that a property is contaminated and the point when the public accepts the remediation as complete (Kiel and McClain 1995)

3.2.1.1.4 Distance

The predominance of findings from the literature indicate that distance can significantly influence property value variances (Havlicek et al 1972, Blomquist 1974, Webb 1980, Nelson 1982, Colwell 1990, McClelland et al 1990, Kohlhase 1991, Ketkar 1992, Mendelsohn et al 1992, Smolen et al 1992 and 1997, Kiel 1995, Kiel and McClain 1995) In a survey of resident perceptions of the impact of a nuclear power plant on property values, Webb found that there is a significant "distance decay" factor, whereby those living closest to the reactor indicated the greatest property values diminution (Webb 1980) Other researchers have also found that the rate of property value diminution decreases over distance, forming a distance gradient (Colwell 1990, Nelson 1982, Smolen et al 1992).

Mendelsohn et al analyzed panel data on repeated sales in New Bedford, Massachusetts and found that proximity to polluted waters resulted in property value reductions of \$7,000 to \$10,000 per individual property (in 1989 prices), with an aggregate loss of \$36 million (Mendelsohn et al 1992) Using a sample of Boston area housing prices from 1975 – 1992, Kiel found that there was a premium of \$3,000 to \$6,000 for each mile of distance away from a Superfund site (Kiel 1995)

Similarly, Reichert measured the stigma-induced property value diminution resulting from a landfill designated as a Superfund site in Uniontown, Ohio Reichert found diminution in property values of just under \$11 million for 1,600 residential properties The rate of property value diminution found varies from 5 percent at 6,750

feet to 15 percent for properties nearer the landfill (Reichert 1997) Reichert points out that the average property value diminution from his research at Uniontown is consistent with earlier research by Kohlhasse, Smolen, and Miller that found the rate of property value diminution varied with distance (Kohlhasse 1991, Smolen 1992, and Miller 1992) Further, the average rate and average dollar amount of diminution at one mile was relatively consistent among these researchers (Table 3)

Table 3 Impacts in Average Dollars and Percentages for Properties One-Mile Away from a Landfill

Kohlhasse (Houston, Texas)	\$12,728	16.2%
Smolen (Toledo, Ohio)	\$8,141	14.2%
Reichert	\$7,880	7.6%
Miller	\$17,189	12.0%
Overall Average Impact	\$8,984	12.5%
Standard Deviation	\$492	3.4%

Source Reichert 1997

Gamble and Downing maintain in their studies of the impact of nuclear power plants on property values, that proximity is not a factor (Gamble and Downing 1982). Gamble investigated residential property values near four nuclear power plants in the Northeast prior to the TMI accident, and residential property values in proximity to TMI after the accident. Gamble used a hedonic model to analyze the sale of 540 single family homes in proximity to the four nuclear power plants in the Northeast and to analyze the sale of 695 single family homes in the TMI area. Gamble and Downing found that nuclear power plants had no discernable effect on the value of properties studied in the Northeast. For the properties in proximity to TMI, Gamble, and Downing found a "sharp

decline in property values" in the immediate period after the accident. However, property values quickly rebounded (Gamble and Downing 1982) Gamble notes that the influx of cleanup contractors after the accident at TMI may be partially responsible for this finding

McCluskey and Rausser measured the complex and dynamic interaction between distance and temporal patterns on property value diminution (McCluskey and Rausser 1999) Using a hedonic price model, they examined how property values varied overtime and distance before the announcement of contamination at a smelter in Dallas, Texas and during two phases of environmental remediation This research indicates that properties closest to the smelter experienced property value diminution even before contamination was discovered at the smelter Upon discovery, amplified perception of risk was found to lead to further diminution that declined over distances out to four miles

Change in property values was assessed from 1979 – 1995, a period that included two separate clean up campaigns The research indicates that property values recover over time at locations greater than one mile but that a permanent stigma remains within the one-mile area This finding has important implications for estimating the extent of property value diminution for ongoing facilities, and for long-term projects such as the transportation of HLW over three decades If the rate of property value diminution changes over distance and time, it is critical that monitoring systems measuring impacts be calibrated to measure changes in property values at various scales and across an extended period in order to capture the dynamic affects of time and distance

3.2.2 Cognitive Factors Influence on Property Value Diminution

By the 1990s, there was a plethora of literature linking the perception of risk from contaminated sites, hazardous waste facilities and the transportation of hazardous materials to property value diminution (Patchin 1988, 1991, McClelland et al 1990, Smolen et al 1992, Mundy 1992; Elliott-Jones 1992, Carroll et al 1996, Pijawka 1998, Gawande and Jenkins-Smith 1999) During this period, social scientists clearly established the links between environmental risk-induced stigma and property value diminution. Economists and real estate appraisers focused their attention on identifying methodologies for quantifying property value diminution resulting from environmental risk-induced stigma. Most of the property value literature during this period is quantitative, depending on surveys and statistical modeling. Like the risk perception literature, the literature on property value diminution, also begins to reflect more multi-disciplinary and multi-methodological approaches during this period.

3.2.2.1 Knowledge

In Harris County, Texas, a hedonic model was used to measure how knowledge of a hazardous waste site affects property values (Kohlhase 1991). The research found that prior to the United States Environmental Protection Agency publicly announcing that a site had been added to the National Priority List (the list that ranks Superfund sites) that there was no property value loss related to the contamination at the site. After EPA's announcement however, there was a sharp decline in property values.

Mendelsohn in his investigation of the effects of PCB contamination in New Bedford harbor on residential property values also found that before broad public awareness of the contamination, the effects on property values were limited. As public

knowledge of the contamination increased, property value diminution grew to \$7,000 - \$10,000 per home (in 1989 dollars) (Mendelsohn et al 1992)

Furthermore, Payne et al found that just the knowledge of a Low-Level Radioactive Waste site is sufficient to have adverse effects on property values (Payne et al 1987)

3.2.2.2 Perception

The link between the perception of risk and property value diminution is illustrated in a 1997 national survey, where respondents indicated that they expected nuclear waste shipments to have a deleterious effect on property values (Flynn et al 1997) McClelland et al.'s research also illustrates the link between risk perception and property value diminution (McClelland et al 1990) McClelland et al used a hedonic price regression model to measure changes in property values resulting from changes in the collective risk judgment of neighborhoods After controlling for a variety of housing characteristics including property size, age, amenities, and disamenities, they found that for each 10 percent increase in the share of respondents who perceived the highest levels of risk, average housing prices decreased by \$2,084

When real estate lenders were surveyed to determine how their perception of risk influenced their underwriting policy, Hanford and Healy found that less than 40 percent of bankers would even consider lending on a parcel of land contiguous to a contaminated site Further, 66 percent of these lenders indicated that they would require additional indemnification and 46 percent indicated that they would adjust the loan-to-value ratio (Healy and Healy 1992)

In contrast, Metz and Clark argue that preference surveys that link the perception of risk to property value diminution are not indicative of actual behavioral outcomes (Metz and Clark 1997). To make their case, Metz and Clark used four different hedonic models to investigate the sale of 765 homes near the Rancho Seco nuclear power plant and 400 homes near the Diablo Canyon nuclear power plant. Their research found that the operational status of the nuclear power plant and the activities related to the transfer of spent fuel into dry cask storage had no deleterious effect on housing prices in California.

3.2.2.3 Values

Chalmers has argued that one of the most complex challenges in assessing property value diminution is the “development of a clear definition of the value concept” (Chalmers, 1993). Since there is a significant disparity between the value of property in use and the value of property for exchange, different definitions and methodologies have been used to define “value.”

Case law and legislative statutes have largely relied on “market value” as the appropriate measure of “value.” Market value is “the price at which a willing seller would sell and a willing buyer would buy, neither being under abnormal pressure” (American Institute of Real Estate Appraisers 1978). Often market valuation is assessed by comparing the value of a property to similar properties in the geographic area. The application of “market valuation” for contaminated properties can be problematic. For example, if a government entity chose to condemn a piece of land that has become contaminated by the actions of another party from a property owner, the “market value” proposed for payment by the government entity to the property owner could be zero.

When valuation of contaminated properties is considered for ad valorem taxation, the tax courts have broadened their determination of value to emphasize “liability or fault” (Gladstone 1991, Dunmire 1992; and McMurray and Pierce 1992)

3.3 Implications of the Literature Review on Clark County Property Values

A preponderance of the research indicates that stigma-induced property value diminution can and does occur. The literature also indicates that there are multiple factors both real and perceived that influence stigma. These factors are dynamic and to date have not been fully quantified.

The literature also demonstrates that stigma-induced property value diminution has been recognized by the courts. This court recognition is discussed in detail in Section 4.0. Formal protocols to measure stigma effects in property values have been developed by experts, such as appraisers. Lenders have developed formal policies for dealing with stigma. The acknowledgement of the effects of stigma on property values by the courts and other experts suggest that it is both reasonable and prudent to consider the potential effects of the Yucca Mountain Project on Clark County’s property values.

4.0 RESIDENTIAL SURVEY RESULTS

This section of the report summarizes the results of a survey that is described in detail in the report, Clark County Residents and Key Informant Surveys Beliefs, Opinions, and Perceptions about Property Value Impacts from the Shipment of High-level Nuclear Waste through Clark County, Nevada The results are applied to the assessed valuation data for three groups of land uses within Clark County The survey of 512 Clark County residents was conducted by the Canon Center at University of Nevada at Las Vegas (UNLV) in August of 2000

“The purpose of the survey was to identify the attitudes, opinions, and perceptions of residents of Clark County, Nevada regarding property values in Clark County, and to characterize their beliefs about the potential impacts of the proposed shipments on property values along the transportation corridor” (UER February 2000). The results of the survey are summarized below in sections 4.1 – 4.4 and then applied to residential, commercial, and industrial assessed valuation data for Clark County along two potential routes in section 4.4 The methodology is discussed in Appendix A, and the survey protocols are attached as Appendix B

4.1. Interest in Residential Property Ownership

Respondents were asked if they presently owned any residential property in Clark County and whether they had plans to buy residential property in Clark County (Appendix A) Greater than 60% of those surveyed stated that they currently own residential property in Clark County and more than 30% stated that they planned a future purchase of residential property within the County These responses indicate that there is

a strong preference toward home ownership among Clark County residents (Appendix F - Table 2)

4.2. Opinions Regarding Residential Property Values in Clark County

4.2.1 Changes in Residential Property Values

In response to questions about the direction of residential property values in Clark County, almost three-fourths of Clark County residents said that they believe residential property values in Las Vegas Valley and throughout Clark County are increasing. Another 15.8% indicated that property values are remaining about the same, while only 2.1% believe property values are decreasing. These results are similar to an earlier survey of Santa Fe, New Mexico residents that found 87% indicating property values were increasing before the DOE implemented a shipment campaign of radioactive transuranic waste to the WIPP facility at Carlsbad, New Mexico.

4.2.2 Impact of Various Facilities or Environmental Conditions on Residential Property Values

Respondents were asked whether twelve different types of facilities or “environmental conditions” would *increase*, *decrease*, or *have no effect* on nearby residential property values. These facilities or “environmental conditions” included

- Casino or gaming property
- Amusement park
- Day care center
- Landfill and waste dumping site
- Nonpolluting manufacturing facility
- Public school
- Limited access highway
- Horse racing track
- Polluting manufacturing plant
- Shelter for the homeless

- Shopping center
- Limited access highway or freeway used to transport nuclear waste

Clark County residents indicated that having a public school and a shopping center nearby has a positive impact on property values, by 61%, and 52.2%, respectively. Respondents stated that a polluting manufacturing plant, a landfill, and a highway or freeway used to ship nuclear waste would have the most negative affect on property values. The findings correlate with the Santa Fe, New Mexico study.

The survey results were analyzed to determine if the responses to each of these environmental conditions varied by any of the demographic variables measured. These demographic variables included the respondent's length of residency in Clark County, age, education, ethnicity, income, gender, property ownership, and the respondent's residential community. No statistically significant differences were identified for the three facilities receiving the highest negative ratings (freeways used to ship nuclear waste, a polluting manufacturing facility, or a landfill) in Clark County. In the earlier survey of Santa Fe County, New Mexico residents, significant differences in perceptions of property value impacts were shown for several demographic variables including age, gender, and household income (Table 4). In the Santa Fe study, respondents between 30-44 years of age, females, and those with incomes between \$15,001-\$40,000, were more likely than others to believe that residential property values would decrease with a nearby freeway transporting nuclear waste. Males and higher income Santa Fe residents (incomes greater than \$40,000 at the time of the survey) were *more likely* to believe that a freeway with nuclear waste shipments would have no effect on residential property.

Table 4 Freeway Used to Ship HLW Waste by Demographics

Freeway Used to Ship Nuclear Waste by Demographic	Significant Difference	Significant Difference
- Length of Residency	No Significant Difference	No Significant Difference
- Age	No Significant Difference	Significant Difference
- Education	No Significant Difference	No Significant Difference
- Ethnicity	No Significant Difference	No Significant Difference
- Income	No Significant Difference	Significant Difference
- Gender	No Significant Difference	Significant Difference

4.3 Familiarity with USDOE's Repository and Transportation Program

Clark County residents were asked if they were familiar with the Yucca Mountain repository project and the DOE's plans for HLW waste shipments through Clark County. Approximately 80% of the respondents indicated that they were familiar with the Yucca Mountain project, while 75% said that they knew about the DOE's plans to ship HLW through Clark County (Appendix I - Table 32)

4.4. Perceptions of the Impacts of Nuclear Waste Shipments on Property Values

4.4.1 Likelihood of Purchasing Residential Property

Respondents were also asked whether a property's location near a HLW transportation route would – increase a lot, increase somewhat, neither increase nor decrease, decrease somewhat, or decrease a lot – the likelihood of purchasing property (Table 5). Altogether almost 82% of the respondents stated that a nearby HLW route would either “decrease a lot” or “decrease somewhat” their likelihood of purchasing a residential property.

Table 5 Likelihood of Purchasing Residential Property near a HLW Transportation Route in Clark County, Nevada

Chances of Buying Property Would...	Percent (N)
Increase a lot	2.7% (14)
Increase somewhat	2.3% (12)
Neither, increase nor decrease	10.2% (52)
Decrease somewhat	11.1% (57)
Decrease a lot	70.7% (362)
Do not know/no answer	2.9% (15)
TOTAL	100.0% (512)

4.4.2 Effects on Property Values: Open-ended Responses

In addition to the closed-ended questions in the survey, the following three open-ended questions were asked to uncover residents' perceptions of the effect shipments of high-level nuclear waste would have, if any, on property values

- (1) "The U S Department of Energy has indicated that Interstate 15, U S 95, State Route 160, and the northern and southern beltways could all be used for high-level nuclear waste shipments to Yucca Mountain. What effect, if any, do you believe shipments of high-level nuclear waste will have on property values located near these highways?"
- (2) How do you think commercial property, or business property values near routes used for the shipment of high-level nuclear waste in Clark County will be affected, if at all?
- (3) Under what conditions would you consider purchasing residential property near a highway that is to be used for the shipment of high-level nuclear waste in Clark County?" (UER August 2000)

The responses to these open-ended questions were categorized and coded. Among the initial responses as shown in Table 6, almost two-thirds of those surveyed indicated that properties near possible shipment routes would *decrease* in value.

Table 6 Perception of Residential Property Value Impacts Located near Specific Routes in Clark County, Nevada (NV) versus Santa Fe, New Mexico (NM)

Response Category	Nevada Percent (N)	New Mexico ^a Percent
Danger**	2.4% (12)	NA
Decrease in value	66.1% (327)	71.0%
No effect	12.7% (63)	16.0%
Do not know	3.4% (17)	5.0%
Pretty bad**	2.4% (12)	NA
Negative effect**	5.3% (26)	NA
Upset people**	1.8% (7)	NA
People move**	1.7% (8)	NA
Increase in value	0.6% (3)	5.0%
No one will buy houses**	0.6% (3)	NA
Other	3.0% (15)	3.0%
TOTAL	100% (495)	100% (489)

^a All percents are rounded to the nearest whole number and only the total N was available for comparison
^{**} NA - Categories not used in the Santa Fe, New Mexico survey

Altogether, 78% of the respondents utilized negative terms to describe the effects of the proposed HLW shipment campaign through Clark County. Among the other terms used to describe the effects of the shipment campaign on property values were a "negative effect," "pretty bad," "upset people," "people would move far away," and "no one will buy houses." In response to a similar closed-ended question, 71% of the Santa Fe, New Mexico residents surveyed indicated that property values would decline from the shipment of radioactive wastes.

Both surveys also questioned respondents about their views concerning potential nuclear waste transportation impacts on nearby commercial or business property (Table 7). In this case, 40.7% of the Clark County respondents indicated that commercial property would decrease with another 5.8% indicating generally "negative effects" on properties. Interestingly, 6.2% responding to this open-ended question suggested adverse effects on business operations located near these routes. In contrast to the general question on property values, 33.9% of responses to the question on commercial properties indicated that there would be "no effect" on these values. The respondents to a

similar closed-ended question in the Santa Fe, New Mexico survey indicated that 37% of the respondents believed that commercial or business property values would decline along the shipment corridor to WIPP, while 38% stated that the shipment campaign would have “no effect.”

Table 7 Perceptions of Property Value Impacts on Commercial or Business Properties

Response Category	Nevada Percent (N)	New Mexico Percent *
Decrease in value	40.7% (231)	37.0%
No effect	33.9% (192)	38.0%
Do not know	7.2% (41)	9.0%
Affect businesses	6.2% (35)	NA
Negative effect**	5.8% (33)	NA
Increase in value	1.6% (9)	13.0%
Dangerous	1.6% (9)	NA
Other	3.0% (17)	3.0%
TOTAL	100.0% (567)	100.0% (496)

* All Santa Fe, New Mexico responses are rounded to the nearest whole number and only the total N was available for comparison

** NA - Categories not included in the Santa Fe, New Mexico survey

Clark County residents were asked under *what conditions* they would consider purchasing residential properties near HLW transport routes. Almost three-fourths of the respondents declared that they would not consider purchasing property along the transportation routes under any conditions (Table 8). These responses are more negative than those expressed by respondents in the earlier Santa Fe, New Mexico study.

Table 8 Conditions under Which Residents Would Consider Purchasing Residential Property near a Highway to be used for the Shipment of HLW in Clark County

Environmental Condition	Nevada Percent (N)	New Mexico Percent *
Under no condition	74.9% (355)	59.0%

Do not know	2.5% (12)	8.0%
Depends on location**	3.2% (15)	NA
Would consider conditions	3.6% (17)	19.0%
Depends on safety measures**	3.2% (15)	NA
Other***	6.1% (29)	5.0%
Would Not Affect Decision to Purchase***	NA	9.0%
TOTAL	100.0% (474)	100.0% (489)

* All Santa Fe, New Mexico responses are rounded to the nearest whole number and only the total N was available for comparison

** NA - Categories not included in the Santa Fe, New Mexico survey

*** NA - Category not included in the Clark County, Nevada survey

4.4.3 Direction and Magnitude of Property Value Impacts on Residential Property

Clark County residents were asked whether residential property near a highway used for transporting HLW would sell for more, the same, or less, than an identical property that *is not near* such a route (Table 9). Eighty-two percent of the respondents believe such a property would sell for less, 15% think it would not make a difference, and only the remaining 3% believe it would sell for more. This pattern of response was similar to the earlier Santa Fe County, New Mexico study which found 71% of the respondents indicating that residential property would sell for less (ZIA Research Associates 1990).

Table 9 Perceptions of Direction of Impact on Property Values

Residential Property Near Nuclear Waste Shipment Routes would sell for...	Nevada	New Mexico
	Percentage (N)	Percentage (N)
More money	3.3% (13)	3.0%
Same amount of money	14.5% (57)	20.0%
Less money	82.2% (324)	71.0%
Not Sure	NA	6.0%
TOTAL	100.0% (394)	100.0% (501)

* All Santa Fe, New Mexico responses are rounded to the nearest whole number and only the total N was available

** NA - Categories not included in the Clark County, Nevada survey

Respondents answering that a residential property would sell for *more/less* than a comparable property not near a shipment route were then asked how much more or less they would expect the price to be. Of the 369 Clark County respondents who expect

lower selling prices for homes near shipment routes, the mean expected drop in selling price in Clark County is estimated at approximately 25% compared to identical homes not near a highway that transports high-level nuclear waste (Table 10)

Table 10 The Amount of Diminution in Selling Price of Residential Properties Near a HLW Shipment Route Compared to an Identical Property Not Near Such a Route

Amount of Diminution	Nevada		New Mexico	
	Percent (N)	Cumulative Percent*	Percent (N)**	Cumulative Percent**
Less than 1 percent	12.4% (47)			
1-5 percent	6.1% (23)	18.5%		
6-10 percent	10.3% (39)	28.8%	11.0%***	11.0%***
11-20 percent	18.9% (72)	47.7%	22.0%	33.0%
21-30 percent	17.6% (67)	65.3%	19.0%	52.0%
31-40 percent	8.2% (31)	73.5%	13.0%	65.0%
41-50 percent	12.4% (47)	85.9%	10.0%	75.0%
51-60 percent	2.9% (11)	88.8%	5.0%	80.0%
61-75 percent	1.8% (7)	90.6%	2.0%	82.0%
More than 75 percent	6.6% (25)	97.2%	6.0%	88.0%
Not sure/refused	2.9% (11)	100.1%	12.0% (357)	100.0%

* Percents are rounded to the nearest tenth

** All percents are rounded to the nearest whole number and only the total N is available for comparison

*** The Santa Fe, New Mexico survey classification was Less Than Ten Percent

When the 25.0% mean diminution rate reported by Clark County survey respondents is applied to all residential properties within one mile of the northern and western beltway routes suggested in the DEIS, the resulting diminution of assessed property values utilizing current assessed residential valuations is \$492.3 million (Table 11 and Map 1 and 2). Alternatively, since the beltway is not expected to be completed before HLW shipments are to commence, the application of the 25.0% mean property value diminution along the I-15 transportation corridor in Clark County could result in a loss of \$604.6 million of assessed residential valuation.

Table 11 Application of Property Value Survey to Clark County Residential Assessed Valuation

Clark County Property Value Survey	Rate	Nevada Transportation Corridor	
		Beltway	I-15

Residential at One Mile	25.0%	\$492,286,135	\$604,611,075
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It is important to note that these ranges represent the application of the mean rate of property value diminution as reported by those Clark County residents who were surveyed to current residential assessed valuation within one mile of the beltway and I-15 routes through Clark County. These rates are based on the respondent's current perception of likely property value diminution and are based on current residential assessed valuation data. As noted in Section 3, perceptions are dynamic and thus are likely to change over time. In addition, the current assessed residential valuation within Clark County does not account for the significant developments that are proposed over the next decade especially along the northern beltway. Thus, these figures are best understood as representing the intensity of public concern about the effect of DOE's proposal to construct the Yucca Mountain repository and ship HLW through Clark County.

5.0 BANKERS AND APPRAISERS SURVEY

This section of the report summarizes the results of focused interviews with Clark County lenders and appraisers that is described in detail in the report, *Clark County Residents and Key Informant Surveys: Beliefs, Opinions, and Perceptions about Property Value Impacts from the Shipment of High-level Nuclear Waste through Clark County, Nevada*. The results are applied to the assessed valuation data for three groups of land uses within Clark County. A survey of 18 Clark County lenders and 35 certified appraisers was conducted by Urban Environmental Research in May of 2000.

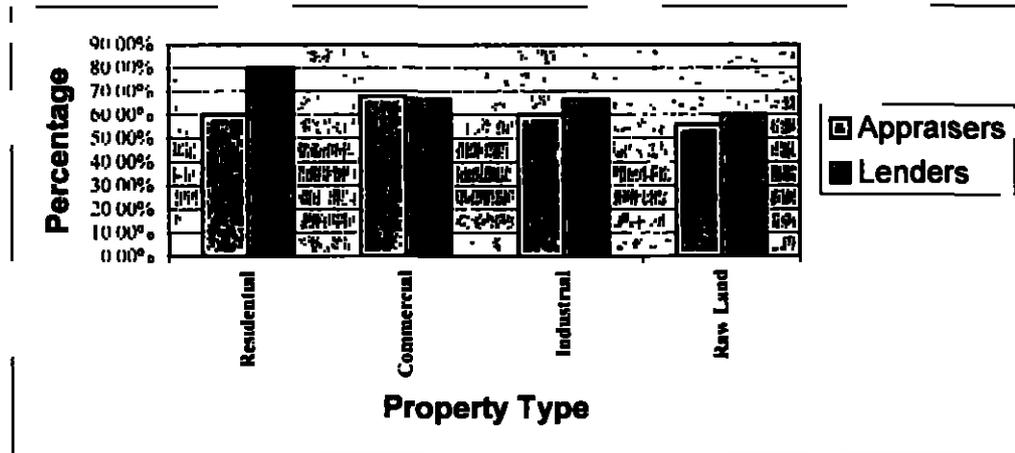
The purpose of the survey was to identify the opinions and perceptions of lenders and appraisers regarding the potential effect on property values of the proposed shipments of HLW through Clark County under three scenarios and for three different types of land uses. In addition, the lenders and appraisers were asked to estimate potential property values at distances up to one mile along the transportation corridor and at distances of one to three miles. The results of the survey are summarized and then applied to residential, commercial, and industrial assessed valuation data for Clark County along two potential routes (see sections 5.1 – 5.4). The methodology for this application is discussed in Appendix C, the survey protocols are attached as Appendix D and E.

5.1 Demographics and Experience

Of the lending institutions surveyed, 80% provide residential mortgages, while approximately 60 to 70% provide loans for commercial, industrial, and raw property (Fig 7). In comparison, 60% of the appraisers conducted appraisals on residential properties, industrial and raw properties, and 68% conducted appraisals on commercial properties.

Only 36% of those interviewed indicated any experience appraising casinos

Figure 7 Lenders and Appraisers Experience by Property Type



The survey asked several questions about the range of experience of both professional populations. The bankers surveyed had an average of 10.4 years experience in Clark County and an average total experience of over 17 years, while the appraisers had an average of 14.3 years experience in Clark County and an average total experience of 19.9 years.

The bankers were queried about their institutions' lending policies on environmental contaminated properties. Eighty percent reported that their institutions have established formal lending policies concerning contaminated properties. Two-thirds of those who have established policies indicated that they would not lend on contaminated properties. Another one-third requires a property to pass a Phase I Environmental Assessment before a loan can be made. Forty-seven percent of the lenders surveyed regularly or sometimes ask appraisers to take into account the effect of any contamination when assessing property values. Another 40% of the banks indicated that

they never do. Further, the majority of the bankers indicated that it was the responsibility of the seller to inform the bank of any environmental contamination.

Approximately one-half of the bankers and one-third of the appraisers knew of properties that had experienced residual property value loss attributable to the fact that at one time the property was contaminated. Both the bankers and lenders revealed that most of their experience with the effects of environmental contamination on property values in Clark County resulted from underground storage tanks, asbestos removal from buildings, and to a more limited degree, commercial and industrial sites. They also indicated that if the property had been fully remediated, typically there were minimal, if any residual effects on property values. They did note, however, that at some sites, especially industrial areas, "earlier contamination, and continuing uncertainty has resulted in small stigma effects resulting in lower than expected values" (UER 2000).

In response to questions about which lending terms were likely to be adjusted if a property was identified as contaminated, more than one-half of the bankers and appraisers indicated that they would adjust Loan-to-Value-Ratio and/or the Risk Premium. In addition, two-thirds of the bankers stated that they also adjusted Interest Rates.

5.2 Property Value Impacts by Scenario

The lenders and appraisers were then asked to estimate the potential impacts of transporting HI.W on property values under three different scenarios, for three different property types, and at varying distances from the transportation corridor. The three scenarios ranged from a benign, no-incident scenario, to an event that results in no release of radiation, and finally, to a significant event resulting in the release of radiation.

to the environment. The descriptions of the properties evaluated are described in Appendix D and E.

5.2.1 Scenario 1

Under the first scenario, the appraisers and lenders were asked to evaluate whether there would be any changes in property values along the corridor if 'no event' occurred, but there was adverse publicity, particularly, at the onset of the shipment campaign. This scenario was assigned to three discrete residential, commercial, and industrial properties that were characterized in terms of size, location, lease fees, and other factors (Appendix D and E). As noted above, the lenders and appraisers were also asked to differentiate the level of impact, if any that might be experienced at two varying distances along the corridor. These distances were within 1 mile of the shipment route and within 1 to 3 miles of shipment routes.

According to the lenders and appraisers, residential properties would lose the most value in percentage terms. Appraisers indicated that within one mile of a shipment route, residential properties would decline on the average by 3.50%, while lenders indicated the decline would be approximately 2.00% (Table 12). When these rates of diminution are applied to residential assessed valuation data for these property types within one mile of the beltway route (Map 3), the potential property value loss for residential property ranges from \$39.4 million to \$68.9 million (Table 12). In contrast, if these rates are applied to the assessed property value data within one mile of the I-15 route (Map 3) then diminution could range from \$48.4 million to \$84.6 million (Table 13).

According to the appraisers and lenders, residential properties at a distance of one-to-three miles from the routes would continue to experience the greatest decline in value relative to the other two property types. When the rates of property value diminution are applied to residential assessed valuation data at a distance of one to three miles from the beltway route, the diminution ranges from \$31.8 million to \$93 million. From the I-15 route, the diminution ranges from \$36.9 million to \$107.7 million (Map 3). Thus, under a "no event" scenario, lenders and appraisers indicated that the rate of residential property value diminution when applied to assessed valuation data along the beltway might be as high as \$71.2 million to \$161.9 million, while along the I-15 route it could go as high as \$85.2 million to \$192.3 million (Map 3).

Table 12 Scenario 1 Mean Property Value Diminutions within 1 Mile and at 1 to 3 Miles of the Beltway Route

Residential Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N _n)	2.00% (11)	\$39,382,891	0.50% (11)	\$31,833,926	\$71,216,816
Lenders Std. Dev.	3.37		1.51		
Appraisers (N _n)	3.50% (13)	\$68,920,059	1.46% (12)	\$92,955,063	\$161,875,121
Appraisers Std. Dev.	3.75		1.99		
Commercial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N _n)	0.56% (10)	\$156,610	0.56% (10)	\$1,808,744	\$1,965,355
Lenders Std. Dev.	1.58		1.58		
Appraisers (N _n)	3.21% (14)	\$897,713	1.25% (14)	\$4,037,376	\$4,935,088
Appraisers Std. Dev.	5.50		2.55		
Industrial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N _n)	0.56% (10)	\$347,723	0.56% (10)	\$1,723,991	\$2,071,715

Lenders Std. Dev.	1.58		1.58	
Appraisers (N)	1.25% (12)	\$776,168	0.83% (12)	\$2,555,202
Appraisers Std. Dev.	3.11		1.95	

When the rates of diminution suggested by the lenders are applied to all commercial properties within Clark County land use codes 335 (professional and services), 338 (financial), and 385 (commercial condominiums), the diminution in assessed value totals almost \$2 million along the beltway route and \$4.9 million along the I-15 route (Map 3). Appraisers indicate that diminution effects for these same commercial property types would be \$4.9 million along the beltway route and \$8.6 million along I-15 route (Map 3).

Table 13 Scenario 1 Mean Property Value Diminution within 1 Mile and at 1 to 3 Miles of the I-15 Route

	Residential Property Value Diminution				Totals
	1 mile		1 - 3 miles		
Lenders (N)	2.00% (11)	\$48,368,886	0.50% (11)	\$36,879,691	\$85,248,577
Lenders Std. Dev.	3.37		1.51		
Appraisers (N)	3.50% (13)	\$84,645,551	1.46% (12)	\$107,688,699	\$192,334,249
Appraisers Std. Dev.	3.75		1.99		
	Commercial Property Value Diminution				Totals
	1 mile		1 - 3 miles		
Lenders (N)	0.56% (10)	\$1,917,545	0.56% (10)	\$3,018,791	\$4,936,336
Lenders Std. Dev.	1.58		1.58		
Appraisers (N)	3.21% (14)	\$4,280,234	1.25% (14)	\$4,474,279	\$8,754,513
Appraisers Std. Dev.	5.50		2.55		
	Industrial Property Value Diminution				Totals
	1 mile		1 - 3 miles		
Lenders (N)	0.56% (10)	\$2,479,014	0.56% (10)	\$5,006,845	\$7,485,860
Lenders Std. Dev.	1.58		1.58		
Appraisers (N)	1.25% (12)	\$14,210,065	0.83% (12)	\$11,175,994	\$25,386,058
Appraisers Std. Dev.	3.11		1.95		

Similarly, when the diminution rates suggested by the lenders and appraisers are applied to industrial properties with the land use codes 240 (storage facilities), 250 (mini-warehouses), and 260 (industrial condos), the lenders' data indicates that industrial property values could experience diminution of \$2.1 million along the beltway route and \$7.5 million along the I-15 route (Map 3). Applying the rates stated by the appraisers along these same routes, property value would diminish by \$3.3 million along the beltway route and \$25.4 million along the I-15 route (Map 3).

5.2.2. Scenario 2

Responses by bankers and appraisers demonstrate that property value diminution would increase substantially under transportation Scenario 2 (Table 14 and 15). Appraisers and lenders indicated that residential property values would fall about 6 to 8% within one mile from the transportation route and up to 4% within one to three miles. When these rates are applied to assessed valuation data, the total residential property diminution ranges from \$226.1 million to \$411.4 million along the Beltway Route and \$270.4 million to \$487.5 million along the I-15 Route (Table 14 and 15 and Map 3).

Applying the rates of diminution for commercial properties (professional and business, financial, and commercial condominium land uses) indicated by the appraisers and lenders under this scenario there would be losses ranging from \$4.3 million to \$11.9 million for commercial property value within three miles of the Beltway route (Map 3). When these rates are applied within three miles of the I-15 Route, the resulting decrease in the assessed valuation for commercial properties escalates to \$26.6 million to \$59.9 million (Map 3).

Table 14 Scenario 2 Mean Property Value Diminutions within 1 Mile and at 1 to 3 Miles of the Beltway Route

Residential Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N=)	6.18% (11)	\$121,693,133	1.64% (11)	\$104,415,276	\$226,108,408
Lenders Std. Dev.	5 13		3 23		
Appraisers (N=)	7.96% (13)	\$156,743,905	4.00% (13)	\$254,671,404	\$411,415,310
Appraisers Std. Dev.	5 81		4 77		
Commercial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N=)	4.00% (10)	\$1,118,645	1.00% (10)	\$3,229,901	\$4,348,546
Lenders Std. Dev.	4 59		3 16		
Appraisers (N=)	7.39% (14)	\$2,066,697	3.04% (14)	\$59,818,898	\$11,885,595
Appraisers Std. Dev.	6 18		4 82		
Industrial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N=)	4.00% (10)	\$2,483,738	1.00% (10)	3,078,556	\$5,562,294
Lenders Std. Dev.	4 59		3 16		
Appraisers (N=)	5.29% (12)	\$3,284,744	2.08% (12)	\$6,403,397	\$9,688,140
Appraisers Std. Dev.	6 13		3 96		

The appraisers and lenders indicated that the rate of property value diminution would be lower for industrial properties than for residential or commercial [(4.0% - 5.29% at one mile and 1.0% - 2.08% at one to three miles) Table 14 and 15] When these rates are applied to the Beltway routes, the total property value decrease for the three industrial land uses examined was \$5.6 million to \$9.7 million along the Beltway Route and \$19.1 million to \$29.3 million along the I-15 Route (Map 3)

Table 15 Scenario 2 Mean Property Value Diminution within 1 Mile and at 1 to 3 Miles of the I-15 Route

Residential Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N)	6.18% (11)	\$149,459,858	1.64% (11)	\$120,965,388	\$270,425,245
Lenders Std. Dev.	5 13		3 23		
Appraisers (N)	7.96% (13)	\$192,508,166	4.00% (13)	\$295,037,531	\$487,545,697
Appraisers Std. Dev.	5 81		4 77		
Commercial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N)	4.00% (10)	\$17,707,246	1.00% (10)	\$8,940,795	\$26,648,041
Lenders Std. Dev.	4 59		3 16		
Appraisers (N)	7.39% (14)	\$32,714,136	3 04% (14)	\$27,180,017	\$59,894,153
Appraisers Std. Dev.	6 18		4 82		
Industrial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N)	4.00% (10)	\$13,696,749	1.00% (10)	\$5,390,69801	\$19,087,447
Lenders Std. Dev.	4 59		3 16		
Appraisers (N)	5.29% (12)	\$18,113,951	2 08% (12)	\$11,212,651	\$29,326,602
Appraisers Std. Dev.	6 13		3 96		

5.2.3 Scenario 3

Scenario 3 as described earlier in the report depicts an accident event and the consequences of the event that involves a truck releasing its radioactive waste content. Lenders and appraisers indicated a substantial property value diminution under Scenario 3 for all three types of property (Tables 16 and 17). Lenders and appraisers indicated that residential property values could drop approximately 30% at one mile. When these rates are applied to residential properties within three miles of the Beltway, the losses range from \$1.8 billion to \$2.2 billion (Map 3). When these rates of diminution are applied to the I-15 Route, there are losses of \$2.2 billion to \$2.6 billion.

Table 16 Scenario 3 Mean Property Value Diminutions within 1 Mile and at 1 to 3 Miles of the Beltway Route

Residential Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N)	29.00% (9)	\$571,051,917	20.00% (5)	\$1,273,357,021	\$1,844,408,938
Lenders Std. Dev.	11 94		NA		
Appraisers (N)	33.79% (14)	\$665,373,940	23.65% (13)	\$1,505,744,677	\$2,171,118,617
Appraisers Std. Dev.	23 57		25 61		
Commercial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N)	22.00% (7)	\$6,152,549	16.67% (5)	\$53,842,411	\$59,994,990
Lenders Std. Dev.	5 70		11 55		
Appraisers (N)	31.88% (16)	\$8,915,602	20.50% (15)	\$66,212,960	\$75,128,562
Appraisers Std. Dev.	23 83		25 34		
Industrial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N)	21.25% (6)	\$13,194,858	10.00% (4)	\$30,785,562	\$43,980,420
Lenders Std. Dev.	6 29		14 14		
Appraisers (N)	25.54% (14)	\$15,858,667	16.73% (13)	\$51,504,245	\$67,362,912
Appraisers Std. Dev.	25 21		25 97		

Appraisers indicated that the potential property value loss for commercial property could be 32% or higher at one mile and 20.50% at one to three miles. Lenders indicated a potential property value loss of 22% at one mile and 16.67% at one to three miles. When these rates are applied to the three commercial properties examined (professional and business, financial, and commercial condominiums) within three miles of the Beltway Route, the resulting property value diminution ranges from \$60 million to \$75.1 million (Map 3). For the I-15 Route, the potential commercial property value loss escalates to \$246.4 million to \$324.4 million (Map 3).

Table 17 Scenario 3 Mean Property Value Diminution within 1 Mile and at 1 to 3 Miles of the I-15 Route

Residential Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N)	29.00% (9)	\$701,348,847	20.00% (5)	\$1,475,187	\$2,176,536,502
Lenders Std. Dev.	11.94		NA		
Appraisers (N)	33.79% (14)	\$817,192,329	23.65% (13)	\$1,744,409,402	\$2,561,601,731
Appraisers Std. Dev.	23.57		25.61		
Commercial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N)	22.00% (7)	\$97,389,851	16.67% (5)	\$149,043,053	\$246,432,903
Lenders Std. Dev.	5.70		11.55		
Appraisers (N)	31.88% (16)	\$141,126,747	20.50% (15)	\$183,286,298	\$324,413,045
Appraisers Std. Dev.	23.83		25.34		
Industrial Property Value Diminution					
	1 mile		1 - 3 miles		Totals
Lenders (N)	21.25% (6)	\$72,763,980	10.00% (4)	\$53,906,976	\$126,670,956
Lenders Std. Dev.	6.29		14.14		
Appraisers (N)	25.54% (14)	\$87,453,744	16.73% (13)	\$90,186,371	\$177,640,114
Appraisers Std. Dev.	25.21		25.97		

The appraisers and lenders indicated that industrial property value losses could range from 21.25% to 25.54% within one mile of the transportation routes and from 10.0% to 16.73% at one to three miles from the routes under scenario 3. When this is applied to the industrial assessed valuation within three miles of the Beltway Route, the losses range from \$44 million to \$67.4 million (Map 3). For the same industrial land uses along the I-15 Route, the potential property value diminution climbs to \$126.7 million to \$177.6 million (Map 3).

5.3 Findings Related to Lenders and Appraisers Evaluations under Three Scenarios

One important observation in the survey responses is the strong consistency in the estimates of property value changes provided by the two professional groups. For

example, the largest difference in percent diminution of a property within the residential sector between the two groups is only 5.5%. It is significant that two different groups with strong expertise in the real estate market are so consistent in their estimations of likely diminution effects for three different scenarios and for three different types of properties. It provides one check for internal validity and lends credibility to the results. It also provides an additional step in the process of triangulating findings from different methodologies and different groups.

What are the results? First, as the following tables show, even under Scenario 1, a no-event characterization, diminution will likely result in all three market segments of the economy — residential, commercial, and industrial (Table 18 and Table 19). The largest declines (\$85.2 million - \$192.3 million) will be experienced in the residential sector within one to three miles of the I-15 Routes (Map 3). The rate of decline is less for commercial and industrial properties than for residential properties, with greater losses along the I-15 corridor than along the Beltway. This is because the I-15 corridor is more fully built out than the Beltway, which has significant stretches that have yet to be developed. Since this study did not examine the potential impact of the DOE's proposal to ship HLW on undeveloped lands, the potential property losses suggested by the experts are viewed as ranges of potential property value diminution for specific property types along the proposed routes. Additional work will be needed to complete and refine these ranges for the full gamut of property types before a direct comparison is possible between the routes.

Table 18 Property Value Diminutions under Three Scenarios within 3-Mile Distance of the Proposed Beltway Route

Groups	Residential		Commercial		Industrial	
	Lenders	Appraisers	Lenders	Appraisers	Lenders	Appraisers
Scenario 1	\$71,126,816	\$161,875,121	\$1,965,355	\$4,935,088	\$2,071,715	\$3,331,370
Scenario 2	\$226,108,408	\$411,415,310	\$4,348,546	\$11,855,595	\$5,562,294	\$9,688,140
Scenario 3	\$1,844,408,938	\$2,171,118,617	\$59,994,990	\$66,212,960	\$43,980,420	\$67,362,912

What these figures suggest, however, is that among those most experienced with estimating Clark County property values, there is a perception that significant adverse impacts will occur along either of the Clark County routes proposed, for all property types examined, even under the most benign scenario

Table 19 Property Value Diminutions under Three Scenarios within 3-Miles of the I-15 Shipment Route, by Professional Group

Groups	Residential		Commercial		Industrial	
	Lenders	Appraisers	Lenders	Appraisers	Lenders	Appraisers
Scenario 1	\$85,248,577	\$192,134,219	\$7,485,860	\$25,386,058	\$4,936,336	\$8,754,513
Scenario 2	\$270,425,245	\$487,545,697	\$26,648,041	\$59,894,153	\$14,087,447	\$29,326,602
Scenario 3	\$2,176,536,502	\$2,561,601,731	\$246,432,903	\$324,413,046	\$126,670,956	\$177,640,114

The findings also indicate that increasing the severity of events within the scenarios, as illustrated in Scenario 2 and 3, results in significantly larger rates of impact. Under Scenario 3, the most serious accident event evaluated, residential property diminution rises to \$1.8 billion - \$2.2 billion within 3 miles of the Beltway Route and \$2.2 billion - \$2.6 billion within 3 miles of the I-15 Route (Map 3)

6.0 Discussion of Community Impacts

This section examines the application of the lenders' and appraisers' survey to specific jurisdictions within Clark County. Both the I-15 and Beltway routes are compared for the cities of Las Vegas and North Las Vegas, and for unincorporated Clark County. Since both routes utilize I-15 through Mesquite and Henderson, the impacts are discussed solely for this route for both of these cities.

6.1 Range of Potential Property Value Impacts for Las Vegas

The City of Las Vegas is the largest jurisdiction within Clark County. Thus, it is reasonable to expect that the largest potential dollar decrease in property values would be experienced in this jurisdiction. According to the lenders and appraisers, residential properties within the City of Las Vegas, like all other jurisdictions within Clark County, are likely to experience the largest loss in property values along both the I-15 Route and the Beltway Route (Table 20). Applying the rates of diminution postulated by the lenders and appraisers, diminution of value of residential property, even without an incident of any type, could range from \$31.7 million to \$71.8 million along the Beltway Route and from \$54.9 million to \$119.2 million along the I-15 Route (Map 4).

Property value diminution for commercial properties is also significantly higher under Scenario 1 along the I-15 Route (\$4.6 million - \$17.2 million) than along the Beltway Route (\$1.1 million - \$2.4 million) (Table 20 and Map 4). Similar patterns of diminution, although at substantially lower levels, are indicated for industrial properties (Table 20).

Table 20 Total Property Value Diminutions by Route, Property Type, Scenario, and Professional Group for Las Vegas

	Beltway Route		I-15 Route	
	Lenders	Appraisers	Lenders	Appraisers
Residential				
Scenario 1	\$31,689,373	\$71,817,187	\$54,874,518	\$119,150,750
Scenario 2	\$100,577,042	\$182,337,680	\$173,316,846	\$297,839,714
Scenario 3	\$816,077,097	\$960,562,585	\$1,299,585,454	\$1,527,937,523
Commercial				
Scenario 1	\$1,063,232	\$2,440,448	\$4,633,047	\$17,209,885
Scenario 2	\$2,014,28	\$5,920,890	\$18,785,945	\$40,394,165
Scenario 3	\$31,832,781	\$39,311,841	\$156,593,356	\$209,480,593
Industrial				
Scenario 1	\$17,921	\$26,561	\$741,142	\$1,326,228
Scenario 2	\$32,001	\$66,562	\$2,950,247	\$4,493,467
Scenario 3	\$320,012	\$535,380	\$19,335,102	\$26,918,928

Since the assessed valuation for all three property types analyzed are significantly higher along the I-15 Route than the Beltway Route in Las Vegas, the dollar loss in assessed property values that results from applying the rates of diminution indicated by the lenders and appraisers is consistently higher along the I-15 Route than the Beltway Route for all three scenarios. Under Scenario 2, the losses along the I-15 Route could range from \$173.3 million to \$297.8 million for residential properties, to \$18.8 million to \$40.4 million for commercial properties, and \$3.0 to \$4.5 million for industrial properties (Map 4). Under the same scenario, the losses along the Beltway could range from \$100.6 million to \$182.3 million for residential properties, to \$2.0 million to \$5.9

million for commercial properties: and approximately \$300 thousand to \$500 thousand for industrial facilities (Map 4)

Under Scenario 3, a HILW truck is involved in a serious accident. This event dramatically increases the level of potential property value diminution for all property types along both the I-15 Route and the Beltway Route. The pattern of distribution by route and property type remains the same as under Scenarios 1 and 2. The biggest drop is for residential property along the I-15 Route, where a \$1.3 billion to \$1.5 billion drop is estimated using the rates of diminution indicated by the lenders and appraisers (Map 4). Along the Beltway Route, the drop ranges from approximately \$816 million to \$961 million for residential properties (Map 4).

The assessed commercial property value losses could range from \$157 million to \$209 million along the I-15 Route (Map 4). Along the Beltway Route, the drop in assessed value for commercial property would be substantially lower than the I-15 Route, ranging from \$32 million to \$39 million (Map 4). The decrease in assessed valuation for industrial properties ranges from \$19.3 million to \$27 million along the I-15 Route and from \$320 thousand to \$535 thousand along the Beltway Route through the City of Las Vegas (Map 4).

When analyzing the results it is important to keep in mind that the I-15 Route represents the heart of existing Las Vegas development. Thus, this area is largely built out and currently is a major contributor to the well being of not only the City of Las Vegas and Clark County, but also the State of Nevada. Lenders and appraisers repeatedly remarked that the future economic growth of the area is inextricably linked to the development of the Northern and Western Beltway, i.e., the Beltway Route. Thus, while property value impacts may be lower today along the Beltway, it is expected to play a

major role in the Valley's future development (see Las Vegas Governmental Fiscal Impact Report) If the DOE selects the Beltway as its preferred route, as it has suggested in the DEIS, then the future economic growth of Las Vegas and in fact the entire Valley may be diminished

6.2 Range of Potential Property Value Impacts for North Las Vegas

In North Las Vegas, under all three Scenarios, the largest property value losses occur along the I-15 Route just as in Las Vegas (Table 21) In addition, like Las Vegas, the largest drop in assessed property value occurs for residential properties Under Scenario 1, the decrease could reach \$6.3 million to \$15.2 million along the I-15 Route and \$2.8 million to \$7.9 million along the Beltway Route (Map 5) The loss of assessed residential valuation rises to \$20.2 million to \$40 million under Scenario 2 along the I-15 Route and \$9 million to \$22 million along the Beltway Route (Map 5) Potential residential property value losses grow significantly under Scenario 3 to \$183 million to \$215 million along the I-15 Route and \$107 million to \$127 million along the Beltway Route (Map 5).

The pattern of distribution of impacts for commercial and industrial properties varies in North Las Vegas from those found in Las Vegas In North Las Vegas, the assessed valuation for industrial properties is much higher than for commercial properties This finding is the reverse of the finding for Las Vegas Losses in assessed valuation for industrial properties range from \$1.3 million to \$2.5 million under Scenario 1, to \$5.7 million to \$8.5 million under Scenario 2, to \$36.4 to \$49.9 million under Scenario 3 along the I-15 Route (Map 5) The range of industrial property value loss along the Beltway Route ranges from \$245 thousand to \$364 thousand under Scenario 1,

\$438 thousand to \$911 thousand under Scenario 2, and \$4.4 million to \$7.3 million under Scenario 3 (Map 5)

Table 21 Total Property Value Diminutions by Route, Property Type, Scenario, and Professional Group for North Las Vegas

Residential	Beltway Route		I-15 Route	
	Lenders	Appraisers	Lenders	Appraisers
Scenario 1	\$2,750,828	\$7,895,167	\$6,329,432	\$15,242,170
Scenario 2	\$9,00,427	\$21,535,044	\$20,234,422	\$39,503,934
Scenario 3	\$107,041,756	\$126,547,402	\$182,566,875	\$215,189,609
Commercial				
Scenario 1	\$19,843	\$44,293	\$309,167	\$1,153,399
Scenario 2	\$35,435	\$107,721	\$1,261,208	\$2,706,564
Scenario 3	\$590,696	\$726,411	\$10,463,116	\$14,007,664
Industrial				
Scenario 1	\$245,372	\$363,677	\$1,343,093	\$2,455,732
Scenario 2	\$438,165	\$911,383	\$5,720,359	\$8,543,148
Scenario 3	\$4,381,649	\$7,330,499	\$36,441,222	\$49,880,442

When the rates of property value diminution indicated by the lenders and appraisers surveyed are applied to commercial property values along the Beltway Route, the decrease in assessed valuation ranges from less than \$20,000 to \$107,000 under Scenarios 1 and 2 (Map 5). With a significant accident, as described in Scenario 3, commercial property values decrease by \$591 thousand to \$726 thousand (Map 5). Along the I-15 Route in North Las Vegas, commercial property value diminution ranges from

\$309 thousand to \$1.2 million under Scenario 1 and \$1.3 million to \$2.7 million under Scenario 2 (Map 5). Under Scenario 3, commercial property value diminution mushrooms to \$10.5 million - \$14 million along the I-15 route in North Las Vegas (Map 5).

Again, as in Las Vegas, when comparing the impacts between the Beltway and I-15, it is important to recognize that the I-15 Route is virtually built out while the Beltway Route is linked to future economic growth. Further, this study only examined a handful of land uses and so the level of impacts described represent only diminution for those types of property. Thus, the numbers presented in this report do not reflect losses that may be experienced by properties that are yet undeveloped. Additional studies will need to be done to more completely understand the full range of impacts that may be experienced along both the I-15 Route and Beltway Route.

6.3 Range of Potential Property Value Impacts for Unincorporated Clark County

A large number of Clark County residents live within unincorporated Clark County. When the survey results from the Clark County lenders and appraisers survey is applied to the assessed valuations for the three property types evaluated in unincorporated Clark County, the greatest losses for commercial and industrial properties occur along the I-15 Route similarly to what is found in Las Vegas and Clark County as a whole. Commercial property value diminution ranges from \$2.5 million - \$6.7 million under Scenario 1, \$6.2 million - \$15.9 million under Scenario 2, and \$76.2 million - \$96.6 million under Scenario 3 along the I-15 Route (Map 6). For the same type of property, along the Beltway Route, the losses range from \$789 thousand - \$2.1 million under Scenario 1, \$1.2 - \$5.0 under Scenario 2; and \$24.4 million - \$30.7 million under

Scenario 3 (Map 6). Industrial property values along both the I-15 Route and Beltway Route follow a similar pattern as commercial properties as is illustrated in Table 22

Table 22 Total Property Value Diminutions by Route, Property Type, Scenario, and Professional Group for Unincorporated Clark County

	Beltway Route		I-15 Route	
Residential	Lenders	Appraisers	Lenders	Appraisers
Scenario 1	\$33,852,368	\$76,319,267	\$21,143,886	\$52,166,467
Scenario 2	\$107,377,106	\$193,409,387	\$67,797,247	\$136,256,906
Scenario 3	\$863,063,950	\$1,051,735,024	\$637,098,310	\$751,312,864
Commercial				
Scenario 1	\$789,352	\$2,080,298	\$2,450,718	\$6,652,723
Scenario 2	\$1,200,313	\$4,991,596	\$6,186,033	\$15,928,036
Scenario 3	\$24,363,023	\$30,744,289	\$76,167,943	\$96,578,768
Industrial				
Scenario 1	\$1,653,819	\$2,690,728	\$2,697,498	\$4,722,149
Scenario 2	\$4,664,186	\$7,973,460	\$9,988,899	\$15,553,252
Scenario 3	\$35,948,502	\$54,432,301	\$67,564,375	\$95,776,012

Residential properties in unincorporated Clark County vary from the pattern in Las Vegas and Clark County as a whole. In unincorporated Clark County the larger property value losses are found along the Beltway, when one applies the results of the lenders and appraisers survey to assessed residential valuation. Along the Beltway Route, the losses could range from \$33.9 million - \$76.3 million under Scenario 1 and \$107.4 million - \$193.4 million under Scenario 2 (Map 6). Along this same route, the losses rise

to \$863 million to \$1.1 billion, under Scenario 3 (Map 6). In contrast, they range from \$21.1 - \$52.2 million under Scenario 1, \$67.8 million - \$136.3 million under Scenario 2, and \$637.1 million - \$751.3 million under Scenario 3 (Map 6).

6.4 Range of Potential Property Value Impacts for Henderson

Both routes evaluated in this paper utilize I-15 through Henderson, and as a result require that only one set of potential property values be discussed. In addition, since most of Henderson lies outside of the three-mile corridor along the route that was studied, the range of potential property value impacts to Henderson are significantly less than for the other communities that have been examined. In fact, the Clark County assessed valuation data used in this study does not indicate any commercial property within three miles of I-15 in Henderson. Therefore, the results of the lenders and appraisers' survey are applied only to residential and industrial properties (Table 2.3).

In Henderson, the potential impacts are larger for commercial properties than for residential properties. Again, this is because most of the residential development is outside of the three-mile corridor along I-15 that was investigated. The ranges of potential commercial property value losses were: \$98 thousand - \$145 thousand under Scenario 1, \$175 thousand - \$364 thousand under Scenario 2; and \$1.7 million - \$2.9 million under Scenario 3 (Map 7).

For residential properties in Henderson, the decrease in assessed valuation ranged from \$38 thousand - \$104 thousand under Scenario 1, \$123 thousand - \$281 thousand under Scenario 2, and \$1.4 million - \$1.6 million under Scenario 3 (Map 7).

It is important to note that Henderson recently annexed property within the three-mile corridor that is largely undeveloped. The DOE's proposal to ship HILW may reduce

both the extent of future development along the I-15 corridor as well as the value of future developments. As mentioned earlier in the discussion of North Las Vegas, this study did not examine undeveloped lands. Given the nature of the land use within the three-mile corridor in Henderson, the level of impacts discussed in this section may significantly understate the potential property value loss. Future efforts should examine the impacts of the DOE's proposed shipment campaign on other types of land uses, especially the vast amounts of undeveloped property within Henderson and the rest of Clark County.

Table 23 Total Property Value Diminutions by Route, Property Type, Scenario, and Professional Group for Henderson

	I-15 Route	
	Lenders	Appraisers
Residential		
Scenario 1	\$37,969	\$104,136
Scenario 2	\$123,444	\$280,617
Scenario 3	\$1,372,013	\$1,620,959
Industrial		
Scenario 1	\$97,906	\$145,111
Scenario 2	\$174,832	\$363,651
Scenario 3	\$1,748,323	\$2,924,944

6.5 Range of Potential Property Value Impacts for Mesquite

Like Henderson, I-15 is used for both alternative routes examined through Mesquite. Thus, the results of the lenders and appraisers survey are applied only along this one route in Mesquite. In contrast to Henderson, virtually all of Mesquite falls within the three-mile corridor along I-15. The pattern of property value diminution within

Mesquite like Clark County as whole and the City of Las Vegas is highest for residential property followed by commercial and then industrial property (Table 24)

Table 24 Total Property Value Diminutions by Route, Property Type, Scenario, and Professional Group for Mesquite

I-15 Route		
Residential	Lenders	Appraisers
Scenario 1	\$2,886,279	\$5,739,365
Scenario 2	\$9,030,389	\$13,852,581
Scenario 3	\$56,854,123	\$66,652,647
Commercial		
Scenario 1	\$92,928	\$370,051
Scenario 2	\$414,855	\$865,388
Scenario 3	\$3,208,489	\$4,346,021
Industrial		
Scenario 1	\$56,697	\$105,294
Scenario 2	\$253,110	\$373,083
Scenario 3	\$1,581,934	\$2,139,788

Under Scenario 1, where no incident occurs, the loss in assessed valuation for residential property ranges from \$2.9 million - \$5.7 million (Map 8). Under Scenario 2, where an incident occurs, but where there is no release of radiation, the level of impact increases significantly. Under this scenario, the residential assessed valuation could decrease by \$9.1 million - \$13.9 million and under Scenario 3 the drop rises to \$56.9 million - \$66.7 million (Map 8). The potential diminution for commercial property ranges from under \$100 thousand - \$370 thousand under Scenario 1 but jumps to between \$415

thousand and \$865 thousand under Scenario 2 (Map 8) In the event of a serious accident, as described in Scenario 3, the diminution in assessed valuation indicated by both types of experts, lenders and appraisers, for all three-property types are devastating Under this scenario, the rate of diminution could be as high as \$3.2 million - \$4.3 million for commercial property and \$1.6 - \$2.1 for industrial property (Map 8)

Chapter 7.0 Comparison and Evaluation of Findings and Discussion of Implications

7.1 Comparison of Findings

The findings from this research using three distinct methodologies – a review of analogous case experience, a survey of residents who live in the potentially affected area, and a survey of experts. The experts are lenders and appraisers who have experience with stigma-induced property value diminution and who daily make decisions based on their knowledge of the factors that influence property values in Clark County. The findings all support the thesis that property values are likely to be adversely affected if the DOE's ships HLW through Clark County to Yucca Mountain.

The literature indicates that both physical and cognitive factors interact in a dynamic fashion that changes over time and distance. When one examines each of the discrete factors that have been shown to influence the extent of stigma-induced property in relationship to the DOE's proposal to ship HLW for over thirty years along the major transportation routes through Clark County, each factor points to an increased risk of property value diminution. Among the physical factors supporting the contention that property values may be adversely affected are

- The type of hazard
- Magnitude of the shipping campaign
- The duration of the campaign, and
- Factors related to distances

Numerous studies have indicated that the most adverse connotations are associated with all things *nuclear*, including the transport of HLW. In fact, when Clark County residents were asked the "effects of different environmental conditions on perceived residential property values," 86.3% indicated that residential property values would decline along a highway used to transport nuclear waste (Table 6). For over a

decade, surveys in the State of Nevada have indicated that by large majorities the public opposes both the construction of the Yucca Mountain repository and the related shipment of HLW through their communities. Given the consistency of the decade long opposition by Nevadans to the DOE's activities, it is unlikely that Clark County residents will fundamentally change their orientation related to this project. Further, national polls, even the most recent Associated Press national survey of public attitudes toward nuclear power indicated that even in the midst of an energy crisis that a large majority of Americans find it unacceptable to site nuclear facilities close to residential areas. Thus, it should be *anticipated* that the shipment of HLW will have an adverse impact on property values along the transportation routes.

In addition, the *magnitude* of the campaign in both *size* and *duration* are unprecedented. If the limited two year effort from 1994 to 1996 to ship radioactive waste through South Carolina resulted in property value diminution, it is only reasonable to expect that a campaign that may require as many as *93,000 truck shipments* and lasting for greater than *thirty years* could potentially result in property value diminution. Further, while the largest property value losses have been found in the areas closest to a negative environmental event or facility, the literature indicates that a number of factors influence the rate at which diminution decreases with *distance*. In Clark County, much of the core of the entire transportation network falls within three-miles of either of the two major routes being considered. When Clark County lenders and appraisers were surveyed as to their opinions, perceptions, and beliefs about the affects of transporting HLW on property values, they indicated that the rate of property value diminution would be highest nearest the transportation route for HLW, for all three types of land uses examined (Table 18 – 19). This finding is consistent with the actual experiences documented in the literature

Among the cognitive factors that have been shown to influence the extent of stigma-induced property value diminution are:

- Knowledge
- Perception, and
- Values

The literature clearly indicates that *knowledge* of an undesirable environmental condition is closely associated with declines in property values. The surveys of Clark County residents reported on in Section 4.0 show that 77% of Clark County residents are familiar with the DOE's plans. This finding is consistent with earlier surveys conducted for over a decade. The media amplification that is sure to accompany any final decision to construct the repository and the transport of HLW will certainly maintain if not increase public awareness of this issue.

Perception, especially the perception of risk, also has been positively correlated with property value diminution. When Clark County residents were asked about their perception of what will happen to residential property values if the DOE proceeds with its plans, over 80% indicated the effects in negative terms and almost two-thirds described the impacts on commercial properties in similar negative terms. Moreover, two expert groups, Clark County lenders and appraisers, who have on average over a decade of experience in Clark County determining property values also overwhelmingly indicated that property values are likely to suffer as a result of the DOE's proposed actions (Tables 22 – 24).

In fact, even under the most benign scenario where no incident of any type occurs, they projected that residential properties would decline by 2.00% - 3.50%, resulting in losses of \$85.2 million - \$192.3 million along the I-15 Route and \$71.1 million - \$162.0 million along the Beltway route. These experts indicate that if an event

were to occur, even with no release of radioactive material that the rate of residential property value diminution would increase to 6% to 8% within one mile and 16% - 40% within one to three miles. This is consistent with actual experience that has demonstrated that *distance* is associated with the rate of diminution with the largest drops occurring closest to the undesirable environmental condition.

When one considers the findings from the lenders and appraisers for the most severe accident event studies, Scenario 3, the level of diminution indicated is substantially higher than for the other two scenarios. Under this scenario, lenders and appraisers indicate that residential property losses would likely reach approximately thirty percent. This is consistent with findings in the literature that show that the increasing *magnitude* of an event influences the degree of property value diminution.

The experts, as well as, the public also found that commercial properties would be adversely affected although to a lesser extent than residential property. This is also consistent with what has been demonstrated with other stigma-induced property value declines.

Actual experience has also shown that *values* influence stigma-induced property value diminution. When one compares the rates of diminution stated by Clark County residents with those indicated by the experts and actual experience, there are variations shown that Reichert compared a number of studies of landfills from across the country and found that the actual level of diminution averaged around 12.5% with a standard deviation of only 3.5% (Section 3). The Clark County residents surveyed indicated on average that they expect a 25% drop in residential property values. This rate of diminution is consistent with an earlier survey of residents in Santa Fe, New Mexico along the transportation corridor for waste shipments to WIPP. This rate of diminution is

substantially higher than what has been demonstrated around landfills, and is remarkably close to the level of diminution indicated as likely by the experts under Scenario 3

Differences between actual experience and public opinion surveys have been widely debated in the literature. Researchers such as Clark and Metz have argued that public opinion surveys are not useful in predicting actual behavior. Furby et al. have rebutted this criticism, arguing that the public incorporates multiple social, psychological, cultural, economic, and environmental factors into their concept of values that goes beyond the economic definitions of "fair market value" embraced by the experts. The findings from this research supports the arguments postulated by Furby et al. Further, work done by Slovic et al, have repeatedly found that the general public links all things "nuclear" with potential catastrophic accident events

If this finding is correct, the residents' survey responses are most associated with the expert's responses to Scenario 3. Thus, while personal *value* systems may vary from economic definitions, this research indicates a consistent positive correlation in the direction of the survey findings with actual experience documented in the literature

7.2 Evaluating the Results

As discussed in Section 3.0, assessing property value diminution from negative environmental conditions is a complex and difficult task. As has been shown, multiple physical and cognitive factors interact in ways that are dynamic and changing over time. Discerning the extent of potential property value diminution resulting from the DOE's proposal to ship HLW through Clark County to a repository at Yucca Mountain, presents an even greater challenge than measuring most other types of stigma-induced property value diminution. This difficulty is the result of the vast uncertainties associated with the

DOE's proposal and the lack of experience with campaigns of the magnitude proposed. However, an evaluation of the findings from this research makes a compelling case that if the DOE proceeds with its plans to ship HLW through Clark County that property values will likely be adversely impacted at a significant level.

Assuming the case has been made that property value diminution is likely to occur along the route selected to ship HLW through Clark County, what is the best estimation that can be made as to the rate of administration? While there is no direct analogous case, actual experience at landfill sites support a rate of residential property value decline of 12.5% within one mile.

This level is significantly above the range estimated by Clark County lenders and appraisers under Scenario 1 (\$71.1 million - \$161.9 million) and Scenario 2 (\$226.1 million - \$411.4 million), but less than under Scenario 3.

The DEIS argues that there will be no event of any kind during the shipment period. This would be consistent with the level of losses indicated by the experts under Scenario 1. Thus, Scenario 1 appears to be an appropriate lower boundary for the level of impact that may be experienced. Using Scenario 1 as the lower boundary, means that at a minimum property value diminution is like to range from \$75.2 million to \$226.5 million.

Several factors support the selection of Scenario 2 as a reasonable upper bound for what can be expected. These factors include the strong public aversion that has been shown in repeated surveys for over a decade. The magnitude and duration of the shipping campaign being proposed, is unprecedented. Even the much smaller shipment campaign of transuranic waste to New Mexico, already has resulted in incidents. For example, a truck has broken down on route to Carlsbad and another truck mistakenly wound up in

Albuquerque, New Mexico. In addition, Clark County is ranked as the fastest growing county in the nation. This growth has led to increasing congestion along the transportation routes being considered. This in turn increases the likelihood of an incident. Most importantly, the rate of diminution projected by the lenders and appraisers under Scenario 2 is significantly lower than both what has been shown in the literature and what has been estimated by Clark County residents. The rate of diminution indicated by Clark County lenders and appraisers under Scenario 2 would mean total assessed property value diminution may range from \$236.0 million to \$433.2 million if the Beltway Route is selected and \$316.2 to \$576.8 million if the I-15 Route is selected. Thus, Scenario 2 is a conservative upper boundary for the level of diminution that is likely to occur.

7.3 Implications of the Research

This study represents an initial assessment of the property value diminution that may occur as a result of DOE's proposal to construct the Yucca Mountain repository if it proceeds to ship HLW through Clark County.

It is important to remember that this study did not look at the full range of land uses in Clark County. In fact, while all residential property was included, only a limited number of commercial and industrial land uses were considered. Of particular note, this study did not address the many land uses associated with Clark County's dominant economic sector, tourism (Map 8).

This study also did not examine the large number of parcels that are yet undeveloped (Map 8). Land uses associated with tourism and undeveloped parcels represent an important component of Clark County's current economic base and its

future. The impacts of DOE's proposal on these land uses must be examined to get a fuller understanding of the extent of property value diminution that may be experienced.

A next step in determining the potential impact to Clark County government should include expanding the types of land uses to be analyzed and investigating what these projected rates of assessed property value declines would mean for governmental services.

It is important to note that this study presents the potential assessed property value damage, which represents only 35% of actual "fair market value." Understanding the range of assessed property value loss is an important first step to understanding what impact the DOE's proposed shipment campaign may have on government services.

Property tax rates are applied to the assessed valuation to generate revenue for government services. Either if assessed valuations decline, then property tax rates must go up, or service levels need to be reduced.

From the private property owner's perspective, these projected rates of diminution imply that there will likely be a loss of personal wealth and either increased property tax rates and/or reduced governmental services, even if the shipment of HI.W occurs without an incident of any type. If an incident occurs, and there is a release of radioactive material, the diminution could be devastating.

As this study has shown, the extent of property value diminution varies by land use and route. This has important implications. If the I-15 route were selected, the total impact would likely be highest using the current value of developed land. This is because the area is almost fully developed, however, in Las Vegas, there is already a greater impact on residential properties along the Beltway. The Beltway has also been identified as critical to future economic growth within the Las Vegas Valley. The DOE's selection

of a route for shipping HLW has very significant consequences that vary by land use and jurisdiction

In conclusion, the Yucca Mountain transportation project program, even under the DOE's own scenario that postulates no *incidents of any type*, will likely result in significant property value losses within Clark County

This research supports the thesis that property values are likely to be affected adversely by the DOE's proposed actions. Further, while it may be impossible to estimate with precision, the exact extent of diminution, there is ample evidence that it will be significant

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APPENDIX A – Clark County Residential Survey Methodology

A survey of Clark County residents was conducted by telephone during the month of August 2000 (Cannon Center, UNLV 2000). The survey collected data on public perceptions of possible property value impacts resulting from the proposal to transport high-level nuclear waste through Clark County to the proposed repository at Yucca Mountain. The sample for the survey was designed to allow estimates for the non-institutionalized population of Clark County and the surrounding areas close to the proposed routes for the shipment of nuclear waste to Yucca Mountain. Residential households were sampled using standard Random Digit Dialing (RDD) methodology. A minimum of five callbacks was placed to each household.

512 interviews were conducted with Clark County residents. The sample was purchased from Survey Sampling, Inc., Fairfield, Connecticut. This sample allowed for the inclusion of all households with a telephone whether the number was listed or not. Residents of institutional housing, such as college dormitories, military barracks, or nursing homes were excluded. One person, 21 years or older, was then selected at random within the sample household to participate in the interview using the "last birthday" technique.

Assuming a 95% confidence interval, the sampling error for this survey is approximately $\pm 4.5\%$. A 95% confidence interval with a $\pm 4.5\%$ sampling error means that in 95 of 100 samples like the one used here, the results should be no more than 4.5% above or below the results that would be obtained interviewing all eligible residents living in Clark County. Because of refusal to participate and other factors, estimates may

understate the extent to which survey results differ from true population values (UNLV, *Clark County Property Value Survey Report* August 2000).

The questionnaire was closely adapted from the *Santa Fe Property Values Opinion Research Regarding the WIPP Bypass Survey* (ZIA Research Associates 1990). The Cannon Center at the University of Nevada - Las Vegas administered the survey that was modified to be specific to Clark County and the proposed Yucca Mountain repository program. Special care was taken to avoid response and question order biases. Whenever necessary, questions were asked in random order (called rotation) to reduce survey bias. The interviews were conducted using Computer-Assisted Telephone Interviewing (CAI) using the UNLV Cannon Center's CATI system.

APPENDIX B – Clark County Residential Survey Instrument

APPENDIX C – Appraisers and Lenders Survey Methodology

C.1 Populations Analyzed

Two questionnaires were developed. One was administered to real estate appraisers and the other to lenders (Appendix D: Appraisers and E: Lenders). The questionnaire design was comprised of three components. The first component had six questions that characterized the demographic traits of those surveyed and measured their level of experience with contaminated property. The second component of the questionnaires was designed to measure how property values would change for three types of properties (residential, commercial, and industrial) under three different transportation-event scenarios. In addition, respondents were asked to provide their assessments of property value impacts for each scenario and at varying distances (within one mile and between one-to-three miles) from a possible transportation route.

The second component provides a direct valuation of property values under the various scenarios based on the experience and training of the lenders and appraisers. The third component queried lenders and appraisers as to how they would adjust key lending terms such as risk premiums and loan-to-value ratios under the various scenarios.

C.2 Scenarios

The State of Nevada's transportation expert developed the three transportation scenarios that were integrated into the survey instrument. The first two scenarios are based on the shipping campaign described in the USDOE's Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (DEIS 1999, Volume 2, Appendix J, Table J, pg. J-1). The third scenario developed by the State of Nevada's transportation expert, describes a serious but plausible accident event. These scenarios are detailed in Appendix D and E.

C.3 Population

C.3.1 Bankers

One of the populations surveyed included representatives from all of the Clark County banks, which provide mortgage loans on residential, commercial, industrial, and raw property in Clark County. These banks were identified through the yearly Las Vegas Chamber of Commerce Membership Directory and cross-referenced for completeness with the Yellow Pages of the Clark County phone book. 31 banks were initially identified. A screening interview with a representative of all 31 banks was conducted by phone in order to determine whether the bank provided mortgage loans for residential, commercial, industrial, or raw land. Thirteen banks were eliminated for not meeting the screening criteria. The 18 banks remaining comprised the bank population included in the study.

C.3.2 Appraisers

The populations targeted for the surveys also included all active Clark County certified appraisers that are members of the Appraisal Institute (MAIs and SRAs). A list of 38, certified appraisers was identified from the 1999 and 2000 membership lists provided by the Appraisal Institute. The Appraisal Institute is a nationally recognized organization that certifies both general and residential property appraisers. The Appraisal Institute data were utilized to determine the survey population not only because of the institute's certification, but because it offers courses on appraising environmentally contaminated properties. Nearly all of the appraisers interviewed either had experience in appraising contaminated properties or were comfortable in doing such appraisals. An initial screening phone call was made with the appraisers in order to determine whether all thirty-eight were still active in Clark County. This screening task revealed that 3 of

the appraisers were no longer working in Clark County. The remaining 35 appraisers would encompass the population that was surveyed.

C.4 Implementation

After the survey instrument was developed, it was pretested with five certified appraisers. As noted above, the entire population of Appraisal Institute certified appraisers in Clark County is 35. In order not to reduce the number of appraisers available to be surveyed, the pretest was conducted with three appraisers from Phoenix and two appraisers from Tucson, Arizona. The pretest did not indicate the need for any changes to the survey instrument. Subsequently, utilizing the targeted interview list of bankers and appraisers as described above, the survey was implemented using a combination of face-to-face and telephone interviews.

Of the 18 lenders contacted, 15 completed the survey and three refused resulting in a response rate of 83.3% (Table 19). Two of those who refused indicated that they were too busy to respond. The third declined to give a reason for the refusal. Of the thirty-five appraisers contacted, twenty-five completed surveys were obtained for a participation rate of 71.4%. The remaining ten either did not return repeated phone calls to schedule a survey interview or indicated that they were too busy to participate.

Table 25 Populations of Lenders and Appraisers

Population	Number Interviewed	Number Refused	Response Rate	TOTAL
Lenders	15	3	83.3%	18
Appraisers	25	10	71.4%	35
TOTAL	40	13	75.5%	53

C.5 Limitations

It is important to recognize that there are a few limitations inherent in this study. The principal limitation is based on the *uncertainty* related to the USDOE's program for shipping spent fuel. For example, there are uncertainties in projecting the number of shipments, the length of time for the shipments, the actual routes to be used, and the nature of possible risk events. This study was designed to reduce these uncertainties as much as possible, by grounding as many of the assumptions as possible in the USDOE's DEIS, and by utilizing existing studies for plausible and likely program events.

A second limitation is inherent in adopting a prospective approach. This study examines the *potential* for property value impacts in the *future*, and the researchers had to develop a study design that not only recognizes these limitations but also reduces them. Hence, the study does not result in an appraisal of current *or* future property values. Appraising properties includes an understanding of existing markets. The questions asked experts to *judge* the potential for property value impacts under certain future conditions. Therefore, the two professional groups surveyed in this study were limited in their answers because of the uncertainties of market reactions to nuclear waste and their own lack of experience with nuclear hazards.

Despite this limitation, the study is based on "key informants" from two professional groups—bank loan officers (lenders) and appraisers who were members of the National Appraisers Institute. Both groups have many years experience in assessing the real estate market in Clark County, evaluating property values, and knowing the impacts of environmental contamination on properties. The high response rate and the consistency of the responses between the two groups increase the credibility of the findings. Yet, the findings from this study are generalizable to only the Las Vegas area as reflected in the focus of the study and the location of the appraisers and lenders.

Another limitation to the research is the use of three distinct property types for evaluation by the lenders and appraisers. These three types of property do not represent the range of properties within each type or that exist in Clark County. No attempt is made to extrapolate from these properties to all land uses in the corridors, although some impact seems likely given the findings of this research. Finally, the study was focused on potential property value diminution within a one-to-three mile distance from the shipment routes. The results of the research should not be extrapolated, therefore to properties outside of the possible shipment corridors.

C.6 Statistical Analysis

The data were entered into the computer using Access 7.0 and SPSS 9.0 software. Descriptive statistics for all dependent and independent variables were analyzed including measures of location, spread and shape. The measures of location also known as central tendency studied included the mean, median, and mode. Measures of spread alternatively known as variability or dispersion that were examined included variance, standard deviation, range, inter-quartile range, and quartile deviation. These measures describe how the survey responses cluster or scatter in their distribution. Skewness and kurtosis, which are measurements of shape, were also calculated mathematically as well as graphically.

Appendix D Appraisers Survey

Date _____ Identification Number _____
 Interview Date & Time _____ Initials _____
Questionnaire: Appraisers Version

INTRODUCTION Hello, I am, _____ we spoke on the phone about the survey of appraisers and lenders that we are conducting concerning the effect on property values of the U S Department of Energy 's plan to transport radioactive waste through Clark County

SCREEN Just to confirm you are an appraiser in Clark County and have been working there for at least five years If "yes" Continue If "no" ask "May I speak with someone in your firm who has five years experience?" Then, repeat the above and continue, if not available, thank, terminate, and tally

To begin, I have a series of questions that focus on your experience

1 What types of properties do you appraise? (Please indicate all that apply.)

Residential ___ Commercial ___ Industrial ___ Raw Property ___ Casinos ___

2 How many years appraisal experience do you have in Clark County? _____

3 How many total years appraisal experience do you have" _____

4 Do you have experience appraising properties that are known or may be contaminated?
 Yes ___ No ___

5 With regards to appraisals

a Who is responsible for informing the appraiser of the contamination?

b Based on your experience, when a clean up is completed at a contaminated property in Clark County is their any residual property value loss attributable to the fact that at one time it was contaminated?

Yes ___ No ___ Sometimes ___

6 Are the following underwriting standards on loans adjusted when a property has a potential or an actual environmental problem?

	Yes	No
Loan-to-value-ratio		
Borrower indemnification		
Personal liability		
Interest rates		
Risk premium		
Amortization period		

Appendix E Lenders Survey

Date _____

Identification Number _ _ _

Interview Date & Time _____

Initials _____

Questionnaire: Lenders Version

INTRODUCTION Hello, I am _____ we spoke on the phone about the survey of appraisers and lenders that we are conducting concerning the effect on property values of the U S Department of Energy's plan to transport radioactive waste through Clark County

SCREEN Just to confirm you are a lender in Clark County and have been working there for at least five years If "yes" Continue If "no" ask "May I speak with someone in your firm who has five years experience?" Then, repeat the above and continue, if not available, thank, terminate, and tally

To begin, I have a series of questions that focus on your experience

1 For what types of properties does your institution provide loans? (Please indicate all that apply.)

Residential Commercial Industrial Raw Property Casinos

2 How many years lending experience do you have in Clark County? _____

3 How many total years lending experience do you have? _____

4a Does your institution have a policy on lending on properties known to be contaminated?

Yes No

b If yes, can I get a copy of it, if it is a written policy? If not written, could you please summarize it?

5 With regards to appraisals

a If the presence of an environmental contaminant is indicated, do you ask your appraisers to consider the known contamination in the appraisal process? Yes No Sometimes

b Who is responsible for informing the appraiser of the contamination? _____

c Based on your experience, when a clean up is completed at a contaminated property in Clark County is there any residual property value loss attributable to the fact that at one time it was contaminated? Yes No Sometimes

6 Are the following underwriting standards on loans adjusted when a property has a potential or an actual environmental problem?

	Yes	No
Loan-to-value-ratio	<input type="checkbox"/>	<input type="checkbox"/>
Borrower indemnification	<input type="checkbox"/>	<input type="checkbox"/>
Personal liability	<input type="checkbox"/>	<input type="checkbox"/>
Interest rates	<input type="checkbox"/>	<input type="checkbox"/>
Risk premium	<input type="checkbox"/>	<input type="checkbox"/>
Amortization period	<input type="checkbox"/>	<input type="checkbox"/>

Appendix F Clark County Residential Survey Tables

Table 26 Residential Property Ownership Interest

	Yes Percent (N)	No Percent (N)	Total Percent (N)
Ownership of residential property or home (Q# 9)	61.3% (313)	38.7% (198)	100.0% (511)
Plans to buy residential property or additional home (Q# 10)	31.8% (155)	68.2% (333)	100.0% (488)

* These responses represent valid percentages. In Question #9 one respondent missed this question. In Question #10, 24 respondents did not answer.

Table 27 Changes in Present Residential Property Values

Believe that residential property values in Clark County, in general are:	Nevada	New Mexico
	Percent (N)	Percent (N)*
Increasing	74.8% (383)	87.0%
Remaining the same	15.8% (81)	6.0%
Decreasing	2.1% (11)	1.0%
Not sure	7.0% (36)	6.0%
No answer	0.2% (1)	NA
TOTAL	100.0% (512)	100.0% (501)

* All percents are rounded to the nearest whole number and only total N was available for comparison.

** Categories not used in the Santa Fe, New Mexico survey.

Table 28 Effects of Different Environmental Conditions on Perceived Residential Property Values Clark County, Nevada (NV) versus Santa Fe, New Mexico (NM)

Environmental Condition	Increase Value		Not Affect Value		Decrease Value		Do Not Know/Refused	
	NV	NM	NV	NM	NV	NM	NV	NM
Public school	61.1%	61%	28.7%	30%	7.2%	5%	2.9%	4%
Shopping center	52.5%	50%	28.1%	22%	16.8%	22%	2.7%	6%
Day care center	42.2%	42%	42.6%	44%	11.3%	10%	3.9%	4%
Limited access highway	31.1%	30%	21.9%	23%	41.4%	40%	4.1%	7%
Amusement park	29.9%	25%	16.2%	26%	47.9%	44%	6.1%	5%
Casino or gaming property*	20.1%	NA	22.7%	NA	49.6%	NA	7.6%	NA
Horse racing track	11.1%	21%	14.3%	30%	68.8%	40%	5.7%	5%
Nonpolluting industry	10.5%	37%	21.7%	26%	64.8%	33%	2.9%	4%
Homeless shelter	5.1%	7%	17.2%	38%	73.6%	50%	4.1%	5%
Landfill	2.5%	6.4%	2.0%	11%	93.9%	80%	1.6%	3%
Highway/freeway used to transport nuclear waste	1.8%	6.4%	9.0%	12%	86.3%	79%	2.9%	3%
Polluting industry	1.4%	5.8%	1.2%	3%	95.5%	89%	2.0%	2%

* Not asked in the Santa Fe, New Mexico survey

Table 29 Effects of Different Environmental Conditions on Decreasing Residential Property Value

Environmental Condition	Rank Order (Percent stating decreasing property values)	
	Nevada	New Mexico
Polluting manufacturing facility	95.5%	89%
Landfill and waste dumping site	93.9%	80%
Freeway used to ship nuclear waste	86.3%	79%

Table 30 Net Environmental Impact Index Ratings Clark County, Nevada (NV) versus Santa Fe, New Mexico (NM) (ranked in order from positive to negative)

Environmental Condition	Net Environmental Impact Index Rating	
	Nevada	New Mexico
Public school	+53.9	+56
Shopping center	+35.4	+28
Day care center	-30.9	+32
Amusement park	-18.0	-19
Casino or gaming property	-29.5	NA
Limited access highway	-41.0	-10
Nonpolluting industry	-54.3	4
Horse racing track	-57.7	-19
Homeless shelter	-68.5	-43
Freeway used to ship nuclear waste	-84.5	-72
Landfill and waste dumping site	-91.4	-74
Polluting industry	-94.1	-83

Table 31 Cross-Tabulation Between Persons Believing Property Values Will Decline and Other Explanatory Factors for Clark County, Nevada

	Yes	No
Plans to buy residential property	90.2%	89.1%
Familiarity with Yucca Mountain	89.5%	86.6%
Familiarity with USDOE plan to ship nuclear waste	89.2%	88.3%

Table 32 Familiarity with the Yucca Mountain Project and the USDOE's Plan to Ship Nuclear Waste Through Clark County

	Yes Percent (N)	No Percent (N)	Not Sure Percent (N)	Refused Percent (N)	Total Percent (N)
Familiarity with Yucca Mountain	77.1% (395)	19.9% (102)	2.0% (5)	1.0% (10)	100.0% (512)
Familiarity with USDOE shipment plans	73.2% (375)	24.2% (124)	1.4% (7)	1.2% (6)	100% (512)

Table 33 Distance from Proposed Shipment Route in Clark County, Nevada

	Do You Live within 3 Miles of One of the Shipment Routes? Percent (N)	Do You Live within 1 Mile of One of the Shipment Routes? Percent (N)
Yes	78.6% (396)	40.6% (205)
No	19.0% (96)	56.0% (282)
No sure	2.0% (10)	3.0% (15)
No answer	0.4% (2)	0.4% (9)
Total	100.0% (504)	100.0% (504)

Table 34 Distributions of Respondents' Residences by Proposed Routes in Clark County, Nevada

Proposed Route	Percent (N)
Interstate 15	31.4% (133)
U.S. 95	53.2% (275)
State Route 160	0.9% (4)
Northern Beltway	6.6% (28)
Southern Beltway	7.8% (33)
Total	100.0% (423)

Table 35 Sample Distributions by Length of Residency in Clark County, Nevada

Residency in Years	Frequency	Percent (N)
Less than 3 years	93	18.2% (93)
3 but less than 5 years	85	16.6% (85)
5 but less than 15 years	136	26.6% (136)
15 but less than 25 years	80	15.7% (80)
More than 25 years	117	22.9% (117)
TOTAL	511	100.0% (511)

Table 36 Sample Distributions by Age

Age	Frequency	Percent
21-29	84	16.4
30-44	170	33.2
45-64	169	33.0
65 and older	79	15.4
Total Responding	502	98.0
Missing	10	2.0
TOTAL	512	100.0

Table 37 Sample Distributions by Level of Education

Level of Education	Percent (N)
--------------------	-------------

Some high school or less	6.4% (33)
High school graduate	26.0% (133)
Some college	20.7% (106)
2-year college degree	13.9% (71)
4-year college degree	19.1% (98)
Post graduate studies/degree	11.3% (58)
Total Responding	97.5% (499)
Missing	2.5% (13)
TOTAL	100.0% (512)

Table 38 Sample Distributions by Race/Ethnic Group

Race/Ethnicity	Percent
Caucasian/White	70.5% (361)
Black/African American	12.9% (66)
Hispanic	6.6% (34)
Asian American	3.9% (20)
Native American	2.0% (10)
Other	1.2% (6)
Total Responding	97.1% (497)
Missing	2.9% (15)
TOTAL	100.0% (512)

Table 39 Sample Distributions by Household Income

Household Income	Percent (N)
Less than \$15,000	8.0 % (41)
> 15,000 - \$25,000	9.4% (48)
> 25,000 - \$40,000	23.2% (119)
> 40,000 - \$70,000	27.9% (143)
> 70,000 - \$100,000	13.1% (67)
More than \$100,000	7.6% (39)
Total Responding	89.3% (467)
Missing	10.7% (55)
TOTAL	100.0% (512)

Table 40 Sample Distributions by Gender

Gender	Percent
Male	45.7% (234)
Female	52.5% (269)
Total Responding	98.2% (503)
Missing	1.8% (9)
TOTAL	100.0% (512)

Table 41 Sample Distributions by Clark County Homeownership.

Ownership	Percent (N)
Yes	61.1% (313)
No	38.7% (198)
Total Responding	99.8% (511)
Missing	0.2% (1)
TOTAL	100.0% (512)

Table 42 Sample Distributions by Clark County, Nevada Residency

Residency	Percent (N)
Yes	97.7% (500)
No	2.1% (11)
Total Responding	99.8% (511)
Missing	0.2% (1)
TOTAL	100.0% (512)

Table 43 Sample Distributions by Residential Locations

Area of Residency	Percent (N)
Las Vegas	47.3% (242)
North Las Vegas	15.4% (79)
Henderson	12.3% (63)
Boulder City	0.4% (2)
Unincorporated Clark County	5.9% (30)
Summerlin	10.7% (55)
Green Valley	6.6% (34)
Total Responding	98.6% (505)
Missing	1.4% (7)
TOTAL	100.0% (512)

Table 44 Sample Distributions by Distance of One to Three Miles of the Proposed Transportation Routes

Proposed Routes	Percent
Interstate 15	26.0% (133)
U.S. 95	43.9% (225)
State Route 160	0.8% (4)
Northern Beltway	5.5% (281)
Southern Beltway	6.4% (33)
Total Responding	82.6% (423)
Missing	17.4% (89)
TOTAL	100.00% (512)

Table 45 Sample Distributions by Distance from Proposed HLNW-SNF Shipment Routes.

Distance from Shipment Routes	Percent (N)
More than 3 miles	18.0% (92)
Within 1 mile	40.0% (205)
Within 3 miles	38.3% (196)
Total Respondents	96.3% (493)
Missing	3.7% (19)
TOTAL	100.0% (512)

Appendix G Lenders and Appraisers Tables

Table 46 Professional Experiences of the Lenders and Appraisers Surveyed

Experience	Average Years of Clark County Experience	Average Years of Total Experience
Lenders	10.4	17.1
Appraisers	14.3	19.9
Std. Dev.	2.8	2.0

Table 47 Lending Terms on Environmentally Contaminated Properties

Lending Terms	Lenders	Appraisers
LTVR*	60.0%	57.1%
Borrower Indemnification	13.3%	42.9%
Personal Liability	20.0%	35.7%
Interest Rate	66.7%	46.7%
Risk Premium	53.3%	53.3%
Amortization Periods	20.0%	13.3%

*Loan-to-value ratio

Final Report

**AN UPDATE OF THE PROJECTED IMPACTS TO CLARK
COUNTY AND LOCAL GOVERNMENTAL PUBLIC SAFETY
AGENCIES RESULTING FROM THE TRANSPORTATION OF
HIGH-LEVEL NUCLEAR WASTE TO YUCCA MOUNTAIN**

August 2005



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EXECUTIVE SUMMARY

This report updates the 2001 public safety fiscal cost projections for Clark County and local government public safety agencies arising from potential impacts of transporting high-level nuclear waste through Clark County to the Yucca Mountain Repository. The projected fiscal costs reported in this study reflect only the additional costs that are a direct result of the repository and the shipping campaign. The fiscal costs of these unfunded public safety mandates emanating from the transportation of high-level nuclear waste to public safety agencies, Clark County, and the cities of Las Vegas, North Las Vegas, Henderson and Mesquite, are provided. The public safety agencies that are charged with protecting the health, safety and welfare of citizens in the event of an emergency are covered in this report include fire, police and emergency management.

This study uses a refined methodology that was employed in the 2001 Public Safety reports. In late 2004 and early 2005, agencies were provided with updated Department of Energy (DOE) plans taken from the 2002 Final Environmental Impact Statement (FEIS) for Yucca Mountain and other DOE documents. A major effort was made to refine our understanding of the potential costs of these impacts. Specifically, the refinements in this report include the elimination of redundancy in emergency management costs across jurisdictions; the use of consistent modeling among all jurisdictions; and, the implementation of twenty-four (24) year projection models that include maintenance, life cycle or useable life projections for equipment, inflation and other recurring costs. These costs are projected over the entire U.S. Department of Energy's estimated 24-year span of the transportation campaign. Hence, cost projections are provided for both the startup in 2010, as well as for the entire transportation campaign. This report, by providing cost estimates to governmental entities that span the total shipping campaign, will allow decision makers to view the projected cumulative total cost and fiscal impacts to public safety agencies for the first time.

Because of the increased information on DOE shipping plans and transportation modes, as well as the development in the FEIS of a Maximum Reasonably Foreseeable Accident (MRF A), local public safety agency personnel have far more detailed information than in 2001. In addition, the information used in projecting costs by the agencies in 2005, is much more closely aligned and tied to DOE planning and analysis

than it could be in 2001. For example, the study utilizes two scenarios one which posits a mostly rail shipping campaign and one with a mostly truck campaign along with the likely shipping routes that are consistent with the DOE's FEIS. Fiscal impact analysis increases in reliability as information about agency planning becomes finalized, and as agency personnel become more familiar with projects and their potential impacts. Hence, the projections in this 2005 report are more specific and refined than those provided in 2001. In the current projections, the public safety agencies have reduced some costs by eliminating some equipment and personnel needs they originally thought important while they have identified other resource needs that were previously overlooked. In examining the projected cost estimates, one should remember that a case study and marginal fiscal cost analysis method has been employed and that these cost estimates represent only those directly attributable to the proposed repository siting and the shipment of waste. That is, the impacts and their costs are only those expenses that would not have been incurred by the public safety agency if there were no repository and shipping campaign.

The projected costs for all of the public safety agencies at the start of the proposed shipping campaign in 2010 total \$385,245,516. Over the entire 24-year period of shipping high-level nuclear waste, the projected impact totals \$3,719,031,513 to the public safety agencies in Clark County and the local jurisdictions. On the following page, Table 1 provides the total projected costs of public safety functions for each jurisdiction at the proposed beginning of the repository in 2010, and for the entire anticipated 24-year shipping campaign.

Table 1 Public Safety Projected Fiscal Impacts for Clark County and Local Jurisdictions at 2010 and for 24-year Shipping Campaign

		2010 Base Case**	24-year Totals
Clark County	Fire	\$244,246,123	\$2,058,613,280
	Police*	\$31,610,989	\$394,323,975
	Emergency Management	\$15,472,500	\$100,111,088
Total		\$291,329,612	\$2,553,048,343
City of Las Vegas	Fire	\$51,561,333	\$526,590,127
	Police*		
	Emergency Management	\$1,878,000	\$36,355,329
Total		\$53,439,333	\$562,945,456
North Las Vegas	Fire	\$29,920,000	\$310,547,085
	Police	\$711,022	\$9,506,627
	Emergency Management	\$325,000	\$12,186,992
Total		\$30,956,022	\$332,240,705
Henderson	Fire	\$159,764	\$6,243,993
	Police	\$495,870	\$14,960,709
	Emergency Management	\$74,864	\$664,309
Total		\$730,498	\$21,869,011
Mesquite	Fire	\$5,151,749	\$151,079,502
	Police	\$3,628,302	\$97,800,906
	Emergency Management	\$10,000	\$47,590
Total		\$8,790,051	\$248,927,998
Combined Total		\$385,245,516	\$3,719,031,513

* Police refers to the Las Vegas Metropolitan Police Department (METRO) which is a jointly funded police force by Clark County and the City of Las Vegas. The projections for METRO have all been placed under Clark County projections.

**Base case is the cost incurred for shipping to commence.

1.0 INTRODUCTION

This report updates the 2001 public safety fiscal cost projections for Clark County and local governmental public safety agencies arising from the potential impacts of transporting high-level nuclear waste through Clark County to the Yucca Mountain Repository (Urban Environmental Research, 2001 a-g; Clark County 2002). Specifically, the public safety fiscal cost projections of the planned transportation of high-level radioactive waste (HLW) is provided for Clark County and the cities of Las Vegas, North Las Vegas, Henderson, and Mesquite. The focus on public safety agencies in this report is a direct result of their programmatic focus and mission, as well as their needs being explicitly recognized in the Nuclear Waste Policy Act, the Nuclear Waste Policy Act Amendments and in the Department of Energy's (DOE) Final Environmental Impact Assessment for Yucca Mountain. These public safety agencies are charged with protecting the health, safety and welfare of citizens in the event of an emergency, and they must be prepared to respond to radiological incidents.

In the 2001 reports projecting the fiscal costs on public safety agencies, each of the communities, Clark County and the Moapa Band of Paiute Indians, were the subject of a separate report that examined the organizational structure of their public safety agencies, their current capacity, funding and the service standard they employed (UER, 2001 b-g). The studies were then integrated into a final report for Clark County (UER, 2001a). This report follows the format of the previous integrated public safety impact report by providing fiscal cost projections for the public safety agencies in the communities listed above. However, the major effort here is to extend our understanding of these fiscal estimates, by projecting them over the entire 24-years of a transportation campaign. Additionally, one of the results of the effort has been the construction of a model that enables public safety agencies to identify their needs and facilitates the determination of the fiscal costs of these impacts.

The fiscal impacts from transporting HLW on public safety agencies that are projected in this report utilize a refined methodology employed in the 2001 studies, as well as the studies that were performed on Nevada state agencies from 1987 through 1998 (Mushkatel, 1988, 1989; Planning Information Corporation and Mushkatel, 1998)

Because the methodological considerations of utilizing the case study and the marginal fiscal cost impact analysis were discussed so thoroughly, in the 2001 reports for Clark County and the previous Nevada studies, only a brief overview is provided here. This discussion is followed by an explanation of the new scenarios that drive the study and are derived from the DOE's Final Environmental Impact Assessment for Yucca Mountain. Following the discussion of the new scenarios, a detailed analysis of the Clark County Fire Department (CCFD) is provided in order to view the process they utilized in projecting impacts from the scenarios and their associated fiscal impacts. Finally, the projected fiscal impact on public safety agencies in each of the communities is addressed.

It is essential to note one important aspect of this and previous studies examining the fiscal impacts of the Yucca Mountain project on the public safety agencies. What is being projected is not the total fiscal cost or the budget of Clark County or any local jurisdiction public safety agency. Rather, the projections in this report are the result of focusing on the increment or any additional cost to these agencies that is directly attributable to the repository's siting and the related HLW transportation shipping campaign. Hence, the cost estimates represent the fiscal impacts associated with public safety agencies needs to ensure public safety that are directly attributable to the transportation of HLW, and they would not be incurred by these governmental agencies in the absence of a repository or shipping campaign.

1.1 An Overview of Fiscal Impact Analysis Methods

Two types of fiscal impact analysis have dominated efforts to estimate the impacts of the growth of governmental services (Ohm, 2005). These same two types of fiscal impact analysis are used in the intergovernmental literature when attempting to estimate the costs of unfunded mandates (Mushkatel and Pijawka, 1995). The first method for estimating or projecting costs is the average costing method and the second is the marginal cost analysis. Both methods are designed to measure projected costs to government from future development or projected actions (Burchell and Listokin, 1980; Burchell, et al. 1990). The average costing approach focuses on population or employment multiplier after establishing an average cost per unit of service and then assesses the additional demand for that service resulting from a project. There is often little consideration of either existing excess or deficient capacity to provide the service by

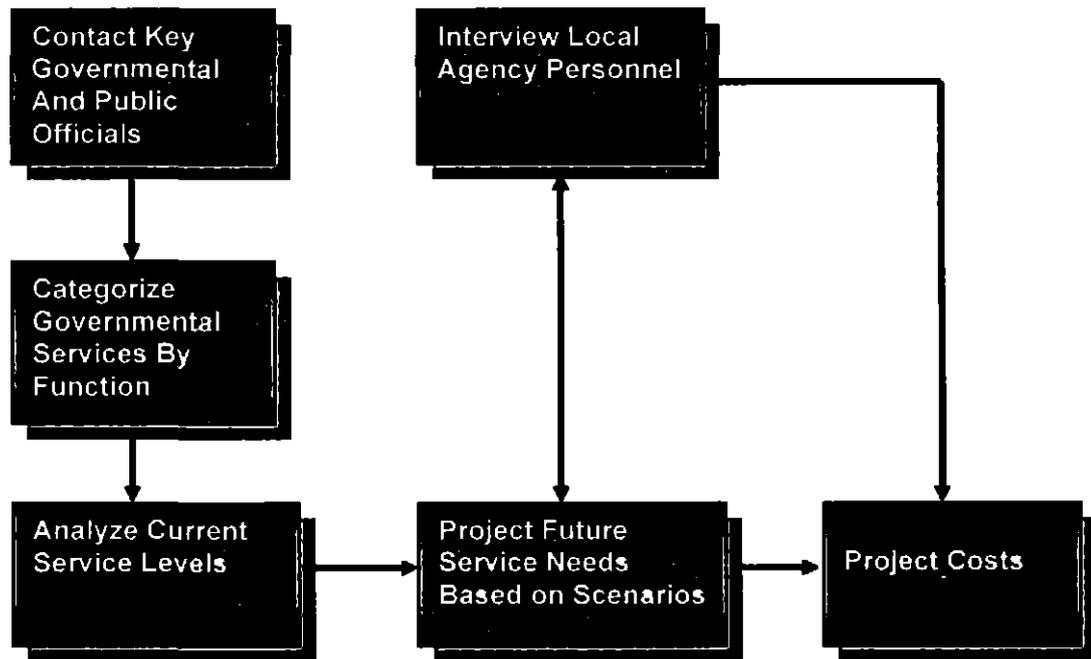
the local entity. That is, a new project, growth or an unfunded mandate may find that existing capacity is inadequate to provide for the new demand for a governmental service. The new demand for services may require new capital construction, equipment, personnel or additional training and result in a community being unable to meet the new demands (or unfunded mandate requirements) without assuming excessive new costs.

A second method of estimating fiscal cost impacts is marginal cost analysis, which examines the current capacity to provide services and determines whether additional demands may push the community past the threshold of its ability to provide the needed services. Marginal analysis does not assume governmental services are linear, but rather some are "lumpy" and may require new infrastructure to serve additional demand, which may have a considerably higher than average cost (Ohm, 2005). The series of 2001 studies examining the fiscal impact on public safety agencies in Clark County utilized a marginal costing technique based on current capacity. The marginal cost analysis is not driven by a project or proposed development, but rather by a scenario, or three scenarios in the case of the 2001 studies. Each community and its public safety agencies are viewed as a case study for the fiscal marginal cost analysis. The underlying assumption is that they differ in the degree to which they exhibit excess or deficient capacity (Burchell and I.istokin, 1980; Burchell, et al. 1990).

A second assumption of the analysis is that marginal changes in service demand or need may result from the scenarios and that the cost of these changes are a reaction to service excesses or deficiencies based on the capacity of the agency or community. The third assumption underlying the projections is that local standards in large part represent the criteria by which local excess and deficient service levels will be measured. The case study of the CCFD provides an excellent example of the utilization of existing service standards and mission to determine whether current infrastructure is adequate to meet the increased service demands that will result from the two transportation scenarios used in the study (CCFD, 2002a). Finally, the last assumption is that local department heads and personnel are the individuals best suited and most knowledgeable about their agency's service capacity and about the future needs associated future service needs associated with new projects or mandates. In each community studied, the steps taken to implement

the case study methodology in conjunction with the public service agencies are provided diagrammatically in Figure 1 and are discussed more fully in Appendix A.

Figure 1 Methodological Approach



The case study fiscal impact analysis method was used for projecting fiscal cost to public safety agencies for each of the governmental entities in this study. However as noted earlier, the scenarios used in this study differ substantially from those used in the 2001 studies.

1.2 The 2005 Study Scenarios

In all of the public safety agencies examined in 2001, the current capacity was determined to be inadequate to respond to a major radiological incident or what is termed a major reasonably foreseeable accident (MRFA). The three scenarios used in 2001 were based on the best available information at the time. The scenarios included information from both the DOE's Draft Environmental Impact Statement for the first two scenarios, as well as information from the State of Nevada's Nuclear Projects Office transportation expert for the third (See Appendix B for a summary of the 2001 scenarios). The 2001 scenarios included a "benign" future shipping campaign beginning in 2007 entailing no accident of any kind. The second scenario used in 2001 involved an accident in which a cask containing HI W breaks free, but remains intact with no release of radiation. Finally, the third scenario entailed a serious accident in which radioactive waste materials are dispersed over a wide area. This third scenario became the MRFA for almost all of the public safety agencies involved in the 2001 series of community studies.

However, in February 2002 the DOE's Office of Civilian Radioactive Waste Management released the Final Environmental Impact Statement for Yucca Mountain outlining what it believed was the worst accident case. In order to maintain as close a tie as possible to the DOE's planning, this worst case was adopted into the current study as the MRFA. In past studies of the State of Nevada's public safety agencies, two trends were noted. First, over time, as more information became available, agency personnel became far more confident in their estimates of how the Yucca Mountain project would affect their agency. Second, the scenarios that were used play an important part in their planning for the project and thus their fiscal projections (Planning Information Corporation and Mushkatel, 1998). Hence, the question of how the new scenarios with a change in the MRFA would affect the impact projections was an important consideration in planning this study. Eventually, it was decided that the importance of aligning the scenarios as closely with the DOE's planning and analysis should be paramount in the fiscal impact analysis. In addition, it became clear that in addition to estimating the fiscal impact at one point in time (the estimated time shipping would begin), it also would provide more insight in the actual projected fiscal impacts by attempting to project these costs throughout the entire 24-year shipping campaign.

The scenarios as they were presented to the public safety personnel in the 2005 study are provided in Appendix C. The new materials were discussed with public safety personnel, along with the new MRFA (discussed below). The two scenarios contained a mostly rail shipments and a mostly truck shipments scenario based on the DOE Final Environmental Impact Statement (Appendix J-11). In addition, the scenarios used in this study showed the potential DOE rail and shipment routes through Nevada that were contained in Chapter 6 of the EIS. The rail route map contained the 513 kilometer Calliente Corridor that DOE hopes will be constructed in order to by-pass the rail line through downtown Las Vegas (Appendix C). In both, the mostly rail and mostly truck, scenarios there are shipments that will pass through Clark County's urbanized population beginning in 2010. A summary of the key details of the mostly truck scenario includes:

Shipments Planned Under Mostly Truck Scenario

Total number of legal-weight truck shipments over a 24-year shipping period:	52,786
Number of shipments per year	2,199
Number of shipments per week	42
Number of shipments per day	6

There are two principal shipment routes for these truck shipments (See attached map1 for these route depictions)

For 45,919 of the legal-weight shipments:

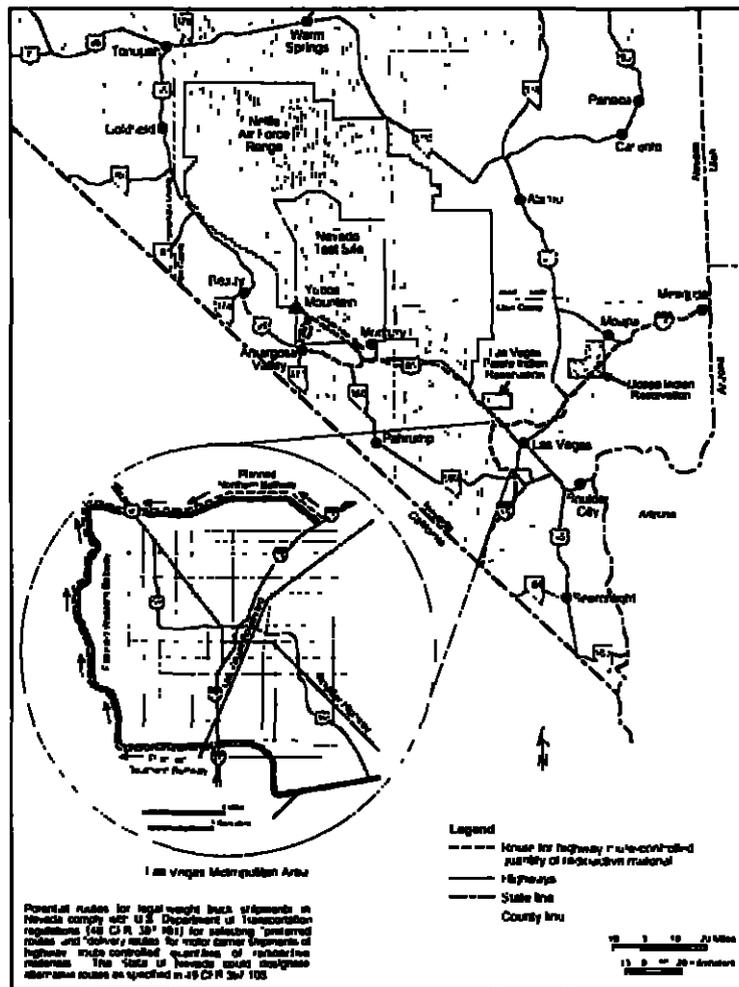
- **I-15 entering Clark County from Arizona via I-15 at Mesquite**
- **I-15 continuing on and traversing the Moapa Reservation to the Northern Beltway continuing on to**
- **U.S. 95 north traversing the Las Vegas Paiute Reservation to the repository**

For 6,867 of the legal-weight shipments:

- **I-15 entering Clark County from California at Primm to the Southern Beltway continuing on to**
- **U.S. 95 traversing the Las Vegas Paiute Reservation to the repository**

The potential trucking routes via Interstate 15 from the north and south end of the Las Vegas valley are further depicted in the maps in Appendix C (the material used with the public safety personnel) and in Figure 2.

Figure 2 Potential Truck Routes



Source: Hinze, D. 2005. Potential Nevada Routes for Legal Weight Truck Shipments of Spent Nuclear Fuel and High-Level Radioactive Waste. <http://www.landercountynv.gov/Maps/s-12.gif>, retrieved June 20th, 2005

In addition, the mostly truck scenario contains 100-300 train shipments from INEEL in Idaho involving Multi Purpose Canisters that will be downloaded at an intermodal transfer facility, at or near Apex, onto heavy haul trucks. These trucks will be 200+ feet long vehicles and will be very slow moving. These vehicles will enter the I-15 at U.S. 93 or at State Route 604 (see map Appendix C) to the Northern Beltway and traverse the Las Vegas Paiute Reservation

The major elements of the mostly rail shipments scenario includes:

Shipments Planned Under the Mostly Rail Scenario

Total number of rail shipments through <i>Clark County</i> over a 24-year shipping period	194-594
Total number of rail cask shipments that <i>would not</i> travel through <i>Clark County</i>	8,896-9,052

Principal Rail Shipment Routes (see attached map 2)

For the roughly 594 rail cask shipments:

- **Enter Clark County from CA. on the Union Pacific Main Line and**
- **Traverse Downtown Las Vegas and**
- **Travel to the Caliente Rail Spur Traversing the Moapa Indian Reservation**

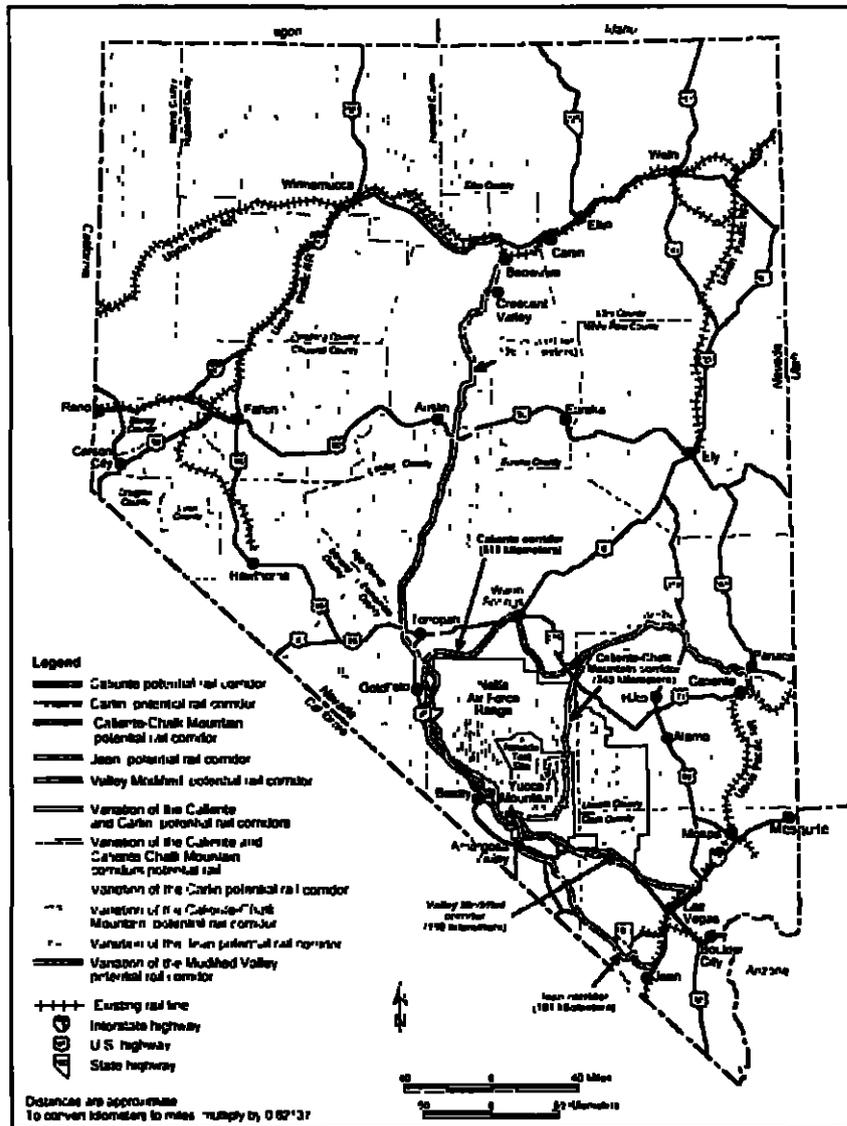
Under the mostly rail shipment scenario there are approximately 1,079 legal-weight truck shipments into Clark County.

The shipment plan for these 1,079 legal-weight trucks:

- **I-15 entering Clark County from Arizona via I-15 at Mesquite**
- **I-15 continuing on and traversing the Moapa Reservation to the**
- **Northern Beltway continuing on to**
- **U.S. 95 traversing the Las Vegas Paiute Reservation to the repository**

The map for the rail shipments is found in Appendix C (the material used with the public safety personnel) and in Figure 3

Figure 3 Potential Rail Routes



Source: Hinze ID 2005 Potential Nevada Rail Routes Yucca Mountain <http://www.landercounty.nv.gov/Maps/s-26.gif> retrieved June 24th 2005

In addition, the public safety personnel were provided with a discussion of the accident rates projected by both the DOE (DOE, 2002: Chapter 6 and Appendix J), as well as accident rates estimated by the transportation consultant to the Nevada Nuclear Projects Office (Appendix C). While accident rates are important, most of the public safety personnel in the study were focused on the MRFA (DOE, 2002: Appendix J-69).

The most likely MRFA for both rail and truck, according to the DOE's FEIS is a long duration high-temperature fire that would engulf a cask. While the DOE's analysis suggests that such an MRFA is highly unlikely, it can not be ruled out. The Baltimore Tunnel fire that occurred July 18, 2001 involved a CSX freight train, which partially derailed in the Howard Street Tunnel. Four of the cars that derailed were tankers carrying flammable and hazardous chemicals. A fire ensued when one of the tankers ruptured. It created an inferno that engulfed the tunnel and paralyzed the downtown area for several days (Associated Press, April 13, 2005.3). The MRFA with a similar scenario became what the "CCFD must be prepared to handle" in planning for their needs (Geldbach-Hall, May 2005).

Before discussing the specific cost projections for each of the governmental agencies and entities, an examination of the process used by the CCFD will be instructive. Obviously, not all of the public agencies used such a detailed planning process in attempting to identify potential impacts. Yet, the process used by the CCFD is instructive in several respects. First, it will demonstrate why the methodology employed over time results in increasing the reliability of both the projected potential impacts, as well as the associated fiscal costs. Second, it clearly demonstrates that the initial fiscal projections are scrutinized and refined over time as new and more detailed information about the transportation of HLW becomes available. Finally, the CCFD effort allows us to see just how seriously agency personnel in the study treat the exercise and how iterative a process it becomes as it expands in scope and additional agency resources and personnel become involved.

1.3 The Model and Questionnaire

The development of a questionnaire that can be used in obtaining fiscal impact projections in the future has been developed (Appendices H and I). The questionnaire consists of items concerning future needs in personnel, capital equipment, training, as well as the entire range of needs identified by fire departments, police departments and emergency management agencies. Once a box has been checked, the drop down populates the need area. For example, if an additional station is needed and the box checked, the drop down populates the station with personnel and equipment based on past experience and solicits from the respondent any additional needs or to identify specific

items that might not be needed by the entity. In this way, the per unit costs can be standardized across jurisdictions and any idiosyncratic needs identified. Only the questionnaire for fire agencies is presented in Appendices H and I, and the other will be provided upon request.

In addition to the questionnaire development, with technical support from Jeremy Agüero of Applied Analysis, an Excel model has been developed that captures all of the per unit cost for each item estimated by a public service agency. Using this model, agencies may alter their projections in a very simple fashion by using the questionnaire and the information being entered into the model. Finally, the model may also be used by agencies for their own budgeting process as they attempt to estimate the cost of such items as substations or other capital equipment or operating expenses.

2.0 THE CLARK COUNTY FIRE DEPARTMENT'S IMPACT ASSESSMENT

The Clark County Fire Department was established November 23, 1953, with its first fire station opening January 1, 1954 (CCFD, 2002b). Prior to its fire station opening, the CCFD worked out of the Las Vegas Fire Department station with only a day shift. In 2002, the CCFD covered an area of over 7900 square miles, and protects a population estimated at that time of over 636,462 (CCFD, 2002b). At any given weekend there are over 500,000 visitors to Las Vegas, and over 36 million visitors annually who fall under the protection of the CCFD. The CCFD's size has grown very quickly to now include 22 fire stations in the urban valley, two stations in Laughlin, and one in Jean. In addition, the CCFD oversees 13 volunteer fire stations located throughout the County (CCFD, 2002; Geldbach-Hall, 2005). The CCFD was composed of 647 full-time employees in 2002 that had grown to 715 authorized positions by the end of 2004 (CCFD, 2002b). Over 350 volunteers served as volunteers outside the urban area. The CCFD along with the Las Vegas Fire and Rescue Department are the only civilian departments housing full time hazardous materials teams in Southern Nevada.

The growth in population the Las Vegas Valley has resulted in an increasing rise in the number of responses by the CCFD. Prior to 2004, the increase in response rates by the CCFD averaged about 6% per year for five years. However in 2004, this response rate

grew to 7%, and the long-term estimates for increases in responses to average about 9.3% per year, for the next 20 years (Geldbach-Hall, 2005; CCFD, 2004). As Geldbach-Hall notes, the potential for transportation accidents involving the transport of HI.W requires the CCFD to prepare for the opening of the repository. The mission statement of the CCFD requires it "to provide optimum protection and prevention for our residents and visitors, with the highest level of valor, integrity, commitment, teamwork, and community involvement" (CCFD, 2002a). Furthermore the CCFD vision statement requires it take a proactive stance in ensuring fire protection, emergency medical and other services (*ibid*).

In late 2004 the CCFD, under the leadership of Chief Earl Green, established a task force to reevaluate the 2001 CCFD impact projections associated with the Yucca Mountain Repository utilizing the latest information available. Deputy Chief William Kolar (who had supervised the 2001 CCFD projections) was designated as the task force leader. The task force was composed of nine CCFD personnel: including Richard Brenner, the CCFD Hazardous Materials Coordinator and a major contributor to the 2001 CCFD impact projections (Appendix D). The task force also had a representative from METRO housed in Emergency Management, Homeland Security Bureau. Finally, the CCFD task force worked closely with an advisor from Urban Environmental Research LLC to ensure that the best available information on the DOE's transportation plans was available. The task force membership ensured representation of varied fields of expertise and experience from communications and fire suppression to hazardous materials. The task force met frequently over the course of four months.

As Geldbach-Hall notes, "It was the intent of this task force to plan for and estimate the fiscal impact of the Yucca Mountain project to the CCFD to avoid unfunded mandates and over taxing CCFD's current operations and fiscal budget" (2005:19). In order to avoid these potential fiscal impacts, the task force began with a SWO I analysis of the project, developed an updated list of safety concerns and a list of infrastructure needs that addressed these concerns. These infrastructure needs were identified, categorized and cost estimates were applied. The cost estimates were based on current operating budgets, experience of other departments, by researching other agencies with comparable facilities, and historical accounts. The formation of the task force and their

work on the projections raised some concern among project personnel as to how the final product would compare to the earlier 2001 estimates. The 2001 estimates were completed using a smaller less diverse group from the CCFD, and the lack of information in 2001 might have resulted in widely divergent fiscal cost projections. However, as will be seen, the two cost estimates are very close to each other when two of the newly identified infrastructure needs are eliminated.

Throughout the planning process, additional personnel in the CCFD were identified and their input solicited. The first meeting of the task force was December 14, 2004, and the last one in April 6 of 2005. During this time, Brenner reviewed the nature of the waste being shipped and what other agencies in other cities and countries were doing to manage high-level nuclear waste transportation through their communities (Geldbach-Hall, 2005). The task force members were designated areas of responsibility based on their expertise at a December 21, 2004 meeting. On January 20, 2005 the task force reviewed a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis, and scheduled a group tour of the Yucca Mountain Repository project. The task force held meetings until the final infrastructure list was approved. As will be seen, the task force organized their infrastructure needs into four main categories including specialty stations, a regional training center, helicopters, and a communication network.

Working with the members of the task force, it soon became clear that everyone understood one of the key factors critical to their analysis. The key was the identification of impacts and their expenses that the CCFD would not incur if there were no repository and shipping campaign. Hence, the effort by CCFD was to identify additional costs that were directly attributable to the project and transportation of the HLW through Clark County. The Department would not incur these costs if the Yucca Mountain Repository and the shipping campaign did not exist. Unlike the 2001 analysis, the 2005 analysis had a previous estimate of the impacts it could review and build on. The task force, its diverse membership representing several elements of the CCFD and the amount of time devoted by the CCFD to the task increase our confidence in their impact projections.

Finally, several assumptions were made by the task force to allow them to direct their efforts at estimating the impacts from the transportation of HLW to Yucca Mountain. First, consistent with the 2001 CCFD analysis, it was assumed that a release of

HLW would have major impact on the operations of the CCFD and that they were not prepared to respond to that level of threat. Second, rather than address the mostly rail and mostly truck scenarios separately, it was assumed that any release would be treated the same for the department and surrounding communities (Geldbach-Hall, 2005:18). Hence, the planning and preparedness necessary would not vary by scenario, but by the nature of a radiological release or the MRFA. Finally, the shipping campaign was assumed to begin sometime in 2010, which now seems increasingly optimistic.

Because this is the first effort to project both the current needs and costs, as well as those through the life cycle of a 24-year shipping campaign, several new demands for information associated with cost estimates are necessary. First, the useful life of equipment and capital facilities must be known so that the 24-year projections can build in their replacement costs. Second, the cost of equipment must be separated from the maintenance and operations expense to avoid projecting additional acquisition costs into the projections prior to the end of their useful life. Because this is the first time an effort has been made to make these 24-year projections, not all of the public safety agencies were always able to refine their projections and separate out these different types of costs. Hence, when information is lacking to permit this, CCFD estimates of useful life of capital equipment has been utilized for some of the other departments. Several other assumptions were necessary and are discussed in the next section of the report.

3.0 THE FISCAL COST PROJECTIONS

There are two types of projections that are provided in this section of the report. The first projection entails cost estimates for the fiscal impacts on the public safety agencies directly attributable to the shipping of HLW to the Repository beginning in 2010. These current projections, are put into 2010 dollars, and are based on the public safety agencies' efforts to identify the equipment, capital infrastructure, training and other upgrades to their capacity necessary for them to be prepared for an MRFA involving HLW. These projections follow the format used in the 2001 fiscal impact reports. The second type of projection is for the fiscal cost of these agency requirements for the entire 24-year period of the transportation campaign. It is essential that in the 24-

year projections the useful life of equipment, vehicles, and capital infrastructure be accounted for so that the projections do not underestimate or overestimate the impacts. For example, vehicles, and equipment will not be useable for the entire 24-year period. Hence, these fiscal cost projections must factor in the useable life of such equipment, the inflationary rise in cost, and build their repurchase into the estimates. Using Microsoft Excel, models were developed, with the assistance of Jeremy Agüero of Applied Analysis, of both useful life and inflationary costs were constructed for all of the items affected by these factors Appendix F provides the useful life schedule from the base year at specific intervals (year 5, 10, 15, 20 and 24). (The schedule exists for each year but in the interests of space conservation only these 5 points are provided). Appendix F provides the cost inflation percentages projected for the same five points in time.

The current fiscal impact projections are provided in F-Y 2010 dollars. However the model permits us to estimate these costs beginning at any point in time including the projected beginning of the shipping campaign 2010 (see Appendix E for the model assumptions and estimated per unit cost of each item). The 2001 fiscal cost estimates were based on 2007 dollars. The current projections or the base case fiscal projections for Clark County and local jurisdictions are provided in Tables 2 to 6.

3.1 Fire Department Projections

Table 2 provides the base case estimates for the Clark County Fire Department. The CCFD projected cost for the impacts identified totals \$244,246,123. In 2001 the CCFD estimated a cost of \$195,896,055 from the repository and the shipping of HLW. On the surface it appears that the CCFD estimate has grown by 24.6% from 2001 to 2005. However, the CCFD identified the need for a Regional Training Center (RTC) at Apex or Jean in their assessment that was not identified in 2001. If the current cost of the land for the RTC (\$78+ million) is removed the estimate for 2005, it results in a total estimated impact of \$165,838,123 or roughly \$30 million less than the 2001 estimate. Therefore, the projected fiscal impact of preparing for the MRFA is lower in 2005 except for the additional land necessary for the RTC. Yet, given the additional attention to estimating these impacts in 2005 through the Task Force that was organized, as well as the additional information available now concerning the MRFA and transportation, the

current projections need to include fewer possible exigencies than was the case in 2001. In short, the estimates are expected too narrow, although not necessarily decline. In this case, CCFD's estimates did decline but the identification of the needed RTC results in an increase in the total fiscal impact.

Table 2 Projected Fiscal Costs on the Clark County Fire Department (2010 Base Case)

CAPITAL COSTS	Base	Total
Capital Construction Costs	\$160,782,050	
Apparatus and Related Equipment Acquisition Costs	\$27,609,484	
Support Equipment Capital Costs	\$283,421	
Air Support Capital Equipment Costs	\$964,431	
Support Vehicle Capital Costs	\$3,409,751	
Communication Capital Equipment Costs	\$1,254,919	
TOTAL CAPITAL COSTS		\$194,304,056
OPERATIONS & MAINTENANCE COSTS		
Routine Operations & Maintenance	\$2,369,864	
Personnel Costs	\$33,914,406	
Personnel Training Costs	\$9,928,907	
Communications System Costs	\$47,091	
Administrative & Planning Costs		
Miscellaneous Operations & Maintenance	\$3,681,799	
TOTAL FIRE OPERATIONS & MAINTENANCE		\$49,942,067
TOTAL FIRE FISCAL IMPACT		\$244,246,123

Table 3 provides the current projection for the City of Las Vegas Fire and Rescue Department (LVFR). The LVFR current fiscal impact projection totals \$51,561,333. The 2001 estimate totaled \$45,158,058. The 2005 total represents an increase of \$6,403,275 or about an increase of 14.1%. The LVFR Department's estimates were constructed by several individuals working under the direction of Deputy Chief Gracia and included Battalion Chief Jay Acebo from the Fire Training Center and Hazardous Materials, as well as the Emergency Manager Tim McAndrew. The delegation of responsibility to these individuals took place after an initial meeting with Chief Washington and the other departmental chiefs were held in which the nature of the project was discussed. Once again, the department was far more involved and used more resources in the unit in developing their impact assessment than in 2001. The increase in the fiscal cost estimate

is largely attributable to the identification of the training and equipment demands emanating from of additional stations in the downtown area near the Union and Pacific railroad because of the rail scenario and the additional population in the LV downtown. In addition, the LVFR believes that the location of another station in the northwest portion of the City near the I-215 near the convergence of the north I-215 and the south I-215 near the HLW truck routes will require additional equipment and training of personnel.

Table 3 Projected Fiscal Costs on the City of Las Vegas Fire and Rescue Department (2010 Base Case)

CAPITAL COSTS	Base	Total
Capital Construction Costs	\$25,600,000	
Apparatus and Related Equipment Acquisition Costs	\$7,817,000	
Support Equipment Capital Costs	\$734,985	
Air Support Capital Equipment Costs	\$214,500	
Support Vehicle Capital Costs		
Communication Capital Equipment Costs	\$3,000,000	
TOTAL CAPITAL COSTS		\$37,366,485
OPERATIONS & MAINTENANCE COSTS		
Routine Operations & Maintenance	\$68,530	
Personnel Costs	\$10,221,575	
Personnel Training Costs	\$3,777,173	
Communications System Costs	\$15,000	
Miscellaneous Operations & Maintenance	\$112,571	
TOTAL FIRE OPERATIONS & MAINTENANCE		\$14,194,849
TOTAL FIRE & RESCUE FISCAL IMPACT		\$51,561,334

Table 4 provides the current base case fiscal cost estimates for the North Las Vegas Fire Department (NLVF). As can be seen from the table the current estimate of the impacts is \$29,920,000. The amount represents an increase of \$7,498,598 or an increase of 33.4% over the 2001 fiscal impact projection. Ten million dollars of the increase is directly attributable to the need for a training center for fire fighters as the City continues to grow. Currently, the radiological training of firefighters for radiological incidents is inadequate for the community which has the Northern outer loop intersecting it.

Table 4 Projected Fiscal Costs on the North Las Vegas Fire Department (2010 Base Case)

CAPITAL COSTS	Base	Total
Capital Construction Costs	\$19,000,000	
Apparatus and Related Equipment Acquisition Costs		
Support Equipment Capital Costs	\$3,940,000	
Air Support Capital Equipment Costs		
Support Vehicle Capital Costs		
Communication Capital Equipment Costs		
TOTAL CAPITAL COSTS		\$22,940,000
OPERATIONS & MAINTENANCE COSTS		
Routine Operations & Maintenance	\$172,000	
Personnel Costs	\$5,700,000	
Personnel Training Costs	\$1,108,082	
Communications System Costs		
Miscellaneous Operations & Maintenance		
TOTAL FIRE OPERATIONS & MAINTENANCE		\$6,980,000
TOTAL FIRE FISCAL IMPACT		\$29,920,000

Table 5 provides the fiscal impact projections for the Henderson Fire Department. Once again the Henderson Fire Department envisions the impacts from the shipping of HLW as minimal. The current projection amounts to \$159,764 as opposed to the 2001 projections of \$285,933. The difference between the two estimates is a reduction of fiscal cost of \$126,169 or 44% less than in 2001 for the fire departments' estimate in part a result of reallocating some fire costs to emergency management.

Table 5 Projected Fiscal Costs on the Henderson Fire Department (2010 Base Case)

CAPITAL COSTS	Base	Total
Capital Construction Costs		
Apparatus and Related Equipment Acquisition Costs		
Support Equipment Capital Costs		
Air Support Capital Equipment Costs		
Support Vehicle Capital Costs		
Communication Capital Equipment Costs		
TOTAL CAPITAL COSTS		
OPERATIONS & MAINTENANCE COSTS		
Routine Operations & Maintenance		
Personnel Costs		
Personnel Training Costs	\$159,764	
Communications System Costs		
Miscellaneous Operations & Maintenance		
TOTAL FIRE OPERATIONS & MAINTENANCE		\$159,764
TOTAL FIRE FISCAL IMPACT		\$159,764

Table 6 provides the fiscal cost impact projections for Mesquite's fire department. The fiscal impact projection is \$5,151,749 for the fire department. The 2001 Mesquite Fire department projections was \$4,141,451, and the 2005 estimate is \$1,000,298 greater than in 2001. This represents an increase of 24.1% over the 2001 estimate as a result of identification of new needs and the continuing rapid growth in the size of the fire department and the resulting increased training needs. In fact, in all of the estimates for the fire departments there is considerable movement within the categories based on growth of force and other factors. However, there are also reductions taking place between 2001 and 2005. For example, Mesquite has arranged a cooperative agreement with the City of Las Vegas to use their 911 Reverse Notification System in the event of an evacuation and as a result has removed the equipment from the Mesquite Fire 2005 estimate.

Table 6 Projected Fiscal Costs on the Mesquite Fire Department (2010 Base Case)

CAPITAL COSTS	Base	Total
Capital Construction Costs		
Apparatus and Related Equipment Acquisition Costs		
Support Equipment Capital Costs	\$1,400,000	
Air Support Capital Equipment Costs		
Support Vehicle Capital Costs		
Communication Capital Equipment Costs		
TOTAL CAPITAL COSTS		\$1,400,000
OPERATIONS & MAINTENANCE COSTS		
Routine Operations & Maintenance	\$1,400,000	
Personnel Costs	\$2,291,749	
Personnel Training Costs	\$60,000	
Communications System Costs		
Administrative & Planning Costs		
Miscellaneous Operations & Maintenance		
TOTAL FIRE OPERATIONS & MAINTENANCE		\$3,751,749
TOTAL FIRE FISCAL IMPACT		\$5,151,749

Table 7 provides a summary of the various entities fire departments' current fiscal projections for the impacts. As can be seen from the table the current base case dollar estimates totals \$331,038,970. In 2001, the fire departments (less the Moapa Band of Paiutes and Boulder City) estimated projections totaled \$267,351,634. The 2005 estimate is \$63,787,336 more than it was in 2001 or an increase of almost 27%. The increase is largely a function of the land cost for the Regional Training Center (\$78 million) in the CCFD impact estimates. In short, the fiscal projections in the fire departments using far more personnel in estimating impacts and with more current data concerning routes and the possible MRFA is converging. This convergence of the estimates is exactly what should be anticipated in an iterative process like the one employed.

Table 7 Summary Current Fire Impact Projections (2010 Base Case)

Fire Entity	Total Fire Fiscal Impact
Clark County Fire Department	\$244,246,123
City of Las Vegas Fire & Rescue Department	\$51,561,334
North Las Vegas Fire Department	\$29,920,000
Henderson Fire Department	\$159,764
Mesquite Fire Department	\$5,151,749
TOTAL FIRE FISCAL IMPACT	\$331,038,970

Table 8 provides a summary of the 24-year fiscal cost projections based on the original fire departments' estimates and it includes inflationary factors and useful life span of equipment and other capital expenditures (see Appendices G and F). The table contains the first effort at projecting out the costs from the 24-year shipping campaign on any public safety agencies. As can be seen from the table, for just these fire departments, a total of \$3,053,423,989 is the projected fiscal impact on these fire departments. This \$3+ billion represents projected costs that none of the departments would incur if not for the repository siting and the accompanying shipping campaign of HLW. The CCFD total of just over \$2 billion represents 67% of the total 24-year projected cost for fire department impacts.

Table 8 24-Year Projected Fiscal Fire Departments

Agency	Projected (24-year)	Subtotal
Clark County Fire Department Total Capital Costs	\$335,007,656	
Clark County Fire Department Total Operations & Maintenance	\$1,723,605,625	
SUBTOTAL CLARK COUNTRY FIRE DEPT		\$2,058,613,281
City of Las Vegas Total Capital Costs	\$75,302,636	
City of Las Vegas Total Fire- Operations & Maintenance	\$451,637,492	
SUBTOTAL CITY OF LAS VEGAS FIRE & RESCUE		\$526,940,128
NLV Total Capital Costs	\$37,750,509	
NLV Total Fires Operations & Maintenance	\$272,796,577	
SUBTOTAL NORTH LAS VEGAS FIRE		\$310,547,086
Henderson Total Capital Costs		
Henderson Total Fire-Operations & Maintenance	\$6,243,993	
SUBTOTAL HENDERSON FIRE		\$6,243,993
Mesquite Total Capital Costs	\$6,662,617	
Mesquite Total Fire -Operations & Maintenance	\$144,416,884	
SUBTOTAL MESQUITE FIRE		\$151,079,501
TOTAL PROJECTED FIRE DEPT COSTS		\$3,053,423,989

3.2 Police Department Projections

As noted in the 2001 Public Safety Report, the Las Vegas Metropolitan Police Department (METRO) is the result of a merger between the Las Vegas Police Department and the Clark County Sheriff's Department in 1973. The 2001 fiscal cost projections for METRO relied heavily on the work of Lieutenant Marty Lehtinen. In 2005, METRO decided to expand the team responsible for developing their impact projections. The estimates that were provided is largely the work of a team in the Office of Quality Assurance in METRO supervised by Lieutenant Kirk Primas. However, the four individuals in Quality Assurance drew upon the expertise of at least eight other METRO personnel representing personnel, payroll, emergency management, budget, fleet management, supply management and the Rapid Assessment Team. Similar to what took place in the CCFD, the number of individuals and the fields of expertise represented were expanded dramatically from 2001. METRO's analyst Nancy Beaty and Detective Bill Green were particularly helpful.

Table 9 provides the base case estimates of fiscal impacts to METRO. The projected impacts in 2010 dollars total \$31,610,989. The 2001 projection was \$67,686,369. The reduction of \$36+ million in projected impacts is largely the result of different working assumptions and the removal of additional substations. In addition, the issue of escorting shipments will need clarification for METRO to be more specific about some of its equipment and personnel needs. For example, the question of which agency METRO, the Nevada Highway Patrol or another police agency will have the responsibility of escorting truck shipments will have a major effect on some of the projections. Also in need of clarification, is whether the DOE uses the primarily rail or truck shipment scenario as mode of shipments will heavily affect the escorting vehicles required.

Table 9 Las Vegas Metropolitan Police Department

CAPITAL COSTS	Base	Total
Support Vehicles	\$585,839	
Haz Mat Radiological	\$1,808,468	
Air Support	\$741,935	
Other Equipment	\$936,672	
TOTAL CAPITAL COSTS		\$19,180,387
OPERATIONS & MAINTENANCE COSTS		
Personnel Costs	\$480,192	
Personnel Training Costs	\$502,549	
Maintenance and Supply Costs	\$260,229	
Haz Mat Emergency Administration	\$958	
TOTAL OPERATIONS & MAINTENANCE COSTS		\$12,430,602
TOTAL POLICE IMPACT		\$31,610,989

The North Las Vegas Police Department's base case estimate is presented in Table 10. As can be seen from the table projected fiscal impacts total \$711,022. This is the same amount estimated in the 2001 report. The majority of the impacts are projected in requiring additional training of personnel and for a variety of additional radiation detection equipment.

Table 10 North Las Vegas Police (2010 Base Case)

CAPITAL COSTS	Base	Total
Support Vehicles		
Haz Mat Radiological		
Air Support		
Other Equipment	\$495,022	
TOTAL CAPITAL COSTS		\$495,022
OPERATIONS & MAINTENANCE COSTS		
Personnel Costs		
Personnel Training Costs	\$216,000	
Maintenance and Supply Costs		
Haz Mat Emergency Administration		
TOTAL OPERATIONS & MAINTENANCE COSTS		\$216,000
TOTAL POLICE IMPACT		\$711,022

The City of Henderson's Police fiscal impacts are displayed in Table 11. The 2005 fiscal cost projection to the Henderson Police Department is \$495,870. The 2001 cost projection totaled \$952,427. The Henderson Police Department 2005 estimate is \$456,557 less than the 2001 projected fiscal impact or a reduction of almost 48%. Hence, both the Henderson fire and police service projections have been reduced from their original 2001 fiscal estimates. The majority of the Henderson police impacts are for personnel training and radiation detection and survey meter equipment.

Table 11 Henderson Police (2010 Base Case)

CAPITAL COSTS	Base	Total
Support Vehicles		
Haz Mat Radiological		
Air Support		
Other Equipment	\$77,677	
TOTAL CAPITAL COSTS		\$77,677
OPERATIONS & MAINTENANCE COSTS		
Personnel Costs		
Personnel Training Costs	\$418,193	
Maintenance and Supply Costs		
Haz Mat Emergency Administration		
TOTAL OPERATIONS & MAINTENANCE COSTS		\$418,193
TOTAL POLICE IMPACT		\$495,870

The Mesquite Police Department fiscal impact estimates are provided in Table 12. The 2005 projected impacts to this agency are \$3,628,302. In 2001 the estimate for the Mesquite Police Department totaled \$2,828,960. The 2005 fiscal impact projection is an increase of \$799,342 or 28%. The majority of the impacts are viewed as requiring additional training and new police officers resulting from the heavy transportation impact potential from truck shipments through the community.

Table 12 Mesquite Police Department (2010 Base Case)

CAPITAL COSTS	Base	Total
Support Vehicles		
Haz Mat Radiological		
Air Support		
Other Equipment	\$917,760	
TOTAL CAPITAL COSTS		\$917,760
OPERATIONS & MAINTENANCE COSTS		
Personnel Costs		
Personnel Training Costs	\$2,710,542	
Maintenance and Supply Costs		
Haz Mat Emergency Administration		
TOTAL OPERATIONS & MAINTENANCE COSTS		\$2,710,542
TOTAL POLICE IMPACT		\$3,628,302

The projected 24-year entire shipping campaign costs to police agencies participating in the study are provided in Table 13. As can be seen from the table, the total police service projected fiscal impacts total \$516,592,217. Of this total, \$394,323,975 is projected just for METRO or about 76% of the total projected fiscal impacts on police departments during the 24-year shipping campaign.

Table 13 Police Departments 24-Year Projected Fiscal Costs

Agency	Projected (24-year)	Subtotal
Clark County METRO Capital Costs	\$61,720,070	
Clark County Operations & Maintenance	\$332,603,905	
SUBTOTAL, CLARK COUNTY		\$394,323,975
City of Las Vegas Capital Costs		
City of Las Vegas Operations & Maintenance		
SUBTOTAL CITY OF LAS VEGAS		
City of North Las Vegas Capital Costs	\$2,081,175	
City of North Las Vegas Operations & Maintenance	\$7,425,452	
SUBTOTAL CITY OF NORTH LAS VEGAS		\$9,506,627
Henderson Capital Costs	\$535,354	
Henderson Operations & Maintenance	\$14,425,354	
SUBTOTAL HENDERSON		\$14,960,709
Mesquite Capital Costs	\$3,858,457	
Mesquite Operations & Maintenance	\$93,942,449	
SUBTOTAL MESQUITE		\$97,800,906
TOTAL PROJECTED POLICE DEPT COSTS		\$516,592,217

3.3 Emergency Management

Table 3.13 provides the first estimates of the cost of constructing and operating a Regional Emergency Operations Center (REOC). The REOC has been placed within the Clark County Office of Emergency Management rather than a local jurisdiction reflecting the regional nature and function of such a center. It is important to note that all of the emergency management personnel from the agencies interviewed indicated the need for such a facility in the event of an MIRA, or a long lasting radiological event. The initial cost projections for such a REOC varied considerably among the jurisdictions, and the City of Las Vegas estimates are used here because of their comprehensive nature. As can be seen from Table 14, the estimate of the REOC is \$15,472,500. The 2001 projections did not include such a facility.

Table 14 Clark County Office of Emergency Management

	2010 Base Case
Regional EOC CONSTRUCTION (15,000 sq ft facility, Communication infrastructure, Land acquisition)	\$13,250,000
Support Equipment Capital Costs	
Routine Operations & Maintenance	\$250,000
Personnel Costs	\$1,472,500
Administrative & Planning Costs	
Miscellaneous Operations & Maintenance	\$500,000
TOTAL	\$15,472,500

Table 15 contains all of the base case estimates for the emergency management function in the local jurisdictions. Briefly, the base case estimate for all jurisdictions is \$2,287,864. In 2001, the estimate was for \$730,597. The 2005 estimate represents an increase of \$1,557,267 or approximately an increase of 300%. Part of this increase is a result of the City of Las Vegas having an experienced emergency manager in place in 2005 which was not the case during the 2001 study. In addition, much of the estimated impact is directly attributable to the need for new radiation response plans, as well as public information programs.

Table 15 Local Jurisdictions Emergency Management Costs (2010 Base Case)

City of Las Vegas	Base	Total
OPERATIONS & MAINTENANCE COSTS		
Routine Operations and Maintenance		
Personnel		
Personnel Training	\$116,000	
Emergency Response Administration	\$1,762,000	
TOTAL OPERATIONS & MAINTENANCE COSTS		\$1,878,000
City of North Las Vegas		
OPERATIONS & MAINTENANCE		
Routine Operations and Maintenance	\$200,000	
Personnel	\$110,000	
Personnel Training		
Emergency Response Administration	\$15,000	
TOTAL OPERATIONS & MAINTENANCE COSTS		\$325,000
Henderson		
OPERATIONS & MAINTENANCE		
Routine Operations and Maintenance		
Personnel		
Personnel Training		
Emergency Response Administration	\$74,864	
TOTAL OPERATIONS & MAINTENANCE COSTS		\$74,864
Mesquite		
OPERATIONS & MAINTENANCE		
Routine Operations and Maintenance		
Personnel		
Personnel Training		
Emergency Response Administration	\$10,000	
TOTAL OPERATIONS & MAINTENANCE		\$10,000
COMBINED TOTAL		\$2,287,864

Table 16 provides the 24-year projected fiscal impacts for the County and the local jurisdictions. As can be seen from the table, the total 24 projected cost for emergency management is \$376,455,465. These projected costs are the direct result from the siting of a repository and the anticipated shipping campaign.

Table 16 Clark County Community Emergency Management 24-Year Projected Fiscal Costs

	Projected (24-year)	Total
Clark County	\$100,111,088	
Las Vegas	\$36,355,329	
North Las Vegas	\$12,186,992	
Henderson	\$664,309	
Mesquite	\$47,590	
COMBINED TOTAL		\$376,455,465

3.4 Summary of Projected Costs

Table 17 provides a summary of the base case costs by community and function. The table permits one to see the total base case estimated fiscal cost projections for Clark County and each community, as well as the total estimated cost for each public safety function. For example, base case fire department projected costs are \$331,038,969 of the total projected public safety cost estimated at \$385,245,516. This total for fire represents almost 86 percent of the total projected base case cost.

Table 17 Total Projected Costs for Clark County and Local Jurisdictions (Base Case 2010)

	Fire	Police *	Emergency Mgmt	Total Costs
Clark County	\$244,246,123	\$31,610,989*	\$15,472,500	\$291,329,612
Las Vegas	\$51,561,333	*	\$1,878,000	\$53,439,333
North Las Vegas	\$29,920,000	\$711,022	\$325,000	\$30,956,022
Henderson	\$159,764	\$495,870	\$74,864	\$730,498
Mesquite	\$5,151,749	\$3,628,302	\$10,000	\$8,790,051
COMBINED TOTALS	\$331,038,969	\$36,446,183	\$17,760,364	\$385,245,516

* Police refers to the Las Vegas Metropolitan Police Department (MF TRO) which is a jointly funded police force by Clark County and the City of Las Vegas. The projections for MF TRO have all been placed under Clark County projections.

Table 18 provides the total projected 24-year cost for Clark County and the local communities by public safety function. Of the total projected \$3,719,031,513, CCFD projections equal over \$2 billion of this total. Fire Departments' total projected fiscal cost estimates total over \$3 billion of the estimated \$3.7 billion. Indeed, Clark County, including METRO account for over \$2.5 billion of the more than \$3.7 billion projected during the 24-year shipping campaign. These projected costs to public safety agencies resulting from the siting of the repository and 24-year anticipated shipping campaign represent the potential for significant unfunded mandates and the County and communities will need to continue to plan for their impact.

Table 18 Total Projected Costs For Clark County and Local Jurisdictions 24-Year Projections

	Fire	Police *	Emergency Mgmt	Total Costs
Clark County *	\$2,058,613,280	\$394,323,975*	\$100,111,088	\$2,553,048,343
Las Vegas	\$526,590,127	*	\$36,355,329	\$562,945,456
North Las Vegas	\$310,547,085	\$9,506,627	\$12,186,992	\$332,240,705
Henderson	\$6,243,993	\$14,960,709	\$664,309	\$21,869,011
Mesquite	\$151,079,502	\$97,800,906	\$47,590	\$248,927,998
COMBINED TOTAL	\$3,053,073,987	\$122,268,242	\$149,365,308	\$3,719,031,513

* Police refers to the Las Vegas Metropolitan Police Department (METRO) which is a jointly funded police force by Clark County and the City of Las Vegas. The projections for METRO have all been placed under Clark County projections.

4.0 CONCLUSIONS AND NEXT STEPS.

As noted in Section 3.0, the projected public safety impacts resulting from the DOE's proposal to ship high-level nuclear waste to Yucca Mountain will result in a significant fiscal burden to Clark County and local jurisdictions. While the Nuclear Waste Policy Act requires the DOE to assist affected units of local government with public safety related impact costs it is not likely that DOE will provide adequate compensation for these impacts. While DOE continues to move forward with transportation planning for the proposed Caliente rail corridor, the likelihood that they will be successful in implementing rail routes in the early stages of the proposed shipment campaign is questionable. Therefore, Clark County must continue to be prepared for highway shipments during the initial years of the proposed Yucca Mountain high-level nuclear waste shipment program. Furthermore, even if the DOE is eventually

successful in implementing rail shipments along the Caliente rail corridor. Clark County will continue to be affected and be responsible for public safety impacts.

Thus, it is critical that Clark County continue to update their impact assessment costs on an annual basis and to continue to provide these costs to the DOE and other federal, state, and local decision makers. In addition, it is vital that Clark County continues to monitor the full range of potential public safety impacts to document Yucca Mountain related impacts for federal, state, and local decision makers.

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APPENDIX A The Case Study Method for Projecting Governmental Fiscal Costs

The case study method “employs intensive site-specific investigations to determine categories of excess or slack in public service delivery capacity.” Excess capacity exists when there is capacity beyond that needed to accommodate existing service need or demand, and deficient capacity exists when the current capacity is below what is needed or near the limits of what can be provided. These deficient or excess service capacities are subtracted from or added to the projected estimates of operating and capital demands. Hence, excess existing capacity can actually mitigate the effects of a project on a community, as it may already possess the capacity to meet these future or projected service needs and demands. Alternatively, should a community be at peak capacity or deficient capacity already exists, then additional demand may have far greater impact than an average cost technique would project. In fiscal impact analysis used by planners, when a new development results in, for example a new fire station, or rescue station, the new development may be charged for the entire cost. In a similar vein if a new project or mandate results in the necessity of new equipment, training, or various capital outlays, the relevant acts (NWPAA, NWPAAA) specify that the agent of these new costs be charged for the entire amount of the new capacity.

Several assumptions underlie the use of the case study cost projection method. Briefly, the first assumption is that communities differ in the degree to which they exhibit excess or deficient capacity. The second assumption is that marginal changes in providing various municipal and county services are a reaction to service excesses or deficiencies. A third assumption is that local standards (not national ones) in large part represent the criteria by which local excess and deficient service levels will be measured. Finally and most importantly, local department heads and personnel are the individuals that are best suited and most knowledgeable about the service capacity of their agencies, and about the future service needs associated with new projects or mandates. It is this case study method that has been used extensively on state agency personnel in Nevada to project the costs of the high-level nuclear waste repository at the state governmental level.

The case study methodology for estimating fiscal impacts was adopted for projecting fiscal costs to the governmental agencies in incorporated cities in Clark County. This methodology entails the following steps.

1. Convene a meeting of city and tribal representatives (and their selected emergency service representative from their city) to the Clark County Nuclear Waste Division’s (NWD) Advisory Committee to explain the purpose and methodology of the study and enlist their cooperation.
2. Contact and interview the city representative to the County Nuclear Waste Division’s Advisory Committee to identify the likely city agencies that will be impacted
3. Contact and interview these key governmental and public officials (emergency management, police, fire, budget, planning)
4. Categorize current local governmental services by function and the administrative agencies responsible for each (particular attention to each community’s governmental organization is required at this stage),

5. Determine current levels of service provision, as well as existing service excess or deficiency for various public services.
6. Project future service needs and demands using existing mandates and agency responsibilities, as well as through the interviews conducted;
7. Interview local agency personnel to determine how their departments will respond to the scenarios characterizing the nature of the future repository and transportation of waste, and how these scenarios will either result in the necessity of expanded capacities (or not) and the projected response of the agency;
8. Estimate fiscal costs that will be incurred by each affected agency and the affected units of local government as a result of their projected response to the scenarios (needed training, equipment, operational expenditures, and capital outlays over the life cycle of the project)

These steps in the methodology that was employed can be collapsed, and be viewed diagrammatically as the basic approach to projecting fiscal impacts from the proposed repository for city agencies. Figure 1.1 (in text) outlines the approach to projecting the fiscal impacts and it can be seen clearly that the process is iterative and non-linear. These steps are not linear as there are several contacts and interviews with agency personnel as the study progresses. Frequently, after an interview with agency personnel it is necessary to again interview that individual for clarification or draw on their expertise to adequately project the impacts of the project. Often interviews with agency staff members results in being referred to another member of an agency's personnel. In addition, in order to increase the comparability of the projections, interview schedules contained a basic set of questions that were developed and used for each informant interviewed.

APPENDIX B Summary of 2001 Scenarios

Scenario	Description
1	No accident of any kind has occurred. However, anti-nuclear environmental groups and property owners along the route (who claim that their property values will decrease) have generated considerable publicity. Residential property values have declined an average of 3.5% within one mile of the transportation corridor, while commercial properties have declined an average of 3.2% and industrial properties have declined an average of 1.25% within one mile of the transportation corridor
2	Shipments of nuclear waste to the Yucca Mountain repository site have progressed for several years without incident. Three days after New Year's Day 2010, the driver of a truck transporting nuclear waste loses control of the vehicle and runs into the median of Interstate 15. The cask containing the nuclear waste breaks away from the trailer and skids 50 yards along the median of I-15 in North Las Vegas. The cask remains intact and no radiation is released, but the national media covers the event heavily. Residential property values decline an average of 7.96% within one mile and an average of 4% between 1 and 3 miles of the transportation corridor; commercial property values decline an average of 7.4% within one mile and an average of 3% between 1 and 3 miles of the transportation corridor. Finally, industrial property values decline an average of 5.3% within one mile and an average of 2% between 1 and 3 miles of the transportation corridor
3*	An accident involving a truck carrying spent nuclear fuel and a gasoline tanker on I-15 near the Las Vegas Strip. The accident triggers a chain reaction collision. Twenty-seven civilians, four sheriff's deputies, and seven firefighters are hospitalized after exposure to radiation at the site of accident. Another 1,000 or more persons are exposed to radiation from the fire's radioactive plume. Experts indicate that 5 to 200 latent cancer fatalities may result from the accident. The affected highway and several access ramps are closed for four days. The two drivers of the spent fuel hauler and the gasoline tanker, and one driver-escort, died from head injuries and burns. Six months later the cleanup effort is still under way, and thousands of lawsuits have been filed. Preliminary reports estimate cleanup costs and economic losses in excess of \$1 billion. Residential property values decline an average of 33.8% within one mile and an average of 23.6% between 1 and 3 miles of the transportation corridor; commercial property values decline an average of 31.9% within one mile and an average of 20% between 1 and 3 miles of the transportation corridor. Finally, industrial property values decline an average of 25.5% within one mile and an average of 16.7% between 1 and 3 miles of the transportation corridor

*Source: State of Nevada, Nuclear Waste Project Office.

APPENDIX C 2005 Scenarios

Scenario 1—ALL COMMUNITIES MOSTLY TRUCK BASE CASE ROUTING

For 24-years beginning around July 2010, the U.S. Department of Energy (U.S. DOE) plans to ship high-level nuclear waste through Clark County to a repository that will be built at Yucca Mountain, Nevada. In the mostly truck scenario, the U.S. DOE plans to ship:

Shipments Planned Under Mostly Truck Scenario

Total number of legal-weight truck shipments over a 24-year shipping period:		52,786
Number of shipments per year	2,199	
Number of shipments per week		42
Number of shipments per day		6

There are two principal shipment routes for these truck shipments (See attached map1 for these route depictions)

For 45,919 of the legal-weight shipments:

- I-15 entering Clark County from Arizona via I-15 at Mesquite
- I-15 continuing on and traversing the Moapa Reservation to the
- Northern Beltway continuing on to
- U.S. 95 north traversing the Las Vegas Paiute Reservation to the repository

For 6,867 of the legal-weight shipments:

- I-15 entering Clark County from California at Primm to the
- Southern Beltway continuing on to
- U.S. 95 traversing the Las Vegas Paiute Reservation to the repository

Under the mostly truck shipping scenario there are between 100-300 train shipments involving the shipment of 300 Multi Purpose Canisters containing Spent Nuclear Fuel from INEEL in Idaho. These train shipments will entail heavy haul truck (HHT) shipments after arriving at an intermodal transfer facility in the Apex area north of Las Vegas where they will be loaded on these heavy haul trucks (one cask per HHT). These HHTs are 200+ feet long vehicles, and will be very slow moving at around 25-35 mph.

The shipment plan for the 100-300 rail shipments and 300 HHTs is:

- Union Pacific Main Line entering Clark County from Utah and Lincoln County (*see attached map2 for these depictions*)
- Traversing the Moapa Indian Reservation to intermodal transfer facility in the Apex area north of Las Vegas and transferred to HHTs
- HHT enter I-15 at U.S. 93 or at S.R. 604 (*see attached map 2*) to the
- Northern Beltway and on to
- U.S. 95 traversing the Las Vegas Paiute Reservation—

Scenario 2—All COMMUNITIES MOSTLY RAIL BASE CASE ROUTING

For a period of 24-years the U.S. Department of Energy (U.S. DOE) plans to ship high-level nuclear waste through Clark County to a repository that will be built at Yucca Mountain, Nevada. In the mostly rail scenario, the U.S. DOE plans to ship.

Shipments Planned Under the Mostly Rail Scenario

Total number of rail shipments through Clark County over a 24-year shipping period:	194-594
Total number of rail cask shipments that <i>would not</i> travel through Clark County	8,896-9,052

The principal shipment route for these rail shipments (see attached map2)

For the roughly 594 rail cask shipments:

- **Enter Clark County from CA. on the Union Pacific Main Line and**
- **Traverse Downtown Las Vegas and**
- **Travel to the Caliente Rail Spur Traversing the Moapa Indian Reservation**

Under the mostly rail shipment scenario there are approximately 1,079 legal-weight truck shipments into Clark County.

The shipment plan for these 1,079 legal-weight truck shipment is:

- **I-15 entering Clark County from Arizona via I-15 at Mesquite**
- **I-15 continuing on and traversing the Moapa Reservation to the**
- **Northern Beltway continuing on to**
- **U.S. 95 traversing the Las Vegas Paiute Reservation to the repository**

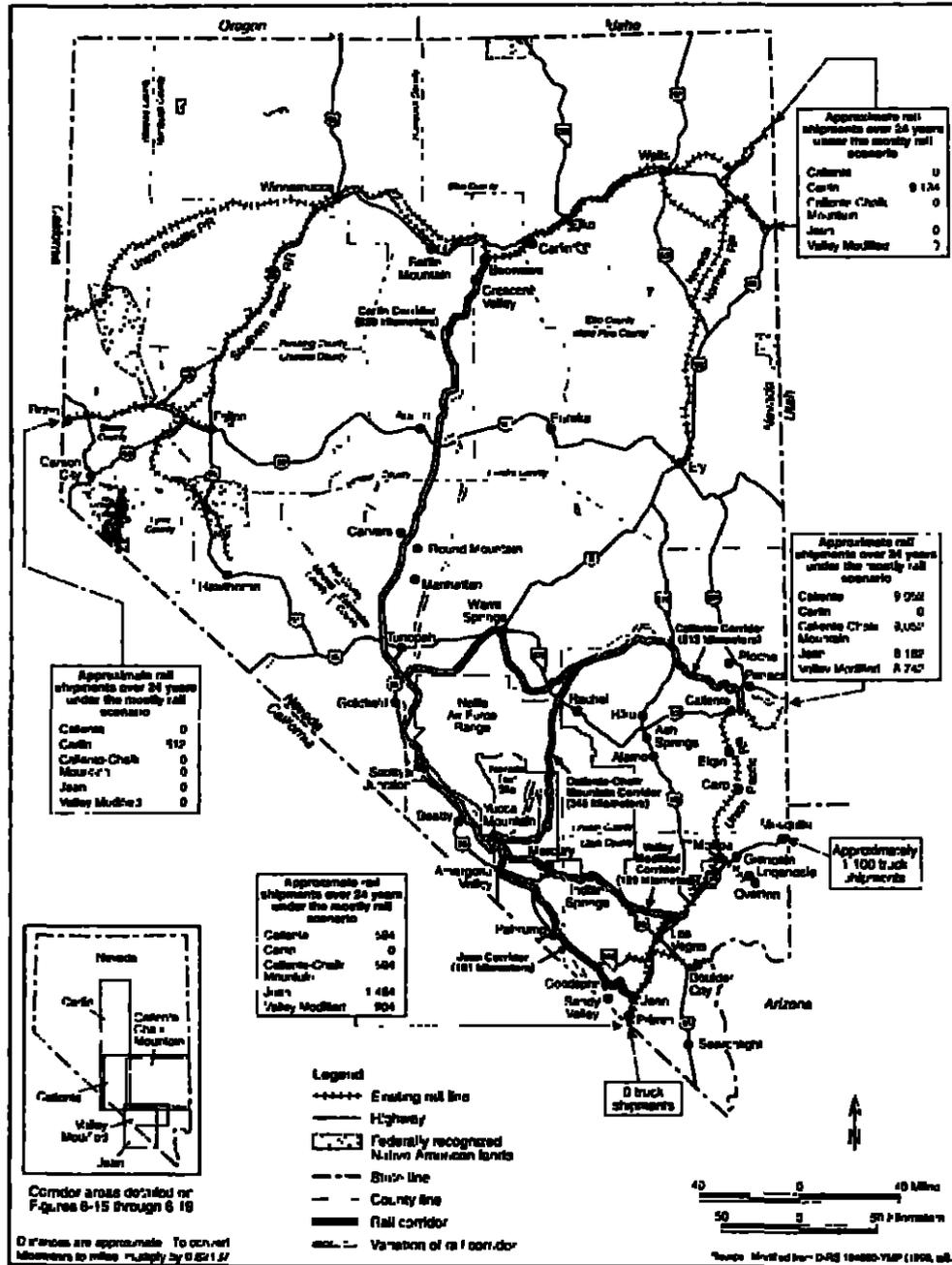


Figure 6-14. Potential Nevada rail routes to Yucca Mountain and estimated number of shipments for each route

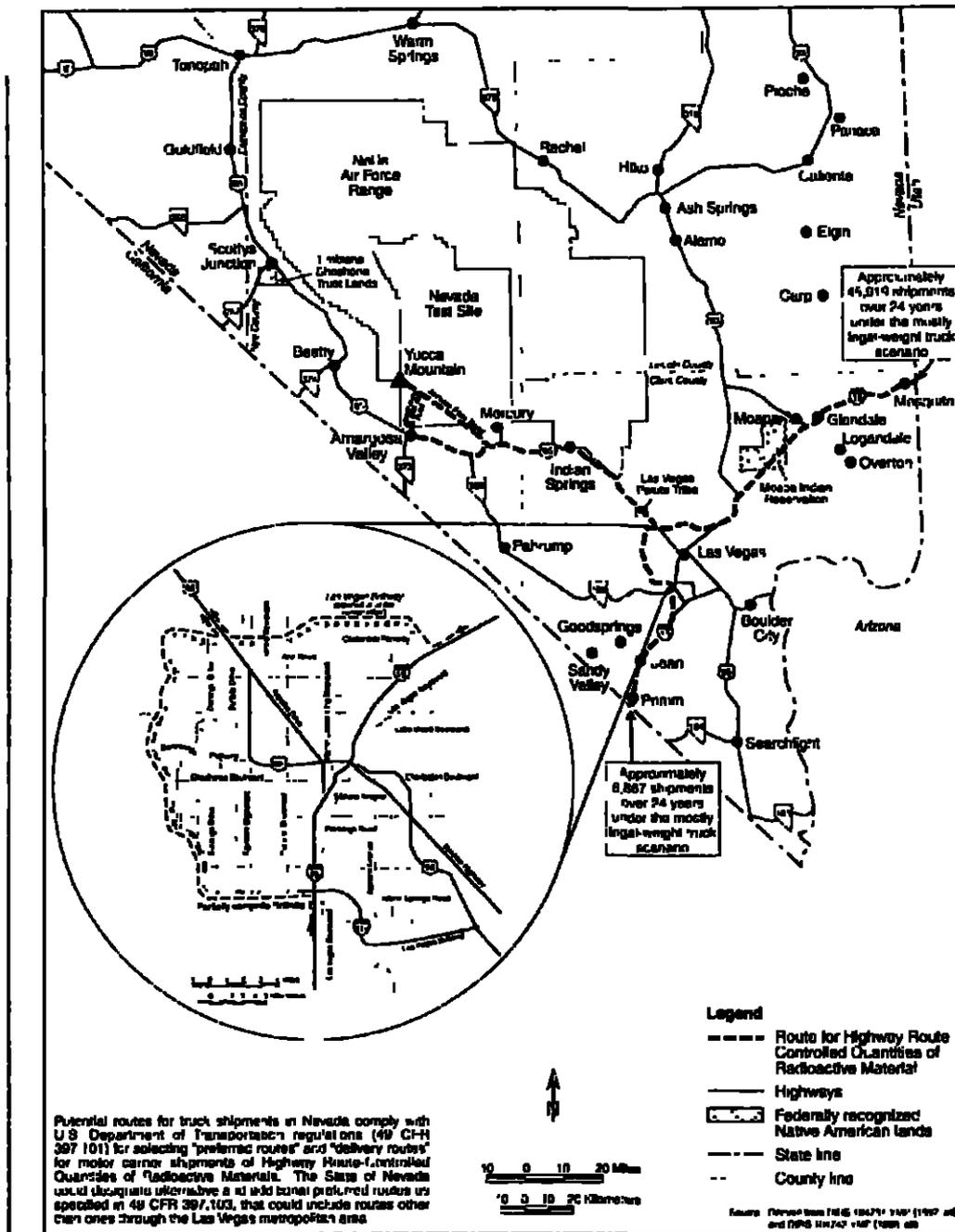


Figure 6-13. Potential Nevada routes for legal-weight trucks and estimated number of shipments

Accident Estimates			
	DOE Estimate	State Estimate Using DOE Data	State of NV Estimate
Mostly Truck	66 Truck	5-6 in NV	75 total
	0-1 Rail		
Mostly Rail	8 Rail	1 in NV	190 total and
	1 Truck		10-20 in NV
Most likely MRFA for both rail and truck is a long duration high-temperature fire that would engulf a cask (similar to the Baltimore Tunnel Fire)			
MRFA is most likely in a rural area			

APPENDIX D Task Force Members

Clark County Fire Department Members: Task Force Members

1. Earl Green, Fire Chief
2. William Kolar, Deputy Fire Chief, Task Force Leader
3. William Kourim, Deputy Fire Chief
4. Gary Sepich, Deputy Fire Chief
5. Fernandez Leary, Assistant Chief
6. Danny Ganier, Battalion Chief
7. Gina Geldbach-Hall, Battalion Chief
8. Richard Brenner, CCID Haz-Mat Coordinator
9. Jim Wilson, SNACC Communications Systems Manager

Representing the Las Vegas Metropolitan Police Force

10. Mike McCrimon, Lieutenant Emergency Management, Homeland Security Division
11. Kirk Primas, Lieutenant Office of Quality Assurance
12. Nancy Beaty, Analyst Office of Quality Assurance
13. Detective Bill Green, Office of Quality Assurance
14. Alan Grimm, Office of Quality Assurance
15. Under Sheriff Douglas Gillespie, Office of the Sheriff
16. Lieutenant Lombardo, METRO
17. Jeff Vialard, Detective METRO Rapid Assessment Team
18. Bob Chinn, Captain, Personnel Bureau
19. Lisa Hale, Payroll Manager
20. Marty Lehtinen, Lieutenant formerly with Emergency Management Section
(author of the 2001 METRO Report)
21. Janelle Kraft, Budget Director
22. Sam Pisacreta, Fleet Manager
23. Jim Schneidewent, Supply Manager
24. Daniel Zehnder, Sergeant

Clark County Office of Emergency Management

- 25. Jim O'Brien, Manager
- 26. Carolyn Levering, Plans and Operations Coordinator

City of Las Vegas

- 27. David Washington, Chief Las Vegas Fire and Rescue
- 28. Rick Gracia, Deputy Chief, Las Vegas Fire and Rescue
- 29. Jay Acebo, Battalion Chief, Las Vegas Fire and Rescue
- 30. Tim McAndrew, Emergency Manager
- 31. Maggie Plaster, Office of Administrative Services
- 32. Jeff Morgan, Deputy Chief Las Vegas Fire and Rescue
- 33. Greg Gammon, Deputy Chief Las Vegas Fire and Rescue
- 34. Ken Riddle, Deputy Chief Las Vegas Fire and Rescue

City of North Las Vegas

- 35. Terri Davis, Assistant Chief (at the time of the study Acting Fire Chief)
- 36. Patricia Loft, Emergency Management Coordinator
- 37. Michael Kincaid, Lieutenant North Las Vegas Police
- 38. Al Gillespie, Fire Chief
- 39. Jimmy Johnson, Assistant Fire Chief

Mesquite

- 40. Derek Hughes, Fire Chief
- 41. David Petersen, Deputy Fire Chief
- 42. Joe Szalay, Deputy Police Chief
- 43. Heidi Karin-Albrecht, former Manager, Emergency Management

City of Henderson

- 44. Mike Cyphers, Emergency Management Coordinator
- 45. Lieutenant James Green, Henderson Police

**Representing the Nuclear Waste Division, Clark County Department of
Comprehensive Planning:**

Alvin Mushkatel, Ph.D., Urban Environmental Research, L.L.C. Project Advisor

APPENDIX E Model Assumption and Cost Worksheet

PUBLIC SAFETY MODULE -						
ENTITY REQUIREMENT SUMMARY MODEL (MULTIPLIER AND COST ASSUMPTIONS)						
	Units	Clark County	Las Vegas	North Las Vegas	Henderson	Mesquite
Station Construction Costs						
Estimated Station Cost	\$ Per Square Foot	\$230	\$0	\$0	\$230	\$230
Average Size of a Station	Square Feet	\$25,000	\$0	\$0	\$25,000	\$25,000
Station Land Requirement	Acres	\$5	\$0	\$0	\$5	\$5
Station Land Cost	\$ Per Square Foot	\$12	\$0	\$0	\$12	\$12
Station Furniture, Fixtures and Equipment Costs	\$ Per Square Foot	\$73	\$0	\$0	\$73	\$73
Station Site Development Costs	\$ Per Station	\$500,000	\$0	\$0	\$500,000	\$500,000
Fuel Tank Farm	\$ Per Station	\$200,000	\$0	\$0	\$200,000	\$200,000
Station Construction Cost (Unspecified)	\$ Per Station	\$0	\$4,100,000	\$4,500,000	\$0	\$0
Annual Facility Operations & Maintenance Costs	\$ Per Station			\$40,000		
Station Equipment Costs						
CBRN Engine w/ Equipment	\$ Per Unit	\$681,760	\$0	\$0	\$681,760	\$681,760
Truck w/ Equipment	\$ Per Unit	\$885,331	\$0	\$0	\$885,331	\$885,331
Rescue w/ Equipment	\$ Per Unit	\$218,876	\$0	\$0	\$218,876	\$218,876
Haz-Mat Unit w/ Equipment	\$ Per Unit	\$700,000	\$0	\$0	\$700,000	\$700,000
Heavy Rescue Engine w/ Equip	\$ Per Unit	\$650,000	\$0	\$0	\$650,000	\$650,000
Mobile Air Unit w/ Equipment	\$ Per Unit	\$330,000	\$0	\$0	\$330,000	\$330,000
Disaster Mitigation Apparatus 1	\$ Per Unit	\$1,389,982	\$0	\$0	\$1,389,982	\$1,389,982
Disaster Mitigation Apparatus 2	\$ Per Unit	\$1,197,000	\$0	\$0	\$1,197,000	\$1,197,000
Suppression Personnel Costs						
Battalion Chief	Annual Cost	\$172,678	\$0	\$0	\$172,678	\$172,678
Captain	Annual Cost	\$160,957	\$0	\$0	\$160,957	\$160,957
Engineer	Annual Cost	\$141,620	\$0	\$0	\$141,620	\$141,620
Firefighter	Annual Cost	\$122,883	\$0	\$0	\$122,883	\$122,883
Communications Costs						
Tower	\$ Per Unit	\$10,000	\$0	\$0	\$10,000	\$10,000
Microwave System	\$ Per Unit	\$175,000	\$0	\$0	\$175,000	\$175,000
Radios for all personnel	\$ Per Unit	\$3,740	\$0	\$0	\$3,740	\$3,740
Batteries for radios	\$ Per Unit	\$125	\$0	\$0	\$125	\$125
Battery Analyzer	\$ Per Unit	\$1,500	\$0	\$0	\$1,500	\$1,500
Haz-Mat In-Suit Communicator	\$ Per Unit	\$1,500	\$0	\$0	\$1,500	\$1,500

Bank Charges	\$ Per Unit	\$700	\$0	\$0	\$700	\$700
SNACC Operating System Cost	\$ Per Unit	\$187	\$0	\$0	\$187	\$187
Capital Buy-In (One time fee)	\$ Per Unit	\$1,500	\$0	\$0	\$1,500	\$1,500
Annual Telephone Cost	\$ Per Station	\$3,697	\$0	\$0	\$3,697	\$3,697
Air Support Costs						
SCBA Backpacks	\$ Per Unit	\$2,273	\$0	\$0	\$2,273	\$2,273
SCBA Bottles- 30 minute	\$ Per Unit	\$823	\$0	\$0	\$823	\$823
Haz-Mat SCBA Backpacks	\$ Per Unit	\$1,820	\$0	\$0	\$1,820	\$1,820
SCBA Bottles- 1 hour	\$ Per Unit	\$1,148	\$0	\$0	\$1,148	\$1,148
SCBA Mask	\$ Per Unit	\$503	\$0	\$0	\$503	\$503
RIT Bags	\$ Per Unit	\$1,290	\$0	\$0	\$1,290	\$1,290
Additional yearly operating cost	\$ Per Unit	\$280	\$0	\$0	\$280	\$280
Supervisor for SCBA Division	Annual Cost	\$90,502	\$0	\$0	\$90,502	\$90,502
Support Vehicle Costs						
Suburban	\$ Per Unit	\$33,852	\$0	\$0	\$33,852	\$33,852
Sedan	\$ Per Unit	\$25,000	\$0	\$0	\$25,000	\$25,000
Van	\$ Per Unit	\$40,000	\$0	\$0	\$40,000	\$40,000
Pick-up Flat Bed Truck	\$ Per Unit	\$50,600	\$0	\$0	\$50,600	\$50,600
Mechanics Truck	\$ Per Unit	\$29,348	\$0	\$0	\$29,348	\$29,348
Unit upgrades (Code 1 Equip, etc.)	\$ Per Unit	\$28,500	\$0	\$0	\$28,500	\$28,500
Administrative Support Costs						
Deputy Chief	Annual Cost	\$182,077	\$0	\$0	\$182,077	\$182,077
Assistant Chief	Annual Cost	\$169,154	\$0	\$0	\$169,154	\$169,154
Materials Controller	Annual Cost	\$90,502	\$0	\$0	\$90,502	\$90,502
Mechanic	Annual Cost	\$99,972	\$0	\$0	\$99,972	\$99,972
Public Information Officers	Annual Cost	\$110,718	\$0	\$0	\$110,718	\$110,718
Alarm Office Dispatcher	Annual Cost	\$90,200	\$0	\$0	\$90,200	\$90,200
Insort/Inspection Personnel	Annual Cost	\$124,961	\$0	\$0	\$124,961	\$124,961
Radiation Safety Officer	Annual Cost	\$154,740	\$0	\$0	\$154,740	\$154,740
Miscellaneous Station related Costs						
Warehouse Inventory	\$ Per Station	\$900,000	\$0	\$0	\$900,000	\$900,000
Turnout Ensemble	\$ Per Unit	\$1,508	\$0	\$0	\$1,508	\$1,508
Cleaning/Repairing of Turnouts	\$ Per Unit	\$120	\$0	\$0	\$120	\$120
Tank Farm Operating Expenses	\$ Per Unit	\$4,000	\$0	\$0	\$4,000	\$4,000
Annual Training Cost	\$ Per Person	\$2,108	\$0	\$0	\$2,108	\$2,108
Annual Services and Supplies	\$ Per Station	\$252,113	\$0	\$0	\$252,113	\$252,113
Apparatus Maintenance Cost	\$ Per Unit	\$18,042	\$0	\$0	\$18,042	\$18,042
Fuel Cost	\$ Per Station	\$46,667	\$0	\$0	\$46,667	\$46,667
Recruit Academy Cost	\$ Per Person	\$15,326	\$0	\$0	\$15,326	\$15,326

Regional Training Center Costs						
Construction Cost	\$ Per RTC	\$25,000,000	\$0	\$0	\$25,000,000	\$25,000,000
Estimates Acreage Requirement	Acres Per RTC	\$150	\$0	\$0	\$150	\$150
Estimated Acre Land Cost	\$ Per Acre	\$12	\$0	\$0	\$12	\$12
Site Development/Upgrades	\$ Per RTC	\$500,000	\$0	\$0	\$500,000	\$500,000
Fuel Tank Farm (Initial Cost)	\$ Per RTC	\$200,000	\$0	\$0	\$200,000	\$200,000
Total Regional Training Center Employment	# Per RTC	\$777	\$0	\$0	\$777	\$777
Training Center Construction Cost (Unspecified)	\$ Per RTC	\$0	\$9,200,000	\$10,000,000	\$0	\$0
Regional Training Center Personnel Costs						
Deputy Chief	Annual Cost	\$182,057	\$0	\$0	\$0	\$0
Assistant Chief	Annual Cost	\$169,174	\$0	\$0	\$0	\$0
Administrative Battalion Chief	Annual Cost	\$172,678	\$0	\$0	\$0	\$0
Training Officers	Annual Cost	\$132,719	\$0	\$0	\$0	\$0
Training Instructors	Annual Cost	\$119,239	\$0	\$0	\$0	\$0
Administrative Specialist	Annual Cost	\$90,702	\$0	\$0	\$0	\$0
Maintenance Controller	Annual Cost	\$90,502	\$0	\$0	\$0	\$0
Mechanic	Annual Cost	\$89,972	\$0	\$0	\$0	\$0
Dispatchers	Annual Cost	\$80,200	\$0	\$0	\$0	\$0
Warehouse Employees (Cadets)	Annual Cost	\$21,000	\$0	\$0	\$0	\$0
Regional Training Center Communications Costs						
Tower	\$ Per Unit	\$10,000	\$0	\$0	\$0	\$0
Microwave System	\$ Per Unit	\$175,000	\$0	\$0	\$0	\$0
Radios for all personnel	\$ Per Unit	\$3,740	\$0	\$0	\$0	\$0
Batteries for radios	\$ Per Unit	\$125	\$0	\$0	\$0	\$0
Battery Analyzer	\$ Per Unit	\$1,500	\$0	\$0	\$0	\$0
Bank Chargers	\$ Per Unit	\$700	\$0	\$0	\$0	\$0
SNAC Operating System Cost	\$ Per Unit	\$185	\$0	\$0	\$0	\$0
Capitol Buy-In (One time fee)	\$ Per Unit	\$1,500	\$0	\$0	\$0	\$0
Emergency Operations Center	\$ Per Center	\$5,000,000	\$0	\$0	\$0	\$0
Annual Telephone Cost	\$ Per Center	\$5,000	\$0	\$0	\$0	\$0
Regional Training Center Training Costs						
Station Tech Training - Number of Techs	# of Techs	\$186	\$0	\$0	\$0	\$0
Station Tech Training - Number of Hours Required	# of Hours	\$300	\$0	\$0	\$0	\$0

Station Tech Training - Cost Per Hour	\$ Per Hour	\$78	\$0	\$0	\$0	\$0
Initial Training - Personnel Count	# of Personnel	\$640	\$0	\$0	\$0	\$0
Initial Training Number of Training Hours Required	# of Hours	\$8	\$0	\$0	\$0	\$0
Initial Training - Cost Per Hour	\$ Per Hour	\$78	\$0	\$0	\$0	\$0
On-going Training - Personnel Count	# of Personnel	\$640	\$0	\$0	\$0	\$0
On-going Training - Number of Training Hours Required	# of Hours	\$4	\$0	\$0	\$0	\$0
On-going Training - Cost Per Hour	\$ Per Hour	\$38	\$0	\$0	\$0	\$0
Recruit Academy Cost	\$ Per Person	\$15,126	\$0	\$0	\$0	\$0
Regional Training Center Equipment Costs						
CBRN Engine Equipment	\$ Per Unit	\$165,601	\$0	\$0	\$0	\$0
Heavy Rescue Equipment	\$ Per Unit	\$200,000	\$0	\$0	\$0	\$0
Truck Equipment	\$ Per Unit	\$110,331	\$0	\$0	\$0	\$0
Haz Mat Equipment	\$ Per Unit	\$200,000	\$0	\$0	\$0	\$0
Rescue Equipment	\$ Per Unit	\$68,876	\$0	\$0	\$0	\$0
Regional Training Center Air Support Costs						
SCBA Backpacks	\$ Per Unit	\$2,273	\$0	\$0	\$0	\$0
SCBA Bottles- 30 minute	\$ Per Unit	\$823	\$0	\$0	\$0	\$0
SCBA Air Mask	\$ Per Unit	\$503	\$0	\$0	\$0	\$0
Haz Mat SCBA Backpacks	\$ Per Unit	\$1,820	\$0	\$0	\$0	\$0
SCBA Bottles- 1 hour	\$ Per Unit	\$1,148	\$0	\$0	\$0	\$0
RIT Rags	\$ Per Unit	\$1,290	\$0	\$0	\$0	\$0
Yearly operating cost for system	\$ Per Unit	\$280	\$0	\$0	\$0	\$0
Regional Training Center Support Vehicle Costs						
Flat Bed Truck, Heavy Duty	\$ Per Unit	\$90,600	\$0	\$0	\$0	\$0
Mechanic Truck	\$ Per Unit	\$29,348	\$0	\$0	\$0	\$0
Bus	\$ Per Unit	\$100,000	\$0	\$0	\$0	\$0
Van	\$ Per Unit	\$90,000	\$0	\$0	\$0	\$0
Suburban	\$ Per Unit	\$39,852	\$0	\$0	\$0	\$0
Sedan	\$ Per Unit	\$25,000	\$0	\$0	\$0	\$0
Unit upgrades (Code % Equip, etc)	\$ Per Unit	\$28,500	\$0	\$0	\$0	\$0
Regional Training Center Miscellaneous Costs						
Annual Tel. phone/ satellite Cost	\$ Per RTU	\$12,500	\$0	\$0	\$0	\$0
Fuel Tank Farm	\$ Per RTU	\$4,000	\$0	\$0	\$0	\$0
Fuel	\$ Per RTU	\$15,000	\$0	\$0	\$0	\$0

(LPG/Gas/Diesel)						
General Operating Expenses	\$ Per RTU Employee	\$2,408	\$0	\$0	\$0	\$0
Fuel Cost (vehicles only)	\$ Per RTU	\$27,000	\$0	\$0	\$0	\$0
APCO Communications Network Cost	\$ Per Network	\$25,000,000	\$25,000,000	\$25,000,000	\$25,000,000	\$25,000,000
Helicopter Equipment Costs						
Bell Augusta AB 139	\$ Per Helicopter	\$8,966,750	\$8,966,750	\$8,966,750	\$8,966,750	\$8,966,750
Equipment Cost	\$ Per Helicopter	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
Helicopter Personnel Costs						
Pilot(s)	\$ Per Helicopter	\$2	\$2	\$2	\$2	\$2
Cost Per Pilot	Annual Cost	\$160,957	\$160,957	\$160,957	\$160,957	\$160,957
Mechanics	\$ Per Helicopter	\$1	\$1	\$1	\$1	\$1
Cost Per Mechanic	Annual Cost	\$99,972	\$99,972	\$99,972	\$99,972	\$99,972
Crew Chief	\$ Per Helicopter	\$1	\$1	\$1	\$1	\$1
Cost Per Crew Chief	Annual Cost	\$160,957	\$160,957	\$160,957	\$160,957	\$160,957
Annual Helicopter Training Costs						
Crew Training	# of Hours Per Crew	\$200	\$200	\$200	\$200	\$200
Crew Training Costs	\$ Per Hour	\$78	\$78	\$78	\$78	\$78
FAA/ Aircraft Recertification	n a	\$0	\$0	\$0	\$0	\$0
Annual Helicopter Operations Costs						
Operating Cost Per Hour	\$ Per Hour of Operation	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
Average Hours of Operation	# of Hours	\$200	\$200	\$200	\$200	\$200
Insurance Cost	\$ Per Helicopter	\$400,000	\$400,000	\$100,000	\$400,000	\$400,000
Annual Storage Costs						
Hanger Cost	\$ Per Helicopter	\$25,500	\$25,500	\$25,500	\$25,500	\$25,500
Warehouse Cost	\$ Per Helicopter	\$350	\$350	\$350	\$350	\$350
Emergency Management						
Facility Construction and Development Costs						
	Square feet	\$15,000	\$15,000	\$0	\$0	\$0
	\$ Per Square Foot	\$150	\$150	\$0	\$0	\$0
	\$ Per Facility	\$5,000,000	\$5,000,000	\$0	\$0	\$0
	\$ Per Facility	\$5,000,000	\$5,000,000	\$0	\$0	\$0
Facility Staffing and Operational Expenses						
	\$ Per Person	\$125,000	\$125,000	\$0	\$0	\$0
	\$ Per Person	\$110,000	\$110,000	\$0	\$0	\$0
	\$ Per Person	\$60,000	\$60,000	\$0	\$0	\$0
	\$ Per Facility	\$700,000	\$700,000	\$0	\$0	\$0
	\$ Per Person	\$0	\$0	\$75,000	\$0	\$0
	\$ Per Facility	\$250,000	\$250,000	\$200,000	\$0	\$0

Training Costs						
	Annual Program Cost	\$0	\$5,000	\$0	\$0	\$0
	Annual Program Cost	\$0	\$10,000	\$0	\$0	\$0
	Annual Program Cost	\$0	\$5,000	\$0	\$0	\$0
	Annual Program Cost	\$0	\$96,000	\$0	\$0	\$0
Public Awareness Program Costs						
	Annual Program Cost	\$0	\$30,000	\$0	\$0	\$0
	Annual Program Cost	\$0	\$750,000	\$0	\$0	\$0
	Annual Program Cost	\$0	\$500,000	\$0	\$0	\$0
Ad Hoc Requirements Fire						
Personnel						
	Annual Cost	\$182,057	\$182,057	\$182,057	\$182,057	\$182,057
	Annual Cost	\$169,134	\$169,134	\$169,134	\$169,134	\$169,134
	Annual Cost	\$172,678	\$97,938	\$158,207	\$172,678	\$172,678
	Annual Cost	\$160,957	\$81,868	\$117,468	\$160,957	\$160,957
	Annual Cost	\$0	\$222,972	\$0	\$0	\$0
	Annual Cost	\$111,620	\$77,112	\$129,752	\$111,620	\$141,620
	Annual Cost	\$0	\$194,988	\$0	\$0	\$0
	Annual Cost	\$122,883	\$68,609	\$112,785	\$122,883	\$88,771
	Annual Cost	\$0	\$130,195	\$0	\$0	\$0
	Annual Cost	\$0	\$78,363	\$71,796	\$0	\$0
	Annual Cost	\$0	\$205,816	\$0	\$0	\$0
	Annual Cost	\$132,719	\$93,719	\$121,597	\$132,719	\$95,876
	Annual Cost	\$119,239	\$119,239	\$119,239	\$119,239	\$119,239
	Annual Cost	\$90,502	\$90,502	\$90,502	\$90,502	\$65,379
	Annual Cost	\$140,719	\$110,719	\$140,719	\$140,719	\$140,719
	Annual Cost	\$99,972	\$99,972	\$99,972	\$99,972	\$99,972
	Annual Cost	\$90,502	\$90,502	\$90,502	\$90,502	\$90,502
	Annual Cost	\$90,200	\$90,200	\$90,200	\$90,200	\$90,200
	Annual Cost	\$90,200	\$90,200	\$90,200	\$90,200	\$90,200
	Annual Cost	\$124,961	\$124,961	\$124,961	\$121,961	\$121,961
	Annual Cost	\$151,740	\$151,740	\$154,740	\$151,740	\$154,740
	Annual Cost	\$24,000	\$24,000	\$24,000	\$24,000	\$24,000
Training						
	Per Person	\$0	\$19,129	\$0	\$0	\$0
	Per Person	\$0	\$18,839	\$0	\$0	\$0
	Per Person	\$0	\$17,193	\$0	\$0	\$0
	Per Person	\$0	\$14,921	\$0	\$0	\$0
	Per Person	\$0	\$19,849	\$0	\$0	\$0
	Per Person	\$0	\$6,476	\$0	\$0	\$0
	Per Person	\$0	\$6,279	\$0	\$0	\$0
	Per Person	\$0	\$5,742	\$0	\$0	\$0
	Per Person	\$0	\$4,974	\$0	\$0	\$0
	Per Person	\$0	\$6,995	\$0	\$0	\$0
	# Per Person	\$0	\$8	\$0	\$0	\$0
	\$ Per Hour	\$0	\$384	\$0	\$0	\$0
	\$ Per Hour	\$0	\$145	\$0	\$0	\$0
	\$ Per Hour	\$0	\$417	\$0	\$0	\$0

	\$ Per Unit	\$0	\$32,500	\$0	\$0	\$0
	\$ Per Unit	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
	\$ Per Unit	\$99,000	\$99,000	\$99,000	\$99,000	\$99,000
	\$ Per Unit	\$97,000	\$97,000	\$97,000	\$97,000	\$97,000
	\$ Per Unit	\$1,389,982	\$1,389,982	\$1,389,982	\$1,389,982	\$1,389,982
	\$ Per Unit	\$1,197,000	\$1,197,000	\$1,197,000	\$1,197,000	\$1,197,000
	\$ Per Unit	\$0	\$1,925	\$0	\$0	\$0
	\$ Per Unit	\$0	\$170	\$0	\$0	\$0
	\$ Per Unit	\$0	\$195	\$0	\$0	\$0
	\$ Per Unit	\$0	\$80	\$0	\$0	\$0
	\$ Per Unit	\$0	\$1	\$0	\$0	\$0
	\$ Per Unit	\$0	\$250,000	\$0	\$0	\$0
	\$ Per Unit				\$2,680	
	Total	\$0	\$0	\$910,000	\$0	\$1,400,000
	\$ Per Year	\$0	\$0	\$92,000	\$0	\$1,400,000
Vehicles						
	\$ Per Unit	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000
	\$ Per Unit	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000
	\$ Per Unit	\$33,852	\$33,852	\$33,852	\$33,852	\$33,852
	\$ Per Unit	\$50,600	\$50,600	\$50,600	\$50,600	\$50,600
	\$ Per Unit	\$29,348	\$29,348	\$29,348	\$29,348	\$29,348
	\$ Per Unit					
	\$ Per Unit	\$28,500	\$28,500	\$28,500	\$28,500	\$28,500
Related Fuel Costs						
	\$ Per Vehicle	\$5,423	\$5,423	\$5,423	\$5,423	\$5,423
	\$ Per Vehicle	\$8,061	\$8,061	\$8,061	\$8,061	\$8,061
	\$ Per Vehicle	\$7,505	\$7,505	\$7,505	\$7,505	\$7,505
	\$ Per Vehicle	\$7,512	\$7,512	\$7,512	\$7,512	\$7,512
	\$ Per Vehicle	\$4,515	\$4,515	\$4,515	\$4,515	\$4,515
	\$ Per Vehicle	\$2,178	\$2,178	\$2,178	\$2,178	\$2,178
	\$ Per Vehicle	\$2,682	\$2,682	\$2,682	\$2,682	\$2,682
	\$ Per Vehicle	\$3,133	\$3,133	\$3,133	\$3,133	\$3,133
	\$ Per Vehicle	\$4,158	\$4,158	\$4,158	\$4,158	\$4,158
	\$ Per Vehicle	\$1,843	\$1,843	\$1,843	\$1,843	\$1,843
	\$ Per Vehicle	\$175	\$175	\$175	\$175	\$175
Related Air Support Costs						
	# Per Engine	\$5	\$0	\$5	\$5	\$5
	# Per Truck	\$5	\$0	\$5	\$5	\$5
	# Per Rescue	\$2	\$0	\$2	\$2	\$2
	# Per Engine	\$5	\$0	\$5	\$5	\$5
	# Per Haz-Mat	\$5	\$0	\$5	\$5	\$5
	# Per Backpack	\$5	\$0	\$5	\$5	\$5
	# Per Haz Mat	\$8	\$0	\$8	\$8	\$8
	# Per Haz Backpack	\$3	\$0	\$3	\$3	\$3
	# Per Backpack	\$1	\$0	\$1	\$1	\$1
	# Per Apparatus	\$1	\$0	\$1	\$1	\$1
	# Per RIT Box	\$1	\$0	\$1	\$1	\$1
	# Per RIT Box	\$1	\$0	\$1	\$1	\$1
	\$ Per Unit	\$2,273	\$0	\$2,273	\$2,273	\$2,273
	\$ Per Bottle	\$823	\$0	\$823	\$823	\$823
	\$ Per Unit	\$1,820	\$0	\$1,820	\$1,820	\$1,820
	\$ Per Bottle	\$1,148	\$1,000	\$1,148	\$1,148	\$1,148
	\$ Per Unit	\$503	\$0	\$503	\$503	\$503
	\$ Per Unit	\$347	\$0	\$347	\$347	\$347
	\$ Per Unit	\$452	\$0	\$452	\$452	\$452

	\$ Per Unit	\$491	\$0	\$191	\$491	\$491
	Total Cost	\$0	\$3,000	\$0	\$0	\$0
Ad Hoc Requirements - Police						
Personnel						
	\$ Per Person	\$104,901	\$104,901	\$0	\$0	\$0
	\$ Per Person	\$88,894	\$88,894	\$0	\$0	\$0
	\$ Per Person	\$104,901	\$104,901	\$0	\$0	\$0
	\$ Per Person	\$88,894	\$88,894	\$0	\$0	\$0
	\$ Per Person	\$160,977	\$160,977	\$0	\$0	\$0
	\$ Per Person	\$99,972	\$99,972	\$0	\$0	\$0
	\$ Per Person	\$160,977	\$160,977	\$0	\$0	\$0
	\$ Per Person	\$49,223	\$49,223	\$0	\$0	\$0
	\$ Per Person	\$91,527	\$91,527	\$0	\$0	\$0
Training						
	\$ Per Person	\$17,000	\$17,000	\$0	\$0	\$0
	\$ Per Person	\$0	\$0	\$0	\$0	\$78,185
	\$ Per Person	\$0	\$0	\$1,200	\$1,394	\$4,944
	\$ Per Unit	\$6,108	\$6,108	\$0	\$0	\$0
	\$ Per Unit	\$914	\$914	\$0	\$0	\$0
	\$ Per Unit	\$10,000	\$10,000	\$0	\$0	\$0
	\$ Per Unit	\$41,000	\$41,000	\$0	\$0	\$0
	\$ Per Unit	\$44,800	\$44,800	\$0	\$0	\$0
	\$ Per Unit	\$7,800	\$7,800	\$0	\$0	\$0
	\$ Per Unit	\$750	\$730	\$0	\$0	\$0
	# of Hours	\$6	\$6	\$0	\$0	\$0
	\$ Per Hour	\$81	\$81	\$0	\$0	\$0
	\$ Per Hour	\$67	\$67	\$0	\$0	\$0
	\$ Per Hour	\$37	\$37	\$0	\$0	\$0
	\$ Per Hour	\$48	\$48	\$0	\$0	\$0
	# of Hours	\$6	\$6	\$0	\$0	\$0
	\$ Per Hour	\$48	\$48	\$0	\$0	\$0
	\$ Per Hour	\$41	\$41	\$0	\$0	\$0
	\$ Per Hour	\$35	\$35	\$0	\$0	\$0
	\$ Per Hour	\$78	\$78	\$0	\$0	\$0
Equipment						
	\$ Per Unit	\$25,500	\$25,500	\$0	\$0	\$0
	\$ Per Unit	\$47,985	\$47,985	\$0	\$0	\$0
	\$ Per Unit	\$730,000	\$730,000	\$0	\$0	\$0
	\$ Per Unit	\$40,000	\$40,000	\$0	\$0	\$0
	\$ Per Unit	\$70,000	\$70,000	\$0	\$0	\$0
	\$ Per Unit	\$30,000	\$30,000	\$0	\$0	\$0
	\$ Per Unit	\$30,000	\$30,000	\$0	\$0	\$0

APPENDIX F Useful Life

Appendix F contains the useful life schedule. Useful life is the length of time some equipment or other asset is expected to be useable. The table in Appendix F provides the number of years of expected use from each asset (such as a building) and the remaining years of expected use at the intervals provided (5, 10, 15, 20, 24-years). The table in Appendix F provides the projected useful life for all equipment and other assets identified in the study, as well as allowing us to identify which equipment and assets will need to be replaced (and at what time) during the anticipated 24-year DOE shipping campaign.

	Base Year	Year 5	Year 10	Year 15	Year 20	Year 24
FIRE STATIONS						
Station Construction Cost						
Estimated Station Cost	50	46	41	36	31	27
Estimated Land Cost (5 acre parcel)	100	96	91	86	81	77
Fixtures, Furnishings, & Equip	20	16	11	6	1	18
Site Development/Upgrades	50	46	41	36	31	27
Fuel Tank Farm (initial cost)	50	46	41	36	31	27
Station Construction Cost (unspecified)	50	46	41	36	31	27
Station Construction Subtotal						
Station Operations & Maintenance Costs (not otherwise specified)	-	-	-	-	-	-
Apparatus						
CBRNE Engine w/ Equipment	10	6	1	7	2	9
Truck w/ Equipment	10	6	1	7	2	9
Rescue w/ Equipment	10	6	1	7	2	9
Haz-Mat Unit w/ Equipment	10	6	1	7	2	9
Heavy Rescue Engine w/ Equip	10	6	1	7	2	9
Mobile Air Unit w/ Equipment	10	6	1	7	2	9
Disaster Mitigation Apparatus 1	10	6	1	7	2	9
Disaster Mitigation Apparatus 2	10	6	1	7	2	9

Apparatus Subtotal**Suppression Personnel**

Battalion Chief	-	-	-	-	-	-
Captain	-	-	-	-	-	-
Engineer	-	-	-	-	-	-
Firefighter	-	-	-	-	-	-
Suppression Personnel Subtotal	-	-	-	-	-	-

Communications

Tower	25	21	16	11	6	2
Microwave System	25	21	16	11	6	2
Radios for all personnel	10	6	1	7	2	9
Batteries for radios	3	3	2	1	-	-
Battery Analyzer	5	1	2	3	4	-
Haz-Mat In-Suit Communicator	5	1	2	3	4	-
Bank Chargers	5	1	2	3	4	-
SNACC Operating System Cost	-	-	-	-	-	-
Capitol Buy-In (One time fee)	10	6	1	7	2	9
Annual Telephone Cost	-	-	-	-	-	-
Communications Subtotal						

Air Support (SCBA)

SCBA Backpacks	15	11	6	1	12	8
SCBA Bottles- 30 minute	15	11	6	1	12	8
Haz-Mat SCBA Backpacks	15	11	6	1	12	8
SCBA Bottles- 1 hour	15	11	6	1	12	8
SCBA Mask	15	11	6	1	12	8
RIT Bags	15	11	6	1	12	8
SCBA Annual Operating Costs	-	-	-	-	-	-
Supervisor for SCBA						

Division	-	-	-	-	-	-
Air Support (SCBA) Subtotal	-	-	-	-	-	-
Support Vehicles						
Suburban	7	3	6	1	4	-
Sedan	7	3	6	1	4	-
Van	7	3	6	1	4	-
Pick-up Flat Bed Truck	7	3	6	1	4	-
Mechanics Truck	7	3	6	1	4	-
Unit upgrades (Code 3, Equip, etc)	7	3	6	1	4	-
Support Vehicle Subtotal	-	-	-	-	-	-
Support Personnel						
Deputy Chief	-	-	-	-	-	-
Assistant Chief	-	-	-	-	-	-
Materials Controller	-	-	-	-	-	-
Mechanic	-	-	-	-	-	-
Public Information Officers	-	-	-	-	-	-
Alarm Office Dispatcher Escort/Inspection Personnel	-	-	-	-	-	-
Radiation Safety Officer	-	-	-	-	-	-
Support Personnel Subtotal	-	-	-	-	-	-
Miscellaneous						
Warehouse Inventory	-	-	-	-	-	-
Turnout Ensemble Cleaning/Repairing of Turnouts	7	3	6	1	4	-
Tank Farm Operating Expenses	-	-	-	-	-	-
Annual Training Cost Annual Services and Supplies	-	-	-	-	-	-

Vehicle Maintenance Cost	-	-	-	-	-	-
Fuel Cost	-	-	-	-	-	-
Recruit Academy Cost	30	26	21	16	11	7
Miscellaneous Subtotal	-	-	-	-	-	-
Regional Training Center Construction Cost						
Estimated Facility Construction Cost	50	46	41	36	31	27
Estimated Land Acquisition Cost	100	96	91	86	81	77
Site Development/Upgrades	50	46	41	36	31	27
Fuel Tank Farm (Initial Cost)	50	46	41	36	31	27
Training Center Construction Cost (Unspecified)	50	46	41	36	31	27
Construction Cost Subtotal	-	-	-	-	-	-
Personnel						
Deputy Chief	-	-	-	-	-	-
Assistant Chief	-	-	-	-	-	-
Administrative Battalion Chief	-	-	-	-	-	-
Training Officers	-	-	-	-	-	-
Training Instructors	-	-	-	-	-	-
Administrative Specialist	-	-	-	-	-	-
Materials Controller	-	-	-	-	-	-
Mechanic	-	-	-	-	-	-
Dispatchers	-	-	-	-	-	-
Warehouse Employees (Cadets)	-	-	-	-	-	-
Personnel Subtotal	-	-	-	-	-	-
Communications						
Power	25	21	16	11	6	2
Microwave System Radios for all personnel	25	21	16	11	6	2

	10	6	1	7	2	9
Batteries for radios	3	3	2	1	-	-
Battery Analyzer	5	1	2	3	4	-
Bank Chargers	5	1	2	3	4	-
SNACC Operating System Cost	5	1	2	3	4	-
Capitol Buy-In (One time fee)	-	-	-	-	-	-
Annual Telephone Cost	-	-	-	-	-	-
Communications Subtotal	-	-	-	-	-	-
Training						
Yearly training for Tech Sta	-	-	-	-	-	-
Initial training for Department	100	96	91	86	81	77
On-going training for Dept	-	-	-	-	-	-
Recruit Academy	30	26	21	16	11	7
Training Subtotal	-	-	-	-	-	-
Equipment/Supplies						
CBRNE Engine Equipment	10	6	1	7	2	9
Heavy Rescue Equipment	10	6	1	7	2	9
Truck Equipment	10	6	1	7	2	9
Haz-Mat Equipment	10	6	1	7	2	9
Rescue Equipment	10	6	1	7	2	9
Equipment/Supplied Subtotal	-	-	-	-	-	-
Air Support (SCBA)						
SCBA Backpacks	15	11	6	1	12	8
SCBA Bottles- 30 minute	15	11	6	1	12	8
SCBA Air Mask	15	11	6	1	12	8
Haz-Mat SCBA Backpacks	15	11	6	1	12	8
SCBA Bottles- 1 hour	15	11	6	1	12	8

RIT Bags	15	11	6	1	12	8
Yearly operating cost for system	-	-	-	-	-	-
Air Support (SCBA) Subtotal	-	-	-	-	-	-
Support Personnel Vehicles						
Flat-Bed Truck, Heavy Duty	7	3	6	1	4	-
Mechanic Truck	7	3	6	1	4	-
Bus	7	3	6	1	4	-
Van	7	3	6	1	4	-
Suburban	7	3	6	1	4	-
Sedan	7	3	6	1	4	-
Unit upgrades (Code 3, Equip, etc)	7	3	6	1	4	-
Support Personnel Vehicles Subtotal	-	-	-	-	-	-
Miscellaneous						
Annual Telephone/Satellite Cost	-	-	-	-	-	-
Fuel Tank Farm	-	-	-	-	-	-
Fuel (LPG/Gas/Diesel)	-	-	-	-	-	-
General Operating Expenses	-	-	-	-	-	-
Fuel Cost (vehicles only)	-	-	-	-	-	-
Miscellaneous Subtotal	-	-	-	-	-	-
Facility Construction and Development Costs						
Facility Construction Costs	50	46	41	36	31	27
Land Acquisition Costs	100	96	91	86	81	77
Information Technology and Communications Infrastructure	20	16	11	6	1	18
Subtotal Facility Construction and Development Costs	-	-	-	-	-	-
Facility Staffing and Operational Expenses						
EOC Managers	-	-	-	-	-	-

Emergency Management Analysts	-	-	-	-	-	-
Clerical/Office Specialists	-	-	-	-	-	-
On-site Security	-	-	-	-	-	-
Personnel (unspecified)	-	-	-	-	-	-
General Operating Expenses	-	-	-	-	-	-
Subtotal Facility Staffing and Operational Expenses	-	-	-	-	-	-
Training Costs						
Senior & Elected Official Workshops	-	-	-	-	-	-
Emergency Management Staff Training	-	-	-	-	-	-
Public Affairs Office Staff Training	-	-	-	-	-	-
Public Works/Field Operations Staff Training	-	-	-	-	-	-
Subtotal Training Costs	-	-	-	-	-	-
Public Awareness Program Costs						
Brochures and other public education materials	-	-	-	-	-	-
Video production	-	-	-	-	-	-
Community awareness courses	-	-	-	-	-	-
Subtotal Public Awareness Program Costs	-	-	-	-	-	-
AFCO Communications Network						
Estimated Facility Construction Cost	50	46	41	36	31	27
AFCO Communications Network Subtotal	-	-	-	-	-	-
General Apparatus/Equipment						
Turnouts/Safety Equipment	7	3	6	1	4	-
CBRNE Engine	10	6	1	7	2	9
Heavy Rescue Engine	10	6	1	7	2	9
Truck Equipment	10	6	1	7	2	9
Rescue Equipment	10	6	1	7	2	9
Haz-Mat Equipment						

	10	6	1	7	2	9
Mobile Air Unit	10	6	1	7	2	9
Andros Wolverine Robot	10	6	1	7	2	9
Andros FGA Robot	10	6	1	7	2	9
Disaster Medical Facility	10	6	1	7	2	9
Mobile Oxygen Storage Tanks	10	6	1	7	2	9
Tx Mass Casualty Decon Unit	10	6	1	7	2	9
Portable Decon Tents	10	6	1	7	2	9
Semi-Trucks	10	6	1	7	2	9
Flat Bed Trailer	10	6	1	7	2	9
Forklift (10,000 lbs capacity)	10	6	1	7	2	9
Disaster Mitigation Apparatus 1	10	6	1	7	2	9
Disaster Mitigation Apparatus 2	10	6	1	7	2	9
Radiological Survey Meters (Monitors)	10	6	1	7	2	9
Radiological Survey Meters (Annual Calibration)	10	6	1	7	2	9
Personal Victoreen Dosimeters (Monitors)	10	6	1	7	2	9
Personal Victoreen Dosimeters (Annual Calibration)	10	6	1	7	2	9
Personal Victoreen Dosimeters (Revealer Dosimeter Reader Kit)	10	6	1	7	2	9
Cascade/Light Re-Fill Unit (One Time)	10	6	1	7	2	9
Equipment Acquisition Costs (unspecified)	10	6	1	7	2	9
Equipment Operations and Maintenance Costs (unspecified)	10	6	1	7	2	9
General Apparatus/Equipment Subtotal	-	-	-	-	-	-
Helicopters						
Equipment	-	-	-	-	-	-
	30	26	21	16	11	7
	30	26	21	16	11	7

Personnel	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Annual Training Costs	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Annual Operations Costs	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Annual Storage Costs	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
Helicopters Subtotal	-	-	-	-	-	-
General Communications Requirements						
Tower	25	21	16	11	6	2
Microwave System	25	21	16	11	6	2
Radios for all personnel	10	6	1	7	2	9
Batteries for radios	3	3	2	1	-	-
Battery Analyzer	5	1	2	3	4	-
Bank Chargers	5	1	2	3	4	-
SNACC Operating System Cost	5	1	2	3	4	-
Capitol Buy-In (One time fee)	-	-	-	-	-	-
Haz-Mat In-Suit Communications	10	6	1	7	2	9
Reverse 911 Notification System	15	11	6	1	12	8
Radiological Public Alert System	15	11	6	1	12	8
Subtotal General Communications Requirements	-	-	-	-	-	-

General Personnel Requirements

Deputy Chief	-	-	-	-	-	-
Assistant Chief	-	-	-	-	-	-
Battalion Chief	-	-	-	-	-	-
Captain	-	-	-	-	-	-
Captain (Instructor)	-	-	-	-	-	-
Engineer	-	-	-	-	-	-
Engineer (Instructor)	-	-	-	-	-	-
Firefighter	-	-	-	-	-	-
Firefighter (Instructor)	-	-	-	-	-	-
Paramedics	-	-	-	-	-	-
Paramedics (Instructor)	-	-	-	-	-	-
Training Officers	-	-	-	-	-	-
Training Instructors	-	-	-	-	-	-
Administrative Specialist	-	-	-	-	-	-
Public Information Officer	-	-	-	-	-	-
Mechanics	-	-	-	-	-	-
Materials Controller	-	-	-	-	-	-
Dispatcher	-	-	-	-	-	-
Alarm Office Dispatcher Escort/Inspection Personnel	-	-	-	-	-	-
Radiation Safety Officer Warehouse Employees (Cadets)	-	-	-	-	-	-
Subtotal General Personnel Requirements	-	-	-	-	-	-

Staff Training Requirements

Haz Mat Specialty Training - Captains (Initial)	100	96	91	86	81	77
Haz Mat Specialty Training - Paramedics (Initial)	100	96	91	86	81	77
Haz Mat Specialty Training - Engineers (Initial)	100	96	91	86	81	77

Haz Mat Specialty Training - Firefighters (Initial)	100	96	91	86	81	77
Haz Mat Specialty Training - Battalion Chiefs (Initial)	100	96	91	86	81	77
Haz Mat Specialty Training - Captains (Annual)	-	-	-	-	-	-
Haz Mat Specialty Training - Paramedics (Annual)	-	-	-	-	-	-
Haz Mat Specialty Training - Engineers (Annual)	-	-	-	-	-	-
Haz Mat Specialty Training - Firefighters (Annual)	-	-	-	-	-	-
Haz Mat Specialty Training - Battalion Chiefs (Annual)	-	-	-	-	-	-
Radiological Refresher Training - Battalion Chiefs (Annual)	-	-	-	-	-	-
Radiological Refresher Training - Fire Training Officer (Annual)	-	-	-	-	-	-
Radiological Refresher Training - Captain (Annual)	-	-	-	-	-	-
Radiological Refresher Training - Paramedic (Annual)	-	-	-	-	-	-
Radiological Refresher Training - Engineer (Annual)	-	-	-	-	-	-
Radiological Refresher Training - Firefighter (Annual)	-	-	-	-	-	-
Recruit Academy Training - Books	100	96	91	86	81	77
Recruit Academy Training - Turnouts	100	96	91	86	81	77
Recruit Academy Training - Supplies	100	96	91	86	81	77
Recruit Academy Training - Drill Filed Costs	100	96	91	86	81	77
Recruit Academy Training - Books	100	96	91	86	81	77
Recruit Academy Training - Turnouts	100	96	91	86	81	77
Recruit Academy Training - Supplies	100	96	91	86	81	77
Recruit Academy Training - Drill Filed Costs	100	96	91	86	81	77
Radiation Training	-	-	-	-	-	-
Mass Evacuation Training Suppression Planning (unspecified)	-	-	-	-	-	-
Training & Planning						

(unspecified)	-	-	-	-	-	-
One-time (Initial) Training Hours (Unspecified)	100	96	91	86	81	77
Recurring (Annual) Training (Hours) (Unspecified)	-	-	-	-	-	-
Subtotal Training Requirements	-	-	-	-	-	-
Planning & Administrative Costs						
Development of Emergency Response Plan	10	6	1	7	2	9
Amendment of Emergency Response Plan	-	-	-	-	-	-
Public Information Program	-	-	-	-	-	-
Subtotal Planning & Administrative Costs	-	-	-	-	-	-
Support Personnel Vehicles						
Flat-Bed Truck, Heavy Duty	7	3	6	1	4	-
Mechanic Truck	7	3	6	1	4	-
Bus	7	3	6	1	4	-
Van	7	3	6	1	4	-
Suburban	7	3	6	1	4	-
Sedan	7	3	6	1	4	-
Unit upgrades (Code 3, Equip, etc)	7	3	6	1	4	-
Support Personnel Vehicles Subtotal	-	-	-	-	-	-
Related Annual Fuel Costs						
Engine	-	-	-	-	-	-
Truck	-	-	-	-	-	-
Rescue	-	-	-	-	-	-
Heavy Rescue	-	-	-	-	-	-
Haz-Mat	-	-	-	-	-	-
Mobile Air	-	-	-	-	-	-
Suburban	-	-	-	-	-	-
Sedan	-	-	-	-	-	-

Mechanics Truck	-	-	-	-	-	-
Flat-Bed Truck	-	-	-	-	-	-
Bus (40 Passenger)	-	-	-	-	-	-
Subtotal Annual Fuel Costs	-	-	-	-	-	-
Related SBCA Air Support Costs						
Air Pack Backpacks	15	11	6	1	12	8
SCBA Bottles	15	11	6	1	12	8
Haz-Mat Air Pack Backpacks	15	11	6	1	12	8
One Hour SCBA Bottles	15	11	6	1	12	8
SCBA Air Mask	15	11	6	1	12	8
RIT Bags	15	11	6	1	12	8
S2 Rescue Regulator w/ Y Conn	15	11	6	1	12	8
Revitox Rescue Mask	15	11	6	1	12	8
SBCA Apparatus (unspecified)	15	11	6	1	12	8
SBCA Air Support Cost Subtotal	-	-	-	-	-	-
Police Training Requiems						
Staff Salaries	-	-	-	-	-	-
Training Costs	-	-	-	-	-	-
Subtotal Police Department Requirements	-	-	-	-	-	-
Police Equipment Requirements						
Equipment Costs - Ion Chambers Survey Meter	15	11	6	1	12	8
Equipment Costs - General	-	-	-	-	-	-
Subtotal Police Equipment Requirements	-	-	-	-	-	-
TOTAL COSTS						

APPENDIX G Cost Inflation Rate Table

	Base Year	Year 5	Year 10	Year 15	Year 20	Year 24
FIRE STATIONS						
Station Construction Cost						
Estimated Station Cost	100%	117%	142%	173%	211%	246%
Estimated Land Cost (5 acre parcel)	100%	117%	142%	173%	211%	246%
Fixtures, Furnishings, & Equip	100%	117%	142%	173%	211%	246%
Site Development/Upgrades	100%	117%	142%	173%	211%	246%
Fuel Tank Farm (initial cost)	100%	117%	142%	173%	211%	246%
Station Construction Cost (unspecified)	100%	117%	142%	173%	211%	246%
Station Construction Subtotal						
Station Operations & Maintenance Costs (not otherwise specified)	100%	117%	142%	173%	211%	246%
Apparatus						
CBRNE Engine w/ Equipment	100%	117%	142%	173%	211%	246%
Truck w/ Equipment	100%	117%	142%	173%	211%	246%
Rescue w/ Equipment	100%	117%	142%	173%	211%	246%
Haz-Mat Unit w/ Equipment	100%	117%	142%	173%	211%	246%
Heavy Rescue Engine w/ Equip	100%	117%	142%	173%	211%	246%
Mobile Air Unit w/ Equipment	100%	117%	142%	173%	211%	246%
Disaster Mitigation Apparatus 1	100%	117%	142%	173%	211%	246%
Disaster Mitigation Apparatus 2	100%	117%	142%	173%	211%	246%
Apparatus Subtotal						
Suppression Personnel						
Battalion Chief	100%	117%	142%	173%	211%	246%
Captain	100%	117%	142%	173%	211%	246%
Engineer	100%	117%	142%	173%	211%	246%
Firefighter	100%	117%	142%	173%	211%	246%
Suppression Personnel Subtotal						
Communications						
Tower	100%	117%	142%	173%	211%	246%
Microwave System	100%	117%	142%	173%	211%	246%
Radios for all personnel	100%	117%	142%	173%	211%	246%
Batteries for radios	100%	117%	142%	173%	211%	246%
Battery Analyzer	100%	117%	142%	173%	211%	246%
Haz-Mat In-Suit Communicator	100%	117%	142%	173%	211%	246%
Bank Chargers	100%	117%	142%	173%	211%	246%
SNACC Operating System Cost	100%	117%	142%	173%	211%	246%
Capitol Buy-In (One time fee)	100%	117%	142%	173%	211%	246%

Annual Telephone Cost	100%	117%	142%	173%	211%	246%
Communications Subtotal	100%	100%	100%	100%	100%	100%
Air Support (SCBA)						
SCBA Backpacks	100%	117%	142%	173%	211%	246%
SCBA Bottles- 30 minute	100%	117%	142%	173%	211%	246%
Haz-Mat SCBA Backpacks	100%	117%	142%	173%	211%	246%
SCBA Bottles- 1 hour	100%	117%	142%	173%	211%	246%
SCBA Mask	100%	117%	142%	173%	211%	246%
RIT Bags	100%	117%	142%	173%	211%	246%
SCBA Annual Operating Costs	100%	117%	142%	173%	211%	246%
Supervisor for SCBA Division	100%	117%	142%	173%	211%	246%
Air Support (SCBA) Subtotal						
Support Vehicles						
Suburban	100%	117%	142%	173%	211%	246%
Sedan	100%	117%	142%	173%	211%	246%
Van	100%	117%	142%	173%	211%	246%
Pick-up Flat Bed Truck	100%	117%	142%	173%	211%	246%
Mechanics Truck	100%	117%	142%	173%	211%	246%
Unit upgrades (Code 3, Equip, etc)	100%	117%	142%	173%	211%	246%
Support Vehicle Subtotal						
Support Personnel						
Deputy Chief	100%	117%	142%	173%	211%	246%
Assistant Chief	100%	117%	142%	173%	211%	246%
Materials Controller	100%	117%	142%	173%	211%	246%
Mechanic	100%	117%	142%	173%	211%	246%
Public Information Officers	100%	117%	142%	173%	211%	246%
Alarm Office Dispatcher	100%	117%	142%	173%	211%	246%
Escort/Inspection Personnel	100%	117%	142%	173%	211%	246%
Radiation Safety Officer	100%	117%	142%	173%	211%	246%
Support Personnel Subtotal						
Miscellaneous						
Warehouse Inventory	100%	117%	142%	173%	211%	246%
Turnout Ensemble	100%	117%	142%	173%	211%	246%
Cleaning/Repairing of Turnouts	100%	117%	142%	173%	211%	246%
Tank Farm Operating Expenses	100%	117%	142%	173%	211%	246%
Annual Training Cost	100%	117%	142%	173%	211%	246%
Annual Services and Supplies	100%	117%	142%	173%	211%	246%
Vehicle Maintenance Cost	100%	117%	142%	173%	211%	246%
Fuel Cost	100%	117%	142%	173%	211%	246%
Recruit Academy Cost	100%	117%	142%	173%	211%	246%
Miscellaneous Subtotal	100%	100%	100%	100%	100%	100%
REGIONAL TRAINING CENTER						

Regional Training Center Construction Cost

Estimated Facility Construction Cost	100%	117%	142%	173%	211%	246%
Estimated Land Acquisition Cost	100%	117%	142%	173%	211%	246%
Site Development/ Upgrades	100%	117%	142%	173%	211%	246%
Fuel Tank Farm (Initial Cost)	100%	117%	142%	173%	211%	246%
Training Center Construction Cost (Unspecified)	100%	117%	142%	173%	211%	246%
Construction Cost Subtotal	100%	100%	100%	100%	100%	100%

Personnel

Deputy Chief	100%	117%	142%	173%	211%	246%
Assistant Chief	100%	117%	142%	173%	211%	246%
Administrative Battalion Chief	100%	117%	142%	173%	211%	246%
Training Officers	100%	117%	142%	173%	211%	246%
Training Instructors	100%	117%	142%	173%	211%	246%
Administrative Specialist	100%	117%	142%	173%	211%	246%
Materials Controller	100%	117%	142%	173%	211%	246%
Mechanic	100%	117%	142%	173%	211%	246%
Dispatchers	100%	117%	142%	173%	211%	246%
Warehouse Employees (Cadets)	100%	117%	142%	173%	211%	246%
Personnel Subtotal	100%	100%	100%	100%	100%	100%

Communications

Tower	100%	117%	142%	173%	211%	246%
Microwave System	100%	117%	142%	173%	211%	246%
Radios for all personnel	100%	117%	142%	173%	211%	246%
Batteries for radios	100%	117%	142%	173%	211%	246%
Battery Analyzer	100%	117%	142%	173%	211%	246%
Bank Chargers	100%	117%	142%	173%	211%	246%
SNACC Operating System Cost	100%	117%	142%	173%	211%	246%
Capitol Buy-In (One time fee)	100%	117%	142%	173%	211%	246%
Annual Telephone Cost	100%	117%	142%	173%	211%	246%
Communications Subtotal	100%	100%	100%	100%	100%	100%

Training

Yearly training for Tech Sta	100%	117%	142%	173%	211%	246%
Initial training for Department	100%	117%	142%	173%	211%	246%
On-going training for Dept	100%	117%	142%	173%	211%	246%
Recruit Academy	100%	117%	142%	173%	211%	246%
Training Subtotal	100%	100%	100%	100%	100%	100%

Equipment/Supplies

CBRNE Engine Equipment	100%	117%	142%	173%	211%	246%
Heavy Rescue Equipment	100%	117%	142%	173%	211%	246%
Truck Equipment	100%	117%	142%	173%	211%	246%

Haz-Mat Equipment	100%	117%	142%	173%	211%	246%
Rescue Equipment	100%	117%	142%	173%	211%	246%
Equipment/Supplied Subtotal	100%	100%	100%	100%	100%	100%
Air Support (SCBA)						
SCBA Backpacks	100%	117%	142%	173%	211%	246%
SCBA Bottles- 30 minute	100%	117%	142%	173%	211%	246%
SCBA Air Mask	100%	117%	142%	173%	211%	246%
Haz-Mat SCBA Backpacks	100%	117%	142%	173%	211%	246%
SCBA Bottles- 1 hour	100%	117%	142%	173%	211%	246%
RJT Bags	100%	117%	142%	173%	211%	246%
Yearly operating cost for system	100%	117%	142%	173%	211%	246%
Air Support (SCBA) Subtotal	100%	100%	100%	100%	100%	100%
Support Personnel Vehicles						
Flat-Bed Truck, Heavy Duty	100%	117%	142%	173%	211%	246%
Mechanic Truck	100%	117%	142%	173%	211%	246%
Bus	100%	117%	142%	173%	211%	246%
Van	100%	117%	142%	173%	211%	246%
Suburban	100%	117%	142%	173%	211%	246%
Sedan	100%	117%	142%	173%	211%	246%
Unit upgrades (Code 3, Equip, etc)	100%	117%	142%	173%	211%	246%
Support Personnel Vehicles Subtotal	100%	100%	100%	100%	100%	100%
Miscellaneous						
Annual Telephone/Satellite Cost	100%	117%	142%	173%	211%	246%
Fuel Tank Farm	100%	117%	142%	173%	211%	246%
Fuel (LPG/Gas/Diesel)	100%	117%	142%	173%	211%	246%
General Operating Expenses	100%	117%	142%	173%	211%	246%
Fuel Cost (vehicles only)	100%	117%	142%	173%	211%	246%
Miscellaneous Subtotal	100%	100%	100%	100%	100%	100%
Facility Construction and Development Costs						
Facility Construction Costs	100%	117%	142%	173%	211%	246%
Land Acquisition Costs	100%	117%	142%	173%	211%	246%
Information Technology and Communications Infrastructure	100%	117%	142%	173%	211%	246%
Subtotal Facility Construction and Development Costs	100%	100%	100%	100%	100%	100%
Facility Staffing and Operational Expenses						
EOC Managers	100%	117%	142%	173%	211%	246%
Emergency Management Analysts	100%	117%	142%	173%	211%	246%
Clerical/Office Specialists	100%	117%	142%	173%	211%	246%
On-site Security Personnel (unspecified)	100%	117%	142%	173%	211%	246%

General Operating Expenses	100%	117%	142%	173%	211%	246%
Subtotal Facility Staffing and Operational Expenses	100%	100%	100%	100%	100%	100%
Training Costs						
Senior & Elected Official Workshops	100%	117%	142%	173%	211%	246%
Emergency Management Staff Training	100%	117%	142%	173%	211%	246%
Public Affairs Office Staff Training	100%	117%	142%	173%	211%	246%
Public Works/Field Operations Staff Training	100%	117%	142%	173%	211%	246%
Subtotal Training Costs	100%	100%	100%	100%	100%	100%
Public Awareness Program Costs						
Brochures and other public education materials	100%	117%	142%	173%	211%	246%
Video production	100%	117%	142%	173%	211%	246%
Community awareness courses	100%	117%	142%	173%	211%	246%
Subtotal Public Awareness Program Costs	100%	100%	100%	100%	100%	100%
APCO Communications Network						
Estimated Facility Construction Cost	100%	117%	142%	173%	211%	246%
APCO Communications Network Subtotal	100%	100%	100%	100%	100%	100%
General Apparatus/Equipment						
Turnouts/Safety Equipment	100%	117%	142%	173%	211%	246%
CBRNE Engine	100%	117%	142%	173%	211%	246%
Heavy Rescue Engine	100%	117%	142%	173%	211%	246%
Truck Equipment	100%	117%	142%	173%	211%	246%
Rescue Equipment	100%	117%	142%	173%	211%	246%
Haz-Mat Equipment	100%	117%	142%	173%	211%	246%
Mobile Air Unit	100%	117%	142%	173%	211%	246%
Andros Wolverine Robot	100%	117%	142%	173%	211%	246%
Andros FGA Robot	100%	117%	142%	173%	211%	246%
Disaster Medical Facility	100%	117%	142%	173%	211%	246%
Mobile Oxygen Storage Tanks	100%	117%	142%	173%	211%	246%
Tx Mass Casualty Decon Unit	100%	117%	142%	173%	211%	246%
Portable Decon Tents	100%	117%	142%	173%	211%	246%
Semi-Trucks	100%	117%	142%	173%	211%	246%
Flat Bed Trailer	100%	117%	142%	173%	211%	246%
Forklift (10,000 lbs capacity)	100%	117%	142%	173%	211%	246%
Disaster Mitigation Apparatus 1	100%	117%	142%	173%	211%	246%
Disaster Mitigation Apparatus 2	100%	117%	142%	173%	211%	246%
Radiological Survey Meters (Monitors)	100%	117%	142%	173%	211%	246%
Radiological Survey Meters (Annual Calibration)	100%	117%	142%	173%	211%	246%

Personal Victoreen Dosimeters (Monitors)	100%	117%	142%	173%	211%	246%
Personal Victoreen Dosimeters (Annual Calibration)	100%	117%	142%	173%	211%	246%
Personal Victoreen Dosimeters (Revealer Dosimeter Reader Kit)	100%	117%	142%	173%	211%	246%
Cascade/Light Re-Fill Unit (One Time)	100%	117%	142%	173%	211%	246%
Equipment Acquisition Costs (unspecified)	100%	117%	142%	173%	211%	246%
Equipment Operations and Maintenance Costs (unspecified)	100%	117%	142%	173%	211%	246%
General Apparatus/Equipment Subtotal	100%	100%	100%	100%	100%	100%
Helicopters						
Equipment	100%	100%	100%	100%	100%	100%
Bell Augusta AB 139	100%	117%	142%	173%	211%	246%
Equipment Cost	100%	117%	142%	173%	211%	246%
Personnel	100%	100%	100%	100%	100%	100%
Pilot(s)	100%	117%	142%	173%	211%	246%
Mechanics	100%	117%	142%	173%	211%	246%
Crew Chief	100%	117%	142%	173%	211%	246%
Annual Training Costs	100%	100%	100%	100%	100%	100%
Crew Training	100%	117%	142%	173%	211%	246%
FAA/ Aircraft Recertification	100%	117%	142%	173%	211%	246%
Annual Operations Costs	100%	100%	100%	100%	100%	100%
Operating Cost	100%	117%	142%	173%	211%	246%
Insurance Cost	100%	117%	142%	173%	211%	246%
Annual Storage Costs	100%	100%	100%	100%	100%	100%
Hanger Cost	100%	117%	142%	173%	211%	246%
Warehouse Cost	100%	117%	142%	173%	211%	246%
Helicopters Subtotal	100%	100%	100%	100%	100%	100%
General Communications Requirements						
Tower	100%	117%	142%	173%	211%	246%
Microwave System	100%	117%	142%	173%	211%	246%
Radios for all personnel	100%	117%	142%	173%	211%	246%
Batteries for radios	100%	117%	142%	173%	211%	246%
Battery Analyzer	100%	117%	142%	173%	211%	246%
Bank Chargers	100%	117%	142%	173%	211%	246%
SNACC Operating System Cost	100%	117%	142%	173%	211%	246%
Capitol Buy-In (One time fee)	100%	117%	142%	173%	211%	246%
Haz-Mat In-Suit Communications	100%	117%	142%	173%	211%	246%
Reverse 911 Notification System	100%	117%	142%	173%	211%	246%
Radiological Public Alert System	100%	117%	142%	173%	211%	246%
Subtotal General Communications Requirements	100%	100%	100%	100%	100%	100%
General Personnel Requirements						

Deputy Chief	100%	117%	142%	173%	211%	246%
Assistant Chief	100%	117%	142%	173%	211%	246%
Battalion Chief	100%	117%	142%	173%	211%	246%
Captain	100%	117%	142%	173%	211%	246%
Captain (Instructor)	100%	117%	142%	173%	211%	246%
Engineer	100%	117%	142%	173%	211%	246%
Engineer (Instructor)	100%	117%	142%	173%	211%	246%
Firefighter	100%	117%	142%	173%	211%	246%
Firefighter (Instructor)	100%	117%	142%	173%	211%	246%
Paramedics	100%	117%	142%	173%	211%	246%
Paramedics (Instructor)	100%	117%	142%	173%	211%	246%
Training Officers	100%	117%	142%	173%	211%	246%
Training Instructors	100%	117%	142%	173%	211%	246%
Administrative Specialist	100%	117%	142%	173%	211%	246%
Public Information Officer	100%	117%	142%	173%	211%	246%
Mechanics	100%	117%	142%	173%	211%	246%
Materials Controller	100%	117%	142%	173%	211%	246%
Dispatcher	100%	117%	142%	173%	211%	246%
Alarm Office Dispatcher	100%	117%	142%	173%	211%	246%
Escort/Inspection Personnel	100%	117%	142%	173%	211%	246%
Radiation Safety Officer	100%	117%	142%	173%	211%	246%
Warehouse Employees (Cadets)	100%	117%	142%	173%	211%	246%
Subtotal General Personnel Requirements	100%	100%	100%	100%	100%	100%
Staff Training Requirements						
Haz Mat Specialty Training - Captains (Initial)	100%	117%	142%	173%	211%	246%
Haz Mat Specialty Training - Paramedics (Initial)	100%	117%	142%	173%	211%	246%
Haz Mat Specialty Training - Engineers (Initial)	100%	117%	142%	173%	211%	246%
Haz Mat Specialty Training - Firefighters (Initial)	100%	117%	142%	173%	211%	246%
Haz Mat Specialty Training - Battalion Chiefs (Initial)	100%	117%	142%	173%	211%	246%
Haz Mat Specialty Training - Captains (Annual)	100%	117%	142%	173%	211%	246%
Haz Mat Specialty Training - Paramedics (Annual)	100%	117%	112%	173%	211%	246%
Haz Mat Specialty Training - Engineers (Annual)	100%	117%	142%	173%	211%	246%
Haz Mat Specialty Training - Firefighters (Annual)	100%	117%	142%	173%	211%	246%
Haz Mat Specialty Training - Battalion Chiefs (Annual)	100%	117%	142%	173%	211%	246%
Radiological Refresher Training - Battalion Chiefs (Annual)	100%	117%	142%	173%	211%	246%
Radiological Refresher Training - Fire Training Officer (Annual)	100%	117%	142%	173%	211%	246%
Radiological Refresher Training -	100%	117%	142%	173%	211%	246%

Captain (Annual)						
Radiological Refresher Training - Paramedic (Annual)	100%	117%	142%	173%	211%	246%
Radiological Refresher Training - Engineer (Annual)	100%	117%	142%	173%	211%	246%
Radiological Refresher Training - Firefighter (Annual)	100%	117%	142%	173%	211%	246%
Recruit Academy Training - Books	100%	117%	142%	173%	211%	246%
Recruit Academy Training - Turnouts	100%	117%	142%	173%	211%	246%
Recruit Academy Training - Supplies	100%	117%	142%	173%	211%	246%
Recruit Academy Training - Drill	100%	117%	142%	173%	211%	246%
Filed Costs						
Recruit Academy Training - Books	100%	117%	142%	173%	211%	246%
Recruit Academy Training - Turnouts	100%	117%	142%	173%	211%	246%
Recruit Academy Training - Supplies	100%	117%	142%	173%	211%	246%
Recruit Academy Training - Drill	100%	117%	142%	173%	211%	246%
Filed Costs						
Radiation Training	100%	117%	142%	173%	211%	246%
Mass Evacuation Training	100%	117%	142%	173%	211%	246%
Suppression Planning (unspecified)	100%	117%	142%	173%	211%	246%
Training & Planning (unspecified)	100%	117%	142%	173%	211%	246%
One-time (Initial) Training Hours (Unspecified)	100%	117%	142%	173%	211%	246%
Recurring (Annual) Training (Hours) (Unspecified)	100%	117%	142%	173%	211%	246%
Subtotal Training Requirements	100%	100%	100%	100%	100%	100%
Planning & Administrative Costs						
Development of Emergency Response Plan	100%	117%	142%	173%	211%	246%
Amendment of Emergency Response Plan	100%	117%	142%	173%	211%	246%
Public Information Program	100%	117%	142%	173%	211%	246%
Subtotal Planning & Administrative Costs	100%	100%	100%	100%	100%	100%
Support Personnel Vehicles						
Flat-Bed Truck, Heavy Duty	100%	117%	142%	173%	211%	246%
Mechanic Truck	100%	117%	142%	173%	211%	246%
Bus	100%	117%	142%	173%	211%	246%
Van	100%	117%	142%	173%	211%	246%
Suburban	100%	117%	142%	173%	211%	246%
Sedan	100%	117%	142%	173%	211%	246%
Unit upgrades (Code 3, Equip, etc)	100%	117%	142%	173%	211%	246%
Support Personnel Vehicles Subtotal	100%	100%	100%	100%	100%	100%
Related Annual Fuel Costs						
Engine	100%	117%	142%	173%	211%	246%
Truck	100%	117%	142%	173%	211%	246%
Rescue	100%	117%	142%	173%	211%	246%
Heavy Rescue	100%	117%	142%	173%	211%	246%

Haz-Mat	100%	117%	142%	173%	211%	246%
Mobile Air	100%	117%	142%	173%	211%	246%
Suburban	100%	117%	142%	173%	211%	246%
Sedan	100%	117%	142%	173%	211%	246%
Mechanics Truck	100%	117%	142%	173%	211%	246%
Flat-Bed Truck	100%	117%	142%	173%	211%	246%
Bus (40 Passenger)	100%	117%	142%	173%	211%	246%
Subtotal Annual Fuel Costs	100%	100%	100%	100%	100%	100%
Related SBCA Air Support Costs						
Air Pack Backpacks	100%	117%	142%	173%	211%	246%
SCBA Bottles	100%	117%	142%	173%	211%	246%
Haz-Mat Air Pack Backpacks	100%	117%	142%	173%	211%	246%
One Hour SCBA Bottles	100%	117%	142%	173%	211%	246%
SCBA Air Mask	100%	117%	142%	173%	211%	246%
RIF Bags	100%	117%	142%	173%	211%	246%
S2 Rescue Regulator w/ Y Conn	100%	117%	142%	173%	211%	246%
Revitox Rescue Mask	100%	117%	142%	173%	211%	246%
SBCA Apparatus (unspecified)	100%	117%	142%	173%	211%	246%
SBCA Air Support Cost Subtotal	100%	100%	100%	100%	100%	100%
Police Training Requiems						
Staff Salaries	100%	117%	142%	173%	211%	246%
Training Costs	100%	117%	142%	173%	211%	246%
Subtotal Police Department Requirements	100%	100%	100%	100%	100%	100%
Police Equipment Requirements						
Equipment Costs - Ion Chambers	100%	104%	104%	104%	104%	104%
Survey Meter	100%	104%	104%	104%	104%	104%
Equipment Costs - General	100%	104%	104%	104%	104%	104%
Subtotal Police Equipment Requirements	100%	100%	100%	100%	100%	100%

APPENDIX H Short Form

URBAN ENVIRONMENTAL RESEARCH FISCAL IMPACT ASSESSMENT MODEL						
PUBLIC SAFETY MODULE - FIRE SERVICES						
ENTITY REQUIREMENT SHORT FORM						
Short-Form Requirement Summary						
		Back Country	Low Density	Medium Density	High Density	Message
PART I FACILITY ADDITIONS						
How Many Additional Stations	0	1	2	3	4	5
Apply this Form Assumptions at Training Centers						
Will You Require Regional Training	Yes	No	No	No	No	No
Apply this Form Assumptions at Training Centers						
PART II AD HOC REQUIREMENTS - FIRE						
Apply this Form Ad Hoc Requirements						
Outside of those Staffing and Additional Station/Regional Training Center Will You Require Any of the Following						
Deputy Chief	0	0	0	0	0	0
Assistant Chief	0	0	0	0	0	0
Battalion Chief	0	0	0	0	0	0
Captain	0	0	0	0	0	0
Engineer	0	0	0	0	0	0
Firefighter	0	0	0	0	0	0
Inspector	0	0	0	0	0	0
Training Officers	0	0	0	0	0	0
Training Instructors	0	0	0	0	0	0
Administrative Staff	0	0	0	0	0	0
Public Information Officer	0	0	0	0	0	0
Mechanics	0	0	0	0	0	0
Maintenance Staff	0	0	0	0	0	0
Dispatchers	0	0	0	0	0	0
Alarm Office Dispatchers	0	0	0	0	0	0
Person Inspection Office	0	0	0	0	0	0
Education Study Office	0	0	0	0	0	0
Warehouse Employees	0	0	0	0	0	0
Outside of a						
Radios	0	0	0	0	0	0
Haz-Mat in Fuel Containers	0	0	0	0	0	0
Communications Towers	0	0	0	0	0	0
Alarm System	0	0	0	0	0	0
Keyless Entry Notification System	0	0	0	0	0	0
Turnouts/Safety Equipment	0	0	0	0	0	0
CBRN Engine	0	0	0	0	0	0
Heavy Rescue Engine	0	0	0	0	0	0
Truck Equipment	0	0	0	0	0	0
Rescue Equipment	0	0	0	0	0	0
RIT Bags	0	0	0	0	0	0
Haz-Mat Equipment	0	0	0	0	0	0
Mobuk Air Unit	0	0	0	0	0	0
Antismoke Woburn Roll	0	0	0	0	0	0
Antismoke Roll	0	0	0	0	0	0
Disaster Medical Unit	0	0	0	0	0	0
Mobuk Oxygen Storage	0	0	0	0	0	0
In Mass Casualty Victim	0	0	0	0	0	0
Scum Trucks	0	0	0	0	0	0
Flat Bed Truck	0	0	0	0	0	0
Truck of Other Equipment	0	0	0	0	0	0
Disaster Mitigation App	0	0	0	0	0	0
Disaster Mitigation App	0	0	0	0	0	0
Biological Survey Methods - Victim Identification	0	0	0	0	0	0
Personal Vehicle Inspections	0	0	0	0	0	0
Helicopters	0	0	0	0	0	0
Van	0	0	0	0	0	0
Seaman and/or Truck	0	0	0	0	0	0

APPENDIX I Summary Model for Inputting from Short Form

URBAN ENVIRONMENTAL RESEARCH FISCAL IMPACT ANALYSIS PUBLIC SAFETY MODEL - FIRE SERVICES ENTITY REQUIREMENT SUMMARY MODEL (DETAIL)										
Requirement Summary (Total)					Requirement Summary (Per Facility Estimated)					
	West County	Las Vegas	North Las Vegas	Henderson	Mcclellan	West County	Las Vegas	North Las Vegas	Henderson	Mcclellan
	Apply Short Form	Apply Short Form	Apply Short Form	Apply Short Form	Apply Short Form	Apply Short Form				
	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
How Many Stations Will You Be Required to Construct?	4	2	0	0	0	14	0	0	0	0
What Types of Support Apparatus Will You Require?										
CBFM Trains	0	0	0	0	0	0	0	0	0	0
Truck	0	0	0	0	0	0	0	0	0	0
Rescue	0	0	0	0	0	0	0	0	0	0
Fire Maintenance	0	0	0	0	0	0	0	0	0	0
Heavy Rescue Trucks	0	0	0	0	0	0	0	0	0	0
Mobile Air Unit	0	0	0	0	0	0	0	0	0	0
Mobile Maintenance Apparatus	0	0	0	0	0	0	0	0	0	0
Mobile Maintenance Apparatus	0	0	0	0	0	0	0	0	0	0
On Average, What is the Staffing Requirement Per Station?										
Station Chief	0	0	0	0	0	0	0	0	0	0
Captain	0	0	0	0	0	0	0	0	0	0
Firefighter	0	0	0	0	0	0	0	0	0	0
What Communications Equipment Will You Require?										
Power	0	0	0	0	0	0	0	0	0	0
Mobile System	0	0	0	0	0	0	0	0	0	0
Mobile	0	0	0	0	0	0	0	0	0	0
Mobile Radios	0	0	0	0	0	0	0	0	0	0
Mobile Vehicle	0	0	0	0	0	0	0	0	0	0
Mobile Vehicle Communicator	0	0	0	0	0	0	0	0	0	0
Mobile Vehicle	0	0	0	0	0	0	0	0	0	0
What Air Support Equipment/Additional Staffing Will You Require?										
SCBA Backpack	0	0	0	0	0	0	0	0	0	0
SCBA Bells	0	0	0	0	0	0	0	0	0	0
SCBA Backpack	0	0	0	0	0	0	0	0	0	0
SCBA Bells	0	0	0	0	0	0	0	0	0	0
SCBA Masks	0	0	0	0	0	0	0	0	0	0
RIT Bags	0	0	0	0	0	0	0	0	0	0
SCBA Backpack	0	0	0	0	0	0	0	0	0	0
What Type of Support Vehicles Will You Require?										
Suburban	0	0	0	0	0	0	0	0	0	0
Sedan	0	0	0	0	0	0	0	0	0	0
Van	0	0	0	0	0	0	0	0	0	0
Light Duty Truck	0	0	0	0	0	0	0	0	0	0
Medium Truck	0	0	0	0	0	0	0	0	0	0
Light Duty Truck	0	0	0	0	0	0	0	0	0	0
What Type of Administrative Support Personnel Will You Require?										
Dispatcher	0	0	0	0	0	0	0	0	0	0
Station Clerk	0	0	0	0	0	0	0	0	0	0
Medical Control	0	0	0	0	0	0	0	0	0	0
Medical	0	0	0	0	0	0	0	0	0	0
Public Information Officer	0	0	0	0	0	0	0	0	0	0
Administrative Support	0	0	0	0	0	0	0	0	0	0
Investigation Personnel	0	0	0	0	0	0	0	0	0	0
Emergency Services	0	0	0	0	0	0	0	0	0	0
What Other Station-related Miscellaneous Costs Do You Anticipate Incurring?										
Turnout Records	0	0	0	0	0	0	0	0	0	0
Station Expenses	0	0	0	0	0	0	0	0	0	0
How Many Regional Training Centers Will You Require?	1	1	0	0	0	1	1	0	0	0
What Will Be the Regional Training Center Staffing Requirements?										
Station Chief	0	0	0	0	0	0	0	0	0	0
Station Clerk	0	0	0	0	0	0	0	0	0	0
Administrative Support	0	0	0	0	0	0	0	0	0	0
Training Officer	0	0	0	0	0	0	0	0	0	0
Training Instructors	0	0	0	0	0	0	0	0	0	0

FINAL June 21 2001

**GAMING INDUSTRY IMPACTS RESULTING
FROM THE DOE'S YUCCA MOUNTAIN
PROPOSAL**

**Prepared for the
Clark County Department of Comprehensive Planning
Nuclear Waste Division**



**8687 East Via de Ventura Dr., Suite 211
Scottsdale, AZ 85258**

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1.0 INTRODUCTION

1.1 Purpose

This report is part of a series of research studies conducted over the last two years for Clark County's Nuclear Waste Division (NWD). It is part of their ongoing efforts to assess the potential impact of the DOE's proposal to site a repository at Yucca Mountain, Nevada, and the related transportation of spent fuel and high-level nuclear waste to that site. The initial study in this research series, *Baseline Information and Community Perspective on Potential Property Value Impacts on Clark County*, documented a range of impacts to Clark County that had been identified by various researchers over the last decade. This study was incorporated in Clark County's response to the *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*. Subsequent investigations have examined the range and magnitude of property value impacts that may be experienced by residential, commercial, and industrial properties. While other studies have provided a first estimation of the range and magnitude of impacts that may be experienced by governmental agencies within Clark County and its local jurisdictions.

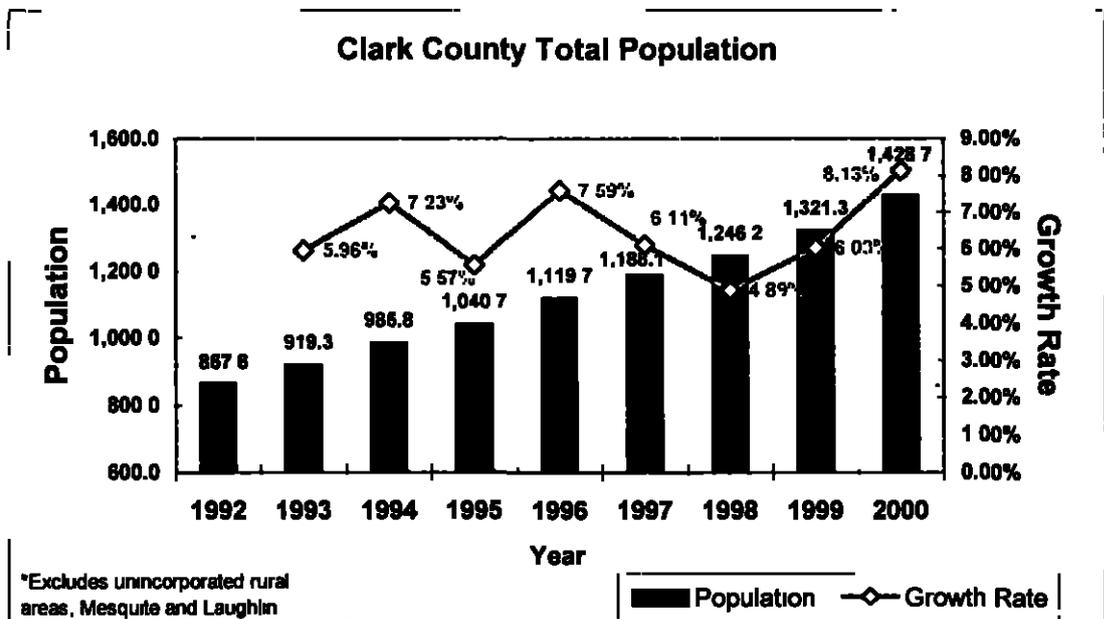
The findings from the initial study, *Baseline Information and Community Perspective on Potential Property Value Impacts on Clark County*, as well as, Clark County and the State of Nevada's response to the DEIS, indicate that tourism may be adversely impacted if the DOE proceeds with its plans. The research examined various aspects of the tourism sector's vulnerability. This study is the first to estimate the range of concerns and issues of the key industry leaders concerning the impacts that may result from the DOE's proposal. Thus, this study reports on focused, confidential interviews with key representatives from the Las Vegas tourism sector, but in particular with representatives of the gaming industry. The focused

interviews were open-ended, but were based on a questionnaire that was developed in coordination with Clark County planners and a representative from the tourism industry

1.2 Significance of Tourism Sector to Clark County's Economy

Clark County has experienced burgeoning population growth over the last decade from a population of 867.6 thousand in 1992 to over 1.4 million in 2000 (Figure 1) Today, Clark County ranks as the fastest growing county of its size in the nation.

Figure 1 – Clark County Population Growth 1992 - 2000

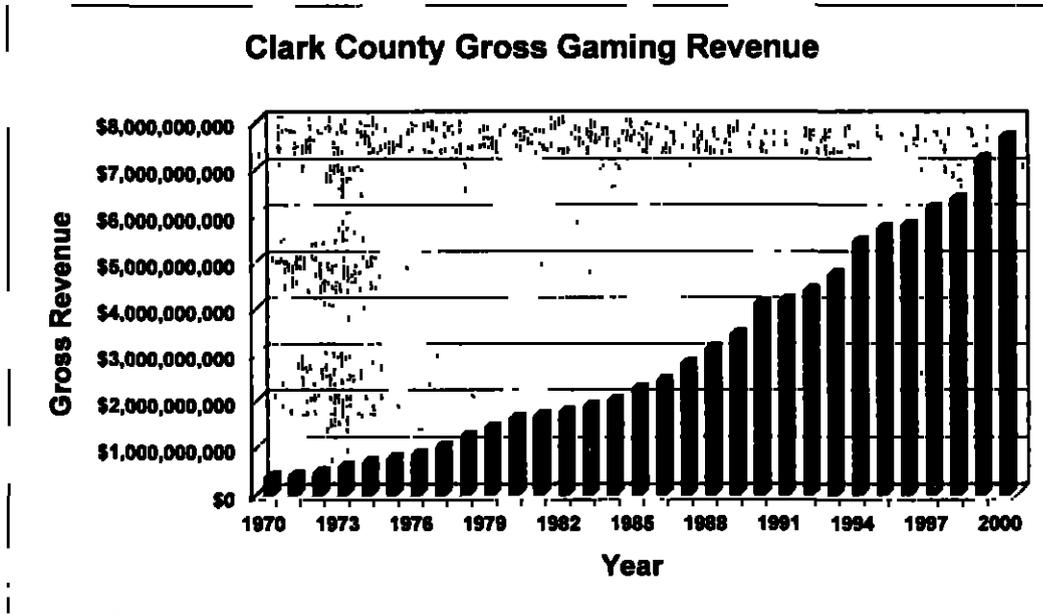


Source: Center for Business and Economic Research, UNLV 2001

Clark County's rapidly growing population has provided a synergistic stimulus to the area's tourism economy. This rapid population growth has helped feed the growth in gaming over the last decade by providing an adequate supply of labor. Between 1990 and 2000, the number of visitors coming to Clark County increased from almost 21 million to 36 million. The number of visitors coming to Las Vegas by auto and air exceeded 42.8 million in 2000. The percent of those visiting Las Vegas by air was 86%, while the percentage of those driving in was 14%. Air traffic into Las Vegas has grown at a compounded annual growth rate (CAGR) of

7.35%, while vehicle traffic grew at a 4.15% CAGR between 1970 and 2000. Over the last three decades, gaming revenues have increased from \$369 million to \$7.67 billion (Figure 2). The overall economic impact from these visitations now exceeds \$31.46 billion making it the primary engine of the area's economy (Las Vegas Convention and Visitor Authority).

Figure 2 – Clark County Gross Gaming Revenues 1970 - 2000



Source: Center for Business and Economic Research, UNLV 2001

2.0 APPROACH

In order to identify both the nature and the range of concerns of key tourism leaders as to the potential effects on the tourism industry of the DOE's proposal to ship HLW through Clark County to a repository at Yucca Mountain, focused, confidential interviews were conducted with key tourism industry representatives, especially concentrating on senior executives from the gaming industry. These representatives were identified with the assistance of the leader of Save Nevada and the head of the Governor's private sector initiative to oppose the DOE's proposed program. Assistance was also provided by the staff of Clark County's NWD.

Focused interviews were held with 14 key leaders representing 10 casinos and one of the leading industry associations. These casinos generate 95.5% of the *Earnings before Interest, Taxes, Depreciation, and Amortization* (EBITDA) on the “Strip.” The gaming executives interviewed included both the largest gaming corporations and representative of the smaller operations. Gaming representatives for the Las Vegas Strip, as well as, the downtown casinos were interviewed. Interviews were requested with 16 executives. Fourteen interviews were completed. One gaming executive declined to be interviewed because of his busy schedule. Another gaming executive did not respond to multiple requests for an interview.

These key industry leaders were generous with their time and forthcoming about both their concerns over the potential impacts from the DOE program, as well as their willingness to assist the State of Nevada and Clark County governmental officials in their efforts to oppose the siting of the repository and the related HLW shipment campaign. Each interview ranged from 1 to 2 hours in length, with only two taking less than this to complete. The interviews were open ended although they were based on the questionnaire that is attached and discussed below (See Appendix A).

2.1 Key Survey Questions

A series of seventeen open-ended questions were utilized to gather information from the tourism and gaming representatives interviewed. These questions have been grouped into the following five categories.

2.1.1 Past, Current, and Future Trends and Vulnerabilities

Interviewees were asked to discuss past and present growth trends in the area’s tourism industry. They were also asked to describe the outlook for the tourism industry over the next ten years, and to discuss the key factors contributing to this outlook.

Industry representatives also were asked to discuss the challenges that the gaming and hotel industry has confronted over the last five to ten years in the Las Vegas market. In addition, they were queried about present or near term future vulnerabilities to this sector of the economy excluding the possible shipment of nuclear waste.

2.1.2 Industry Position on the Proposed Yucca Mountain Project

The gaming executives and their association representatives were asked if the industry had taken a position on the Yucca Mountain project, and if so, what the industry's position was. They were also asked to identify and specific issues and concerns that have been identified by the industry as a whole that were related to the DOE's proposal.

2.1.3 Issues and Concerns Identified

Interviewees were asked what areas, if any of the visitor economy might be vulnerable to the proposed nuclear waste shipments. Inquiries of respondents were also made regarding their organizations and any specific concerns for their own businesses as a result of the DOE's proposal. They were also asked whether the "transportation of nuclear waste near areas of economic activities may create stigma effects resulting in people not wanting to visit such places or buy homes nearby." Gaming executives also were asked to rank the impact of the proposed nuclear waste shipment campaigns impact on tourism volume; their corporation's credit rating; and their appraised value.

2.1.4 Plans for Addressing Potential Downturns

Another series of questions were asked of the gaming industry executives about the types of activities that the industry and/or their individual organization have undertaken to plan and prepare for the DOE's proposed activities. Specifically, they were also asked to discuss "what risk management tools or measures" that they might deploy to offset any declines in visitation

and to address whether they felt "that any downturn from stigma effects can be overcome by effective marketing." Gaming executives were asked whether they were aware of any coordinated planning activities for evacuating the "Strip" in case of an incident. Finally, responses were obtained to questions about their own organization's evacuation planning activities and whether their insurance covered nuclear related events.

2.1.5 Industry and Government Responses to Yucca Mountain

The final area of questions involved asking the gaming representatives to discuss both the government's and the private sector's response to the DOE's proposal to ship HLW through Clark County to a repository to be built at Yucca Mountain, Nevada. Specifically, they were asked what they thought was an appropriate course of action for their industry and their own organization, and what Clark County, the State of Nevada, and the City of Las Vegas should be doing to address this issue. The responses to these questions are summarized in the next section.

3.0 FINDINGS

All of the gaming executives interviewed indicated that they were opposed to the DOE's plans, especially the shipment of HLW through Clark County. In fact, several representatives pointed to a resolution that the Nevada Resort Association had passed in opposition to the proposed repository on September 11, 1991 (Appendix B). The resolution recognizes that "visitors from outside the State of Nevada constitute the economic lifeblood for this state's continued prosperity with their expenditures directly and indirectly accounting for more than half of the state's economic activity." Further, the resolution indicates that "any diminution in the image that Nevada now conveys" ... "would reduce tourism and severely damage the welfare of Nevada's citizens." They also noted that a similar statement of opposition was made more recently, in January 2001, by both the Las Vegas Visitors and Convention Authority and the Las

Vegas Chamber of Commerce. While opinions varied as to the likelihood of a transportation incident related to the shipment campaign, there was universal opposition to DOE shipping waste through Clark County and significant concern about the potential vulnerability of the tourism sector if the DOE went forward with their plans. The comments of the gaming executives are summarized within the following categories:

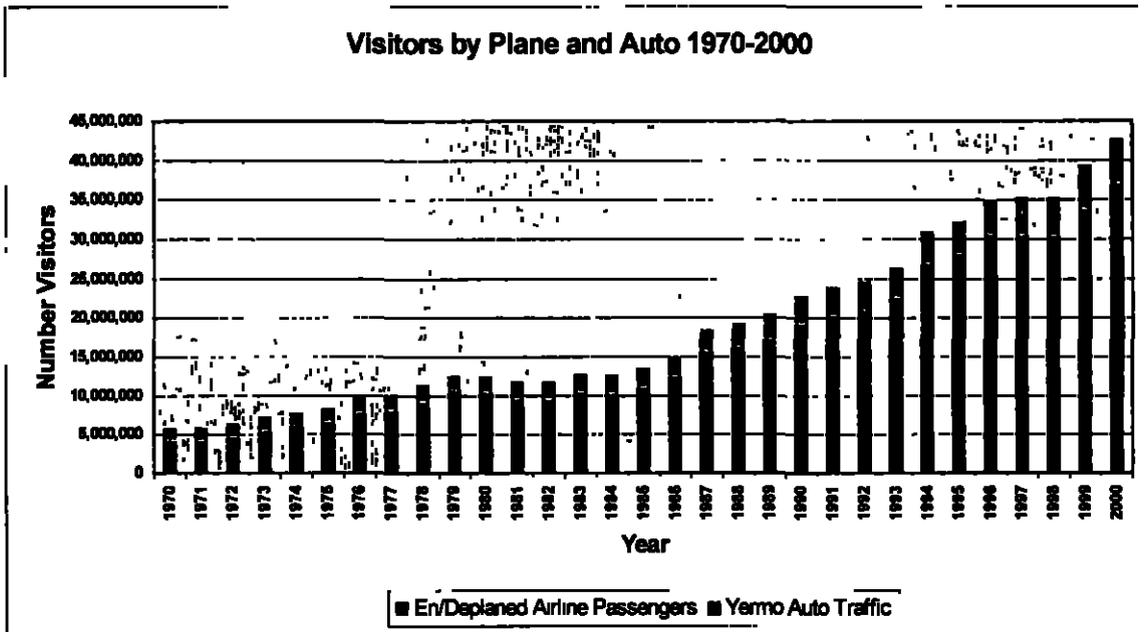
- Past, Current, and Future Trends and Vulnerabilities
- Industry Position on the Proposed Yucca Mountain Project
- Issues and Concerns Identified
- Plans for Addressing Potential Downturns
- Industry and Government Responses to Yucca Mountain

3.1 Past, Current, and Future Trends and Vulnerabilities

Most of the gaming executives were bullish in their discussion of the growth that has occurred within their sector, especially over the recent past. Several noted that the growth in the number of gaming and hotel properties in the last three years is unprecedented. Similarly, several gaming industry executives reported that visitations, hotel occupancy, and payrolls have all grown significantly over the last decade. Several factors were identified as contributing to this growth in addition to the stimulus presented by new properties

Among the major contributors, they identified the strong U.S. economy as key. The strong economy coupled with easy and inexpensive flights has boosted the number of visitors that have enplaned/deplaned at McCarran Airport from 19 million in 1990 to 36.68 million in 2000 (Figure 3).

Figure 3 – Visitors by Plane and Auto 1970-2000



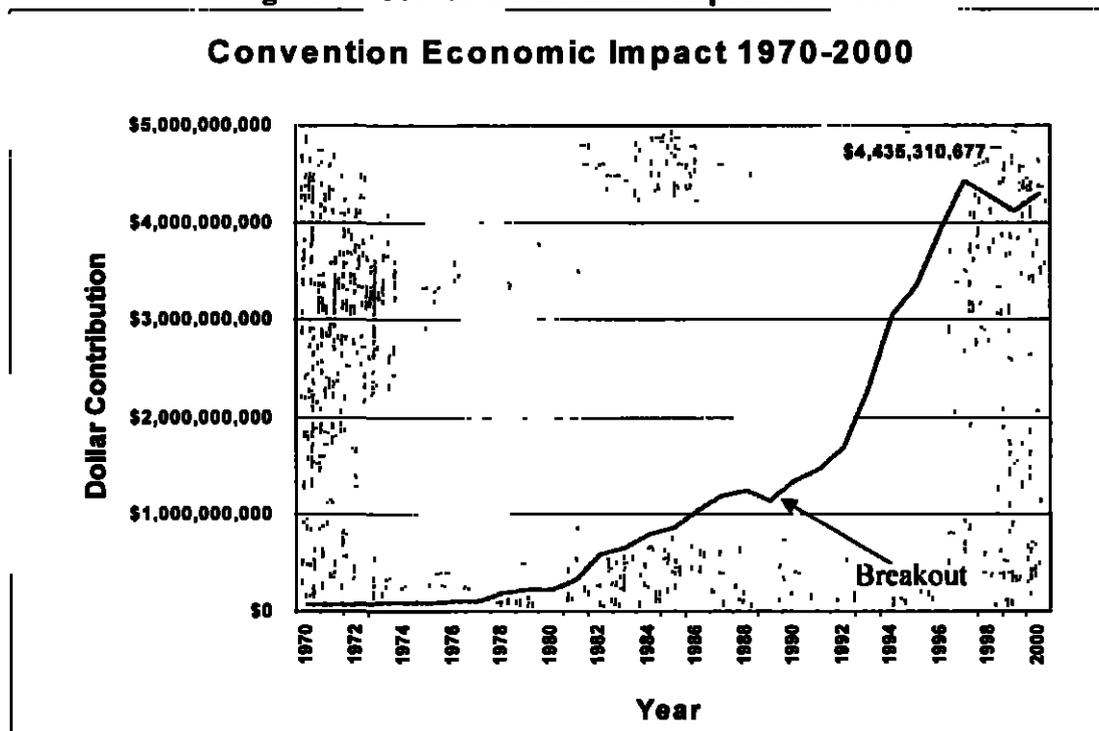
Source Las Vegas Visitors and Convention Authority

Several pointed out that tourism was now central to the American economy and that entertainment is the key component that drives this sector. One representative of a major resort casino described Las Vegas as having overcome past stigma related to gambling and its earlier association with organized crime. He noted that today, Las Vegas attracts a diverse clientele including families. This senior executive commented that Las Vegas was now at the apex of the entertainment industry noting that it now generates twice the revenues of Hollywood. Gaming executives, especially those representing "Strip" properties emphasized the diversification in their products as also being a key factor in the expansion of their customer base. The Chief Executive Officer at one of the larger resort properties commented that their customers now spend 2 to 3 hours a day shopping which is almost the equivalent to the average time they spend gambling. He noted that for the destination resort properties, this has resulted in the revenue mix shifting from predominantly gaming where other services, such as hotel, food and beverage, and

retail were considered “loss leaders” to a current 50/50 mix of gaming and other services. Several resort operators noted that over the next five years this shift would likely continue resulting in a mix of 60% for other services and only 40% for gaming revenues.

Other casino operators, especially those representing downtown properties and those properties catering to local clientele indicated that this phenomenon was not nearly so pronounced in their part of the market. In fact, they noted that gaming remains the primary driver for revenues in their operations. These comments are supported in an analysis of gaming revenues by Bear, Stearns & Company. This report indicated that by 1998, the average percent of net revenues from gaming for “Strip” casinos had fallen to 53.7%, while for downtown casinos it remained at 67.4% (Bear Stearns & Company 2000).

Figure 4 – Convention Economic Impacts 1970-2000



Source: Las Vegas Visitors and Convention Authority

Gaming executives emphasized two other key sub markets as also contributing to the growth in revenues that their operations have experienced. Since 1990, the number of convention visitors has grown dramatically as has their economic contribution to Clark County (Figure 4). Since 1990, the number of conventioners has grown from 1.74 million to 3.86 million in 2000. The economic impact from this component of the market also has experienced phenomenal growth contributing \$4.4 billion to the Valley's economy in 2000. One gaming executive of one of the larger destination resorts stated that the convention trade is responsible for approximately one-third of their room nights.

These executives noted that Las Vegas would soon be second only to New York as a convention center. An industry analyst supports this contention noting that this year Las Vegas will surpass Chicago to become number one with regard to convention exhibit space (Bear Stearns 2000).

Several gaming industry representatives also discussed the impact that Clark County's dynamic population growth has had both its direct contribution to gaming revenues and its importance in providing an adequate labor pool for the gaming industry. According to an analysis by the Center for Business and Economic Research at UNLV, 26.7% of Clark County residents surveyed visit a casino at least once a week. This behavior or visitation has fueled a gaming market in Clark County that caters more to the local market and Californians. Gaming operators who have targeted this market observed that some of their facilities are particularly vulnerable to the DOE's proposal because many of them are located along the transportation corridors that DOE is considering for the transport of H.W. or would have their California visitors vulnerable to potential transportation disruptions.

Gaming executives pointed to at least three other factors that have contributed to the positive economic growth in the gaming industry. They note that repeated surveys of area residents have identified the high quality of life in Clark County as a significant factor in attracting and maintaining residents to the area. They also indicated that State and local political leaders have also provided positive leadership in maintaining a balance between needed government services and an attractive business environment. Finally, several gaming executives pointed to their own efforts in staying in front of the curve by bringing new entertainment into the market and routinely upgrading their facilities, resulting in an unique experience.

The gaming executives spoke frankly to the challenges that they see today and the future. The current downturn in the U.S. economy was identified as a significant current challenge that will likely contribute to slowing growth among this sector in the near term. While some executives noted that even in times of poor economic growth, many people continue to enjoy gaming. Others noted that the gaming industry is just as vulnerable as any other sector to economic slowdowns with some indicating that it is more sensitive than many sectors. Other representatives emphasized the cyclical nature of the industry's growth. They noted that after the large number of new properties which have opened in the last few years that a period of slower growth is to be expected so that these additional facilities to be adequately absorbed.

According to most of the gaming executives interviewed, beyond future economic growth and the health of the economy, one of the more significant challenges is Indian gaming. Several executives indicated that Indian gaming particularly in California could present a serious problem for the smaller casinos especially those located downtown. Several also noted that this problem is likely to be compounded by the mounting price of fuel. Of concern is a synergistic effect between Indian gaming and high fuel prices resulting in the likelihood of some

Californians deciding to drive a shorter distance to a tribal casino within their own state instead of coming to Las Vegas. Increasing energy costs were also identified as a challenge in both keeping down their operating expenses, as well as the potentially adverse effect it may have on visitor airline fares. One executive noted that energy costs for his operation had gone up \$10,000,000 this past year and that it was now costing about 1½ cents per share of their stock price.

Another gaming executive expressed support for nuclear energy as an environmentally sound energy source, but noted that nuclear waste should be stored on site at the point of generation. He also stated that federal subsidies including the Price Anderson Act should be repealed so that nuclear energy can compete on a level playing field with other forms of energy.

In addition to energy costs, road congestion and air pollution were identified as significant issues that could endanger the longer-term economic health of the gaming industry. In fact, in a recent filing with the SEC, one of the largest companies stated that congestion along the I-15 corridor from California was a potential problem and that “capacity constraints of that highway or any other traffic disruptions may affect the number of customers who visit our facilities.” Other challenges faced by these industry representatives include improving Clark County’s education system and according to some, ensuring that immigration continues so that there is a sufficient labor pool. One executive noted that despite all of the population growth that Clark County had experienced, maintaining an adequate educated labor force remained a significant challenge in the face of tight supply.

Overall, most of the executives believe that despite short-term cyclical responses to national and worldwide economic conditions, the overall trend for the gaming industry in the absence of nuclear waste shipments is positive

3.2 Industry Position on the Proposed Yucca Mountain Project

As noted earlier, all of the industry representatives interviewed indicated that their industry has been on record since September 11, 1991, through a resolution of the Nevada Resort Association, as being opposed to the construction of a repository at Yucca Mountain and the related shipment of HLW. Several also noted that other organizations including the Las Vegas Visitors and Convention Authority have more recently issued public statements in opposition to the DOL's proposal.

Further, all of the gaming executives interviewed expressed concern that an accident, even a minor one along a route anywhere in Clark County could have a devastating impact on their business. While some representatives were unsure of the scientific viability of the Yucca Mountain repository, all indicated that under no circumstance should trucks carrying HLW come through Clark County. Several noted that just the transportation of HLW, especially HLW coming from California through Clark County on route to Yucca Mountain, could significantly affect their business in an adverse manner. These industry representatives noted that congestion, particularly on weekends along the California/Nevada transportation corridor, has already proved problematic. The addition of slow moving trucks containing such dangerous wastes they believe will increase the likelihood and severity of an accident discouraging some Californians from coming to Las Vegas to gamble. These representatives stated that Californians make up 30% of the visitors to Clark County. The increase in congestion along the California/Nevada corridor, combined with rising energy costs, and the availability of Indian gaming closer to home, is seen as a significant risk to gaming in Southern Nevada, especially for the Las Vegas downtown casinos.

According to virtually every gaming industry representative interviewed, the most serious risk is from the stigma that will result if there is any accident of any kind involving the shipment of HLW. These representatives referenced the media coverage (amplification) that is likely to accompany any incident with a nuclear waste vehicle. Several stated that an accident anywhere in Clark County would be reported worldwide, and it would be linked to Las Vegas because it is the nearest media outlet. While most of those interviewed were unsure as to the degree and duration of the stigma that would accompany an accident, virtually all indicated that it could be a serious problem. One senior gaming executive of a destination resort indicated that the media's amplification of even a small traffic incident could result in a double digit drop in the number of visitors such as what occurred in Florida after several German tourists were killed. Another gaming executive noted that while "cyclical markets can be managed, collapsing markets can not" referring to the negative images that he believes would be associated with the media amplification of an accident event. Gaming executives described the potential impact of a serious accident on their industry, as crippling, devastating, and "Chernobyl" like, referring to the Russian city that had to be permanently evacuated after a 1986 nuclear reactor accident that released radiation across a wide area. It is clear that the gaming industry believes that the transportation of HLW through Clark County would bring increased risk to the primary economic base for the entire State of Nevada.

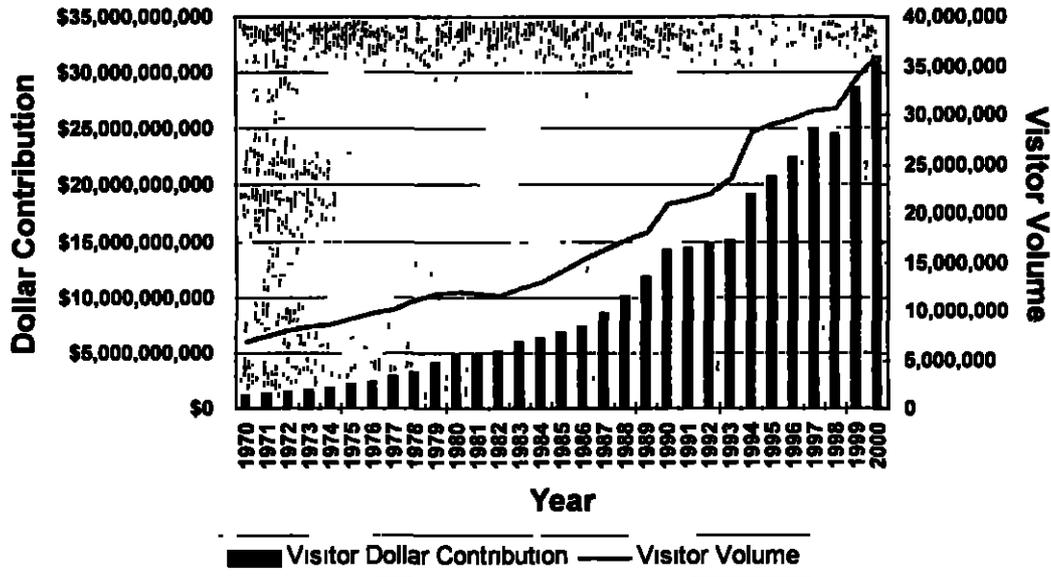
In addition, several gaming industry executives stated that many of their customers, and virtually all of their employees, are residents of Clark County and any incident that detracts from their quality of life and economic well-being, such as the transportation of HLW, is not good for their business.

3.3 Issues and Concerns Identified

The most important concern of all of those interviewed, as noted above, are the impacts related to stigma that would occur in the event of an accident. Several representatives of the gaming industry noted that Las Vegas is a city built on perception. They note that Las Vegas markets itself as a place where you can experience exotic locations and during your visit play out your fantasies in a safe environment. These representatives strongly suggested that positive public perceptions of Las Vegas contributed to increased revenues for the gaming industry, but that negative perceptions resulting from an accident would result in decreasing revenues. Several representatives strongly believe that the public's perception of their environment has real economic consequences that are clearly demonstrable in the gaming industry. Some of the gaming executives interviewed felt the impacts could be mitigated if a rail corridor outside of Clark County was used to transport the HLW. Others argued that accidents even outside of Nevada along the transportation corridor could be potentially damaging to the industry because the media would be likely to associate the shipment as "on route to Yucca Mountain outside of Las Vegas." Several gaming industry executives stated that the State of Nevada should not identify transportation routes, since the DOE would perceive this action as acquiescence.

Figure 5 – Visitor Volumes and Dollar Contribution

Visitor Volume and Dollar Contribution 1970-2000



Source: Las Vegas Visitors and Convention Authority

Many of the gaming executives discussed the various ways that stigma could affect their businesses. For example, earlier studies conducted for the State of Nevada indicated that convention planners would be less likely to hold a convention in Las Vegas if there were a nuclear transportation incident. Since 1990, the contribution of convention visitors to the local economy has grown exponentially. Several gaming representatives stated that given the growth in this sector, it is important to investigate what the fiscal implications could be to this subset of the market if the DOE proceeds with the program.

Another concern related to stigma that was frequently cited was the potential loss of attractiveness of Clark County as a place for families to live, especially if an incident were to occur. Representatives of the full range of casino executives interviewed repeatedly mentioned that the tourism economy is driven by growth and that “population growth begets growth.” For

these representatives, anything that makes Clark County a less attractive environment for in-migration will have some degree of adverse affect on their businesses. Some noted that this could also result in fewer retirees moving into the area, particularly as Indian gaming becomes available closer to their home state. Others felt that younger workers might leave resulting in an aging population that over time would require more services and would contribute fewer resources to the area economy eventually cascading into "urban decay."

At least one gaming executive thought that it was only a matter of time before an Indian gaming establishment used the increased risk associated with the transportation of H1.W as a reason California gamers should shun Las Vegas in lieu of a tribal operated facility closer to home. Others noted that riverboat gaming, Atlantic City, and other vacation destinations might be perceived as less risky resulting in few visitors to Las Vegas.

One gaming executive who grew up in Clark County also noted that while Clark County has grown rapidly because of in-migration that long-time residents have ample reason to distrust the federal government. He noted that those residents who lived downwind when the Nevada Test Site (NTS) was fully operational have already experienced adverse effects from the DOE's (and its predecessor agency) past inability to appropriately manage their programs in a way that protected the public's health and safety. Another gaming executive commented that it is only recently that Nevadans have become aware of the residual health effects from wind carried radiation from the NTS. Thus, the uncertainty and stigma associated with the proposed H1.W shipment campaign will likely linger well into the future.

Another area of concern that was raised by a few gaming industry executives was the possibility that investors might find Clark County a less attractive area for investment because of increased uncertainty related to the effects of the shipment campaign on the visitor economy.

These gaming executives linked the high fixed costs associated with the gaming industry, as well as the need to continuously attract investment funds so that the new products can be developed to stimulate the market place, with the potential that the shipment campaign might make the industry less attractive for investors.

Others interviewed emphasized that the size of a casino and its geographic location significantly influences the percentage downturn that it can absorb without being critically impacted. Specifically, several gaming executives stated that the downtown casinos would be less able to absorb any, let alone a significant downturn even for a limited period.

Finally, most of the representatives emphasized that the gaming industry is particularly sensitive to downturns in revenues because of the high level of fixed costs associated with this type of business. Thus, for every dollar of revenues that is reduced the impact on the bottom line net income is even greater.

3.4 Plans for Addressing Potential Downturns

In the past, the gaming industry has weathered economic or gaming downturns, most of which have been reductions in the rate of growth, rather than the actual loss of revenue, because most have been of short duration. For example, national downturns in the economy can be seen in the slow growth rates during 1973, 1987, and 1989 (Table 1). The downturn in the Asian economy referred to as the "Asian Flu" of 1998 can also be seen in reduced growth rates. Less apparent but reported downturns have been linked to weather events such as the floods in 1999. One casino representative indicated that these floods caused their roof to collapse over part of the casino resulting in reduced revenues of 25% to 33% during the period of reconstruction. This casino executive, as well as others, also stated that gaming operations in the Lake Tahoe/Reno area have been adversely affected by winter storms resulting in lost visits from Californians.

Whatever the cause, when visitation rates drop, the gaming industry attempts to attract clientele who spend more at the gaming tables. Thus, the cost for perks goes up when business is down. These operators noted that these increased marketing costs coupled with the high fixed cost associated with this industry would make it particularly difficult for the industry to mitigate any downturn from a nuclear waste shipment incident that resulted in long-term stigma.

Further, several gaming executives noted that their insurance would not cover the costs associated with a disruption of this type. Many also noted that while each casino has emergency response plans for their own facility(s) that a coordinated "Strip" wide emergency response plan requiring in-place evacuation did not exist.

3.5 Industry and Government Responses to Yucca Mountain

Most of the gaming representatives gave the State of Nevada, the congressional delegation, and local officials high marks for their efforts to defeat DOL's siting effort. They noted that Nevada is facing an uphill battle against those interests who want to make Yucca Mountain the nation's nuclear waste dumping ground. Several representatives were critical of some specific aspects of the effort that has taken place so far to defeat the repository program. These criticisms focused on three key issues. First, many of the gaming representatives noted that the transportation issues faced by Clark County are in many ways similar to those that will be experienced by other states along the transportation corridor although more severe because of the volume of trucks that will funnel into the Valley, and because of the sensitive singular focus of the Valley's economy.

These representatives stated alliances must be made with corridor states and they further believe that the states along the corridor must be informed as to the range of impacts that are

likely to occur if HLW is transported through their communities. There is a strong sentiment that Nevada must make an all out effort to collaborate with communities across the entire corridor.

Second, many industry representatives believe that a greater effort must be made to distill the findings from the many studies conducted by the State and Clark County that have identified the potential impacts so that they may be shared and used by various stakeholder groups in these states. This action would allow these groups to make a strong case as to why Yucca Mountain should not be selected as the nation's HLW repository. Third, they noted that this is a bi-partisan issue of such importance to Clark County and the State of Nevada, that every effort be made to approach this united, bringing to bear all of the resources that can be assembled. One gaming executive noted that a successful campaign to deter the DOI will require bringing together a diversity of stakeholders from workers within the gaming industry, such as the Culinary Union workers, to leaders of the gaming industry, such as those interviewed, as well as developers, and representatives of the mining industry. Several gaming executives stated that every effort must be made to avoid turning this issue into a political football. While many felt that efforts to date have largely succeeded in avoiding this pitfall, others noted that the opposition tent should be large enough to include those who have more limited objectives such as keeping the waste out of Clark County.

For many gaming executives, the salient issue is the case for on-site storage at the point of waste generation. These representatives believe that armed with accurate, balanced scientific data, that a strong case could be presented to the states along the transportation corridor that on-site storage is the best solution for the foreseeable future. A few representatives also stated that greater efforts should be made to find a technological solution that would make the waste less dangerous.

Several key industry representatives remarked that if the State were to succeed in defeating the repository siting, the Governor would need to bring together leaders from the gaming industry, as well as other important sectors of the economy including developers and the mining sector. The governor should, these executives believe ask the representatives of these industries to use their influence within the corridor states and in Washington to defeat the proposal. Some of these gaming executives noted that if this initiative cannot be defeated then every effort must be made to ensure that no HI W trucks come through Clark County

Several of the gaming executives pointed to ongoing relationships that they had with members of Congress, the Administration including the Secretary of Energy, and with political leaders in some states along the corridor. These gaming executives indicated that if they were asked to aid the Governor and the Congressional delegation they would be willing to help in a focused effort to educate decision-makers both in Washington and the states along the corridor as to the adverse impacts associated with the DOE's proposal both for Clark County and all of the corridor states. Several suggested that the Governor bring together small groups of gaming industry representatives, as well as other key economic sectors such as the construction industry, and ask them to utilize their resources and contacts to explain why the DOE should not go forward with its plans to construct the repository and the related shipment of HI.W. Others noted that it was equally important for the entire Congressional delegation, as well as, the County Commissioners and all other Nevada political leaders to become actively involved in this effort to build a coalition along the transportation corridor and in Washington, DC to stop the DOE proposal from going forward as currently fashioned

Further, they noted that it is important that the State and the County assist various stakeholder groups by providing information packets that distill the findings from the many

studies that have been done identifying the range and magnitude of impacts that are likely to occur if the DOE proceeds with its program. In addition, stakeholder groups need information on the transportation routes, as well as, the schedule, and avenues for participation that are available under the Nuclear Waste Policy Act (NWPA). One gaming representative remarked that the Internet should be used as a centralized access point to community leaders across the transportation corridor and to Congress and the Administration.

Several also indicated that it is important that viable alternatives to Yucca Mountain be explored. A¹ number of alternatives was suggested ranging from paying to export the waste to Siberia, offering financial incentives to a State or Indian tribe that was economically disadvantaged, transmutation, and on-site dry cask storage at the point of generation, while new technologies are developed to safely manage these wastes.

¹ The Russian Duma has recently proposed accepting HI W from Europe and Japan for permanent storage

All of the representatives indicated that under no circumstance should HI.W be allowed to come through Clark County. Several of the gaming executives recognized that litigation needed to be part of the State's strategy. One executive indicated that the loss of property values within the gaming industry, resulting from the DOE's proposed action, might be the basis to litigate for compensation. Many of the gaming executives interviewed noted that it "just doesn't make sense" to ship IILW through the rapidly growing Clark County. If all else fails, efforts need to be made to ensure that the waste does not traverse the same transportation corridor as the customers of the State's primary industry sector. In addition, at least one gaming executive indicated not only should rerouting the waste outside of Clark County, preferably by rail be explored, but also that other compensation be sought if the DOE can not be deterred.

Finally, there was strong sentiment that this issue is so large and so important to the well-being of all of the State's residents that it must be approached in a bi-partisan fashion using all of the resources that the State can avail itself of, if it is to succeed.

4.0 DISCUSSION/NEXT STEPS

The comments by the gaming executives interviewed indicate that concerns about the potential impacts of the DOE's proposal on the singular most important sector of Nevada's economy are well justified. The gaming industry leaders were thoughtful in their consideration of the impacts and generous in their willingness to assist the Governor, the Congressional delegation, and local political leaders in mounting a bi-partisan effort to deter the DOE from going forward with the repository and related HLW shipment campaign.

The next step they believed is for the Governor and the congressional delegation to marshal these resources in a concerted effort to form an alliance that can bring Nevada's case to the corridor states and to Congress and the Administration. In addition, the gaming executives were also clear about additional studies and information that they believe will be beneficial in helping estimate potential impacts and educating others about why the DOE proposal is not good for Nevada or the nation. Some of these suggestions have been incorporated into Urban Environmental Research's studies to be conducted for Clark County's NWD over the next year and are discussed in the next section. In the last section of this report, issues that were identified by the gaming executives that still need to be addressed are identified and detailed

4.1 4.1 Issues Addressed in Next Years Work Plan

Several of the gaming executives indicated that detailed studies were needed to understand how different visitor groups are likely to respond to the shipment of HLW through Clark County. Several gaming executives suggested the use of focus groups of various visitor

types to assess the nature and extent of potential impacts on the gaming industry. This suggestion has been incorporated into UER's work plan for this next year. As has the suggestion to use focus groups to more fully understand how the DOE's proposal would effect in-migration and out-migration.

Other gaming executives noted that it would be important to understand how the investment community may react if the shipment of HLW were to begin. Several industry representatives remarked that the cost of capital is a critical factor in maintaining profitability for gaming organizations. UER has also incorporated a detailed financial analysis of the effect of revenue downturns within the gaming sector on net income into our work plan for next year.

4.2 Issues Still to be Addressed

Areas of study that were suggested by the gaming executives that have not yet been addressed are largely focused on the need for distilled information that can be used by stakeholders groups and individuals to make the case that the DOE's proposal is likely to have adverse impacts on Nevada and the other states along the proposed transportation corridor. This informational need is an area that both Clark County and the State of Nevada still need to address, as well as, studies to assess the viability of alternatives to the repository.

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APPENDIX A

Survey Questions for the Gaming Industry

SURVEY QUESTIONS FOR THE GAMING INDUSTRY

We are under contract with the Nuclear Waste Division of the Clark County Department of Comprehensive Planning to assist in preparing an impact report on the proposed Yucca Mountain repository for storing and transporting of high-level nuclear waste. Some of the proposed routes for shipping nuclear waste to the repository will be through Clark County as shown in map #1. This part of the study involves a preliminary evaluation of the potential effects of transporting nuclear waste on the gaming-hotel industry. We were asked to interview key management personnel in the gaming- hotel industry to ascertain information on their corporation's awareness, concerns, and planning regarding the possible shipments of nuclear waste through the larger Las Vegas metropolitan area. We would also like to identify the types of information and research you may require at this point to assist you in your planning and decision-making, if at all.

We will start with some very general questions about the gaming industry and trends and then ask you to respond to specific questions about possible impacts as a result of the proposal to ship nuclear waste through Clark County. [Show Scenario # 1 and take respondent through this as a possibility at this point]

QUESTIONS

1 a). Based on past and present growth trends in the gaming-hotel industry in the Las Vegas area, what is your outlook for the industry over the next ten years?

b) What are the key factors that contribute to this outlook?

2. From your perspective, do you see any present or near future vulnerabilities to the gaming-hotel industry in the larger Las Vegas area, excluding the possible nuclear waste shipments.
___ YES ___ NO ___ DO NOT KNOW (DNK)

If yes, what are these vulnerabilities?

3. Over the last 5 to 10 years, what challenges or problems has the gaming-hotel industry confronted in Las Vegas?

4. As far as you know, has the gaming industry in Las Vegas taken a position regarding the Yucca Mountain project and the nuclear waste shipments through Clark County?
___ YES ___ NO ___ DNK

If YES, can you tell us what that position is?

5 Base on your awareness, has the casino-hotel industry discussed the possible impacts on your industry that may result from the Yucca mountain program and shipment campaign?

YES NO DNK

If YES, what issues have been identified by the gaming industry?

6. In your opinion, what, if any, are the areas of the visitor economy that are vulnerable to shipments of nuclear wastes?

7 In general, the Las Vegas economy has continued to grow and expand. Has your corporation planned for any downturns? YES NO DNK

If YES, can you reveal the general nature of these plans

8a). What is you corporation doing, if anything, to plan for the DOE's proposed shipment campaign of HLW through Clark County?

b). Do you believe that you have sufficient information to plan, prepare, and respond to any potential impacts? YES NO DNK

c). What additional information could Clark County provide that would be of help?

9. What do you think at this point in time is the appropriate response from the gaming industry to the DOE's proposal to ship nuclear waste through Clark County to the Yucca Mountain repository?

10. If the decision was yours to make today about transporting nuclear waste to Yucca Mountain, what options would you propose.

11. There have been numerous studies showing that the transportation of nuclear waste near areas of economic activities may create stigma effects resulting in people not wanting to visit such places or to buy homes nearby

(a) Do you think that the transportation of nuclear waste through Clark County could create such stigma effects? YES NO DNK IT DEPENDS

(b) If so, do you think that this could reduce people's desire to visit and stay in Las Vegas hotels? In this case we are talking about a no-incident transportation of high-level nuclear waste. YES NO DNK IT DEPENDS

Please explain. _____

12. What risk management tools or measures would the gaming industry employ to offset any declines in visitations?

13. If shipments of nuclear waste as described* here occur, do you anticipate any adverse impacts on your own hotels? YES NO DNK IT DEPENDS

* Benign scenario

Please explain. _____

14. Do you think that any downturns from stigma effects can be overcome by effective marketing mechanisms? YES NO DNK IT DEPENDS

Please explain _____

15. What do you think is the appropriate response at this point in time regarding the proposed nuclear waste program for the following entities?

- The City of Las Vegas to do?

- Clark County government to do?

- The State of Nevada government to do?

- The gaming industry to do?

16 (a). Do you believe that the shipment of nuclear waste through Clark County could influence how convention planners around the country make decisions as to Las Vegas as a destination place for large conventions?

(b) How? _____

17 a). What vulnerabilities do you envision for your corporation under any of the scenarios provided?

b). Do you have insurance coverage for nuclear-related problems?

c). Is there a corporate plan for a serious downturn in visitations?

d). Is there a plan for short-term disruption?

e). Do you have plans for evacuating guests?

Do you know, if there is a plan for evacuating the "Strip"?

18 Do you think that if the nuclear waste shipment campaign begins in a few years, the following areas of the gaming industry will be impacted?

- Tourism volume ___ Positive ___ Negative ___ DNK ___ No Impact
- Corporations' credit rating ___ Positive ___ Negative ___ DNK ___ No Impact
- Appraised value? ___ Positive ___ Negative ___ DNK ___ No Impact

APPENDIX B

Nevada Resort Association Resolution



RESOLUTION

WHEREAS, visitors from outside the State of Nevada constitute the economic life blood for this state's continued prosperity with their expenditures directly and indirectly accounting for more than half of the state's economic activity; and

WHEREAS, the emergence of gaming in new jurisdictions throughout the United States and the rest of the world has intensified the competition for tourists who seek to make gaming a part of their leisure experiences; and

WHEREAS, any diminution in the image that Nevada now conveys to the prospective visitor as an exciting, attractive, healthy and safe destination would reduce tourism and severely damage the welfare of Nevada's citizens; and

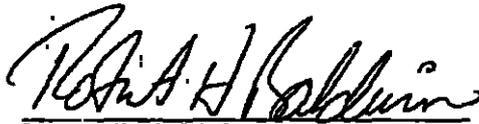
WHEREAS, the establishment of a high-level, nuclear waste repository in Nevada is inconsistent with the positive image the state seeks to present to the world; and

WHEREAS, because Las Vegas, the principal resource in Nevada's tourism product, has earned international recognition as the recreation capital of the world and would be the closest population center to the proposed nuclear waste repository, any news story about the repository and the associated transportation of radioactive materials to it could cause special damage to the reputation enjoyed by Las Vegas and the success of its tourism promotion efforts; now, therefore, be it

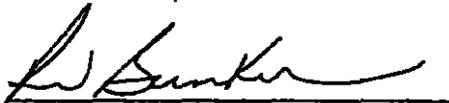
2300 West Sahara #440 Box 32, Las Vegas, Nevada 89102
Phone (702) 362-2472, Fax (702) 362-9278

RESOLVED, by its Board of Directors this 11th day of September, 1991, that the Nevada Resort Association objects to the establishment of a high-level, nuclear waste repository in the State of Nevada; and be it further

RESOLVED, that copies of this Resolution be transmitted to Nevada's Congressional delegation.



Robert H. Baldwin
Chairman of the Board



Richard W. Bunker
President