RADIOLOGICAL AND ENGINEERING ASSESSMENT

FOR

GENERIC APPLICATION OF SUPPLEMENTAL STANDARDS
TO PAVED STREETS AND ALLEYS WITHIN THE

SHIPROCK, NEW MEXICO

VICINITY PROPERTIES PROJECT AREA

JUNE 23, 1998

FOR

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT OFFICE

ALBUQUERQUE OPERATIONS OFFICE

U.S. DEPARTMENT OF ENERGY

BY

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) Standards for Remedial Actions at Inactive Uranium Processing Sites (40 CFR Part 192) defines two types of remedial action: control and cleanup. Control is the operation that places tailings piles in a condition that will minimize the risk to people over a long period of time. Cleanup is the operation that reduces the potential health consequences of tailings that have been dispensed from tailings piles by natural forces or removed by people and used elsewhere in buildings or land. The purpose of the EPA Standards for cleanup is to provide the maximum reasonable protection of public health and the environment. The varied conditions at the designated sites and limited experience with remedial actions, which existed at the time the law was created, made it appropriate for the EPA to allow tailings to be left in place where circumstances make such action reasonable. Circumstances that make removal of tailings contamination unreasonable are accommodated by the EPA through provisions within 40 CFR Part 192 for Supplemental Standards. The U.S. Department of Energy (DOE) requested that MK-Ferguson Company consider the Application of Supplemental Standards and alternatives to remedial action work for street contamination in Shiprock, New Mexico.

This Radiological and Engineering Assessment (REA) considers all specified paved streets and alleys within the Shiprock vicinity properties project area. Although a detailed radiological assessment was not conducted within the streets and alleys, deposits of tailings are suspected to extend into the adjacent street on 20 percent (3 out of 15 properties) of the remedial action projects performed by the Shiprock Projects Office.

This REA serves as an Executive Summary for the remainder of this document and contains a description of remediation alternatives, evaluation of health risks for the alternative actions, estimated costs of the remedial actions, approximate volumes of contaminated materials, and the recommended action. Appendix A contains the Executive Summary for the Radiological Assessment data and a table that summarize the available radiological data. Appendix B is the Supplemental Standards Application and contains analysis of land use, health risks, alternative actions, construction costs, and owner input.

2.0 EVALUATION

There are no structures on the portion of the property being considered for supplemental standards; therefore, it does not meet the eligibility criteria for inclusion on the National Register of Historic Places.

This REA is focused on the residual radioactive material (RRM) believed to be located under the specified paved streets and alleys in the Shiprock vicinity properties project area. Figures 1 and 2 depict the areas being considered for supplemental standards. Field assessment radiological data are included in Table A.T1. An analysis of potential health risks is presented in Table B.T1.

The alternatives being considered in Appendix B are summarized below.

Alternative 1 - No Remediation (Supplemental Standards)

Health Risk: See Appendix B, Table B.T1

Estimated Subcontract Construction Cost: $ 0

Estimated Total Project Cost: $ 0

Approximate Volume of RRM Removed: 0 cubic yards

Approximate Volume of RRM Remaining: 17 cubic yards

Alternative 2 - Complete Remediation

Health Risk: Reduced to EPA Standards

Estimated Subcontract Construction Cost: $48,191.00

Estimated Total Project Cost: $113,468.00

Approximate Volume of RRM Removed: 17 cubic yards

Approximate Volume of RRM Remaining: 0 cubic yards

3.0 CONCLUSIONS AND RECOMMENDATIONS

Examination of the health risks evaluated in Appendix B suggests that there will be no significant identifiable health risks from radiation exposure if Alternative 1, No Remediation, is approved for supplemental standards. The $48,191.00 subcontract cost of Alternative 2, Complete Remediation, is unreasonably high when compared to the long-term benefits.

APPENDIX A

SUPPLEMENTAL STANDARDS
RADIOLOGICAL ASSESSMENT

FOR

GENERIC APPLICATION OF SUPPLEMENTAL STANDARDS
TO PAVED STREETS AND ALLEYS WITHIN THE

SHIPROCK, NEW MEXICO

VICINITY PROPERTIES PROJECT AREA

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

This Appendix contains the applicable street and alley "spillover" radiological information gathered during the remediation of 15 vicinity properties in Shiprock, New Mexico, between 1984 and 1985. A "spillover" is a deposit of residual radioactive material (RRM) that extends beyond the property inclusion boundary.

In 1989, the Department of Energy issued Vicinity Property Management and Implementation Manual (VPMIM) Directive #E4, instructing Remedial Action Contractors to document known spillover contamination under paved streets and alleys in the Radiological and Engineering Assessment (REA) for the contiguous property. Since Directive #E4 was issued after remedial action had been completed at Shiprock, street contamination was not documented in this way.

MK-Ferguson examined the vicinity property files of all remediated properties to compile a list of properties where RRM is known or suspected to spill over into streets or alleys. The file review conservatively considered two primary factors for inclusion: Either 1) documentation exists confirming spillover into adjacent streets or alleys, or 2) excavation occurred immediately adjacent to a street or alley and documentation does not exist to refute the existence of contamination extending under the roadway. All available documentation was reviewed, including REAs, Completion Reports, field notes, survey data, as-built drawings, and correspondence.

Twenty (20) percent (3 out of 15) of remediated properties are suspected to have RRM extending into an adjacent street or alley. A summary of the suspected depths of contamination, gamma exposure rates, and available Ra-226 soil concentrations is included in Table A.T1. Note that figures provided in the table are independent maximums only. Therefore, the reported depth does not necessarily correspond to the depth at which either the exposure rate or Ra-226 concentration was measured.

2.0 GAMMA EXPOSURE RATE SURVEYS

2.1 Exterior

The area background reading for the Shiprock, New Mexico, locale is 12 μR/hr. Street gamma exposure rates are 12 μR/hr. A summary of gamma exposure rates is included in Table A.T1. Potential gamma exposure rates resulting from exposure of the subsurface deposits during road or utility maintenance/ construction has been estimated using Ra-226 soil concentrations recorded beneath

the roadway. A conservative conversion factor of 1.8 μR/hr per 1.0 pCi/g Ra-226 has been employed in accordance with the results of the EPA's gamma radiation survey of twenty inactive mill sites conducted for the Final Environmental impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) (Vol. I; October, 1982; pp. 109-10). Estimated exposure rates of the exposed deposits range from 37 to 70 μR/hr.

2.2 Interior

Not applicable.

3.0 Ra-226 CONCENTRATIONS IN SOIL

The area background soil concentration of Ra-226 in the Shiprock, New Mexico, locale is 1.3 pCi/g. Estimated street Ra-226 concentrations range from 20.6 to 39.9 pCi/g Ra-226. A summary of this data is included in Table A.T1.

Ra-226 concentrations, in most cases, were estimated by converting the highest surface or subsurface gamma exposure rate. A conservative conversion factor of 1.8 μR/hr per 1.0 pCi/g Ra-226 has been employed in accordance with the results of the EPA's gamma radiation survey of twenty inactive mill sites conducted for the Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) (Vol. I; October, 1982; pp. 109-110).

4.0 RADON/RADON DECAY PRODUCT CONCENTRATION (RDC)

RDCs are not applicable since there are no structures within the areas considered for supplemental standards.

5.0 EXTENT OF CONTAMINATION

5.1 Exterior

A summary of the suspected depths of contamination is included in Table A.T1. The maximum known depth of contamination is 12 inches. For quantity estimates of RRM left in place, this Application makes the conservative assumption that the depth of contamination below the street is the same as the depth of contamination adjacent to the street.

In general, boreholes were not drilled into streets or alleys known or suspected to be underlain with RRM to characterize the areal extent of contamination. In all cases, the depth of contamination is assumed to extend out to the centerline of the street or alley, 20 or 15 feet, respectively.

The overall extent of contamination is presented in Figures 1 and 2. Note that the data presented are based on limited information and are not drawn to scale. Drawings should be utilized as a visual aid only which approximates areas of known or suspected contamination.

5.2 Interior

Not applicable.

6.0 REMEDIAL ACTION RECOMMENDATIONS

6.1 Exterior

One paved street in the Shiprock vicinity properties project area, specified in this REA, should be considered for Application of Supplemental Standards (see Appendix B for further evaluation of the alternatives and recommendations).

6.2 Interior

Not applicable.

7.0 COMMINGLED WASTE INVESTIGATION

A commingled waste investigation was not performed on the paved street or alley.

TABLE A.T1
SUMMARY OF RADIOLOGICAL DATA
SHIPROCK, NEW MEXICO
PAVED STREETS
GENERIC SUPPLEMENTAL STANDARDS APPLICATION

Item No.	DOE ID No.	Address	Spillover Trend	Surface Gamma Rate (μR/hr) (SEE NOTE 1)	Est. Subsurface Gamma Rate (μR/hr) (SEE NOTE 2)	Ra-226 Conc. (pCi/g) (SEE NOTE 3)	Depth of Contam. (Inches) (SEE NOTE 4)	Potential Volume (cubic yards) (SEE NOTE 5)
1	SH-006	301 VCA ROAD	TO VCA ROAD	BKG	70	39.9	12	7
2	SH-007	303 VCA ROAD	TO VCA ROAD	BKG	37	20.6	7	4
3	SH-009	311 VCA ROAD	TO VCA ROAD	BKG	57	31.7	7	6
		MAXIMUM VALUES		BKG	70 μR/hr	39.9 pCi/g	12 Inches	
		TOTAL POTENTIAL VOLUME						17 CY

NOTE 1: The gamma exposure rate listed is the maximum gamma rate measured on the paved street or immediately adjacent to the street on the associated vicinity property. Background for the Shiprock, New Mexico, locale is 12 μR/hr.

NOTE 2: The estimated subsurface gamma exposure rate listed was calculated using the maximum Ra-226 concentration measured under the roadway and a conversion factor of 1.8 μR/hr per 1.0 pCi/g Ra-226. The conversion factor was employed in accordance with the results of the EPA's gamma radiation survey of twenty inactive mill sites conducted for the Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) (Volume I; October, 1982; pp. 109-110).

NOTE 3: The Ra-226 concentration listed is the maximum final Ra-226 concentration recorded under the roadway. Background for the Shiprock, New Mexico, locale is 1.3 pCi/g Ra-226.

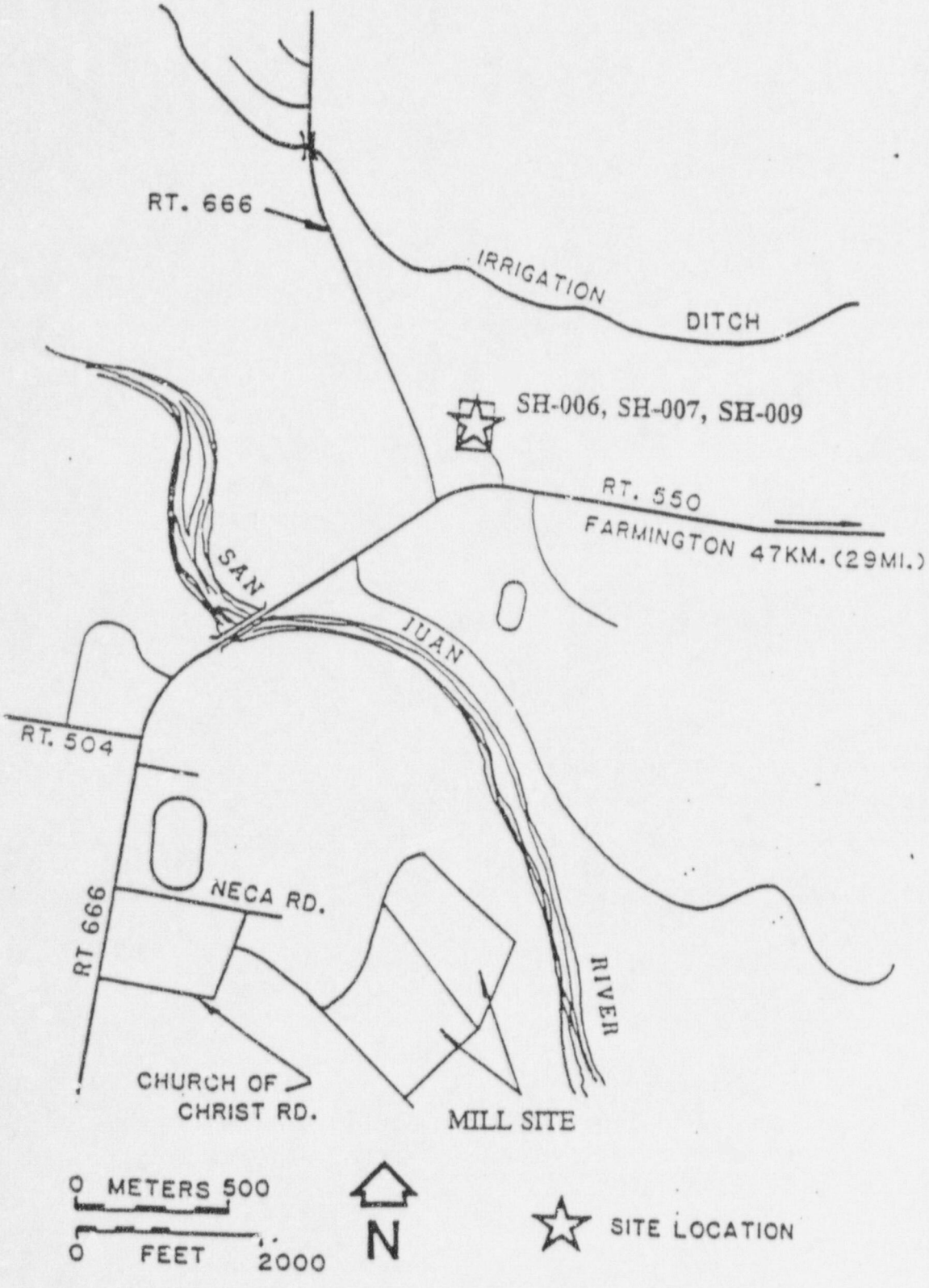
NOTE 4: The depth of contamination listed is the depth from the ground surface to the depth of contamination adjacent to the street.

NOTE 5: The potential volume was estimated by multiplying the depth of contamination adjacent to the street, by the length of the street associated with that property, and the distance to the centerline of the road. Note that this potential volume is based on extremely limited information and should be viewed as a conceptual estimate with order-of-magnitude accuracy.

SHIPROCK, NEW MEXICO

Figure 1. Vicinity Site Location.

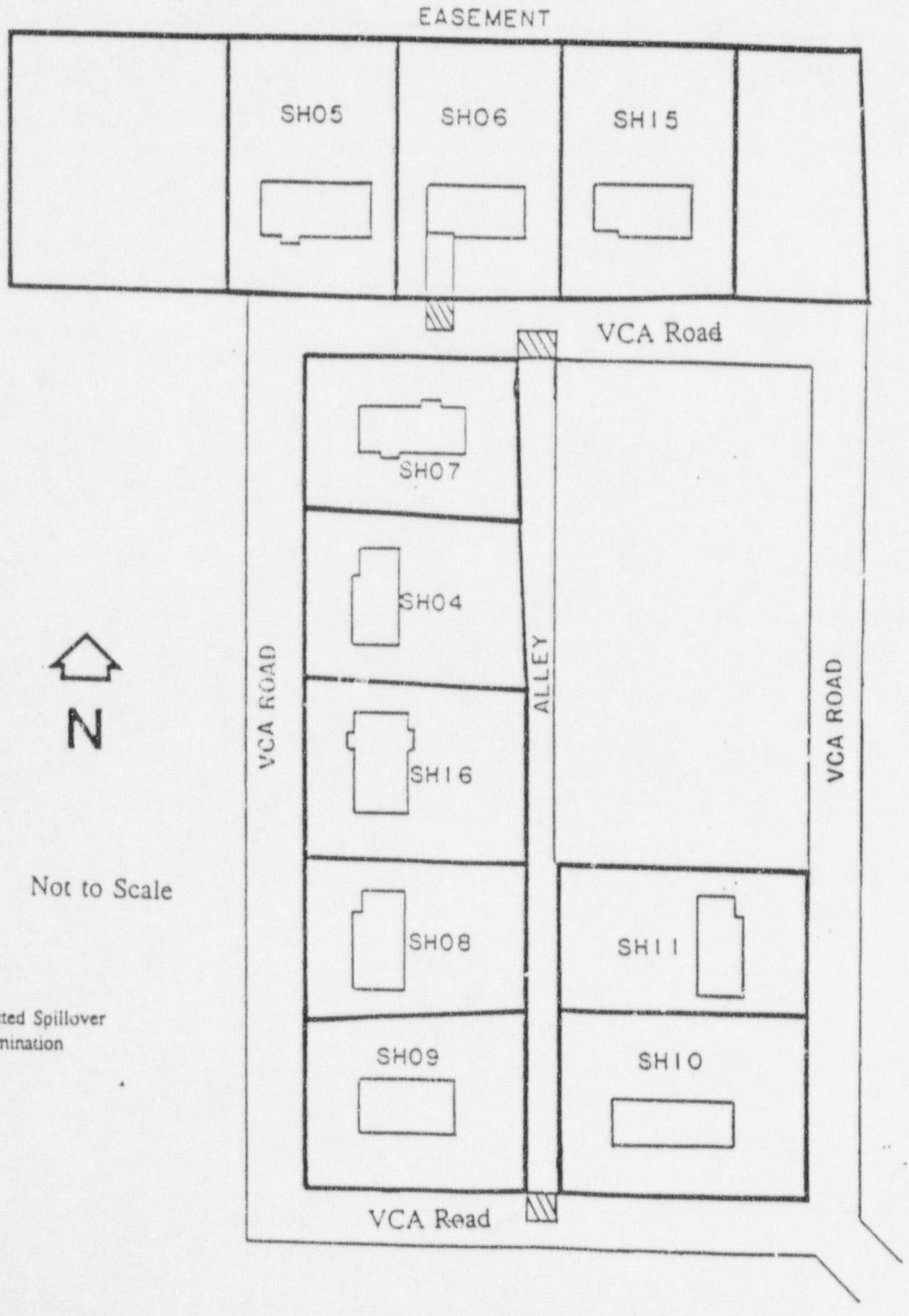
ANL-HP DWG.NO. 82-49



SHIPROCK, NEW MEXICO

Figure 2. VCA Properties.

ANL-HP DWG. NO. 82-50



APPENDIX B

GENERIC APPLICATION OF SUPPLEMENTAL STANDARDS
TO PAVED STREETS AND ALLEYS WITHIN THE

SHIPROCK, NEW MEXICO

VICINITY PROPERTIES PROJECT AREA

APPENDIX B

APPLICATION OF SUPPLEMENTAL STANDARDS
SHIPROCK, NEW MEXICO

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B.1 Applicable EPA Criteria

Supplemental Standards Application is in accordance with the regulations set by the U.S. Environmental Protection Agency (EPA) in 40 CFR 192. The potential and applicable criteria as stated in 40 CFR 192.21 are as follows:

_____ a) Remedial action would pose a clear and present risk of injury to workers or to members of the public

_____ b) Remedial action would directly cause excessive environmental harm

__X__ c) The cost of remedial action is unreasonably high relative to the long-term benefits.

_____ d) The cost of remedial action for cleanup of a building is unreasonably high relative to benefits

_____ e) There is no known remedial action

_____ f) Radionuclides other than Radium-226 and its decay products are present

An "X" indicates the appropriate subsection(s) for this application.

B.2 Introduction

This Supplemental Standards Application pertains to residual radioactive material (RRM) contamination associated with the paved streets in the Shiprock, New Mexico, vicinity properties project area. Figures 1 and 2 depict the areas for which supplemental standards are being sought.

B.2.1 Scope

40 CFR 192.22(c) states that "the implementing agencies may make general determinations concerning remedial actions under this Section that will apply to all locations with specific characteristics, or they may make a determination for a specific location . . ."

This Supplemental Standards Application is intended to apply to "all locations with specific characteristics" and will commonly be referred to as a Generic Application for Supplemental Standards (Generic Application). The specified characteristics, all of which must be present for any site to fall within the scope of this Application, are:

1. The site must contain a paved street or alley under the institutional control of a Homeowners Association, City, Town, County, or State government agency.

2. The street or alley must be located within an apparent public right-of-way or easement.

3. There may not be any habitable structure within 10 feet of the proposed application boundary unless the radon daughter concentration (RDC) within those structures is below acceptable limits, or unless acceptable methods other than RRM removal are employed to reduce the RDC to within acceptable limits.

4. There is no likely land-use change planned for the foreseeable future that might place a structure within 10 feet of the street or produce a scenario that would increase the health risk to the public by exposure to excessive levels of radiation.

B.2.2 General Assumptions and Parameters

This Application is intended to apply to the RRM in the subgrade of the asphalt/concrete pavements and concrete curbs and gutters. The inclusion boundary for this application is a 45° line at the edge of the pavement or curb/gutter as shown in Figures B.F1 and B.F2. This 1:1 slope was left in place to ensure that the bearing capacity at the edge of the pavement would not be diminished due to a weakened subgrade.

B.2.3 Land Use

To the best of MK-Ferguson's knowledge, the land use in this area is not expected to change in the near future. The contaminated material left in place may be disturbed if extensive road work is performed in this area. Land use is not expected to change because all of the areas proposed for supplemental standards in this application are within apparent public right-of-ways or easements. Tailing migration due to wind, erosion, or other forces is not viewed as an immediate threat to the area.

B.2.4 Owner Input

A copy of this document was sent to the Owner and written comments solicited in a letter dated June 4, 1998. It was requested that the Owner respond to the Application for Supplement Standards by July 3, 1998. The Owner, who also acts as a regulatory body, has responded, but has not concurred with the recommendation for the application of supplemental standards. Additional copies of this document will be sent to the Owner if significant changes are made during the review and concurrence process.

B.3 Radiological Data

Appendix A contains the radiological data relevant to this Supplemental Standards Application. Appendix A consists of an Executive Summary, Table AT.1 summarizing the radiological data, and two maps.

The radiological conditions within the Supplemental Standards Application area are summarized as follows:

Maximum gamma exposure rates are at background levels, 12 μR/hr. These rates were generally taken at the surface of the unexcavated concrete, asphalt, or unpaved ground adjacent to the street or alley prior to remedial action. Maximum estimated gamma exposure rates resulting from exposure of the subsurface deposits range from 73 to 90 μR/hr. These exposure rates were calculated from known Ra-226 soil concentrations recorded beneath the roadways using the EPA conversion factor 1.8 μR/hr per 1.0 pCi/g Ra-226 (EPA, Final Environmental Impact statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192), Vol. I; October, 1982; pp.109-10).

Average gamma exposure rates over the contaminated areas are not included in this Application because insufficient radiological information exists to determine an average exposure rate on the individual properties. Because the gamma exposure rates included in Table A.T1 are maximum values recorded adjacent to the roadway, the average exposure rate for each property will generally be less than these maximum values.

Surface exposure rates for these properties are reduced by shielding from asphalt, concrete, and/or backfill from remediation. Actual surface and subsurface exposure rates for the street and alley locations are unknown.

B.3.1 Health Risk Analysis

The analysis of current health risks is presented in Table B.T1. This analysis is only intended to be a screening-type analysis that depicts how many hours an individual could be exposed to the major pathway (gamma) and stay below the 100 or 500 mrem limits. Since maximum values at each property are utilized for the analysis, rather than an average exposure rate, MK-Ferguson contends that it is adequately conservative for an initial screening of the health risks at each property.

Exposure potentials are compared with two criteria as follows:

a. Long-term exposures are examined based on an allowable exposure rate of 100 mrem per year above background (hereinafter referred to as a 100 mrem dose).

b. Short-term unusual exposures are examined based on an allowable exposure rate of 500 mrem per year above background (hereinafter referred to as a 500 mrem dose).

The maximum gamma dose rate at waist level recommended by the International Commission on Radiological Protection (ICRP 1977, 1978) in DOE Order 5400.5 (March, 1990) is 100 mrem. This dose limit is for an individual member of the general public. Doses that exceed 100 mrem are acceptable when the higher exposures do not persist for long periods and when the average annual dose over an individual's lifetime is expected to be less than 100 mrem. The ICRP and

DOE suggest that dose rates be reduced "as low as reasonably achievable," but also state that no annual dose shall exceed 500 mrem. The health risk analysis presented in this recommendation for supplemental standards has compared the dose rates measured at ground level with the recommendations of the ICRP and DOE regarding waist level exposures. This procedure ensures a conservative evaluation.

The long-term exposure analysis considers three scenarios showing the following:

a. The required number of hours of continuous exposure to obtain the 100 mrem dose. This scenario is intended to model the exposure received by an individual residing on the site in the extreme case where no time away from the site is considered.

b. The hours per day of exposure during a continuous one-year period required to receive the 100 mrem dose. This scenario is intended to represent a maximum allowable daily exposure by an individual who occupies the point where the high gamma reading occurs.

c. The hours per day of exposure in a one-year period, utilizing week days only (260 days), required to receive the 100 mrem dose. This scenario models the potential exposure that could be received by an individual working in the area the indicated number of hours daily for one year.

The short-term unusual exposure analysis also considers three potential scenarios as follows:

a. The required number of hours of continuous exposure to obtain the 500 mrem dose. The intent of this scenario is to allow examination of the estimated time of continuous exposure required to receive the allowable dose.

b. The number of 48-hour temporary occupancy periods, in one year, necessary to receive a 500 mrem dose. This scenario represents the case where an individual occupies the site for repair work or other short-term purposes.

c. The number of 24-hour periods of exposure, in one year, necessary to receive a 500 mrem dose. This scenario considers emergency operations to perform repair work at the site.

Worst-case scenarios in this health risk analysis are based on maximum surface gamma rates, including the assumed background of 12 μR/hr. The scenarios do not create models of likely situations, but present data that can be used to evaluate the potential for a health hazard if this Supplemental Standards Application is approved.

Table B.T1 reflects maximum surface and subsurface gamma exposure rates from RRM extending into the streets and alleys. The worst-case scenarios include: 1) the maximum exposure rate occurring at the surface of the contaminated material, which equals 12 μR/hr; and 2) the maximum exposure rate resulting from exposure of a subsurface deposit, which equals 70 μR/hr. Estimated subsurface gamma exposure rates were calculated using the EPA conversion factor of 1.8 μR/hr per 1.0 pCi/g Ra-226.

The maximum surface exposure rate, 12 μR/hr, was measured on all the vicinity properties where contamination is suspected under adjacent streets. An exposure scenario at this location would require occupation at the point of highest gamma for approximately 22.8 hours per day during a one-year period (8,333 hours total) to receive a 100 mrem dose. It is unlikely that an individual would occupy this site for that amount of time in a given year.

The maximum subsurface exposure rate, 70 μR/hr, was calculated using the maximum Ra-226 soil concentration, 39.9 pCi/g, recorded on vicinity property SH-006, where contamination may exist beneath VCA Road. This scenario would require 1,429 hours of continuous exposure directly on the exposed deposit, or approximately 4.0 hours per day during a one-year period to receive a 100 mrem dose. Since the spillover contamination is a subsurface deposit buried under asphalt, with current ground surface gamma exposure rates significantly reduced by shielding, it is unlikely that an individual would occupy the point of highest gamma for the amount of time necessary to receive a 100 mrem dose in a given year.

The most likely situation where individuals would be exposed to the RRM is the future occupational scenario. Future maintenance and construction on streets and utilities will cause the contaminated subgrade material to be disturbed and workers to be exposed to the RRM. Two scenarios were examined for this occupational exposure: (1) a long-term exposure scenario based on the maximum ground surface gamma exposure rate; and (2) a worst-case scenario of the short-term "occupational" exposure based on the maximum estimated subsurface gamma rate of the RRM remaining in place.

The maximum ground surface gamma exposure rate is 12 μR/hr. An individual exposed to 12 μR/hr could not work in the area of the deposit for the length time ($>$ 24 hours per day) during a one-work-year period (260 days) to receive a 100 mrem dose. It is unlikely that an individual would spend all of his working hours in the high gamma contaminated area.

The maximum estimated subsurface exposure rate was the worst-case scenario of 70 μR/hr. The only individuals exposed to these high gamma rates should be maintenance and construction workers working on the installation and repair of streets and utilities requiring the removal of asphalt. The nature of this work makes the "short-term, unusual" exposure analysis more appropriate than a long-term exposure analysis. Under the worst-case scenario, a worker would need to be in the proximity of the exposed deposit for approximately 7,143 hours during a one-year period to receive a 500 mrem dose; 7,143 hours equates to

approximately 149 48-hour temporary occupancy scenarios or 298 24-hour emergency repair scenarios. It is unlikely that an individual would spend this amount of time in the highest gamma contaminated area in any given year.

B.4 Remediation Alternatives

B.4.1 Alternative 1 - No Remediation (Supplemental Standards)

B.4.1.1 Work Description

No work is required under this alternative.

B.4.1.2 Health Risk Analysis

The health risks associated with this alternative are approximated in Table B.T1 and discussed in Section B.3.1. Given the generally low levels of radioactivity, the subsurface location of the deposits and the reduced gamma exposure rates at the ground surface, it is unlikely that an individual would be exposed for the period of time required to approach the 100 mrem/yr above background or 500 mrem/yr above background limits.

B.4.1.3 Construction Parameters

No construction is required under this alternative.

B.4.1.4 Alternative-Specific Issues

The buried RRM is semi-permanently in place due to its location under a paved street. Nevertheless, it is known that these deposits will be disturbed by future maintenance and construction activities. The development and implementation of a long-term tailings management plan will be required to properly address the RRM remaining in place.

However, the DOE cannot commit to a long-term post-UMTRA plan for management and control of the RRM remaining in place because it would be a violation of the Anti-Deficiency Act, 31 U.S.C. 665. No executive agency or office may obligate the government to future commitments which require the authorization and appropriation of funds by Congress. Since DOE's authority to remediate vicinity properties expires on September 30, 1998, DOE cannot obligate the government to any plan for the control and management of RRM beyond that date.

The DOE believes that there is a clear separation between the issues of post-UMTRA and approval of supplemental standards application. 40 CFR 192.22(c) Supplemental Standards Criteria states that "remedial action will generally not be necessary where

residual radioactive materials have been placed semi-permanently in a location where site-specific factors limit their hazard and from which they are costly or difficult to remove." By citing such semi-permanent examples as public roads, sidewalks, sewer lines, and fence posts, the EPA acknowledged potential disturbance without making post-UMTRA a requirement.

Although DOE cannot commit to the implementation of such a plan, it has been working to develop a post-UMTRA strategy. As a result of discussions, a conceptual plan has been proposed that addresses RRM that may be discovered or encountered during the course of new construction and changing land use after DOE's authority to perform surface remedial action expires. A component of this conceptual plan is to leave Cheney disposal cell, located near Grand Junction, Colorado, partially open to receive RRM from effected communities. Many issues and details need to be resolved before this conceptual plan may be implemented. Although the DOE will continue to work with State, City, and County governments to develop a post-UMTRA plan, resolution of the post-UMTRA issues is beyond the scope of this Application.

B.4.1.5 Engineering Data

No cost is associated with this alternative. The volume of RRM to remain in place is approximately 17 cubic yards. The approximate volume represents a rough order-of-magnitude estimate that was extrapolated from excavations adjacent to the street. In general, no boreholes were augered in the roadways themselves due to the risk of hitting utilities and exposing the workers to occupational risks. Therefore, the actual areal extent of contamination is unknown.

B.4.2 Alternative 2 - Complete Remediation

B.4.2.1 Work Description

This alternative would remove all material contaminated in excess of EPA standards and replace it with clean material. The work for this alternative includes, but is not limited to: radiological assessment of the suspected contaminated streets; removal of asphalt pavement, concrete curbs and gutters, and subgrade materials; backfilling of pitrun and roadbase; and construction of asphalt pavements and concrete curbs and gutters. For this alternative the following assumptions were made: (1) the average depth of asphalt pavement to be removed is 5-inches thick (including overlays); (2) 80 percent of the total streets/alleys have concrete curbs/gutters; (3) the average depth of new asphalt to be replaced would be 4-inches; and (4) no utility replacement would be required as a result of this remedial action alternative.

Although the last assumption is likely to be false and the replacement cost of potentially contaminated utilities could substantially increase actual remediation costs, these costs were not included in this Application due to the limited information that exists regarding them.

B.4.2.2 Health Risk Analysis

Removal of the RRM will reduce to EPA Standards the health risks to maintenance/construction workers. The health risk to members of the general public would not be significantly reduced because the present location of the RRM (buried under uncontaminated asphalt or clean backfill) does not expose the public to gamma radiation above background levels. The current health risk from radon is negligible since no structures will be built on the deposits to remain in place.

B.4.2.3 Construction Parameters

Remediation for this alternative will include:

a. Developing a traffic-control plan with the City, County, State and Nation to phase construction in such a way to minimize the impact on the local community.

b. Installation of traffic-control barriers and signs.

c. Demolition of asphalt pavement and concrete curbs/gutters.

d. Excavation of contaminated subgrade materials.

e. Haul contaminated material to the Cheney disposal cell.

f. Backfill with roadbase and pitrun.

g. Construct concrete curbs and gutters.

h. Place asphalt concrete pavement.

B.4.2.4 Alternative-Specific Issues

Prior to any construction, a radiological assessment will be required to determine a more exact extent of contamination. Even the best attempt to assess and remove RRM from the streets of Shiprock may not fully resolve the problem. Due to shielding from asphalt and roadbase, and the limited ability to auger streets, deposits of RRM are nearly certain to go undetected and remain in place.

The remediation of 71 square yards of streets would temporarily disrupt residential traffic in the community. Although this disruption would be minor, residents would be inconvenienced due to re-routing of traffic. There are no commercial establishments on the affected street.

B.4.2.5 Engineering Data

Approximately 17 cubic yards of RRM would be removed under this alternative; 0 cubic yards of RRM would remain in place. The first portion of the cost presentation only includes the estimated subcontract cost (without normal contractor overhead or anticipated additional contractor costs). The second portion of the cost presentation, is more indicative of the total project costs. All costs are detailed in the estimate presented in Table B.T2.

The estimated subcontract cost of remedial action is approximately $ 48,191.00. This cost estimate includes a 30 percent contingency factor to account for preliminary design considerations, but does not include contractor overhead or anticipated additional contractor costs. The per unit subcontracted cost to remove the RRM is approximately $ 2,181.00 per cubic yard.

The estimated total project cost of remedial action is approximately $ 113,468.00. This cost estimate includes. This cost estimate includes a 30 percent contingency factor in the estimated subcontract cost to account for preliminary design considerations and specified contractor costs. Contractor costs include: general and administrative expenses; radiological assessment and engineering design, project management, construction field support (including health and safety, radiological verification, and construction oversight), and completion reports and records archival. The per unit total project cost to remove the RRM is approximately $ 6,675.00 per cubic yard.

Neither the subcontract or total cost of remedial action includes any amount for the remediation or replacement of contaminated utility lines, or for the potential loss of revenue suffered by commercial establishments affected by remedial action.

B.5 Summary

In summary, the remaining RRM is semi-permanently in place and does not pose a significant present or future health risk due to the low levels of radioactivity and the subsurface location of the deposits. For these reasons, MK-Ferguson recommends that Alternative 1, No Remediation, be approved.

The data in Table B.T1 shows no identifiable significant health risks if Alternative 1 is approved. Shielding by clean backfill and asphalt has reduced the exposure to the

general public at the ground surface to background levels. In the worst-case scenario, a construction or maintenance person would be exposed to RRM when they disturb the deposits in the future. An individual would have to occupy the point of highest gamma exposure for a continuous period of 1,429 hours to receive the 100 mrem dose. It is unlikely that an individual would be annually exposed for the amount of time necessary to exceed the recommended annual maximum dose of 100 mrem, due both to the length of time of exposure required and the physical location of the deposit. In a short-term unusual situation, such as replacement of a utility or reconstruction of a road, a worker would have to occupy the point of high gamma exposure for a continuous period of 7,143 hours to receive the 500 mrem dose. It is unlikely that a worker would be exposed for the amount of time necessary to exceed the recommended maximum dose of 500 mrem/yr above background.

Alternative 2, Complete Remediation, is excessively costly and would temporarily disrupt local traffic due to construction activities. Replacement of contaminated utility lines under the streets could cause costs to escalate beyond the current estimated subcontract cost of $ 48,191.00.

Each alternative examined by this application can be summarized as follows:

Alternative 1 - No Remediation (Supplemental Standards)

Health Risk: See Appendix B, Table B.T1

Estimated Subcontracted Construction Cost: $ 0

Estimated Total Project Cost: $ 0

Approximate Volume of RRM Removed: 0 cubic yards

Approximate Volume of RRM Remaining: 17 cubic yards

Alternative 2 - Complete Remediation

Health Risk: Reduced to EPA Standards

Estimated Subcontracted Construction Cost: $ 48,191.00

Estimated Total Project Cost: $ 113,468.00

Approximate Volume of RRM Removed: 17 cubic yards

Approximate Volume of RRM Remaining: 0 cubic yards

B.6 Recommendations

Alternative 1, No Remediation of the Paved Streets and Alleys (Supplemental Standards), should be applied under 40 CFR 192.21 Criteria C (see Section B.1).

TABLE B.T1
HEALTH RISK ANALYSIS FOR NO REMEDIATION
OF PAVED STREETS
(ALTERNATIVE 1)

SHIPROCK, NEW MEXICO
GENERIC SUPPLEMENTAL STANDARDS APPLICATION

Item No.	DOE ID No.	Address	Spillover Trend	Maximum Gamma (μR/hr) (See Note)		LONG-TERM EXPOSURE ANALYSIS: Required Number of Continuous Hours in One Year to Receive 100 mrem Dose	LONG-TERM EXPOSURE ANALYSIS: Required Number of Hours Per Day Over One Year to Receive 100 mrem Dose	LONG-TERM EXPOSURE ANALYSIS: Required Number of Hours Per Day Over 260 Days to Receive 100 mrem Dose	SHORT-TERM "OCCUPATIONAL" EXPOSURE ANALYSIS: Required Number of Continuous Hours in One Year to Receive 500 mrem Dose	SHORT-TERM "OCCUPATIONAL" EXPOSURE ANALYSIS: Required Number of 48-Hour Repair Scenarios to Receive 500 mrem Dose	SHORT-TERM "OCCUPATIONAL" EXPOSURE ANALYSIS: Required Number of 24-Hour Repair Scenarios to Receive 500 mrem Dose
1	SH-006	301 VCA ROAD	TO VCA ROAD	Surface	BKG	N/A	N/A	N/A	N/A	N/A	N/A
				Subsurface	70	1,429	3.9	5.5	7,143	149	298
2	SH-007	303 VCA ROAD	TO VCA ROAD	Surface	BKG	N/A	N/A	N/A	N/A	N/A	N/A
				Subsurface	37	2,703	7.4	10.4	13,514	282	564
3	SH-009	311 VCA ROAD	TO VCA ROAD	Surface	BKG	N/A	N/A	N/A	N/A	N/A	N/A
				Subsurface	57	1,754	4.8	6.7	8,772	183	366
	WORST CASE SCENARIOS:		Surface Max Gamma		BKG	N/A	N/A	N/A	N/A	N/A	N/A
			Subsurface Max Gamma		70	1,429	3.9	5.5	7,143	149	298

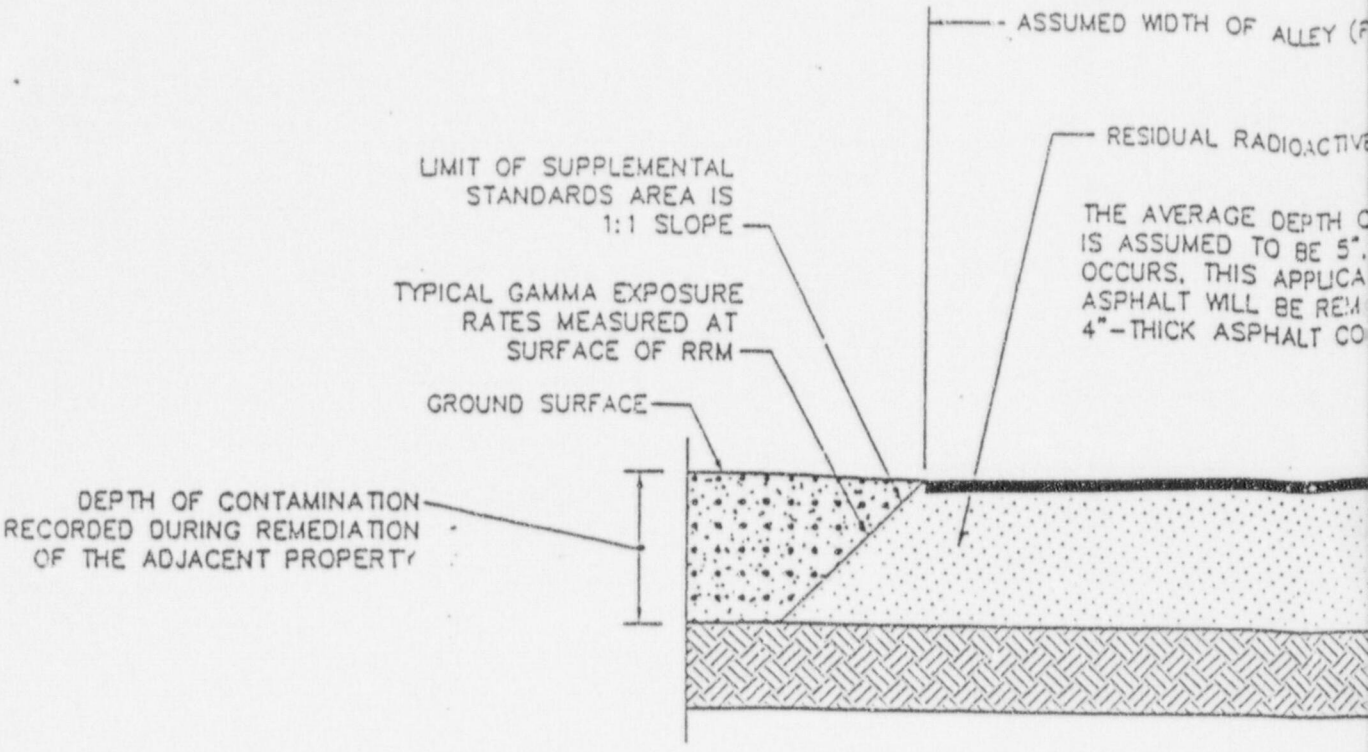
NOTE: The surface gamma exposure rate listed is the maximum gamma rate measured immediately adjacent to the roadway on the associated vicinity property prior to remedial action. The subsurface gamma exposure rate listed was estimated using the maximum Ra-226 concentration measured under the roadway and a conversion factor of 1.8 μR/hr per 1.0 pCi/g Ra-226. The conversion factor was employed in accordance with the results of the EPA's gamma radiation survey of twenty inactive mill sites conducted for the Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) (Volume 1; October, 1982; pp. 109-10). Background for the Shiprock New Mexico, locale is 12 μR/hr.

THIS HEALTH RISK ANALYSIS IS FOR SCREENING PURPOSES ONLY AND DOES NOT DEPICT THE TOTAL POTENTIAL RADIOLOGICAL DOSE FROM THE REMAINING RESIDUAL RADIOACTIVE MATERIAL (RRM). THE ANALYSIS ONLY EXAMINES THE RADIOLOGICAL DOSE FROM ONE SOURCE (RRM) AND ONE PATHWAY (GAMMA EXPOSURE) IN THE PAVED STREETS AND ALLEYS.

TABLE B.T2
SHIPROCK STREETS SUPPLEMENTAL STANDARDS APPLICATIONS

COST ESTIMATE FOR COMPLETE REMEDIATION
OF PAVED STREETS AND ALLEYS

ITEM NO.	ITEM	QUANTITY	UNIT COST	TOTAL
001	Mobilization	1 ls	$ 14,337.51	$ 14,338.00
002	Bond Premium	1 ls	1,265.00	1,265.00
201	Traffic Control	1 ls	6,758.90	6,759.00
202	Demolition - AC Pavement	6 cy	210.83	1,265.00
204	Demolition - Curb and Gutters	26 lf	33.33	867.00
210	Utilities - Locate, Protect, Maintain	1 ls	905.74	906.00
401	Excavate C.M. - Street Residential (1)	17 cy	126.43	2,149.00
410	Haul C.M. to Cell	17 cy	115.71	1,967.00
801	Backfill, Common Fill - Street Residential(1)	17 cy	79.84	1,357.00
810	Subbase Material	36 ton	31.10	1,120.00
820	Aggregate Base Course	24 ton	36.58	878.00
830	Asphalt Pavement	12 ton	63.25	759.00
850	Replace Curb and Gutters	26 lf	12.65	329.00
860	Replace Sidewalks, Driveways, Etc.	96 sf	12.65	1,214.00
870	Signs and Fencing	1 ls	632.50	633.00
880	Pavement Marking	1 ls	632.50	633.00
890	Landscape, Seeding, Etc.	1 ls	632.50	633.00
			Subtotal	$37,070.00
			Add Contingency @ 30%	11,121.00
				$ 48,191.00
Total Estimated Cost of Remediation (Contractor Field Management)				
1.0	Estimated Subcontract Cost	1 ls	$48,191.00	$48,191.00
2.0	Contractor General & Administration	1 ls	4,819.00	4,819.00
3.0	Radiological Assessment	1 ls	15,229.00	15,229.00
4.0	Engineering Design - 10% of Subcontract Cost	1 ls	4,819.00	4,819.00
5.0	Construction Field Management-0.75 months@ $50,258/month	1 ls	37,694.00	37,694.00
6.0	Project Management-0.25 mos.@ $10,862/month	1 ls	2,716.00	2,716.00
			Total Cost Estimate (Rounded)	$113,468.00



SECTION OF CON

SCALE: 1/4" =

R COMPUTING VOLUMES) = 20'-0"

MATERIAL (RRM) TO REMAIN IN PLACE

THE EXISTING ASPHALT PAVEMENT
NCLUDING OVERLAYS. IF REMEDIATION
ON ASSUMES THAT THIS 5"-THICK
ED AND REPLACED WITH NEW
CRETE.

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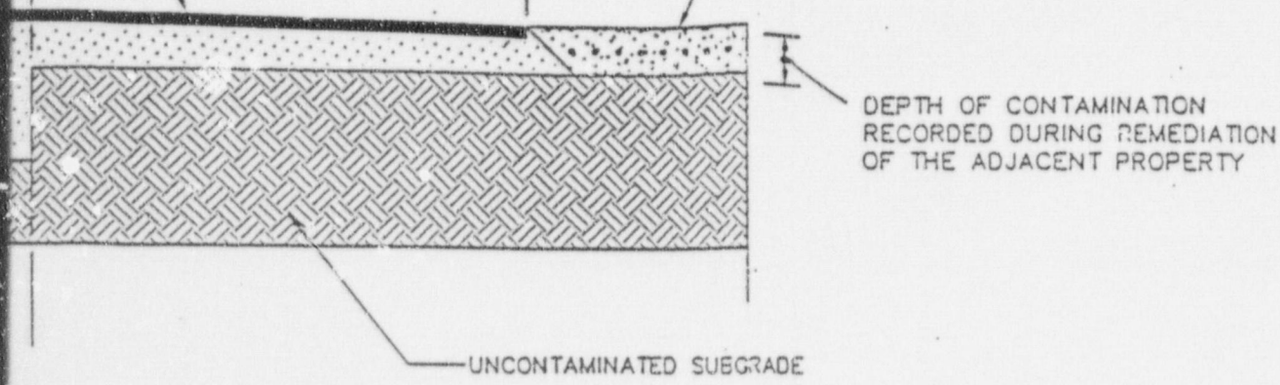


APERTURE
CARD

Also Available on
Aperture Card

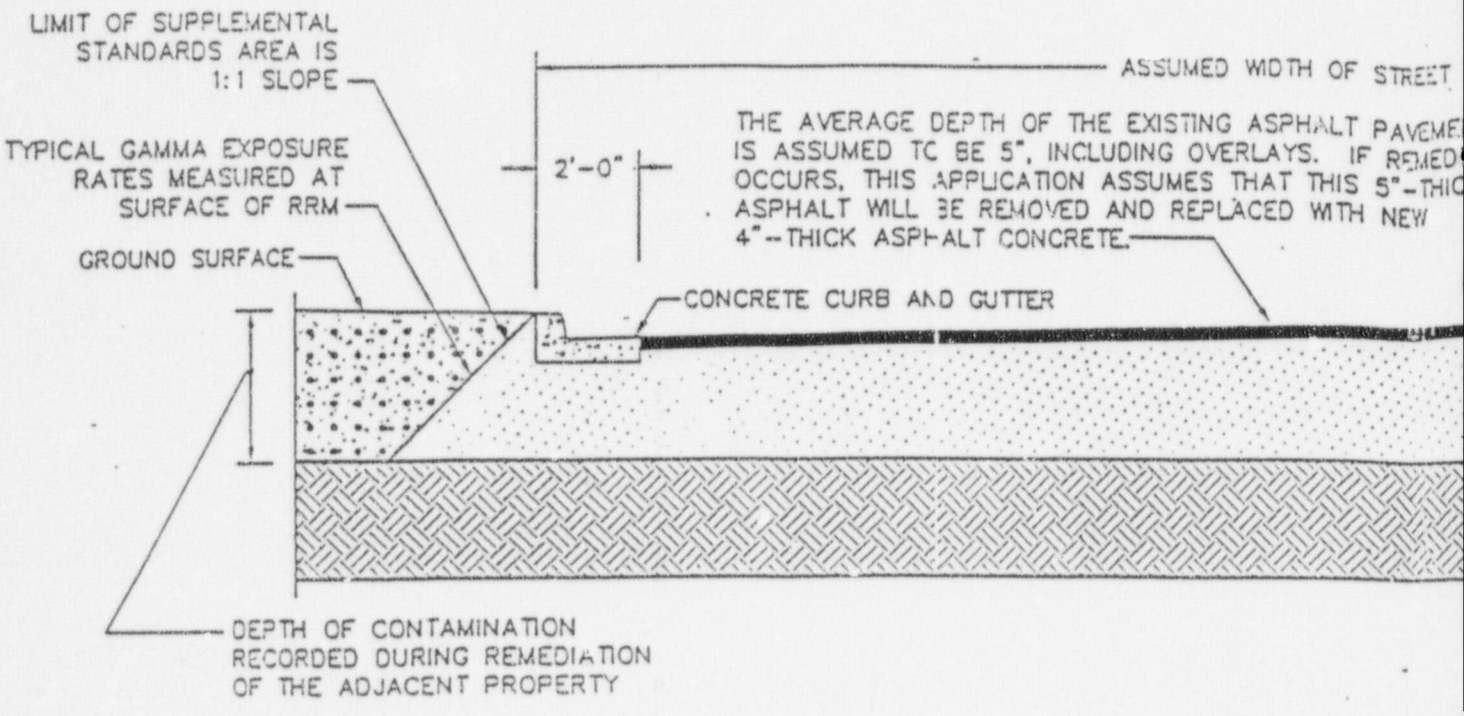
TAMINATED ALLEY

1"-0"

9809300231-2

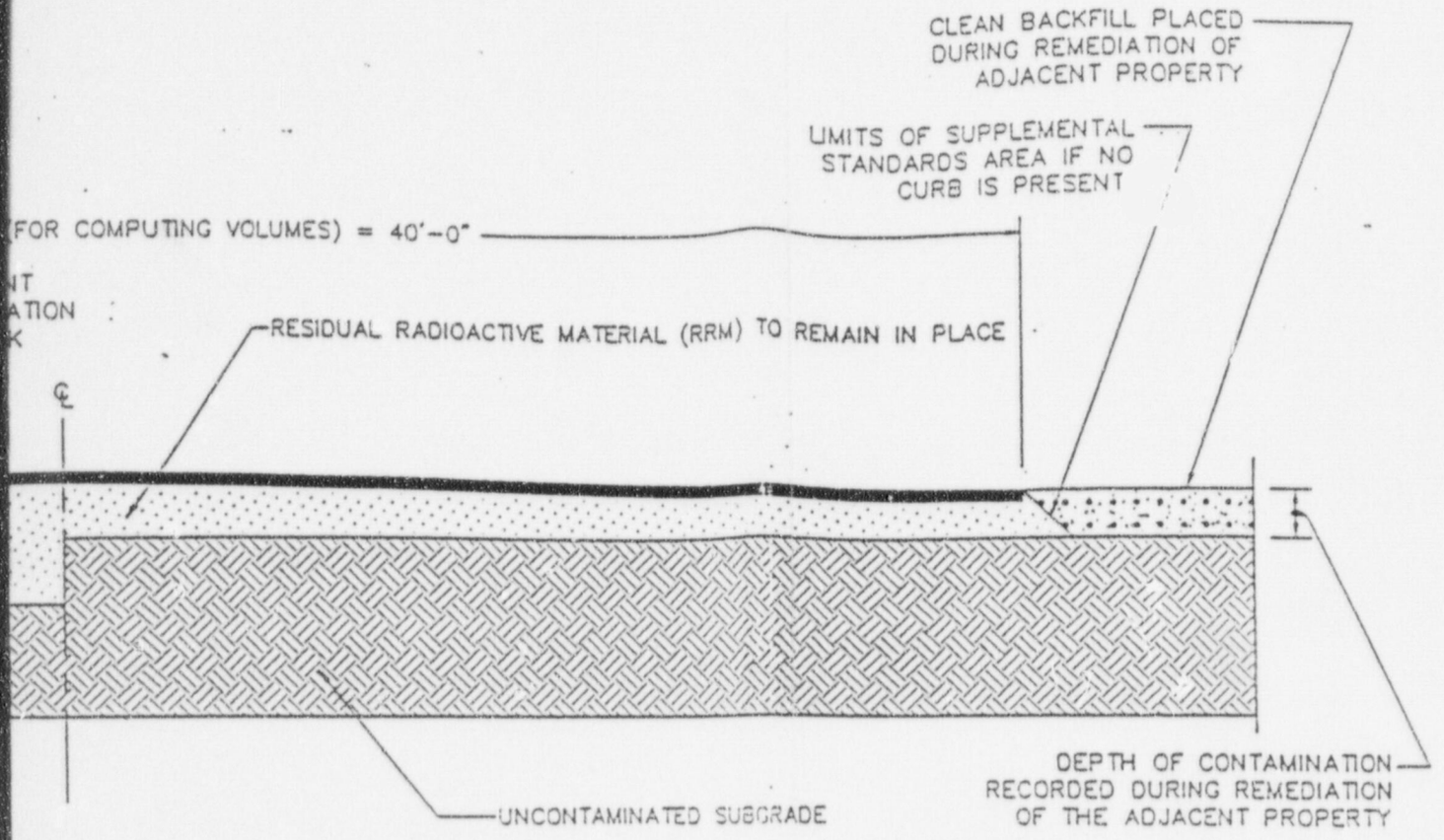
MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

Figure B.F2	Generic Application for Supplemental Standards for Paved Streets and Alleys
DATE PREPARED: May 13, 1997	FILE NAME: 1SHBF2



SECTION OF CON

SCALE: 1/4" = 1'



NTAMINATED STREET

-0"

APERTURE CARD

Also Available on Aperture Card

9809300231-1

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

Figure B.F1 — Generic Application for Supplemental Standards for Paved Streets and Alleys

DATE PREPARED: May 13, 1997

FILE NAME: 1SHBF1