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Inclusion Survey Contractor Implementation Plan for Fiscal Years 1986 – 1988

M. L. Espegren
T. E. Carter
C. A. Little
S. J. Ramos

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Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road, Springfield, Virginia 22161
NTIS price codes—Printed Copy: A07; Microfiche A01

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ORNL/TM-10116

Health and Safety Research Division

INCLUSION SURVEY CONTRACTOR IMPLEMENTATION PLAN FOR FISCAL YEARS 1986 - 1988

M. L. Espegren
T. E. Carter
C. A. Little
S. J. Ramos

Date Published - March 1987

Prepared by the
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-840R21400

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ACKNOWLEDGMENTS

This project was sponsored by the U.S. Department of Energy (DOE), under contract DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc. The authors wish to acknowledge the support of William E. Mott and John E. Baublitz, of DOE, and members of their staff. The input by Walt Smith of Argonne National Laboratory, Jim Berger of Oak Ridge Associated Universities, and Phil Jenkins of Mound Facility during preparation of this document is gratefully acknowledged.

INCLUSION SURVEY CONTRACTOR IMPLEMENTATION PLAN FOR FISCAL YEARS 1985 - 1988*

M. L. Espegren, T. E. Carter, C. A. Little, S. J. Ramos

ABSTRACT

The Radiological Surveys Activities Group (RASA) of Oak Ridge National Laboratory acts as the Inclusion Survey Contractor (ISC) to the Uranium Mill Tailings Remedial Action (UMTRA) Project of the U.S. Department of Energy (DOE). The ISC investigates properties to determine whether the properties qualify for remedial action according to the standards set forth for the UMTRA Project by the U.S. Environmental Protection Agency. The major work elements making up the ISC's activities are: consent form acquisition, land survey/drawing, inclusion survey, post-survey activities, survey report, file transmittal, and recommendation for a vicinity property to be included into or excluded from UMTRAP. The ISC will produce 2960 recommendations in FY 1988 for $3.98M.

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1. EXECUTIVE SUMMARY

1.1 INTRODUCTION

1.1.1 Role of the Inclusion Survey Contractor

The Radiological Survey Activities (RASA) of Oak Ridge National Laboratory (ORNL) acts as the Inclusion Survey Contractor (ISC) to the Uranium Mill Tailings Remedial Action (UMTRA) Project of the U.S. Department of Energy (DOE).

The ISC investigates designated properties to determine whether the properties qualify for remedial action according to the standards set

* Research was performed by members of the Radiological Survey Activities Group of the Health and Safety Research Division at Oak Ridge National Laboratory under U.S. Department of Energy contract DE-AC05-84OR21400.

forth for the UMTRA Project by the U.S. Environmental Protection Agency (EPA). Based on the investigations, the ISC makes recommendations to the DOE, and the DOE decides whether the given properties should be included in or excluded from the UMTRA Project.

1.1.2 Description of Work

Properties to be investigated are selected from "designation lists" or result from requests or other sources (refer to Chap. 2.4). The first step in the ISC's work is to acquire the property owner's consent to enter on the property in order to conduct the investigation. When the consent-for-access form is signed, the field work begins: the preparation of a base map or property sketch and the inclusion survey.

Following the inclusion survey, the "post-survey" activities begin, which involve data reduction, soil analysis, and final map preparation. When these activities are completed, the survey report is prepared, and then the files are transmitted.

In summary, the major work elements making up the ISC's activities are: consent form acquisition, land survey/drawing, inclusion survey, post- survey, survey report, and file transmittal. In addition to these activities, which contribute directly to the production of recommendations, there are "non-direct" activities including all administrative, managerial, and support services. The generalized work flow within the ISC is presented graphically in Figure 1.

1.1.3 Organization

The ISC's organization chart for January 1, 1986 is presented in Figure 5. The ISC intends to use this organizational structure through

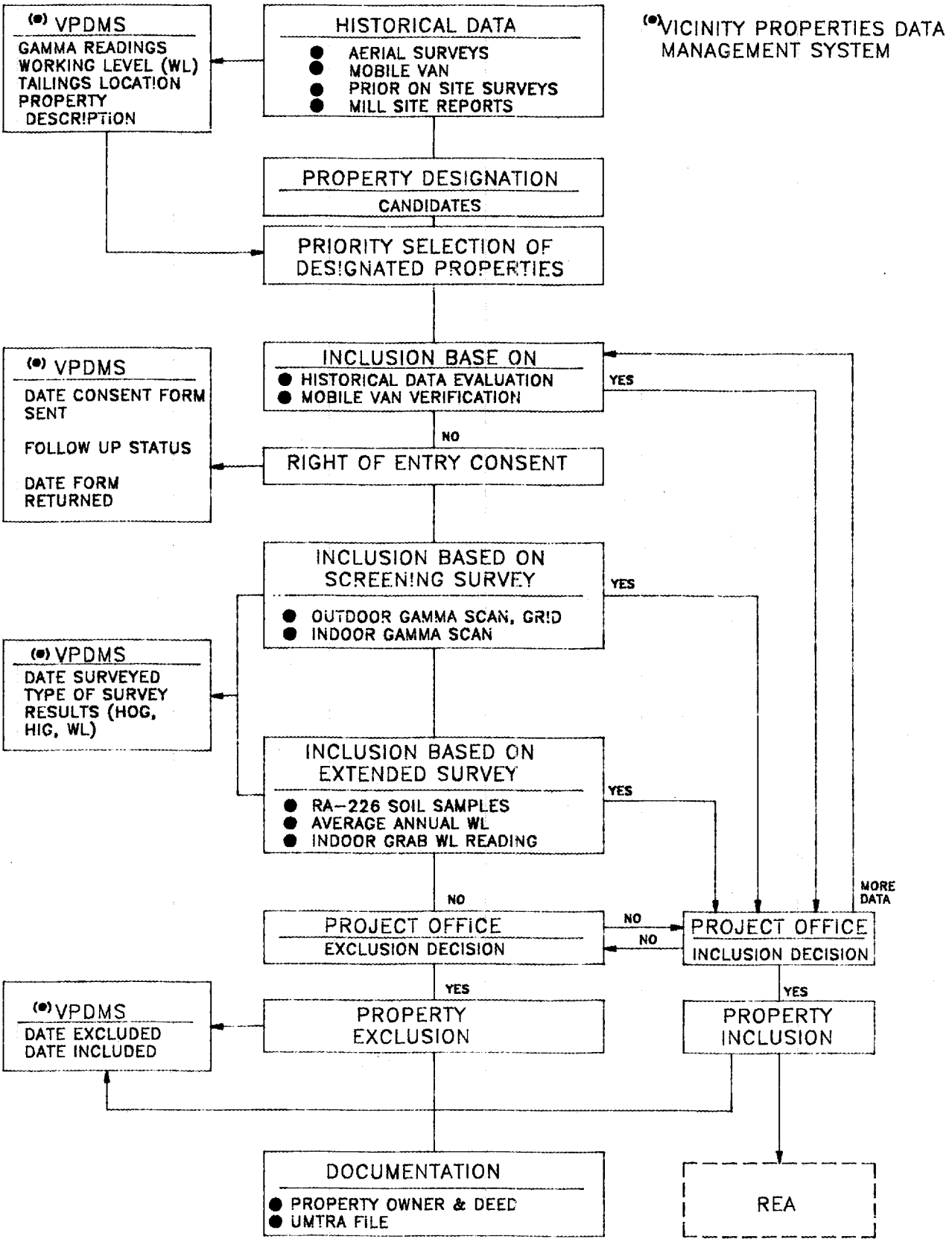


FIGURE 1
INCLUSION PROCESS FLOW DIAGRAM

the life of the project. Details concerning responsibilities and lines of authority are presented in Chapter 2.

1.2 SCHEDULE

1.2.1 Recommendation Needs

The ISC has developed activity schedules based on the planned dates of site remedial actions and the assumption of lag times required to develop inclusion/exclusion recommendations (16 weeks), for the DOE to make the inclusion/exclusion decision (4 weeks), for the remedial action contractor (RAC) to perform remedial action (52 weeks), and for the remedial action at the tailings piles to be completed (26 weeks after the last property is completed). Thus, the total time required between the ISC beginning work on a property and the closure of the site associated with that property is 98 weeks.

1.2.2 Milestone Schedule

The official designation list published by DOE Headquarters contains 8,213 vicinity properties. The ISC estimates that 9,487 properties will ultimately receive inclusion surveys. The reasons for the increased number of surveys are identification of properties through advertising, spillover to undesignated properties, requests from DOE, State, Tribe, and local officials, and through additional mobile gamma scanning. The total projected recommendations per site are shown in Table 1.

The activity schedule for recommendations per site per year is shown in Table 3. Detailed activity schedules are presented in Chapter 3.

1.2.3 Staffing Plan

The ISC has established subcontracts for portions of the work in order to smooth peak-level work loads and staff levels and to provide training. Five subcontracts are presently envisioned: with Oak Ridge Associated Universities to provide personnel and training in the fields of health physics and radiation biology; with ARIX, Inc. to prepare survey reports for Grand Junction "dovetail" properties; with Colorado State University to provide technicians on a temporary basis to work on survey teams and to investigate technical questions relating to the ISC's activities; with a graphics subcontractor to provide approximately half of the required property sketch maps; and with a land title company to conduct title research for those properties where ownership or legal description is obscure.

Table 1. Total recommendations by fiscal year by site.

Site	FY84	FY85	FY86	FY87	FY88	Total
Ambrosia Lake	0	0	0	10	0	10
Belfield	0	0	0	22	0	22
Bowman	0	0	0	6	0	6
Canonsburg	41	113	30	0	0	231
Durango	28	121	175	0	0	329
Edgemont	61	97	2	0	0	220
Falls City	0	0	40	0	0	40
Grand Junction	178	1148	2551	2363	1538	7597
Green River	0	0	0	58	0	58
Gunnison	0	0	0	28	0	28
Lakeview	0	0	8	0	0	8
Lowman	0	0	34	0	0	34
Maybell	0	0	0	5	0	5
Mexican Hat	17	1	0	0	0	21
Monument Valley	17	0	0	0	0	17
Naturita	0	0	0	120	0	120
Rifle	18	62	115	381	0	576
Riverton	55	2	4	0	0	81
Salt Lake City	44	53	0	0	0	162
Shiprock	15	5	0	0	0	17
Slick Rock	0	0	0	7	0	8
Spook	0	0	1	0	0	1
Tuba City	6	1	0	0	0	8
Total	480	1600	2960	3000	1538	9571

Total surveys may not equal sum of annual surveys because of historical inclusion reassessment of historical inclusions, known refusals, failure to locate, or inappropriate designation.

1.3 BUDGET

1.3.1 Unit Costs and Labor Requirements

The average labor requirements for the various major work elements that contribute directly to production of recommendations are: consent form acquisition, 2.4 person-hours; land survey/drawing, 5.5 person-hours; inclusion survey, 7.2 person-hours; post-survey, 3.3 person-hours; survey report, 7.75 person-hours; file transmittal,1.0 person-hours, extended measurements, 0.86 person-hours; and miscellaneous activities, 1.55 person- hours. The total direct labor requirement (including incidental activities) per recommendation is 32.77 person-hours. This labor estimate does not include support and administrative activities that do not directly contribute to producing a recommendation and inclusion survey report.

The average cost per recommendation, including all administrative, support, non-capital equipment, capital equipment, and supplies was $2,782 in FY 1985 and will be $2,128 in FY1986, $2,134 in FY 1987, and $2,355 in FY 1988. Ramp-up and van-scanning costs increased the unit costs for FY85 and close-out costs increase the unit costs for FY88.

1.3.2 Annual Budgets

The ISC's estimated budget requirements (excluding contingency) to support the proposed milestone schedules are $6.21M in FY 1986, $6.99M in FY 1987, and $3.98M in FY 1988. The details of cost estimates and budget development are presented in Chapter 4.

2. DETAILED OFFICE OPERATIONS

2.1 INTRODUCTION

The Radiological Survey Activities (RASA) Group of the Health and Safety Research Division (HASRD) at Oak Ridge National Laboratory (ORNL) participates in the U.S. Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project as the Inclusion Survey Contractor (ISC). ORNL maintains an office at the DOE compound in Grand Junction, Colorado in order to conduct ISC activities.

The Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) requires the Federal Government to perform remedial action to clean up inactive uranium mill tailings sites and properties in the vicinities of these sites that are contaminated by residual radioactive materials resulting from the operation of the mill sites. Pursuant to the Act, the U.S. Environmental Protection Agency (EPA) established standards that govern qualifications of vicinity properties for remedial action and the extent to which properties should be decontaminated. These standards are set forth in 40 CFR 192.

The DOE has designated properties where tailings contamination is suspected. The ISC investigates these designated properties and other properties where there is reason to suspect contamination to determine whether tailings contamination is present in excess of the EPA standards and recommends to the DOE whether properties should be included in the Project. The ISC's investigations are designed to apply the EPA standards as interpreted in the Summary Protocol - UMTRA Project Vicinity Properties and the Vicinity Properties Management and

Implementation Manual (VPMIM). Information flow throughout the project is indicated by Fig. 1.

2.1.1 Purpose and Scope

The purpose of this chapter is to describe ISC activities from the point of view of the management of those activities. It is intended to outline the ORNL work elements, organization and responsibilities, and to describe the contingencies that are planned to allow ORNL to accomplish its work load.

This document is not intended to be a procedures manual. Detailed descriptions of measurement protocols, work methodologies, operation and calibration of equipment, etc., can be found in the RASA UMTRA Procedures Manual.

This chapter describes ISC activities in order of: 1) the work elements as they are performed, and 2) organizational, administrative, and managerial activities and structure.

2.2 IDENTIFICATION OF PROPERTIES REQUIRING SURVEYS

The DOE has provided the ISC with listings of "designated" vicinity properties located in the affected States. Properties have been designated on the basis of historical information, radiological surveys conducted on properties prior to 1983, and by mobile gamma-scanning van identification. Once a property has been designated it requires a radiological inclusion survey to ascertain whether residual radioactive material originating from one of the 24 mill sites is present on the property and, if so, whether it is in excess of appropriate EPA standards. Additional properties are identified as requiring surveys by the ORNL mobile scanning van, responses to advertising and requests for

surveys by owners, and DOE, state, tribe and local officials. Each designated property has been assigned a location number by the DOE. The location number is a tracking number for a specific property and is used on all documents and reports pertaining to that property. The DOE Technical Assistance Contractor (TAC), Jacobs Engineering Group, Inc. (JEG), maintains a computerized data base called the UMTRA Vicinity Property Data Management System (VPDMS). The TAC is responsible for the control of location numbers. Assignment of location numbers to newly identified properties (such as those that are detected by the mobile scanning van), as well as any changes in location numbers, must be coordinated with the TAC. If newly identified vicinity properties are to be added to the Grand Junction "designation" list, the GJ location numbers are assigned by the Colorado Department of Health. Such information is then transmitted to the TAC by the ISC. The TAC is responsible for assignment of location numbers to additional designated properties in all other affected communities.

2.3 MOBILE GAMMA SCANNING

Mobile gamma scanning is conducted by the ISC in those areas identified by the DOE UMTRA Project Office. All accessible streets, alleys, and roadways are surveyed within the area. Detailed and specific methodology for performing this activity is described elsewhere. Once the mobile gamma scan of the specified area is completed, all properties for which anomalous gamma radiation levels are detected relative to background radiation levels (using a ^{226}Ra-specific algorithm) are identified by location, assembled into a report, and submitted to the UMTRA Project Office. The UMTRA Project Office will

designate the appropriate properties from this listing, and an inclusion survey will be conducted on those properties by the ISC.

2.3.1 Re-location of Properties

In some areas (notably portions of Mesa County), vicinity properties are impossible to locate based on the description given in the designation list. In such instances, the mobile scanning van may be used to define the locations of the poorly described properties. As the ISC contacts property owners in Mesa County using the Designated Property List (DPL), areas of unlocatable designated properties are defined. In addition, the DPL will be reviewed during FY 1986 to identify areas in Mesa County where there appear to be significant numbers of unlocatable designated properties. When these areas have been defined, a scan proposal and cost plan will be developed and submitted to the UMTRA Project Office.

2.4 INCLUSION SURVEY PROCESS

2.4.1 General

Initial identification of a property that may require remedial action is made on the basis of three sources of information: (1) historical information obtained from the results of early (1970 to 1975) mobile and onsite surveys; (2) aerial radiological surveys; and (3) mobile gamma scanning surveys. By this process, 8,156 properties were designated (i.e. formally identified by DOE as potential candidates for remedial action) on February 2, 1984. As the UMTRA Project progresses, new sites will be identified as potentially contaminated sites by the ISC, and will be recommended to the UMTRA Project Office for

designation. Also, additional properties may be identified for survey by the ISC by owner request or response to advertising or by requests from DOE, state, tribe, or local officials.

Once a property has been designated by the DOE, the ISC will perform an inclusion radiological survey on that property. The only exception to this procedure occurs when the Remedial Action Contractor (RAC) has discovered contaminated material on one property extending onto an adjacent property. In this situation, the RAC may directly request DOE to designate and include the adjacent property (called a "spillover" property) into the UMTRA Project without the designation recommendation or inclusion survey recommendation by the ISC.

2.4.2 Access Consent to Survey

2.4.2.1 Identification of Properties

Those properties identified by aerial radiological surveys and historical information have already been identified and designated. There are three remaining methods of identification available to the ISC: information from knowledgeable sources, mobile gamma scanning using the ORNL scanning van, and requests from property owners or other Project participants.

2.4.2.2 Information

Properties potentially contaminated with uranium mill tailings or ore material may be identified by federal, state, tribe, or local officials who have a reasonable suspicion that contaminated material may exist on a property. Additionally, information from local citizens regarding transport to and placement of uranium ore or tailings on a

property is sufficient evidence to warrant a designation recommendation by the DOE UMTRA PO. This triggers an inclusion survey by the ISC. If there is adequate evidence, and if conditions warrant an immediate response by the ISC (due to time or cost considerations), the ISC may proceed with an inclusion survey, without formal DOE designation of a property. Solicitation of pertinent information from government officials, DOE contractors, and private citizens is encouraged through individual interaction with property owners, former mill site employees, public meetings, and newspaper advertisements.

2.4.2.3 Requests

At most UMTRA Project sites, there will be advertising to invite property owners to request that their properties be surveyed by the ISC. It is intended that property owners who suspect that their properties are contaminated by residual radioactive materials have an opportunity to ask DOE to investigate. At most sites, the ISC will arrange advertising in coordination with State and local officials and with the TAC. At Indian sites, the TAC will arrange the advertising in coordination with the ISC's activities.

Advertising will not be performed in Salt Lake City. Because of experience in Canonsburg and Durango, it is expected that advertising at most sites, will approximately double the total number of properties to be surveyed.

Because of the large increase in surveys due to "advertised" properties, and because few "advertised" properties are actually contaminated, the ISC proposes to process them differently from designated properties. If any contamination is found, a report and

recommendation will be prepared as described in succeeding sections of this plan. However, except for small point sources, if no gamma radiation in excess of background plus 30% (or accepted default percent of standard deviation) is detected, the data will be archived, and a short-form recommendation letter will be sent to DOE describing the situation and recommending exclusion.

Requests may be made by various Project participants for inclusion surveys. There are various reasons for these requests. When DOE transmits the requests to the ISC, the surveys will be performed according to the procedures outlined in succeeding sections of this plan.

2.4.3 Acquisition of Consents-for-Access

2.4.3.1 Introduction

The Inclusion Survey Contractor conducts radiological surveys at vicinity properties. Based on the radiological condition of that property, a recommendation is made to the DOE that the properties be "included" in the UMTRA Project, or that they be "excluded" from further consideration for remedial action.

Prior to the radiological survey, a signed consent-for-access agreement granting permission for the survey must be obtained from the property owner. This agreement also grants permission for the performance of an engineering assessment by the Remedial Action Contractor (RAC) provided that the property is "included" for remedial action.

If a property owner does not grant permission for a survey, the section on the consent form which states "I do not wish to participate

in the UMTRA Project" is signed. At some future date, DOE may wish to recontact the owners of these properties. The DOE is going to develop a plan defining the final disposition of UMTRA Project interactions with property owners who do not wish to participate. This plan is needed by early FY 1987 in order to allow the ISC to complete its work on schedule.

2.4.3.2 Consent-For-Access Agreements

The UMTRA Project is a cooperative program between the Federal Government and the affected States and Indian Tribes. The responsibility for acquiring consents-for-access, as well as the contents of the agreements, are determined by the individual states and tribes in cooperation with the DOE. The following listing shows the entities responsible for acquisition of consents-for-access.

Pennsylvania	- ORNL/State of Pennsylvania
Colorado	- ORNL
Wyoming	- ORNL
Utah	- State of Utah (Salt Lake City - State, Green River - ORNL)
South Dakota	- Bendix Field Engineering Corp.
Navajo Tribal Lands	- The Navajo Nation
Oregon	- ORNL
Texas	- ORNL
Idaho	- ORNL
North Dakota	- ORNL

(others to be added)

2.4.3.3 Acquiring Consents-For-Access

Consents-for-access generally are obtained in two ways: copies of the consent agreement are mailed to the property owner with a request that a signed copy be returned by mail, or the property owner is personally contacted. In most communities, a combination of the two methods is used.

Following are the clerical and review steps taken in the acquisition of consents-for-access to vicinity properties in Grand Junction and communities outside Grand Junction. For each property, progress through the ISC Project is monitored by creating a tracking form. A portfolio is also made which collects data and proceeds through the consent form acquisition, ISC survey, and reporting processes. This procedure is summarized in this and succeeding sections of this plan.

Development of Property Data

Prior to a visit to a vicinity property, a thorough review of existing information is required. This information is contained in various reports and is as follows:

a. The DOE designation list is reviewed to determine which properties will require consents for access and radiological surveys. A review of this list is also necessary to assure that all properties have been assigned location numbers. Questions and/or discrepancies are resolved by contacting the TAC.

b. Reports of mobile scanning surveys, when available, are reviewed to ascertain whether or not additional properties not appearing on the "designation" list have been identified for surveys.

Consents-for-access are required for these additional properties and location numbers are assigned by the TAC. Discussions are held with the individual who performed the mobile scan.

c. The ISC has acquired the CDH (Colorado Department of Health) files on some properties in Mesa County, Colorado. For properties in that county, the CDH data are reviewed before surveying the properties.

Selection of Properties

At all sites except Grand Junction, Rifle, and Salt Lake City, the number of designated properties is sufficiently small to allow the ISC to contact the majority of owners in a single mailing. In Salt Lake City, owners are contacted when the scanning van indicates the likelihood of contamination on their properties. The selection procedure for Grand Junction is as follows:

a. Properties in Mesa County, CO, are selected to receive requests for consent-for-access by one of two methods. The first method is that the ISC selects properties for inclusion surveys by combining groups of properties that are located near each other to allow for expeditious and cost-effective surveys. This selection process also may be useful to the RAC and DOE in meeting remedial action schedules. In addition, the areas are selected so as to provide an approximation of the "mix" of property types (i.e., commercial, residential) required by the RACs to support their remedial action schedules. Although it would be ideal for all designated properties in a given area to be surveyed at the same time,

experience shows that only a portion of the property owners respond promptly to requests for access. The ISC is able to provide a large number of inclusion recommendations in a given neighborhood at a given time, but further recommendations from the neighborhoods will continue to be produced for many months after the ISC begins work there. The second method of property selection in Mesa County is for the Grand Junction Projects Office of the DOE to make individual requests in writing, for inclusion recommendations on specific properties.

b. For the Grand Junction "Dovetail" properties, the Colorado Department of Health (CDH) submits requests to the Grand Junction Project Office of the DOE, requesting inclusion recommendations on properties which are active under the Grand Junction Remedial Action Program (GJRAP). The properties may simultaneously qualify for remedial action under the UMTRA Project. The objective is to perform the remedial action authorized by the two programs at the same time to incur cost and time savings. However, portions properties previously remediated under GJRAP, cannot be investigated by the ISC.

The "dovetail" requests are submitted by DOE to ORNL for inclusion recommendations. If a recommendation cannot be made on a property based on existing historical CDH data, a consent-for-access form is then mailed by ORNL to the property owner and the same procedures are followed for acquisition of consent as for other GJ vicinity properties.

Acquisition of Consents-for-Access

For communities outside Mesa County, consents-for-access are most readily obtained by visiting the communities. Such visits allow access to courthouse records and personal contact with individuals who have knowledge pertaining to owners and unlocatable properties. These visits are also helpful in identifying properties which may be vaguely identified on the "designation" lists and in resolving questions which often arise regarding location and ownership of properties. In some instances, owners are contacted by mail using the same methods as outlined for properties in Mesa County.

For Mesa County properties, if the current owner of a property is not available from the computerized data base obtained by the ISC from the Mesa County Tax Assessor's Office, the ISC contacts the Tax Assessor's Office to see if more current information is available. If this information proves inadequate, the ISC will visit the property, contact neighbors, contact banks, or attempt to pursue other avenues.

The consent-for-access package is prepared for mailing. Each such package consists of a transmittal letter, two copies of the access agreement, a stamped, self-addressed envelope, and (for Mesa County properties and a few other communities) a DOE information booklet on cleanup of vicinity properties in Grand Junction. The owner's name is typed as the inside address on the transmittal letter and the property address is inserted in the letter. The location number, corresponding property address, and the parcel number are typed on each copy of the consent-for-access agreement. Copies of the transmittal letter and consent-for-access agreement are presented in Appendix A. Computer

mailing labels, certified mail labels, and filetab labels are then prepared.

Then the consent-for-access packages are ready for mailing, data for each property is entered into the ORNL computer database from a temporary computer file consisting of a block of names and related information. The vicinity property location number is used as the main tracking number. This number is verified with the TAC and/or with CDH prior to its use in the ISC's system.

The consent-for-access packages are mailed by certified mail. A file folder is established for each property, with the location number, the corresponding property address, and the parcel number shown on the filetab. This file is transferred to Document Control (pending action, section 2.4.4).

Follow-up to Consent Form Acquisition

Consent-form mailings have historically resulted in a 60% response rate. Because a 100% response rate for the project is desirable, the ISC makes further efforts to obtain responses from the remaining 40% of the designated-property owners. Follow-up procedures involve:

a. If no response to the first mailing is received within 60 days, a second mailing is sent, also by certified mail. It is identical to the first mailing. It also indicates the availability of further information at the ISC's offices or by calling the ISC.

b. If there is no response to the second mailing within 60 days, an attempt is made to reach the property owner by phone.

c. If no phone contact is made within approximately 15 days, a visit to the property is made to acquire information about the owner.

The sources of information are researched, such as tax records, records of foreclosures, bank records, and sometimes neighbors are contacted.

d. When all of the above methods fail to produce a response, the property portfolio will be placed in a "dead" file, 30 days after the final attempt. Final disposition of the properties in the dead file will be negotiated with the UMTRA Project Office.

e. In cases where the postal service is unable to deliver the consent packages and they are returned to ORNL, a search of the next "update" of the Tax Assessor's file is performed in an effort to acquire current owner information. If the information is not available, subsequent routine searches are made of quarterly updates until the information is acquired. Once acquired, the consent acquisition follow-up procedures are followed as outlined in items a through d.

f. To further support the acquisition of consent-for-access, ORNL will cooperate with the DOE to establish a program of advertising in the media to arouse public interest of participation in and to educate the public with respect to the UMTRA Project.

The ORNL data base is updated by adding newly acquired information and file folders are prepared for locations to be surveyed. A review of the existing data as described above will provide the general status of consent acquisition in a particular community and a basis from which to determine need of additional consents.

2.4.4 Graphics

2.4.4.1 Legal Description

A legal description is needed to properly identify and locate a property. For properties outside Mesa County, legal descriptions are obtained via normal land title research methods at the appropriate county courthouse. There are three principal techniques used to acquire legal descriptions for properties in Mesa County.

Most legal descriptions in Mesa County can be acquired by searching the Mesa County Tax Assessor's files contained on the GJPO CYBER computer system. These files are updated monthly.

When a parcel is described by lot and block without dimensions, it is necessary to refer to the appropriate subdivision plat. ORNL maintains a complete plat file, as does the Mesa County Courthouse. Copies are obtained as needed by the Graphics staff.

For properties with multiple ownership or those combined from multiple to single ownership, it is necessary to conduct land title research at the Mesa County Courthouse.

2.4.4.2 Property Sketch

Before an inclusion survey may be conducted, a scale-drawing of the location is produced for use by the radiological survey team. After determining the legal description of the location, the drafting technicians or a subcontractor visits the property to take the necessary physical measurements to determine the boundaries and the placement of any structures on the property. No drawing of the interior of any structures is made prior to the inclusion survey.

Following the visit, an ink drawing is generated by hand or computer that accurately reflects the property (e.g., Fig. 2). All buildings and permanent structures are noted and labeled on the drawing. If the size of the property permits, the preferred scale of 1"-20' is used. A photomechanical transfer (PMT) is made from the ink drawing and is used as the final original drawing. Photocopies of the PMTs are made for use by the field team during the radiological survey. The complete file is placed in the file drawer marked "Ready for Survey" (as shown in Fig. 2).

2.4.4.3 Automation

During FY 1986, the ISC will automate most of its property sketch activities by implementing an electronic surveying system and a computer- aided drafting system.

The Lietz Total Station System is the electronic surveying system selected by the ISC. Two people are required to operate it; one to operate the instrument station and one to act as the rodman. The survey data are collected into an electronic notebook and can then be downloaded into a microcomputer equipped with appropriate software. This system is intended for use on large and/or complex properties. In addition, it may prove possible for radiological survey teams to gather the property sketch data with this system, download the data via modem to the office, and proceed with the inclusion survey while the property sketch is being prepared in the office.

AutoCAD is the computer-aided drafting software selected by the ISC. The system may be loaded with data either electronically (as described above) or manually. Data may be loaded manually by keyboard

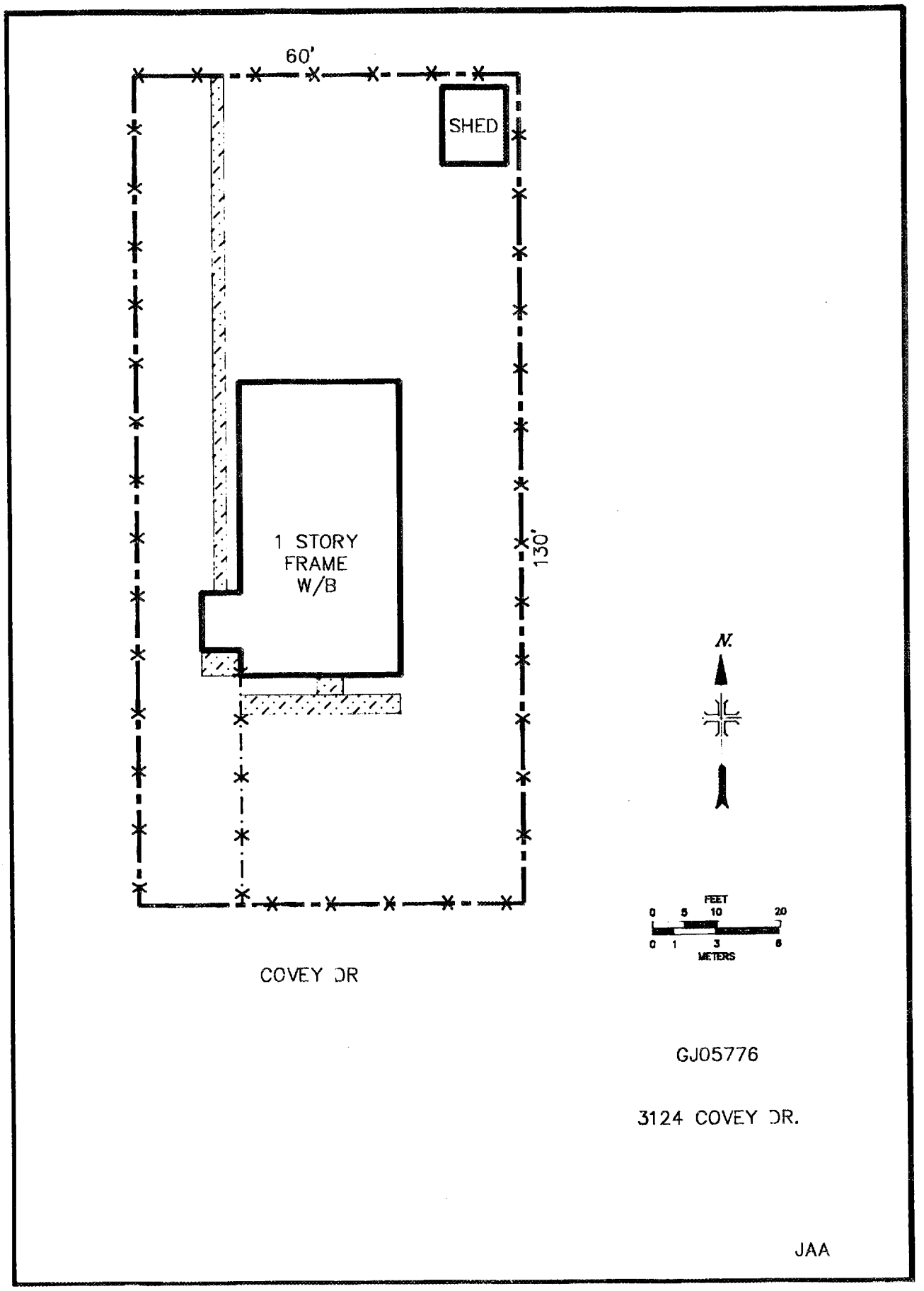
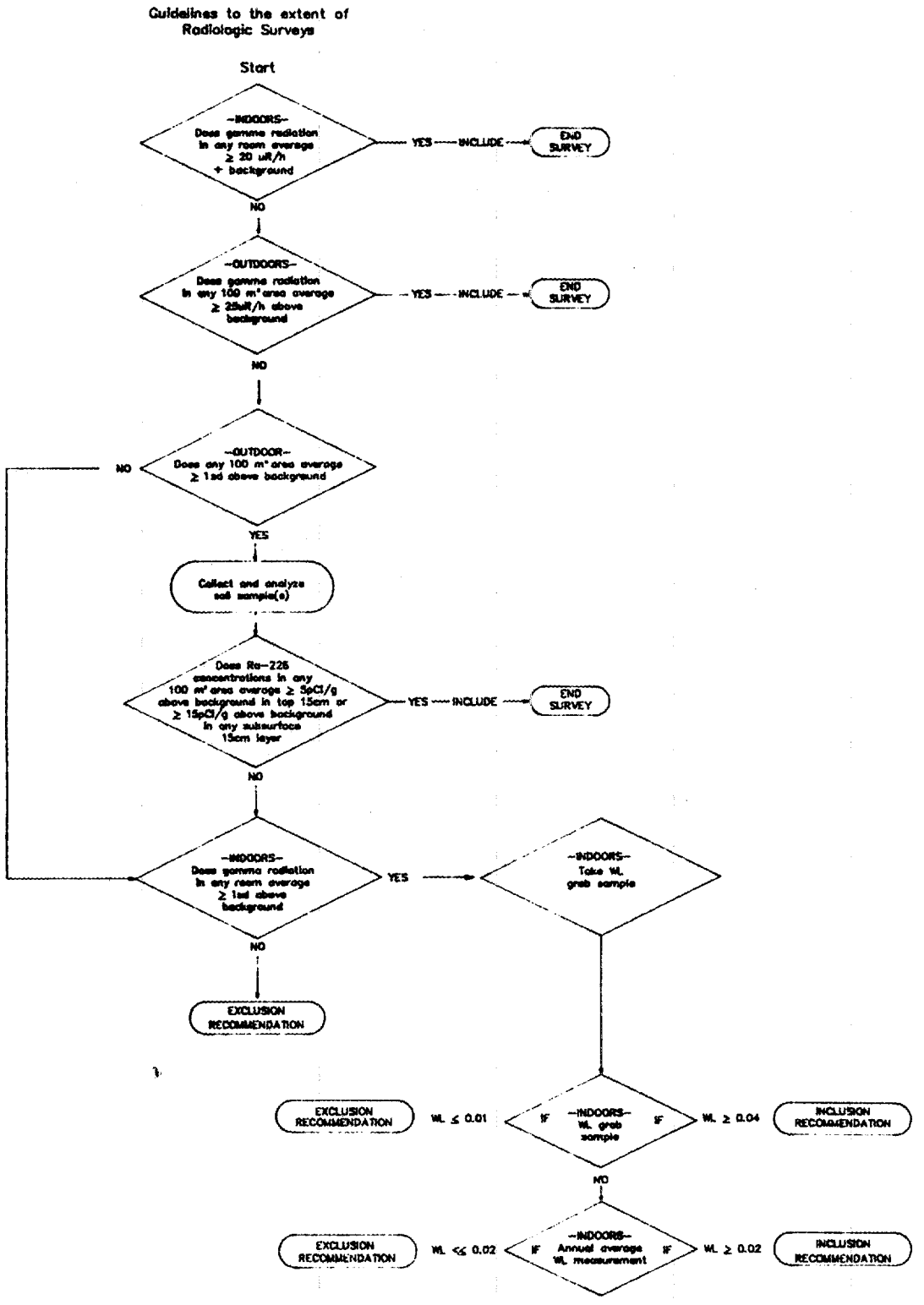

60'
SHED
1 STORY
FRAME
W/B
130'
N.
FEET
0 5 10 20
0 1 3 6
METERS
COVEY DR
GJ05776
3124 COVEY DR.
JAA

Fig. 2



Guidelines To The Extent of Radiologic Inclusion Surveys

FIGURE 3.

or by tracing a drawing with a mouse or digitizing tablet. Using AutoCAD and other automation techniques may ultimately result in slightly improved efficiency for the ISC, especially with respect to changes and revisions. However, the use of automation is expected to result in substantially improved efficiency for the Remedial Action Contractors (RACs).

As the use of AutoCAD is implemented, the preparation of ink drawings and PMTs will cease. For property sketches prepared by ISC staff, AutoCAD drawings will be prepared using the property measurements. When a property is to be radiologically surveyed, the property sketch can be plotted by computer and copies made for use in the field. Approximately one-half of all Mesa County property sketches are to be made by subcontractors, who submit ink drawings to the ISC. These drawings are converted to AutoCAD files by ISC staff using digitizing tablets. The ISC plans to attempt to establish a subcontract under which AutoCAD files would be delivered instead of ink drawings.

2.4.5 Radiological Survey

2.4.5.1 Introduction

All measurements and methodology utilized during the inclusion survey are as described in the ORNL RASA UMTRA Procedures Manual.

2.4.5.2 Scope of Survey

The extent of an inclusion survey is guided by a decision matrix designed to minimize the effort necessary to make a defensible inclusion/exclusion recommendation. Figure 3 is adapted from the VPMIM

and summarizes the various levels of investigation required to characterize a property based on the levels of radioactivity detected.

The survey begins with a gamma scan of the property, both indoors and out. During the scanning, if any 100 m^2 area outdoors averages more than 25 uR/h above background, or if any room of a building averages more than 20 uR/h above background, then a recommendation of inclusion can be made and the survey ends. Conversely, exclusion is recommended if no 100 m^2 area outdoors and no room of a building averages greater than background plus (30% or acceptable percentage) when the entire property has been scanned. For levels of gamma exposure between background plus 30% and background plus 25 (or 20 indoors) uR/h , extended measurements are dictated.

Extended measurements consist of soil sampling outdoors (sometimes indoors) or indoor RDC measurements. Soil samples may be taken from either surface levels (0-15 cm) or subsurface depths (>15 cm). RDC measurements may be either instantaneous (grab) samples taken under standard conditions (see VPMIM) or annual average measurements.

For purposes of inclusion survey simplicity, soil samples are always taken before RDC measurements. If ^{226}Ra concentrations averaged over 100 m^2 in soil samples exceed 5 or 15 pCi/g for surface or subsurface samples, respectively, then inclusion is warranted. Exclusion is warranted if soil samples are less than 5 and 15 pCi/g for surface and subsurface samples, respectively, and if interior extended measurements are not dictated.

The need for RDC measurements is determined after analyzing the extended soil measurements. RDC measurements require additional visits to the property and can take approximately one year. When RDC

measurements are needed, the exclusion/inclusion criteria are in terms of working levels (WL). Instantaneous RDC of <0.01 WL and annual average RDC values of <0.02 WL result in exclusion recommendations. Inclusion results from grab or annual average concentrations of >0.04 or > 0.02 WL, respectively. Inconclusive grab RDC measurements (between 0.02 and 0.04 WL) require that annual average measurements be made.

2.4.5.3 Responsibilities Within the Teams

Each team consists of, at most, four members, one of whom is designated the "team leader". The other members are designated as sample technician and report technicians on a monthly basis. In practice, however, the team members are expected to have several talents and are expected to perform duties as assigned by the team leader.

Each team is expected to produce an average of 10 completed recommendations each week. In order to accomplish this goal, prime responsibility for various tasks is assigned to the different team members. The prime responsibility for a team's activities rests with the team leader. Responsibilities within the teams are as follows:

Team Leaders

The team leader is responsible for ensuring that his team completes the required number of surveys and recommendations each week and month. Therefore, the team leader has the authority to assign the team's goals. To ensure quality, the team leader must see to it that all data is processed, and reports are written and reviewed by the team. The team leaders are responsible for maintenance of the equipment and vehicles assigned to the team. The team responsibilities must be equally

dispersed and regulated to ensure that personnel are utilized efficiently.

The Process Coordinator, through use of a listing provided by document control is responsible for assigning surveys to be done by each team. A file in the "ready to survey" drawer should contain a signed consent form that indicates the property owner's identity and telephone number. The team leader should accommodate the wishes of both owners and tenants. In the case of businesses, for example, surveys may need to be scheduled during non-business hours or on weekends. Even though a signed consent form exists, an oral refusal to cooperate, either during attempts to schedule or upon arrival at the property, will constitute ad hoc refusal. At a later date, the refusing owner or subsequent owners may be recontacted to attempt to survey the property. Documentation of oral refusal should be placed in the location file folder by the team leader.

Sample Technician

In addition to field survey activities, the sample technician is responsible for ensuring the data are correctly entered on the base map and that the final map is correctly prepared for the survey report. The sample technician is also responsible for coordination with the Sample Coordinator (described in a later section) to process the samples collected by the team. In addition, the sample technician is responsible for entering the results of the analyses into the property files. Finally, the sample technician is to alert his team that appropriate sample data are available for completion of reports. The sample technician's duties rotate among team members on a monthly basis.

Report Technician

In addition to field survey activities, the report technicians are responsible for writing and reviewing the reports and recommendations for the properties surveyed by the team. The report technicians are also responsible for reporting the data required by the VPDMS.

2.4.5.4 Conduct of Survey

Background Estimates

Where required, background gamma exposure rates are measured on the uncontaminated portions of the property at ground level using both a pressurized ionization chamber and a gamma scintillator. Scintillator readings in counts per minute (cpm) are converted to uR/h based on the conversion factor described later.

Unless there is reason to suspect abnormal variations for the location under investigation, background ^{226}Ra concentrations in soil (pCi/g) are taken to be equivalent to the state-wide mean. At locations where near-surface outcrops of natural bedrock formations exist or where there is reason to wish additional background data, a background soil sample may be obtained.

Conversion Factors

Raw field data from gamma scanning is recorded in units of thousands of counts per minute (kcpm). Decision-making and reference to standards is in terms of micro Roentgen per hour (uR/h). Therefore, field measurements in kcpm must be converted to uR/h using a unit conversion factor (CF in kcpm/uR/h). In Mesa County, an empirical conversion equation is used which has been developed on the basis of

measurements ORNL has made to date. The conversion equation is as follows:

$$uR/h = 1.69\ (kcpm) + 3.45,$$

where uR/h = estimated gamma exposure rate

kcpm = scintillator meter reading

1.69 = empirical slope

3.45 = empirical intercept.

(Durango also has a conversion equation.)

In other localities, conversion factors are generated from measurements taken at one or more locations on each property by making duplicate measurements according to established procedures.

Screening Survey

Indoor. The floor surface of the lowest habitable level of any habitable structures is completely scanned. If gamma exposure levels 30% (or accepted percentage) or more above background are detected, their location is noted on the field data sheets, a drawing of the interior of the structure is made, and the contaminated region is measured, shaded and labelled.

Locations having any single room which averages greater than 20 uR/h above background are automatically eligible for inclusion. A recommendation will be made for immediate inclusion with no further measurements. When no rooms or larger rooms are present, an average 10 m^2 room is assumed. Average gamma exposure rates (field averages)are estimated in the field by the team leader.

Outdoor. The ground surface of the entire accessible portion of the property should be scanned until coverage is complete or until an includable deposit is found. The team leader may establish an informal grid to allow control of scanned regions and to assure complete coverage of the property where necessary. Coverage by team members is noted on field maps to insure complete coverage. Uninhabitable structures are scanned as though they are part of the outdoors.

Any elevated regions of gamma exposure (1000 counts plus background) are indicated on the scale drawing by the team leader. Each distinct, elevated region is labelled with a letter (A, B, C, etc.), an affected area (e.g., $10m^2$), a surface gamma exposure range (e.g., 10,000-15,000 cpm), and a mean gamma exposure rate. Photographs of the property are taken to document it for other participants in the project (usually the front of the property). Regions averaging greater than 25 uR/h above background over $100m^2$ are eligible for inclusion with no further measurements required. Average gamma rates are estimated in the field by the team leader.

Extended Survey

Outdoor. Extended measurements outdoors constitute measurements in addition to gamma scanning. Such measurements may take two forms: 1) boring of holes to make subsurface gamma exposure measurements, or 2) removal of surface or subsurface soil samples to ascertain the ^{226}Ra concentration in the soil. Each of these will be discussed in the following sections.

Soil Sampling. All soil samples taken during the inclusion survey are "biased" samples. No systematic, or randomly chosen soil samples are taken during inclusion surveys. Samples, both surface and subsurface, are taken at the discretion of the team leader. Likely locations are deposits identified during gamma screening which clearly do not exceed the gamma screening inclusion criterion of 25 uR/h above background averaged over $100m^2$.

Surface and subsurface soil samples taken at the location specified are obtained in the following manner. A sod plug (if any) is removed from the top of the hole, and all the remaining soil down to the depth to be sampled is removed and placed on a sheet of plastic adjacent to the hole. This soil is mixed on the plastic sheet and an aliquot of about 500 g collected, packaged, labelled and transported to the laboratory. The ISC and the TAC are investigating the improvement of sampling techniques, and it is expected that ISC procedures will be modified during FY 1986 in accordance with the findings of the investigation.

Subsurface Gamma Measurements. To investigate the possibility of subsurface activity sufficient to include a location, subsurface gamma measurements may be needed. Near or beyond the edge of any deposit located during the gamma screening measurements, a series of holes should be made with a posthole digger. Preferably, one hole should be dug on each side of any deposit located. The hole should be at least 15 cm deep. The purpose of these measurements is to ascertain whether or not the buried deposit has portions that are shielded by the soil to such an extent that those

portions are undetectable from the surface. Once the top 15 cm of soil has been removed, an increase in gamma exposure count rate in excess of 30%, which would be expected from geometry alone, should be taken as evidence that additional contamination exists further below the surface. Such a result indicates the need for a deeper hole and further gamma measurements or soil samples. If no increase in gamma count rate is observed in the hole, the team leader should so note and presume that the deposit detected from the surface measurements does not extend beyond the limit implied by those surface measurements.

Radon Daughter Concentration Measurements. The ISC is currently employing the use of alpha- sensitive film devices but is also developing techniques for RDC sampling that will improve on the existing approved techniques. The approved techniques are cumbersome and sample time is lengthy. The ISC is investigating use of air-filter sampling devices and charcoal canisters.

2.4.5.5 Soil Sample Analysis

Soil samples taken on surveyed properties are routinely analyzed using a sodium-iodide (NaI) well-crystal method. Samples are first dried overnight at 110°C, then crushed using a jaw crusher. An aliquot of approximately 500 g is placed in a 3"-diameter jar, sealed with a teflon cap and tape and then sealed into a plastic bag. The sample is allowed to sit for at least 12 days to allow the radon gas to equilibrate and it is then counted. An empirical relationship between ^{214}Bi concentration in soil over time is used to back-calculate the ^{226}Ra concentration. More details regarding the system may be found in

the referenced report. Soil analysis results are added to the field data sheets and the soil analysis database by the team's soil coordinator.

2.4.5.6 Data Conversion

The team leader is responsible for converting all gamma exposure rate data on field data sheets and drawings from kcpm to uR/h. This is done using a predetermined empirical relationship as follows:

$$E = m\,C + b,$$

where, E = estimated gamma exposure rate (uR/h)

m = fitted slope of line,

C = measured scintillator gamma rate (kcpm), and

b = fitted intercept of line.

From measurements in each community, the slope and intercept is determined with standard statistical methods. For properties in Mesa County, the values of m and b have been determined from measurements made by the ISC to date. Experience to date indicates correlation coefficients of greater than 95%.

2.4.5.7 Data Archiving

All field data sheets and drawings are copied by the team leader and filed numerically by location number in loose leaf binders kept in each team leader's possession for future reference, if necessary. Extra copies of location photographs are also archived by the team leader.

2.4.5.8 Final Drawing

Under supervision of the team leader, the team sample technician is

responsible for final shading and labeling of the PMT. Contaminated regions are shaded and identified by letter, size, and gamma exposure rate range. Other features of radiological interest, such as soil sample locations PIC locations and point sources, are also identified on the drawing (Fig. 4).

2.4.5.9 Report Preparation

After completing the radiological survey of a property, the data collected in the field are returned to the office. The gamma-scan data are converted from thousands of counts per minute (kcpm) to uR/h, the final map is prepared and shaded, and any samples collected are prepared for analysis.

Preparation of the report and recommendation must wait until an analyses are complete.

The report technician prepares the survey report by using a "report skeleton", which allows standardization of reports. An example of a report skeleton is attached as Appendix A.

When the draft of the report is written, it is typed and given to the team leader for review. After the team leader's review, it is given to a member of another team for review. During this review, the draft recommendation letter and the summary evaluation and recommendation forms are prepared, and the information required for the VPDMS is extracted. This package is typed "final" and given to the Process Coordination Department for final review. Following this review, the property file (containing the report and recommendation) is forwarded to the office manager for his signature.

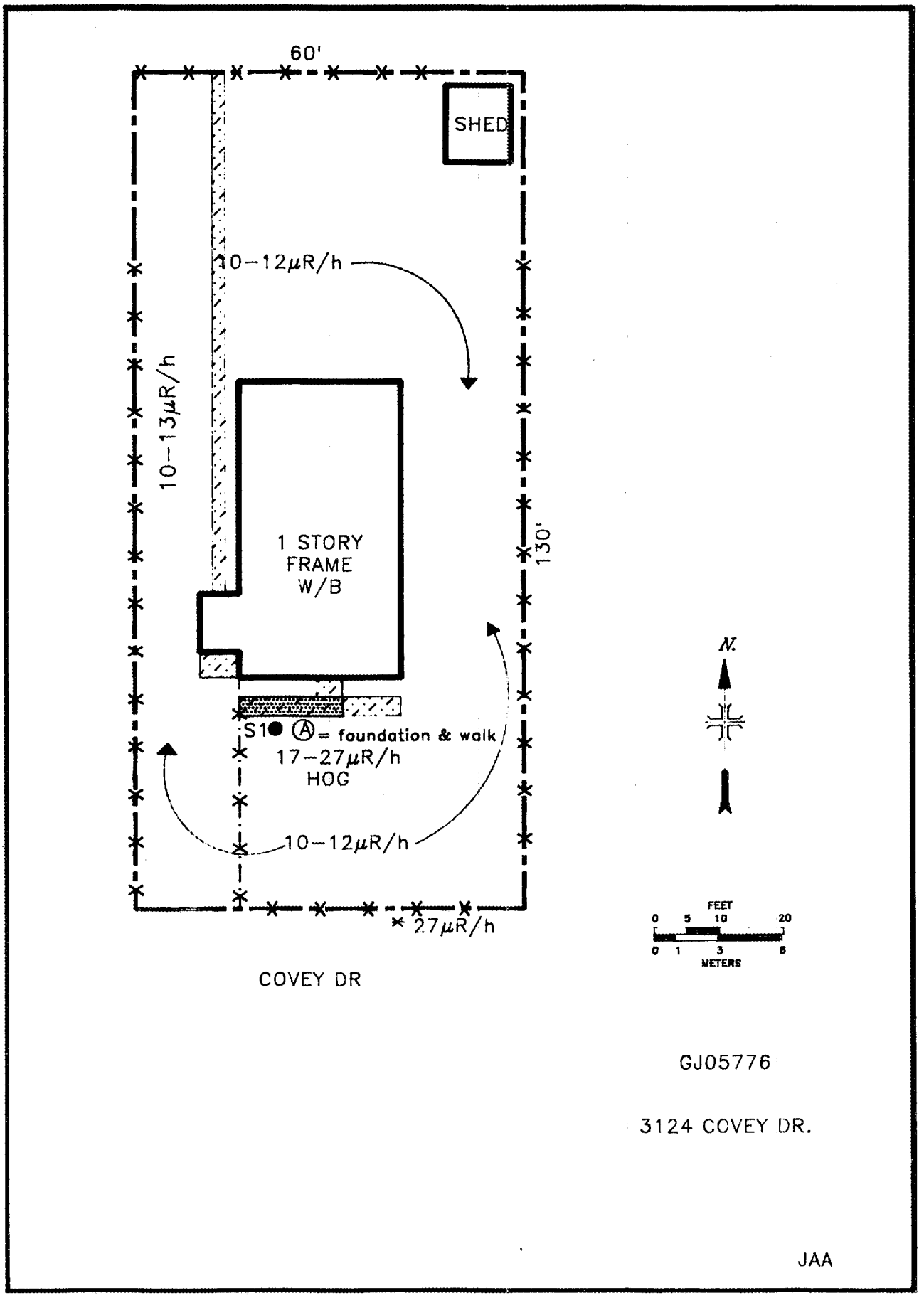

60'
SHED
10–12μR/h
10–13μR/h
1 STORY
FRAME
W/B
130'
S1
Ⓐ = foundation & walk
17–27μR/h
HOG
10–12μR/h
27μR/h
COVEY DR
N.
FEET
0 5 10 20
0 1 3 6
METERS
GJ05776
3124 COVEY DR.
JAA

Fig. 4.

2.4.6 File Transmittal

2.4.6.1 Information Transmitted

After the GJ Office Manager has signed the recommendation letter for a given property, the following information is transmitted to the DOE:

a. Cover letter summarizing the recommendation and the survey procedures that were used.

b. Vicinity Property Summary Evaluation and Recommendation form.

c. Two copies of the finished inclusion survey report.

d. Copies of the original color photographs.

e. Scale drawing of the property.

f. Original signed access consent form.

g. Complete historical data file.

h. Field map with raw and converted data.

i. Field gamma sheets.

j. Field soils sheets.

k. Gamma calculation sheets.

l. Soils calculation sheets.

All of these items are placed in a manila folder stamped "Official Location Folder". This folder is forwarded to the RAC upon completion

of the decision-making by the DOE. A copy of all transmitted materials is retained in a file by the ISC.

Recommendations and files for Grand Junction and Edgemont are transmitted to the inclusion authority at GJPO. Recommendations and files for all other UMTRA Project sites are transmitted to the inclusion authority at the UMTRA Project Office in Albuquerque. Copies of the recommendation letters, without attachments, are sent to ORNL, JEG, and the appropriate RAC.

2.4.6.2 Recommendation Follow-Up

The DOE inclusion officer may not concur with the ISC's recommendation, or may require further information to make an inclusion/exclusion decision. When this occurs, the inclusion officer writes appropriate comments on the Summary Evaluation form and returns the entire location folder to the ISC's Process Coordinator.

The Process Coordinator will contact the inclusion officer if further clarification is required. The Process Coordinator is responsible for making the corrections, if minor, or returning the location folder to the same team leader whose team produced the survey report and requesting that the team leader make the required revisions to the report. A monthly report summarizing this activity is provided to the Quality Assurance Coordinator and Office Manager.

After the requested revisions or additions have been made to the report, the entire location folder is returned to the DOE. The Process Coordinator is responsible for ensuring that the revisions are acceptable to the appropriate inclusion officer.

If no additional field work is required to revise the report,

folders will be re-submitted to the DOE within approximately one month of their return to the ISC. Folders for Grand Junction locations requiring additional field work will be returned to the DOE within two months, unless radon sampling or concrete coring is necessary. The return times for locations needing radon sampling will depend on the time required for the sampling, which can take as much as one year. Remote locations requiring additional field work will be scheduled in accordance with other field work requirements and will be revisited as quickly as possible.

2.5 ADMINISTRATIVE AND SUPPORT OPERATION

2.5.1 Organization and Staffing

The ISC's present internal organization is shown in Figure 5. It is expected that the organization and staffing level shown will remain constant through 1987, when the ISC's activities are likely to begin winding down. No specific "wind-down" plans are shown at this time because of the uncertainties concerning the total number of properties to be surveyed and requirements for closeout and data archiving. It is anticipated that staff levels will begin to be reduced no later than December, 1987, and that the Grand Junction Office will be closed by the end of FY 1988.

2.5.2 Responsibilities of GJO Administrative Staff

2.5.2.1 Office Manager

The office manager has the final responsibility for all personnel matters, product quality, milestone achievement, planning, interface with the DOE and other contractors, and all other functions of the ISC's

Grand Junction Office.

2.5.2.2 Survey Manager

The survey manager acts as the assistant office manager and assists the office manager in each area of responsibility. The survey manager's primary responsibilites are assignment and scheduling of survey teams, coordination of efforts between survey teams and other areas of responsibility, and the setting of priorities in accordance with milestones.

2.5.2.3 Administrative Secretary

The administrative secretary reports to the office manager, and is responsible for assisting the office and survey managers with all administrative activities of the GJ Office. In addition, the administrative secretary is responsible for all senior secretarial duties at the GJ office.

2.5.2.4 Technical Assistant

The technical assistant reports to the office manager, and is responsible for assisting the manager in resolving technical questions as they arise. The technical assistant is also responsible for ensuring that employees receive consistent on-the-job training and that procedures are technically adequate and are followed.

2.5.2.5 Quality Assurance Coordinator

The QA coordinator reports directly to the office manager and bears the prime responsibility for establishing and maintaining the operation of the ISC's quality assurance program.

2.5.3 Support Staff Responsibilities

2.5.3.1 Process Coordinator

The process coordinator is responsible for assisting the survey manager in supervising and coordinating the activities of the survey teams and in coordinating the survey teams' activities with the activities of other functional groups in the GJ Office. In addition, the process coordinator supervises the editing technicians and maintains quality control of inclusion survey reports.

2.5.3.2 Assistant Process Coordinator

The assistant process coordinator reports to and assists the process coordinator in all phases of the process coordinator's work.

2.5.3.3 Clerical Staff

The clerical staff reports to the process coordinator and is responsible for final typing of all survey reports and recommendation letters, maintaining the files, and all other general secretarial and clerical duties.

2.5.3.4 Electronics Technician

The electronics technician is responsible for control, distribution, and maintenance of all electronic equipment at the GJ Office, including computer equipment. He also coordinates the purchase of all electronic equipment with the purchasing coordinator and, when appropriate, with the computer services staff.

2.5.3.5 Property Coordinator

The property coordinator is responsible for coordinating and

monitoring all procurement and property management activities of the GJ Office. In addition, the property coordinator will provide the primary interface with procurement and facility support staff at GJPO.

2.5.3.6 Computer Services Staff

The computer services staff is responsible for developing, maintaining, and controlling all data processing services required by the GJ Office and for training personnel in the use of the network. In addition, the computer services staff will coordinate hardware and software procurement with the purchasing coordinator and hardware repair with the electronics technician.

2.5.3.7 Editing Technicians

The editing technicians will provide editorial quality control of survey reports and recommendations. In addition, they will coordinate with the computer services staff and the process coordinator to provide tracking of properties through the ISC's inclusion process.

2.5.3.8 Extended Measurements Staff

The difficult measurements staff will manage the ISC's sample analysis facilities, provide quality control of sample analysis, coordinate the team's sample technicians' activities, conduct radon sampling, and conduct concrete coring and other special sampling.

2.5.3.9 Graphics Staff

The graphics staff will prepare property sketches and approve property sketches produced by the graphics subcontractors. Graphics staff responsibilities are described in Sect. 2.4.4.

2.5.3.10 Public Relations Staff

The public relations staff is responsible for acquiring consents-for- access. Their other activities are described in Sect. 2.4.3. The document control clerk is part of the public relations staff and maintains all central filing, archiving, and folder tracking functions.

2.6 PROJECT CONTROLS

2.6.1 Reporting Requirements

The ISC is subject to various external reporting requirements of varying frequencies. Regular reports to the UMTRA Project Office are:

a. Bimonthly presentation to the Project Office on (usually) the third Friday of alternate months concerning actual and projected accomplishments and expenditures.

b. Monthly VPDMS reporting by the 25th of each month.

c. Monthly written report to the Project Office by the 10th working day of the following month showing actual accomplishments and expenditures and planned activities.

d. "Triannual" presentation to the Project Office and other DOE representatives. This is a somewhat expanded monthly presentation which occurs each fourth month.

e. Annual and mid-year presentations to the Project Office and other DOE representatives.

f. Monthly (if required) submissions to the UMTRA Project Change Control Board requesting modifications to ISC budgets or schedules.

The ISC also maintains an internal control system with three major elements:

a. Weekly reports to the office and survey managers (oral and informally written) on progress in various functional areas during the previous week. This report is made each Monday.

b. Daily entries from each functional group into the ISC's data base.

c. Monthly review of potential cost and performance trends by the office and survey managers.

d. Monthly progress report from the quality assurance coordinator on the status of external audits, internal surveillances, quality problem reports, and personnel training activities.

e. Monthly reports from the process coordinator on the returned report activities.

2.6.2 Data Base

The ISC plans to establish a computerized data base as the center of a computer network. The data base and computer network have been established, and the programming necessary to fully implement the system should be substantially completed by the end of FY 1986. The main network configuration will be hierarchical in structure. The computer

support group will control and maintain the main database system (DBS).

For purposes of interaction with the DBS, four main areas of responsibility have been identified within the work flow. The four areas are public relations, graphics, radiation surveys, and reporting. Other accessory groups will interact with the DBS to varying degrees. At present, the accessory groups are project administration, quality assurance, systems support, and survey systems support.

The DBS and network will provide for automated input, tracking and notification. When the network programming has been completed, an outline of the interactions between the DBS and various parts of the work flow will be as follows:

a. Data are downloaded from the Mesa County Tax Assessor's files on the Bendix CYBER system or are entered interactively by the public relations staff. When consent forms are sent, the dates are entered on the DBS. When the forms are received, the property data are entered interactively on the DBS. The DBS provides automatic notification of the need for follow-up for non-responding property owners.

b. When a consent form is on file, the DBS will trigger notification of the graphics group. When the property sketch is prepared, an AutoCAD file is transmitted to the DBS, triggering a notification of the process coordinator.

c. The process coordinator will assign the file to a survey team and the DBS will transmit the drawing and information files to the team. These files will be accessible only to the

designated team until the report is completed. The team will enter the radiological data and edit the drawing file. Soil sample results will be transmitted directly to the DBS and thus distributed to the information files.

d. A hard-copy plot of the property is transmitted to the clerical support group, who will receive the final report on the DBS and print it out for signature by the office manager.

As each step is accomplished, the DBS will automatically record the completion dates on a master tracking record that will be available to the process coordination and administrative support groups. As part of the tracking, as each step is accomplished, the next responsible group receives automatic notification of which properties are ready for work.

2.6.3 Cost Tracking

The principal responsibility for cost tracking is borne by staff at Oak Ridge, Tennessee. The financial officer assigned to the GJ Office maintains liaison with the ORNL financial staff and performs estimating and budgeting for the GJ Office. Financial reports are compiled at ORNL and delivered to the ORNL-RASA program manager on the 10th working day of each month. These financial data are included in the monthly written report to the DOE.

2.7 STAFF TRAINING

2.7.1 Formal Training

Formal education is completed prior to employment by ORNL. Applicants are not seriously considered unless they have at least an associate degree in some technical discipline. Preference is given to

staff having experience in radiological surveys or radiation measurement.

2.7.2 On-site Training

More detailed training in radiological physics and radiation biology is given by use of short courses. Professional staff of the Health and Safety Research Division of ORNL conducted a short course in Spring of 1985. Oak Ridge Associated Universities, which is renowned for its training in radiological matters, has provided training in health physics for all staff at ORNL/GJ.

2.7.3 On-the-Job Training

Training of ORNL/GJ field staff regarding field methods is provided via three methods. First, each new staff member is required to read the Vicinity Properties Management and Implementation Manual, Appendix A, that describes the protocol by which inclusion surveys are conducted. Second, the technical assistant and process coordinator, with assistance from the editing technicians, gives new employees an orientation session and also conducts regular training update sessions regarding the Procedures Manual and Q.A.P.P. Third, new staff are assigned to the supervision of an experienced team leader. The team leader is responsible for the conduct of the inclusion survey and the data collected. Consequently, the team leader is responsible for primary field training of new staff assigned to his or her team.

Proficiency is maintained by regular writers' workshops, technical discussion sessions, and internal quality assurance surveillances and follow-ups.

In addition, training in the use of AutoCAD and attendance at various

computer software seminars is enccouraged for appropriate personnel.

2.8 SUBCONTRACTING

2.8.1 Purpose

The ISC intends to use subcontracting to achieve four aims in addition to accomplishing the ISC's primary assignment: 1) to quickly accomplish "peak-load" activities as efficiently as possible, 2) to minimize ORNL's hiring/layoff cycle, 3) to offer practical experience to students in the field of health physics and radiation biology, and 4) to provide formal health physics training for technicians.

To accomplish these aims while achieving Project milestones, the ISC plans to employ five subcontracts, some of which are already established.

2.8.1.1 Oak Ridge Associated Universities (ORAU)

The ISC has established a work order with ORAU to provide formal health physics training to all field technicians and other interested personnel. In addition, ORAU will provide approximately 34 personnel who will work on survey teams and in other areas under ORNL direction. It is intended that ORAU and ORNL personnel will be fully integrated in the various work units.

2.8.1.2 Colorado State University (CSU)

During the summer of 1985, CSU provided 6 technicians (5 students and 1 advisor) to work on a temporary basis with ORNL survey teams. The CSU technicians devoted approximately 20% of their time to technical problems of interest to the ISC in the performance of its work, and the remainder to survey crew duties. During 1985, CSU technicians

investigated variations in background exposure rates, reasons for non-response to requests for consent, and the accuracy and precision of the soil analysis system. Because this program provides additional technicians during the busy summer months and allows for investigation of technical problems of concern to the UMTRA Project, it will probably be repeated during succeeding years.

2.8.1.3 ARIX, Inc.

ARIX was retained to provide data to the ISC on Grand Junction "dovetail" properties. Because of ARIX's long involvement in the GJRAP, it was thought that this arrangement was more efficient than for the ISC to investigate each "dovetail" property anew. This subcontract expired at the end of September, 1985.

2.8.1.4 Graphics Subcontractor

Registered land surveyors have been retained (by competitive bid) to provide property sketches for selected properties. The ISC intends to retain a graphics subcontractor each year of the Project. Approximately one-half of the Mesa County property sketches will be prepared by subcontractors.

2.8.1.5 Land Title Research Subcontractor

The ISC has retained a land title company to conduct title research for those properties where ownership or legal description is obscure. At present, some 1200 properties on the designation list for Grand Junction alone are expected to require title research. This subcontract was in place 4/28/86.

3. SCHEDULES

3.1. ASSUMPTIONS

3.1.1 Dates of Last Recommendation

Site closure dates and dates for last receipt of inclusion were originally estimated using data from the Project Schedule and Cost Estimate (PSCE, UMTRA-DOE/AL-166, November 1984).

Since these dates were originally developed, the UMTRA Project Master Schedule has undergone many modifications. The greatest change has been that the Project is now to be completed in FY 1993, rather than FY 1990. The ISC will complete all non-GRJ recommendations by the end of FY 1987 and will complete all recommendations by May of FY 1988. This schedule is not expected to affect vicinity-property remedial action schedules.

3.1.2 Lag Times

Lag times between various pieces of the inclusion process can be considered in two generic groups: those caused by forces internal to the survey process and those outside of or following the ORNL/ISC survey process.

3.1.2.1 Internal Lags

Internal lag times are those that affect the flow of information through the inclusion survey process described in section 2. Potential lags exist in most parts of the process, including: consent form acquisition, base map preparation, survey scheduling, survey performance, soil analysis, report writing, and file transmittal. Generally speaking, a

delay in one of these activities for a given property will not automatically produce a delay for another property. This is to say that the normal process lags are more or less independent with regard to a single location.

For the purposes of this discussion, we assume typical lag times as listed in Table 2. In difficult situations, many of the listed times are likely to be too short. For instance, if a property owner is completely unwilling to respond either affirmatively or negatively to requests for access consent, then the lag time for consent might be unlimited for that property. For the other activities listed, the range of lag times is not nearly so large as for consent form acquisition. Equipment breakdowns might add a few weeks to the total, but this is not likely to occur frequently or influence many locations. The range of lag times will be discussed in more detail in later sections.

Table 2. Assumed lag times for use in schedule preparation.

Process	Lag time (wk)
Internal	
Consent form acquisition	4
Base map preparation[a]	3
Inclusion survey	3
Soil analysis	3
Report preparation	2
File transmittal	1
Internal total	16
External	
Recommendation to inclusion	4
Inclusion to remedial action[b]	52
Remedial action to closure[b]	26
External total	82
Overall total	98

[a]At some sites, base maps are prepared concurrently, or nearly so, with consent form acquisition or with the inclusion survey, resulting in an effective lag time of 0 weeks.

[b]Figure agreed upon through discussion with RACs and TAC.

The total amount of production or lag time that we anticipate within our own system is anticipated to be 16 weeks. In short, this means that for the average or typical location, a sixteen-week period will elapse between the time that we initially begin to work on it and the time that a recommendation is forwarded to DOE.

3.1.2.2 Lag Times External to ISC

Once an inclusion recommendation has been made to DOE/UMTRA the process leading to remedial action may begin. For DOE-accepted exclusion recommendations the process is completed, because no remedial action will occur.

For planning purposes, we have assumed the three categories of external lag times listed in Table 2. We conservatively assume that the length of time from an inclusion recommendation to an inclusion decision by DOE is 4 weeks. This is usually an overestimate of the actual time. Generally speaking, the RAC's assume that remedial action is completed one year (52 weeks) after the property is formally included. For most sites, the PSCE assumes that the final remedial action is to be completed 6 months (26 weeks) prior to the final disposition of the tailings pile itself. These assumptions bring the total lag time between the last inclusion recommendation for a site and the site's closure to 82 weeks.

3.1.2.3 Total Assumed Lag Times

Assuming the total lag time identified above, the investigation into the final vicinity property at a given site must begin 98 weeks prior to the planned site closure date. This length of time becomes a prime constraint on the scheduling activity.

3.1.3 Changes in Efficiency

Two factors may affect the efficiency with which the inclusion survey process occurs; namely, organizational growth and technological or methodological advances. Growth in the organization, especially rapid growth, is likely to prevent or delay the highest level of productivity for each member of the staff. This is true because growth requires staff who are well trained and efficient to slow their production rate to accommodate newer staff who are still in the learning mode. We anticipate as much as a 10% reduction in efficiency/production during times of rapid growth. This estimate is based on a required output of 10 recommendations per work week per team. Our experience dictates that the addition of a new team member causes a team to do roughly four fewer surveys per month for the first month. Prolonged growth month to month can result in roughly a 10% decrease in efficiency throughout an entire year.

With a stable staff size, experience over time will result in higher efficiency. Over the course of several months, the loss of efficiency from growth can be reclaimed and even overcome.

Another increase in efficiency may be anticipated in the advent of technological advances. In particular, a telemetry system is being developed at ORNL to transmit positional and radiological information directly from the detector unit to a nearby computer. If successful, this unit may cut field survey time by as much as 30%, will eliminate transcription errors, and decrease report writing time because data will not need to be keyed in to the computer. The total savings per recommendation using such a system could approach 25%. Factors such as consent form acquisition and data interpretation would not be made more efficient by such a telemetry system.

3.1.4 Total Number of Recommendations

As listed in Table 3, the total number of designated vicinity properties to be considered is 8,156. This number is slightly at variance with numbers published in other places. The official designation list published by DOE/HQ listed 8213 vicinity properties (some of these properties were included by DOE/HQ and thus will not be surveyed by the ISC).

We believe that the number of inclusion surveys to be completed during the project is likely in excess of any of these numbers. A number of factors, including additional mobile gamma van scanning and advertising, will serve to increase the total number surveyed. Each of these factors will be discussed briefly in the following sections. The estimated total number of recommendations to be made is listed in Table 3.

3.1.4.1 New Van Identifications

There appear to be areas in Mesa County where property descriptions are vague or where historical coverage by the CDH has been relatively sparse. The ISC is considering the use of the mobile gamma-scanning van in these areas, once they are adequately delineated, to locate properties that appear to have radioactive contamination on them but that have not been designated for survey. This effort will probably not occur until FY 1987, because it is necessary to narrow down the target areas to a manageable size first, which requires the ISC to gain relatively detailed knowledge of all areas of Mesa County.

Table 3. Total number of inclusion/exclusion recommendations estimated by site.

Site	No. Properties Designated	Additional Properties	Total Estimated
Ambrosia Lake	0	10	10
Belfield	11	11	22
Bowman	3	3	6
Canonsburg	111	120	231
Durango	137	192	329
Edgemont	216	4	220
Falls City	20	0	20
Grand Junction	6905	690	7597
Green River	29	29	58
Gunnison	14	14	28
Lakeview	4	4	8
Lowman	17	11	28
Maybell	0	5	5
Mexican Hat	21	0	21
Monument Valley	17	0	17
Naturita	60	60	120
Rifle	384	192	576
Riverton	50	31	81
Salt Lake City	127	35	162
Shiprock	17	0	17
Slick Rock	4	4	8
Spook	1	0	1
Tuba City	8	0	8
Totals	8156	1415	9571

Additional properties are properties identified by van-scanning, advertising, requests, spillovers or other means.

Additional scanning of Grand Junction should probably not result in large numbers of additional identifications because such a large portion of Mesa County has already been surveyed by the State of Colorado. However, those surveys were limited to properties having habitable structures; i.e. vacant lots were not surveyed, as a rule. Therefore, it is reasonable to assume some increase. However, reliable non-estimate of additional properties can be made until the areas to be scanned have been delineated. The most efficient method of identifying such locations is probably through public contacts while surveying adjacent properties or through advertising which is discussed in the following section.

3.1.4.2 Advertising

General guidance from the UMTRA/PO to date has been that advertising to locate previously unidentified properties will be done at all sites. Recent experience in Canonsburg and Durango suggest that a large bolus of property identifications may occur following widespread advertising. Approximately 120 additional Canonsburg surveys and 225 additional Durango surveys have been conducted as a result of advertising and resultant owner requests. This represents more than a 100% increase over the original designation list. There is reason to believe that the public in Canonsburg and Durango are sensitized regarding radiation in general, and therefore, more likely to request a survey following advertising, relative to property owners at other sites.

We estimate the number of new identifications from advertising based on the following factors: a) for communities having 100 or fewer designations, we assume that advertising will result in 100% response, roughly the same as Canonsburg; and b) for communities having more than 100

designations, we assume an increase of 50%. Table 3 reflects actual ISC experience at sites where advertising has already been completed.

Exceptions to these rules are Grand Junction, Salt Lake City, Monument Valley, Tuba City, Mexican Hat, and Shiprock. Because of the number of walk-on surveys already conducted in Grand Junction by CDH and the general awareness of the public there, we assume a much smaller response, only 10%. At this point Salt Lake City is exempted from blanket advertising and, therefore, we assume no response. Because of the small size of the Indian sites, it seems unlikely that any additional sites exist. In addition, the assistance of Indian officials in locating properties for designation probably precludes missing of vicinity properties on Tribal lands.

3.1.4.3 Comparison With Vicinity Property Special Study

The VPSS estimated that 525 additional properties would be surveyed in excess of the designation list. That estimate was developed from conversations with state representatives. By contrast, our estimate is that over 1400 additional properties will ultimately be surveyed for inclusion recommendations. Given the large variables represented by van scanning and advertising, even this estimate may be low.

3.1.5 Completed Sites

Due to inclusion survey work from FY 1984 through mid FY 1986, inclusion survey work is virtually complete at several sites. Completed sites include Tuba City, Monument Valley, Mexican Hat, Lakeview, Lowman, Falls City, and Shiprock. Sites to be completed during FY 1986 are Salt Lake City, Edgemont, Canonsburg, Durango, and Riverton. Table 4 presents

the ISC's recommendation production for FY1984-1985 and the UMTRA-approved abbreviations for the sites.

3.2 ACTIVITY SCHEDULES

The total number of inclusion/exclusion recommendations by site for the remainder of the program is given in Tables 4, 5 and 6. These schedules have been produced within the constraints of the assumptions given above. The "Baseline" numbers refer to plans at the beginning of FY1986 or whenever the project baseline is re-set. "Planned" numbers refer to current projections as approved by the UMTRA Project Office. Because these schedules are used for reporting, "actual" numbers, which reflect performance, are included through March 1986.

3.2.1 Pre-recommendation Activities

As shown in Table 2, there are a number of lags involved in the remedial action process. For the purpose of scheduling activities that lead to the inclusion of a property for remedial action, we have used the assumed lag periods. Therefore, a total of 20 weeks must be allowed between the time that we initiate a consent form acquisition and the time that the inclusion decision is delivered to the RAC. Thus, for each site except Grand Junction and Rifle, consent-form acquisition must begin approximately five months before the date shown for delivery of the first recommendations for the given site. For both Grand Junction and Rifle, the processes of consent form acquisition, etc., as listed in Table 3 are continuous processes. Pre-survey processes for those two sites have already begun and will continue until the required number of surveys have been completed.

Table 4. Recommendations per site for FY1984 and FY1985

Site	Abbreviation	FY84	FY85
Ambrosia Lake	AMB	0	0
Belfield	BEL	0	0
Bowman	BOW	0	0
Canonsburg	CAN	41	113
Durango	DUR	28	121
Edgemont	EDG	61	97
Falls City	FCT	0	0
Grand Junction	GRJ	178	1148
Green River	GRN	0	0
Gunnison	GUN	0	0
Lakeview	LAK	0	0
Lowman	LOW	0	0
Maybell	MAY	0	0
Mexican Hat	HAT	17	1
Monument Valley	MON	17	0
Naturita	NAT	0	0
Rifle	RIF	18	62
Riverton	RVT	55	2
Salt Lake City	SLT	44	53
Shiprock	SHP	15	5
Slick Rock	SLR	0	0
Spook	SPK	0	0
Tuba City	TUB	6	1
Total		480	1603

TABLE 5

INCLUSION SURVEY CONTRACTOR RECOMMENDATION SCHEDULE BY SITE

Site	Recommendations	Fiscal Year 1986 Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Belfield	Baseline							22		0				22
	Planned							0		0				0
	Actual													0
Bowman	Baseline							6		0				6
	Planned							0		0				0
	Actual													0
Canonsburg	Baseline				0		0							0
	Planned				0		30							30
	Actual				6		3							9
Durango	Baseline	35	40	0	0	0	0	0						75
	Planned	35	40	0	0	30	35	35						175
	Actual	34	40	10	1	30	35							150
Edgemont	Baseline							0						0
	Planned							2						2
	Actual													0
Falls City	Baseline							40						40
	Planned							40						40
	Actual													0
Grand Jct	Baseline	205	200	195	203	190	161	132	167	192	254	260	300	2459
	Planned	205	200	195	203	190	195	173	225	230	255	240	240	2551
	Actual	162	209	224	211	205	229							1240
Green River	Baseline						58							58
	Planned						0							0
	Actual													0
Gunnison	Baseline									28				28
	Planned									0				0
	Actual													0
Lakeview	Baseline	0	0	8	0									8
	Planned	0	0	8	0									8
	Actual	6	1	0	2									9
Lowman	Baseline	0	0	17	17		0							34
	Planned	0	0	17	17		0							34
	Actual	3	2	10	10		1							26
Mexican Hat	Baseline													0
	Planned													0
	Actual													0
Monument Valley	Baseline													0
	Planned													0
	Actual													0
Naturita	Baseline							60	60					120
	Planned							0	0					0
	Actual													0
Rifle	Baseline	0			0	30	33	40	80	80	46	40	0	349
	Planned	0			0	0	0	10	30	30	5	20	20	115
	Actual	30			1	0	0							31
Riverton	Baseline								0					0
	Planned								4					4
	Actual													0

TABLE 5 (continued)

INCLUSION SURVEY CONTRACTOR RECOMMENDATION SCHEDULE BY SITE

Site	Recommendations	Fiscal Year 1986 Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Salt Lake City	Baseline	0			0									0
	Planned	0			0									0
	Actual	13			9									22
Shiprock	Baseline													0
	Planned													0
	Actual													0
Slick Rock	Baseline		0											0
	Planned		0											0
	Actual		1											1
Spook	Baseline						1		0					1
	Planned						0		1					1
	Actual													0
Tuba City	Baseline													0
	Planned													0
	Actual													
Total (by mo.)	Baseline	240	240	220	220	220	253	300	307	300	300	300	300	3200
	Planned	240	240	220	220	220	260	260	260	260	260	260	260	2960
	Actual	248	253	244	240	235	268	0	0	0	0	0	0	1488
Total (YTD)	Baseline	240	480	700	920	1140	1393	1693	2000	2300	2600	2900	3200	3200
	Planned	240	480	700	920	1140	1400	1660	1920	2180	2440	2700	2960	2960
	Actual	248	501	745	985	1220	1488	1488	1488	1488	1488	1488	1488	1488

TABLE 6

INCLUSION SURVEY CONTRACTOR RECOMMENDATION SCHEDULE BY SITE

Site	Recommendations	Fiscal Year 1987 Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Ambrosia Lake	Baseline			10										10
	Planned			10										10
	Actual													0
Belfield	Baseline		22											22
	Planned		22											22
	Actual													0
Bowman	Baseline		6											6
	Planned		6											6
	Actual													0
Canonsburg	Baseline													0
	Planned													0
	Actual													0
Durango	Baseline													0
	Planned													0
	Actual													0
Edgemont	Baseline													0
	Planned													0
	Actual													0
Falls City	Baseline													0
	Planned													0
	Actual													0
Grand Jct	Baseline	230	202	180	190	220	260	260	190	137	153	160	181	2363
	Planned	230	202	180	190	220	260	260	190	137	153	160	181	2363
	Actual													0
Green River	Baseline								30	28				58
	Planned								30	28				58
	Actual													0
Gunnison	Baseline												28	28
	Planned												28	28
	Actual													0
Lakeview	Baseline													0
	Planned													0
	Actual													0
Lowman	Baseline													0
	Planned													0
	Actual													0
Maybell	Baseline									5				5
	Planned									5				5
	Actual													0
Mexican Hat	Baseline													0
	Planned													0
	Actual													0
Monument Valley	Baseline													0
	Planned													0
	Actual													0
Naturita	Baseline									40	40	40		120
	Planned									40	40	40		120
	Actual													0

TABLE 6 (continued)

INCLUSION SURVEY CONTRACTOR RECOMMENDATION SCHEDULE BY SITE

Site	Recommendations	Fiscal Year 1987 Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Rifle	Baseline	30	30	30	30				40	50	60	60	51	381
	Planned	30	30	30	30				40	50	60	60	51	381
	Actual													0
Riverton	Baseline													0
	Planned													0
	Actual													0
Salt Lake City	Baseline													0
	Planned													0
	Actual													0
Shiprock	Baseline													0
	Planned													0
	Actual													0
Slick Rock	Baseline										7			7
	Planned										7			7
	Actual													0
Spook	Baseline													0
	Planned													0
	Actual													0
Tuba City	Baseline													0
	Planned													0
	Actual													
Total (by mo.)	Baseline	260	260	220	220	220	260	260	260	260	260	260	260	3000
	Planned	260	260	220	220	220	260	260	260	260	260	260	260	3000
	Actual	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (YTD)	Baseline	260	520	740	960	1180	1440	1700	1960	2220	2480	2740	3000	3000
	Planned	260	520	740	960	1180	1440	1700	1960	2220	2480	2740	3000	3000
	Actual	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 7

INCLUSION SURVEY CONTRACTOR RECOMMENDATION SCHEDULE BY SITE

Site	Recommendations	Fiscal Year 1988 Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Ambrosia Lake	Baseline													0
	Planned													0
	Actual													0
Belfield	Baseline													0
	Planned													0
	Actual													0
Bowman	Baseline													0
	Planned													0
	Actual													0
Canonsburg	Baseline													0
	Planned													0
	Actual													0
Durango	Baseline													0
	Planned													0
	Actual													0
Edgemont	Baseline													0
	Planned													0
	Actual													0
Falls City	Baseline													0
	Planned													0
	Actual													0
Grand Jct	Baseline	260	260	220	220	220	150	120	88					1538
	Planned	260	260	220	220	220	150	120	88					1538
	Actual													0
Green River	Baseline													0
	Planned													0
	Actual													0
Gunnison	Baseline													0
	Planned													0
	Actual													0
Lakeview	Baseline													0
	Planned													0
	Actual													0
Lowman	Baseline													0
	Planned													0
	Actual													0
Maybell	Baseline													0
	Planned													0
	Actual													0
Mexican Hat	Baseline													0
	Planned													0
	Actual													0
Monument Valley	Baseline													0
	Planned													0
	Actual													0
Naturita	Baseline													0
	Planned													0
	Actual													0

TABLE 7 (continued)

INCLUSION SURVEY CONTRACTOR RECOMMENDATION SCHEDULE BY SITE

Site	Recommendations	Fiscal Year 1988 Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Rifle	Baseline													0
	Planned													0
	Actual													0
Riverton	Baseline													0
	Planned													0
	Actual													0
Salt Lake City	Baseline													0
	Planned													0
	Actual													0
Shiprock	Baseline													0
	Planned													0
	Actual													0
Slick Rock	Baseline													0
	Planned													0
	Actual													0
Spook	Baseline													0
	Planned													0
	Actual													0
Tuba City	Baseline													0
	Planned													0
	Actual													
Total (by mo.)	Baseline	260	260	220	220	220	150	120	88	0	0	0	0	1538
	Planned	260	260	220	220	220	150	120	88	0	0	0	0	1538
	Actual	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (YTD)	Baseline	260	520	740	960	1180	1330	1450	1538	1538	1538	1538	1538	1538
	Planned	260	520	740	960	1180	1330	1450	1538	1538	1538	1538	1538	1538
	Actual	0	0	0	0	0	0	0	0	0	0	0	0	0

4. COSTS

4.1 INTRODUCTION

The estimated costs of conducting the ISC's activities have been recalculated using work elements defined in the ISC's Implementation Manual of FY 1985. Modifications to previous cost estimates have been made in accordance with the ISC's experience during the past year.

4.2 DIRECT-LABOR COSTS

To develop new labor-cost estimates for the ISC's activities, the individuals responsible for performing the various work elements were requested to provide estimates of the time required per property to complete the work elements. These estimates were compiled and adjusted to allow for such factors as travel times, and are presented in Table 8. These costs refer only to those activities which directly contribute to the production of inclusion/exclusion recommendations.

4.2.1 Consent-Form Activities

The ISC still experiences a 60% response rate to its mailings of consent-for-access forms. Some 25-50% of the non-responses in GRJ appear to be vacant properties of uncertain ownership. In addition, some 1200 GRJ vicinity properties on the designation list have uncertain ownership or cannot be located based on the information contained in the designation list. For non-GRJ properties, the ISC has been visiting the sites and directly contacting the owners, which has met with good success.

DIRECT-LABOR COSTS

TABLE 8.

			1986 ave.	1986 low	1986 high	1987 ave.	1988 ave.
1.	1.	Consent Form Activities					
	a.	Info acquisition	1.00			1.00	1.00
	b.	First mailing	0.15			0.15	0.15
	c.	Processing responses	0.50	0.15	1.00	0.50	0.50
	d.	File preparation	0.25			0.25	0.25
	e.	Inquiries, PR, misc.	0.50			0.50	0.50
	f.	Total	2.40			2.40	2.40
2.	2.	Graphics Activities					
	a.	Obtain legal desc.	0.25			0.25	0.25
	b.	Schedule, visit, measure	1.50	0.50	4.00	1.50	1.50
	c.	Base map preparation	1.75	0.75	6.00	1.75	1.75
	d.	Prep PMT for teams	0.50			0.50	0.50
	e.	ACAD data entry	1.25			1.25	1.25
	f.	Staff assistance, misc.	0.25			0.25	0.25
	g.	Total	5.50			5.50	5.50
3.	3.	Inclusion Survey Activities					
	a.	Rev. hist. data, schedule	0.50			0.50	0.50
	b.	Outdoor scan	0.50	0.25	2.00	0.50	0.50
	c.	Indoor scan	0.40	0.20	1.00	0.40	0.40
	d.	Extended measurements	0.50	0.20	1.00	0.50	0.50
	e.	Travel, cleanup, misc.	0.50			0.50	0.50
	f.	Total per person	2.40			2.40	2.40
	g.	Total (3 people/survey)	7.20			7.20	7.20
4.	4.	Post-Survey Activities					
	a.	Data conversion	0.50			0.50	0.50
	b.	Final drawing preparation	1.00	0.30	1.70	1.00	1.00
	c.	Data archival	0.50			0.50	0.50
	d.	Soil sample prep/analysis	1.00			1.00	1.00
	e.	Total	3.00			3.00	3.00
5.	5.	Survey Report Activities					
	a.	Folder preparation	0.50			0.50	0.50
	b.	First draft prep	2.75			2.75	2.75
	c.	Typing of draft	0.50			0.50	0.50
	d.	Completion of forms	0.50			0.50	0.50
	e.	Team leader review	0.75	0.50	1.50	0.75	0.75
	f.	Team review/editing	1.00			1.00	1.00
	g.	Report coord/review	1.25	0.50	4.00	1.25	1.25
	h.	Final typing	0.50	0.40	1.20	0.50	0.50
	i.	Total	7.75			7.75	7.75

TABLE 8

DIRECT-LABOR COSTS (cont.)

6.	6.	File Transmittal Activities			
	a.	Recommendation letter	0.40	0.40	0.40
	b.	Final revisions	0.35	0.35	0.35
	c.	Copying, transmittal	0.25	0.25	0.25
	d.	Total	1.00	1.00	1.00
7.	7.	Extended Measurements for Difficult Properties			
	a.	Concrete cutting/sampling	9.00	9.00	9.00
	b.	Proportion of properties	0.015	0.015	0.015
	c.	Ave hours/all properties	0.14	0.14	0.14
	d.	Radon sampling/ann. ave.	32.00	32.00	32.00
	e.	Proportion of properties	0.015	0.015	0.015
	f.	Radon sampling/partial	16.00	16.00	16.00
	g.	Proportion of properties	0.015	0.015	0.015
	h.	Ave hours/all properties	0.72	0.72	0.72
	i.	Total	0.86	0.86	0.86
8.	8.	Miscellaneous Direct-Support Activities			
	a.	Property assignment	0.20	0.20	0.20
	b.	Document control	0.50	0.50	0.50
	c.	Data entry	0.75	0.75	0.75
	d.	Correcting returned recs.	2.00	2.00	2.00
	e.	Proportion returned	0.05	0.05	0.05
	f.	Total for returns	0.10	0.10	0.10
	g.	Total	1.55	1.55	1.55
9.	9.	Total Person-Hours Per Recommendation			
	a.	Total	29.26	29.26	29.26
	b.	Incidental (12%)	3.51	3.51	3.51
	c.	Grand Total	32.77 person-hours per rec.	32.77	32.77

Info acquisition (1a) refers to all activities that lead to the location of vicinity properties and identification of the owner(s). For GRJ mass-mailings, this cost element is small, but as the ISC pursues more recontacts and difficult properties, this element increases in size. The average figure is the ISC's estimate for all properties during FY1986.

First mailing (1b) refers to all activities performed during the preparation and execution of a mass mailing, including data downloading, package preparation, envelope stuffing, and mailing.

Processing responses (1c) refers to the activities that follow the receipt of a response, such as data entry, comparison to mailing lists, response to property-owner phone calls, etc. Low and high represent the range of times required per property to complete these tasks.

File preparation (1d) is the preparation of a property folder and appropriate data entry and filing.

The miscellaneous (1e) category covers the multitude of small but important tasks handled by the Public Relations group, such as staff inquiries, public inquiries, travel, liaison with DOE and other official representatives, and preparing advertising.

4.2.2 Graphics Activities

Obtain legal desc. (2a) refers to the identification and verification of a property's legal description. Schedule, visit, measure (2b) refers to all field work performed leading to the preparation of a base map. The low and high figures represent the range of times required for these activities. The ISC's experience shows that the time required for these activities is approximately twice the previous estimates.

Base map preparation (2c) refers to the office work involved in drawing a base map or entering it in a computer file using AutoCAD. The ISC is currently in the process of switching over from hand-drawn maps to AutoCAD maps, and we find that the AutoCAD maps are somewhat more time-consuming than the hand-drawn. This cost category also includes entering the maps prepared by subcontractors into AutoCAD. The low and high figures reflect the range of times required for easy and difficult drawings. The average figure is 75% higher than previous estimates.

Prep PMT (2d) for teams refers to the printing, checking and copying of base maps for use by the teams. These activities are performed by team members, not by the Graphics staff.

The Staff Assistance and Miscellaneous (2f) category refers to the training, information, and assistance provided other staff members by the Graphics staff.

The estimated labor requirement for this category overall is 63% higher than previously estimated, primarily due to the use of AutoCAD and the ISC's increasing experience of larger and more difficult properties. Half of the base maps are prepared by subcontractors at an average cost of $105 per property. The subcontracted work includes the schedule, visit, measure and base map preparation activities, which require approximately 3.25 hours of the ISC's time. The costs for ISC and subcontractor maps are thus approximately the same.

4.2.3 Inclusion Survey Activities

Review historical data and schedule (3a) refers to the time spent researching the information available on each property and contacting the owner and tenant (if applicable) to schedule a radiological survey.

Outdoor scan (3b), indoor scan (3c), and extended measurements refer to the elements of a radiological survey. The average figure is adjusted to reflect the fact that at most properties, the indoor and outdoor scans are concurrent and that extended measurements are not made at all properties. The low and high figures for the outdoor scan show the range of times required for small and large uncontaminated properties.

The travel, cleanup and miscellaneous (e) category includes such activities as travel between properties, cleaning of sampling equipment, record keeping, and calibration or field checks of instruments.

Because three of four team members are generally involved in the survey activities (while the fourth remains in the office, writing or working in the soils lab), the per-person total is multiplied by 3 to arrive at the per-property total. The estimate for this cost category is approximately the same as previous estimates.

4.2.4 Post-Survey Activities

Data conversion (4a) refers to the conversion of the data collected in the field to the units used in the recommendation reports.

Final drawing preparation (4b) is the placement of the data onto the base map using AutoCAD. The low and high figures reflect the range of times required for easy and difficult properties.

Data archival (4c) refers to the team's record keeping and filing, which is generally performed by the team leader.

Soil sample prep/analysis (4e) refers to all office and lab activities involved in preparing samples for analysis, analyzing them, and recording and distributing the data.

The time required for post-survey activities is 18% higher than previous estimates, principally due to the use of AutoCAD.

4.2.5 Survey Report Activities

The various cost elements in this category are self-explanatory, except for folder preparation (5a), which involves the assembly of all data, drawings, photographs, and necessary forms. It should also be noted that each report undergoes three review cycles. First, the team leader reviews each of his or her team's reports, then another team reviews the report, and finally, an editing technician reviews the report.

Although a fraction (less than 10%) of the reports are written in Oak Ridge, all reports must go through all three review cycles.

The ISC's experience shows that this activity is more time-consuming than previously estimated. The current estimate is 53% higher than earlier estimates.

4.2.6 File Transmittal Activities

The three cost (6a) elements in this category include preparation of the recommendation letter, incorporation of final revisions in the report and accompanying documents, and the copying and filing performed at the time of transmittal (6c).

Based on the ISC's experience, this category is estimated to require 54% more time than earlier thought.

4.2.7 Extended Measurements for Difficult Properties

The tasks included in this category have not been considered separately before, but the ISC now has enough experience to estimate the

proportion of properties requiring radon measurements and concrete coring and to make a rough estimate of the person-hours required for these tasks. In both instances, the time required has been averaged over all recommendations by multiplying the hours required per property by the fraction of all properties requiring further sampling.

The concrete cutting/sampling cost element (7a-c) includes review of the data, scheduling, mobilization, cutting and sampling, repair, and cleanup. The sample analysis and report preparation are covered in other categories. It is assumed that a 3-person team will perform the work.

Radon sampling/annual average (7d-e) refers to those properties at which it is necessary to collect samples for an entire year, while the partial category (7f-g) assumes radon sampling for six months. It is further assumed that approximately half the properties requiring radon sampling will fall in each category, and that a 2-person team will perform the work. Sample analysis is included in this task, but not report preparation.

4.2.8 Miscellaneous Direct-Support Activities

This category has not been separately considered in previous estimates; most of it was previously included in Indirect-Cost categories.

Property assignment (8a) and correcting returned recommendations (8d) are functions of the Reports/Process Coordination group, which assigns properties to the teams for survey and performs most corrections to returned recommendations. The time requirement for corrections is averaged over all properties by multiplying the average time spent on a re-do by the fraction of recommendations returned.

Document control (8b) includes all central filing tasks and responding to staff inquiries concerning historical data and the location and condition of property folders. Data entry (8c) refers to the general entry of data into the data base at various stages of the process and is shared by the computer services group, the public relations group, and the Document Control Coordinator.

4.2.9 Total Person-Hours Per Recommendation

This category summarizes all cost elements contributing directly to the production of inclusion/exclusion recommendations.

Incidental (9b) refers to all activities that are necessary, contribute to the production of recommendations, take the time of direct-cost staff, but that are difficult to capture separately. It includes the time spent for meetings, training, staff interactions and information sharing, travel to sites other than GRJ, resolution of technical problems, and so on.

4.3 INDIRECT-LABOR COSTS

The costs in this category refer to labor costs that are necessary but that do not directly contribute to the production of inclusion/exclusion recommendations. Indirect-labor costs are presented in Table 9.

4.3.1 Oak Ridge Office Support

The management and administration (1a) category includes the time charged to the UMTRA Project by the Program Manager, line management, clerical workers, and the Finance Officer. The technical support (1b) category includes the technicians who assist with ISC activities in such

Table 9. INDIRECT-LABOR COSTS

(units in full-time equivalents - FTEs)

1.	1.	Oak Ridge Office Support			
		a. Management and admin.	4.00	4.00	2.00
		b. Technical support	3.00	3.00	1.00
		c. Total	7.00	7.00	3.00
2.	2.	Grand Junction Office			
		a. Management and admin.	4.00	4.00	3.00
		b. Computer services	3.00	3.00	2.00
		c. Electronics support	1.00	1.00	0.50
		d. Quality assurance	1.00	1.00	0.50
		e. Process coordination	1.00	1.00	0.50
		f. Property management	0.50	0.50	0.50
		g. Total	10.50	10.50	7.00
3.	3.	Grand Total Indirect FTE's	17.50	17.50	10.00

areas as sample analysis, cross-checking, report-writing, and editing and the work of the Instrumentation and Controls Division.

4.3.2 Grand Junction Office

The management and administration category (2a) includes the Project Manager, Survey Manager, Technical Assistant, and Office Secretary. Property management (2f) refers to the activities of the designated Procurement and Property Coordinator. The other categories are self-explanatory.

4.3.3 Grand Total Indirect FTE's

The figures given in this category (3) represent the level of effort required for support activities that are necessary but do not directly contribute to the production of inclusion/exclusion recommendations. The level of effort is expressed in full-time equivalents on an annual basis.

4.4 DIRECT-COST LABOR REQUIREMENTS

The figures in Table 10 represent the full-time equivalents required to meet the ISC's milestone schedule. The labor included in these categories contributes directly to the production of inclusion/exclusion recommendations. The FTEs are calculated for each category by multiplying the number of recommendations to be produced in each fiscal year by the number of hours required per recommendation per functional area, and dividing the result by the number of person-hours in a work year (which is assumed to be 1,750). The annual production of recommendations is taken to be: FY 1986, 2,960; FY 1987, 3,000; and FY 1988, 1,538. The exception to this method is for the functional area of Graphics. Only 1/2 of the base

TABLE 10.

LABOR REQUIREMENTS BY FUNCTIONAL AREA (DIRECT-COST)
(FTEs)

			1986 Calculated	1986 Rounded FTEs	1987 Rounded	1988 Rounded
1.	1.	Public Relations				
		a. Consent form acquisition	4.06		4.11	2.11
		b. Other activities	1.44		1.46	0.75
		c. Total	5.50	6	6	3
2.	2.	Graphics				
		a. Map preparation	2.75		2.79	1.43
		b. Other activities	2.96		3.00	1.54
		c. Total	5.71	6	6	3
3.	3.	Survey Teams				
		a. Surveys	13.02		13.20	6.77
		b. Post-survey	5.29		5.36	2.75
		c. Reports	9.30		9.43	4.83
		d. Special sampling	1.45		1.47	0.75
		e. Other activities	0.25		0.25	0.13
		f. Total	29.30	29	30	15
4.	4.	Reports Coordination				
		a. Editing and revisions	2.88		2.91	1.49
		b. Typing	2.79		2.83	1.45
		c. Returned recs.	0.14		0.14	0.07
		d. Miscellaneous	0.42		0.43	0.22
		e. Total	6.22	6	6	3
5.	5.	Total Direct-Cost FTEs				
		a. Total	46.73	47	48	24
		b. Incidental (12%)	5.61	6	6	3
		c. Grand Total	52.34	53	54	27

maps required will be produced in-house; the remainder are to be produced by subcontractors, so the number of maps used to calculate the Graphics FTE's is 1/2 of the annual recommendation milestones. The calculated FTEs represent the exact number of FTEs required to perform the work of each functional area. The rounded FTEs represent the number of people actually required to perform the work. The assumption is made that any fraction of an FTE greater than 0.35 must be rounded upward to ensure that sufficient personnel are available to each functional area. For FYs 1987 and 1988, the subcategories are presented as calculated FTEs and the functional category totals are presented as rounded FTEs, or personnel requirements. Because personnel are not freely interchangeable between functional areas, causing personnel requirements to be rounded upward for some areas, the total direct-cost personnel requirement is 0.75 FTEs greater than the exact calculated FTE requirement. The cost elements from Table 8 that are included in the labor requirements by functional area are, by Table 8 line number:

1) Public Relations: Consent form acquisition includes line 1f; Other activities includes one-half of line 8a, one-third of line 8c, and all of line 8b.

2) Graphics: Map preparation includes lines 2b and 2c multiplied by one-half the total recommendations; Other activities include lines 2a,e and f multiplied by the total number of recommendations.

3) Survey Teams: Surveys includes lines 2d and 3g; Post-survey includes line 4e and one-sixth of line 8c; Reports includes lines 5a,b,d,e,and f; Special sampling includes line 7i, and Other activities includes one-sixth of line 8c and one-fifth of line 8f.

4) Reports Coordination: Editing and revisions includes one-half of line 8a and all of lines 5g and 6b; Typing includes lines 5c, 5h, 6a, and 6c; Returned recs includes four-fifths of line 8f; and Miscellaneous includes one-third of line 8c.

5) Total Direct-Cost FTEs: The totals include the calculated and rounded totals plus the Incidental category described above.

4.4.1 Total ISC Labor Costs

In Table 11, the rounded FTE requirement for each fiscal year is multiplied by the annual cost for each employee to calculate the total labor budget for each fiscal year. All dollars are constant FY 1986 dollars. The cost per FTE is the annual average cost for an employee of the Dosimetry and Biophysical Transport Section of the Health and Safety Research Division at ORNL, of which the ISC is a part. This annual cost includes salary, benefits, and overhead.

4.4.2 Non-Labor ISC Costs Excluding Capital

The figures in Table 12 represent all non-labor costs excluding the budget for capital equipment expenditures. Each cost category has been estimated based on the ISC's experience to date in the UMTRA Project.

4.4.3 Procurement via Bendix Contract

The ISC has established a contract with the operator of the Grand Junction Projects Office of the DOE, Bendix Field Engineering Corporation, under which Bendix provides services, including procurement services, to the ISC's Grand Junction Office.

The first category, services (1a), includes the services provided to the ISC by Bendix, such as equipment repair, equipment calibration, chemistry lab services, mainframe computer use, reproduction services, building maintenance, furniture moving, and so on. The second category (1b), rental, presents the costs to the ISC for renting office space, government vehicles, and equipment (such as copiers). The third category, procurements (1c), represents all purchased services (services not directly

provided by Bendix), communications, and purchased materials. Purchased services include repairs to equipment, repairs to properties (for example, when a sprinkler line is damaged during soil sampling), vehicle repair, training, and some technical services such as copying, temporary help, and so on. Communications includes all telephone service charges. Purchased materials includes all supplies and non-capital equipment. It is expected that the cost of the Bendix procurements will remain approximately proportional to the number of surveys the ISC is to perform in the out years.

4.4.4 Other Procurement

All procurements of supplies and services that are not performed under the subcontract with Bendix are included in this category. This involves subcontracts, such as the graphics subcontract to draw one-half of all properties and the planned subcontract to perform title research; procurements performed by the Martin Marietta purchasing department; and direct purchases made by Grand Junction Office staff and billed to Martin Marietta. The contract established with Oak Ridge Associated Universities (ORAU) to provide labor as required is not included in this category. ORAU labor costs are included in the labor-cost categories discussed above. The graphics subcontract is estimated to cost $150K in FY 1986 and the title research subcontract is estimated to cost $15K in FY 1986. Other services will make up the difference. For the out years, the cost of supplies and equipment is expected to, although the number of recommendations is to rise slightly in FY 1987. This is because purchase of low-value capital equipment is expected to drop.

4.4.5 Travel

The survey trip category of travel includes all travel by survey crews, graphics staff and consent-form staff for the purpose of preparing inclusion/exclusion recommendations. Each survey trip is assumed to last 5 days, cost $110 per day per person for per diem, travel and accommodations, and to involve 4 people. Most such trips are accomplished in government vans. Fifteen such trips are estimated to be required in FY 1986. Twenty additional person-travel days are estimated for consent-form and graphics staff travel in FY 1986. Twenty such trips plus 35 person-travel days are estimated for FY 1987. Twenty person-travel days are estimated for FY 1988 to allow for the possibility of out-of-town radon or extended sampling. Other travel includes all non-survey travel, such as travel to monthly meetings, training, and to Oak Ridge.

4.4.6 USRADS Development

This category includes only the incremental funding already identified for the development of the telemetry system in FY 1986. Although additional funding may be required, the amounts are uncertain at this time.

4.4.7 Close-Out Costs

This category allows $160K in FY 1986 dollars for costs to close out the Grand Junction Office at the end of the ISC's involvement in the UMTRA Project. Close-out costs include the cost of shipping equipment to Oak Ridge, moving personnel to Oak Ridge, and arranging for the archiving of ISC files. The actual cost to close out the Grand Junction Office is unknown, but it is estimated that the amount estimated is approximately correct.

4.4.8 ISC Capital Budgets

The ISC projects capital equipment expenditures as follows: for FY 1986, $90K; for FY 1987, $50K; and for FY 1988, $0. Capital costs will largely be accrued for purchases of equipment to support efficient utilization of the Ultrasonic Ranging and Data System (USRADS). Specifically, the following equipment will be purchased: 5 portable 80286-based microcomputers with hard disk storage media @ $4000; 5 trailers for transport of USRADS systems @ $3000; a high-resolution graphics display work station for continued elaboration of the USRADS System, especially the three-dimensional display of gamma exposure related to position on the property @ $6000; and a large-scale high-resolution plotter which will also support advancement of USRADS @ $9000. Failure to fund these items will slow continued progress in the efficient maturation of the USRAD System. Some of the items, such as the portable microcomputers might be purchasable in lower cost versions (such as those based on less sophisticated microprocessors). However, the overall efficiency of USRADS depends to a large extent on the speed of the microcomputer available. Failure to fund the graphics work station and the plotter will slow or prevent completion of programming to allow 3-D plotting of the data gathered by the USRAD system. A 3-D display of the detected deposits will facilitate remedial action design and will lower engineering costs.

4.4.9 Total Annual ISC Operating Budgets

In Table 13, the total labor and non-labor costs are drawn from earlier sections and added to provide the total operating budget in the line "Subtotal Operating". The escalation indices provided in Attachment I to the letter of February 11, 1986 from J. Themelis to C. Little are

applied to the operating budgets and result in the Total Operating Budget for each year. The Requested Contingency is 10% of the operating budget for each year. Capital funds are not included in the operating budgets, nor are they escalated.

4.4.10 Calculated ISC Cost Per Recommendation

The average ISC cost per recommendation is presented in Table 14, and is calculated using escalated operating dollars and unescalated capital dollars. The average cost is shown for operating costs only and operating costs plus capital costs. There are two principal reasons that the cost per survey rises substantially in FY 1988. First is that there will be closeout costs applied to the recommendations in that year, but that do not directly apply to the production of recommendations. Second is that during the closeout activities, there will be staff at the Grand Junction Office performing necessary closeout functions but not contributing directly to the production of recommendations. Both these factors serve to increase the cost of recommendations in that fiscal year

TABLE 11

TOTAL ISC LABOR COSTS (FY1986 $K)

			1986	1987	1988
1.	1.	Cost per FTE per year	72.4	72.4	72.4
2.	2.	Direct-Labor Cost	3837.2	3909.6	1954.8
3.	3.	Indirect-Labor Cost	1267.0	1267.0	724.0
4.	4.	Total Labor Cost	5104.2	5176.6	2678.8

TABLE 12

NON-LABOR ISC COSTS EXCLUDING CAPITAL (FY 1986 $K)

				1986	1987	1988
1.	1.	Procurement via Bendix Contract				
		a. Services:				
			Electronics	36.0	36.0	18.5
			Chemistry Lab	4.5	4.5	2.3
			Facility Support	45.6	45.6	23.4
			Utilities	21.6	21.6	11.1
			Computer Usage	3.0	3.0	1.5
			Miscellaneous	23.0	13.0	6.7
		b. Rental:				
			Space	35.4	35.4	18.1
			Vehicles	36.0	36.0	18.5
			Equipment	13.2	13.2	6.8
		c. Procurements:				
			Communications	62.4	62.4	32.0
			Supplies & Equip	132.0	132.0	67.7
			Purchased Servic	126.0	126.0	64.6
		d. Total		538.7	528.7	271.0
2.	2.	Other Procurement				
		a. Supplies & Equipment		150.0	100.0	51.3
		b. Contracted Services		180.0	140.0	71.8
		c. Total		330.0	240.0	123.0
3.	3.	Travel				
		a. Survey trips (4 people, 5 days each)		35.2	47.9	2.2
		b. Other travel		50.0	50.0	25.6
		c. Total		85.2	97.9	27.8
4.	4.	USRADS Development		150.0	0.0	0.0
5.	5.	Close-out Costs		0.0	0.0	160.0
6.	6.	Non-Labor Totals (all figures are fy86 constant dollars)		1103.9	866.6	581.9

TABLE 13

TOTAL ANNUAL ISC OPERATING BUDGETS (K$)

			1986	1987	1988
1.	1.	Total Labor Costs	5104.2	5176.6	2678.8
2.	2.	Total Non-Labor Costs	1103.9	866.6	581.9
3.	3.	Subtotal Operating	6208.1	6043.2	3260.7
4.	4.	Escalation Index	1.000	1.051	1.111
5.	5.	Total Operating	6208.1	6351.4	3622.7
6.	6.	Requested Contingency (10%)	620.8	635.1	362.3
7.	7.	Total plus Contingency	6828.9	6986.5	3984.9

TABLE 14

CALCULATED ISC COST PER RECOMMENDATION (ESCALATED $K)

		1986	1987	1988
1.	Total Operating Budget (w/o contingency)	6208.1	6351.4	3622.7
2.	Total Capital Budget	90.0	50.0	0.0
3.	Total Budget (w/o contingency)	6298.1	6401.4	3622.7
4.	Cost/Rec (operating)	2.097	2.117	2.355
5.	Cost/Rec (operating + capital)	2.128	2.134	2.355

5. RISK ANALYSIS

A number of events could occur that would affect the performance of the work required by the ISC. Each of these events carries some likelihood of occurrence and some predictable impact. This section will focus on those risks, will describe potential impacts, and contingencies that have been planned to prevent the impact from becoming project-threatening.

Specific risks arise from a variety of institutional interfaces, unknowns having to do with vicinity properties and their owners, and policy and scope changes within the project itself. These risks are evaluated individually within the remainder of this section. Risks, changes of occurrence, consequences, and contingencies are summarized in Table 5.1.

The primary frame of reference against which to measure the impact of a given risk is the requirement for completion of the project within the statutory time-frame of March, 1990. Losses of efficiency which increase cost but still allow timely completion are taken to be secondary impacts.

5.1 UNFORESEEN CHANGES IN BUDGET

5.1.1 Major Decreases

Major decreases in the ISC budget could have a major impact on completing the inclusion process early enough to allow all remedial action before March, 1990. If the ISC budget were to fall 20% below levels outlined in this plan, the recommendation milestones outlined herein would not be met, nor would the ultimate completion of the project proceed on schedule.

The likelihood of major cuts to the ISC budget is judged to be only 10%. Two factors contribute to this assessment. First, Congressional

support for UMTRA currently appears firm. Major cuts do not appear probable at present. Second, the position of the ISC at the front of the project tends to preclude major budgetary cuts to the ISC. Such cuts would cascade downward throughout the project and would greatly slow overall progress.

Roughly 20% budget cuts could be absorbed by the ISC without forcing layoff of any ORNL staff. Rather than terminating ORNL staff, subcontractor personnel would be laid off. This contingency would allow inclusion survey work to continue, although at a reduced pace.

5.1.2 Increased Budgets

A more likely risk is that of major increases in the ISC budget. Consequences of a 20% increase in the budget would be an increased rate of inclusion/exclusion recommendations, but at the expense of an increased unit cost per survey and decreased efficiency. The completion of all inclusion surveys would likely be accelerated compared to the existing plan.

Short-term increases could be dealt with by adding to the responsibilities of existing subcontractors to allow a higher rate of production. Longer-term increases would likely result in an increased level of ORNL staffing.

5.2 STAFFING PLAN INCOMPLETE

Planning for this document indicates that the milestones required for the remainder of the project are attainable by the ISC. There is, however, a chance (20% or less) that more manpower, particularly in the form of field staff will be required.

The consequence of having underestimated the radiological survey staffing requirement by 10% is that approximately 400 required properties would go unrecommended during either FY76 or 87. This number represents slightly more than the required production outlined for a single team in earlier sections.

Action required to ameliorate this risk would be to add an additional team either via subcontracting, hiring, or rededication of an existing team from Oak Ridge. These contingencies would increase the required budget for that fiscal year by approximately $300K.

5.3 LACK OF CONSENT FORMS

The major impact of having too small a number of consent-for-access agreements is that surveys cannot be conducted. If no consents are in hand, no surveys may be done., It seems unlikely until very late in the program that this will be the case. It is fairly probable (50%), however, that lack of consents will increasingly be a hindrance to a smooth flow of recommendations. The most likely effect of difficulty in obtaining consents is that efficiency will decrease and unit cost will increase.

Planning to mitigate this impact has already begun as outlined earlier (Section 2). Other contingencies include more creative methods of acquiring consents, such as rewards for early response or research to ascertain what methods are more likely succeed. If either large scale rewarding or major research is entered into, more funds may be required. In addition, more funds might be required if the number of ISC staff dedicated to consent acquisition has been underestimated.

5.4 LACK OF CAPITAL FUNDS

Although capital funds are promised to the ISC by UMTRA/PO, there is always the possibility that capital monies will be scarce. Recent indications are that most, if not all, capital funds requested will be available. Therefore, it is judged that this is a fairly unlikely risk (20%).

Impacts of not receiving capital monies would include decreased efficiency, and slightly increased unit costs. It is possible that milestones could be missed during the highest production portions of the year, but major slippage of the ISC schedule is not thought to be probable. However, if the CAD systems, in particular, are not available for use by the ISC, there will ultimately be large impacts to the RAC schedule. This is especially true for Bendix, who will profit the most from ISC usage of computer assisted drafting.

Strictly from the ISC point of view, the relatively small impacts of not having capital equipment could be assuaged by a compensating increase in staffing to produce the required base maps. From the project point of view, the lack of capital dollars to purchase CAD's would require moderate budgetary increases to maintain the same level of production.

5.5 TELEMETRY SYSTEM

ORNL is undergoing a development program to produce a gamma exposure rate detector coupled to a data transmission system. The system is based on ultra-sonic location finding and a low-power radio-frequency (RF) transceiver tied to a portable, IBM-compatible computer. A proof of principle has already been demonstrated, and the success of the system seems likely (70%).

This system, when operational, will result in accurate collection of gamma exposure data, which will streamline certain aspects of the inclusion survey process. The overall benefit of the system will, as with the CAD system, benefit the RAC's more than the ISC.

Risks associated with the telemetry system are associated with funding requirements. At present, funding for the development is coming from seed monies available at ORNL. Full-scale production of the system may require additional funds to a level which is presently unforeseen. There is at present no contingency plan for this eventuality.

5.6 CHANGED SURVEY PROTOCOL

During ORNL involvement in UMTRA, there have been several changes in survey protocol and methodologies. Most of these have been relatively minor and have been accommodated relatively easily. Recent interest by the Inspector General's office regarding the inclusion process raises the possibility that some more extensive changes in inclusion philosophy might occur. It seems unlikely (10%) that a major change might be dictated, especially given the expense to re-visit the 2000 or so vicinity properties that will have been examined by the end of FY85.

The most major change in protocol that might occur is to extend the inclusion survey to collect data suitable for an REA on some or all properties that seem includable. A likely change ()70%) is that more extensive soil sampling will be required at most properties. Soil-sampling protocols are currently being investigated by the ISC and the TAC. The protocol may be changed in order to increase the representativeness of ISC soil sampling, which would slightly increase ISC costs.

Impacts of this potential protocol change could be large relative to the ISC's milestones. The total duration of the ISC project could be extended 6 months or more. This estimate is based on the fact that approximately 50% of the properties are includable and would require a more extensive survey. The unit cost for such an extended survey as described above would be at least twice that projected within this plan.

The ISC response to such a changed direction would be to completely reorganize the activities directly related to the inclusion survey efforts. No other contingency is planned.

5.7 INCREASED STATE INVOLVEMENT

At present the State's and Tribes generally have no involvement in the inclusion process. However, it is possible that some state agencies may wish at some point in time to review or certify inclusion decisions. This is judged to be improbable (10%), especially in light of the present interpretation of the Uranium Mill Tailings Radiation Control Act (UMTRCA) by DOE.

If state agencies were allowed to oversee and approve inclusion /exclusion decisions, the impact on ISC performance could range from major to minor. If state involvement were limited to that of recommendation recipient, then only a very minor impact in terms of manpower would occur. No additional staff would be needed. However, if state involvement extended to reversal of inclusion recommendations with resultant collection of additional data or property revisits, then a more major impact would occur. In such a case, increased staffing would be required. The extent of increased staffing/budgets would not be known for some time after such a change, and therefore, no specific contingency plan has been developed.

5.8 INCREASED SCOPE OF WORK

At present, the scope of work of the ISC is to perform inclusion surveys and make recommendations to DOE/UMTRA regarding the necessity to clean up vicinity properties. In the future, DOE may find it desirable to involve the ISC in other aspects of the program, such as remedial action certification or inclusion of windblown acreage. Such possible increases in the ISC scope or work, if they occur in parallel with existing duties, present a risk to the timely completion of inclusion recommendations. Such an increase in work scope is a decision of DOE/UMTRA in response to programmatic dynamics. Therefore, we estimate the change of occurrence at 50%.

At presently planned funding levels, it would not be possible to do additional types of work in parallel with inclusion survey work without extending the duration of the inclusion survey effort or increasing staff levels. To add to the scope of work would require larger funding levels so that more staff could be hired and more equipment purchased than is now planned.

If the scope of work were to be expanded near the end of the project (FY88), then little or no contingency would be required except for an extension of funding. Staff presently planned for that period would be adequate to perform most additional work that might be required.

5.9 JUSTIFICATION OF REQUESTED CONTINGENCY

Funding is requested to be set aside as a contingency fund for the ISC. This request is based on the possibility that the cumulative effects of all contingencies that arise will be to increase the ISC's expenditures.

The most probable events outlined above are 1) lack of consent forms, 2) development and deployment of the USRAD system, and 3) a change in protocol to require more extensive soil sampling.

The effect of each of these events occurring would be as follows:

1) If a lack of consent forms develops, the ISC will have to increase efforts to acquire consent. This would involve increased staffing (approximately three additional people), increased advertising, and establishment of open-office hours at various locations in Mesa County. The increase in cost could amount to as much as $216K for staff and $35K for other costs.

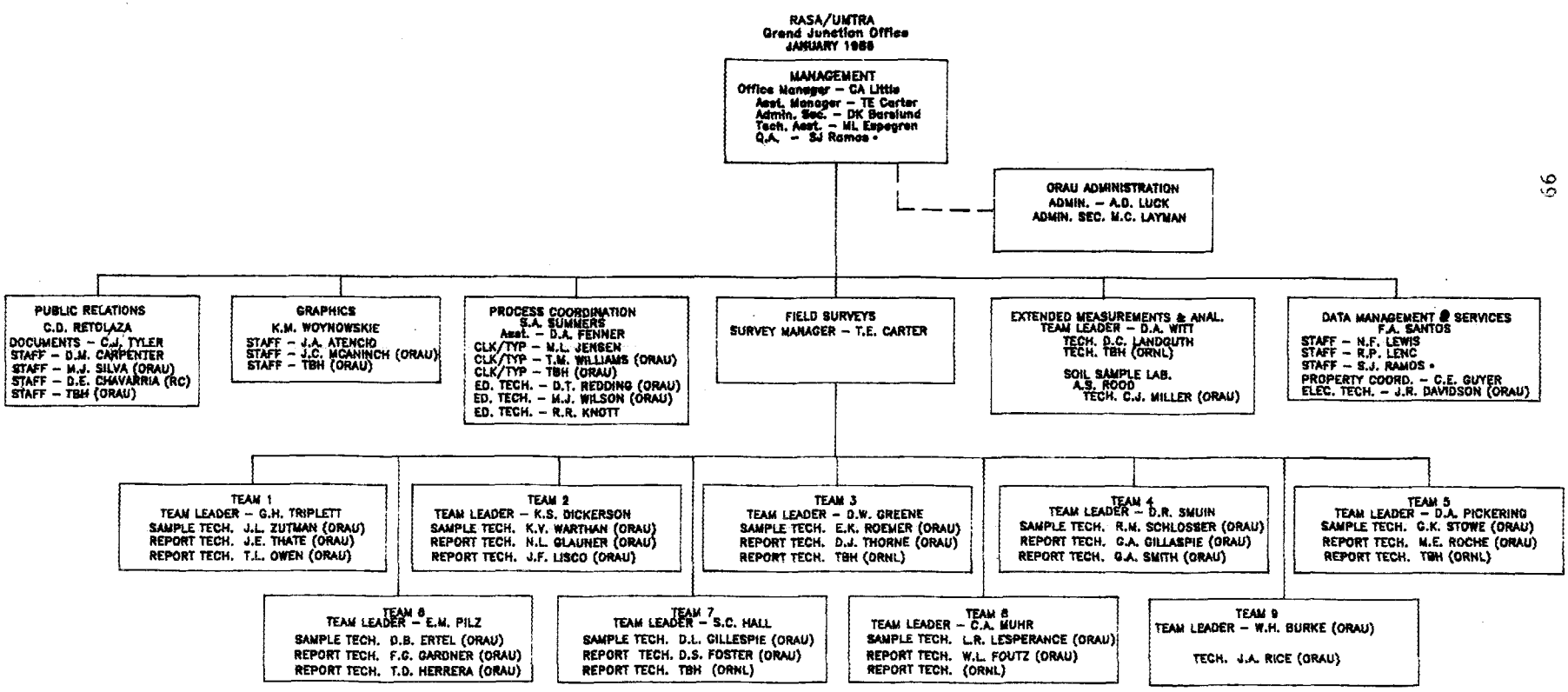
2) Development and deployment of the USRAD system will cost approximately $15K (non-capital funds) per unit plus lost efficiency during training. For nine units (one per team), the equipment cost will be approximately $135K. The cost of lost efficiency and training is difficult to measure, but could be estimated to be one person-year (two trainers for six months) or $72K. This results in a total additional cost of $207K. This cost is a front-end, short-term cost that would be recaptured as the benefits of improved efficiency accrue.

3) If the soil-sampling protocols change to dictate increased sampling, the additional labor in collection, preparation, analysis and report preparation may be as much as two FTE's per year, or $154K.

The aggregate of these changes in FY1986 dollars is $612K, or approximately 10% of the ISC's FY86 estimated costs. The requested

contingency for each year is 10% of the ISC's estimated costs, which assumes that the risks in each year have approximately the same likelihood of occurring.

FIGURE 5



• DUAL CAPACITY

REFERENCES

1. "EPA standards for Remedial Action at Inactive Uranium Mill Processing Sites," Federal Register, Code of Federal Regulations, 40, No. 192, (Jan. 5, 1983).

2. U.S. Department of Energy, Summary Protocol - UMTRAP Vicinity Properties: Identification - Characterization - Inclusion (September 1983).

3. U.S. Department of Energy, Vicinity Properties Management and Implementation Manual, UMTRA-DOE/AL-050601 (June 1984).

4. ORNL, Radiological Survey Activities - Uranium Mill Tailings Remedial Action Project Procedures Manual, Little, C.A., et. all, ORNL/TM-9902 (September 1985).

5. ORNL, State Background Radiation Levels: Results of Measurements Taken During 1975-1979, T. E. Myrick, B. A. Berven, F. F. Haywood.

APPENDIX A

Exhibit 1	Consent-for-Access Form
Exhibit 2	Cover Letter for Consent-for-Access Form
Exhibit 3	Recommendation Report Skeleton

CONSENT FOR ACCESS TO CONDUCT SURVEYS AND ENGINEERING STUDIES

VICINITY PROPERTY NO.:

PROPERTY ADDRESS:

PROPERTY PARCEL NUMBER OR DESCRIPTION:

I (We) acknowledge that I (We) own the property described above, and grant permission to employees, contractor and subcontractor personnel, and other representatives of the U.S. Department of Energy and the State of _____ to enter upon the property at a reasonable time or times during the next 36 months to conduct radiation surveys to determine the nature and extent of any radioactive material that might be present. In addition, permission is given to perform engineering assessments, if necessary, to evaluate the remedial measures that might be taken, as well as to evaluate the extent of the work required and the cost.

I (We) understand that DOE's and the State's responsibility for any damage or disturbance to my (our) property caused by its activities shall be any backfilling, seeding, sodding, landscaping, rebuilding or repair of the property required to restore it to a condition comparable to its apparent physical condition immediately prior to entry upon the property.

I (We) understand that the DOE and the State of _____ are not obligated to perform remedial action upon the property. I (We) understand that no remedial action shall be performed until the DOE, the State, and the property owner have entered into a separate written agreement setting forth terms, conditions, and plans for remedial action.

I (We) understand that the DOE and the State have the right to disclose to the public, in the form of technical data and reports, the results of its data-gathering on the above-described property.

( ) I grant access for the conduct of surveys and engineering studies as provided in this Consent-for-Access.

_____ _____
Signature of Owner(s) Date

( ) I have decided not to participate in the UMTRA Project.

_____ _____
Signature of Owner(s) Date

OWNER DATA:

_____ _____
Owner(s) Name Tenant Name (If Applicable)

_____ Phone: _____
Owner(s) Address

Home Phone: _____

Business Phone: _____

(REV 05/85)

Exhibit I

OAK RIDGE NATIONAL LABORATORY
OPERATED BY MARTIN MARIETTA ENERGY SYSTEMS INC

GRAND JUNCTION OFFICE
P.O. BOX 2567
GRAND JUNCTION, COLORADO 81502

Dear Property Owner:

This letter is to request access to your property by representatives of the U.S. Department of Energy (DOE) and the Colorado Department of Health, for purposes described below.

The Uranium Mill Tailings Radiation Control Act, Public Law 95-604, was passed by Congress in 1978. It authorized the Department of Energy (DOE) to carry out the Uranium Mill Tailings Remedial Actions (UMTRA) Project. On October 19, 1981, DOE and the State of Colorado entered into a cooperative agreement to implement the UMTRA Project and accomplish remedial action at the nine Colorado mill sites and their associated vicinity properties. The vicinity properties include any residential and commercial structures and open lands contaminated with mill tailings derived from the mill sites. The objective of the UMTRA Project is to remove or control uranium mill tailings and ensure that the standards published by the Environmental Protection Agency (EPA) for the protection of the public health, safety and the environment are met.

DOE is now evaluating properties to determine potential eligibility for inclusion in the UMTRA Project. Previous radiological surveys by State and Federal agencies suggest the possible presence of uranium mill residues on your property. Even though your property may have been surveyed in the past under the Grand Junction Remedial Action program, another survey may be required to ensure that the radiation levels do not exceed the standards established by the EPA for UMTRA.

Staff of the Oak Ridge National Laboratory, under contract to DOE, need to visit your property, located at:

to take instrument readings and, possibly, air and soil samples to decide whether or not your property is eligible for remedial actions under the UMTRA Project.

Enclosed for your signature are two copies of a Consent form granting access to your property. Please note that a signature block is provided in the Consent form for your approval or disapproval of DOE's survey of your property. In either case, you should sign both copies of the Consent, retain one copy for your information, and return the second copy to DOE. A stamped, self-addressed envelope has been provided for your convenience.

Exhibit 2

If you consent to the DOE survey of your property, and upon our receipt of the signed Consent, you will be contacted by a survey team to schedule entry onto your property. You will be notified of the results of the tests and whether or not your property is eligible for remedial action. Any remedial action recommended, will be with your knowledge and consent, and at no cost to you.

If it is determined that your property is eligible for remedial action, DOE and the State of Colorado will transmit to you a remedial action agreement setting forth the terms and conditions for such remedial actions.

Please be advised that, in the event you do not consent to the DOE survey program, either by your signature in the appropriate space or by not returning the Consent form, DOE and the State might not contact you again regarding radiological survey of your property. Consequently, your property may not be included in the remedial action program.

If you have questions about the consent form and anything else mentioned in this letter, please feel free to contact Dr. Craig Little at 303/242-8621.

Sincerely,

Craig A Little

Craig A. Little, Ph.D.
Oak Ridge National Laboratory

Albert J. Hazle

Albert J. Hazle
Colorado Department of Health

CAL/ovj

Mr. John G. Themelis
UMTRA Project Manager
U.S. Department of Energy
P.O. Box 5400
Albuquerque, NM 87108

Dear Mr. Themelis:

Radiation levels at the property identified below appear [] to [] not to exceed the U.S. Environmental Protection Agency (EPA) standards as specified in 40 CFR 192.

This evaluation is based on [] indoor [] outdoor screening measurement criteria, [] indoor [] outdoor extended measurement criteria of the U.S. Department of Energy Vicinity Properties Management and Implementation Manual (UMTRA-DOE/AL-050601), Appendix A, and/or [] other criteria stated below.

Other:

_____

_____

This recommendation is based upon the Inclusion Survey Contractor's assessment of the [] ^{226}Ra concentration in the soil [] indoor radon daughter concentration [] indoor gamma exposure rate at this property.

Therefore, this property is recommended for [] inclusion in [] exclusion from the Uranium Mill Tailings Remedial Action Project.

Sincerely,

C. A. Little, Ph.D.
Inclusion Survey Contractor

cc w/ att: B. A. Berven ORNL
P. Stassi, JEG

Location Number: _____
Location Address: _____
Property Owner: _____
Owner Address: _____
Tenant Name: _____

Exhibit 3

OAK RIDGE NATIONAL LABORATORY
OPERATED BY MARTIN MARIETTA ENERGY SYSTEMS, INC.

GRAND JUNCTION OFFICE
P. O. BOX 2567
GRAND JUNCTION, COLORADO 81502

Mr. Leo E. Little, Manager
U. S. Department of Energy
Grand Junction Area Office
P. O. Box 2567
Grand Junction, Colorado 81502

Dear Mr. Little,

Radiation levels at the property identified below appear [] to [] not to exceed the U. S. Environmental Protection Agency (EPA) standards as specified in 40 CFR 192.

This evaluation is based on [] indoor [] outdoor screening measurement criteria, [] indoor [] outdoor extended measurement criteria of the U. S. Department of Energy Vicinity Properties Management and Implementation Manual (UMTRA-DOE/A1-050601), Appendix A, and/or [] other criteria stated below.

Other:

_____

_____

This recommendation is based upon the Inclusion Survey Contractor's assessment of the [] ^{226}Ra concentration in the soil [] indoor radon daughter concentration [] indoor gamma exposure rate at this property.

Therefore, this property is recommended for [] inclusion in [] exclusion from the Uranium Mill Tailings Remedial Action Project.

Sincerely,

C. A. Little, Ph. D.
Inclusion Survey Contractor

cc w/o att: B. A. Berven, ORNL

Location Number:_____
Location Address:_____
_____
Property Owner:_____
Owner Address:_____
_____
Tenant Name:_____

OAK RIDGE NATIONAL LABORATORY
OPERATED BY MARTIN MARIETTA ENERGY SYSTEMS, INC.

GRAND JUNCTION OFFICE
P. O. BOX 2567
GRAND JUNCTION, COLORADO 81502

Location Number:_____
Location Address:_____
_____
Date of Issue:_____
Survey Date:_____

ISC CONDENSED EXCLUSION REPORT
ORNL Health and Safety Research Division
Work performed as part of the Radiological Activities Program

This radiological survey was conducted using methods as defined in the Vicinity Properties Management and Implementation Manual, UMTRA-DOE/AL-050601 (June 1984) and the RASA/UMTRA Procedures Manual (September 1985). This property is recommended for exclusion from further consideration by the UMTRA Project based on: 1) Outdoor gamma is less than background plus one standard deviation or 30% averaged over 100 m^2, and 2) Indoor gamma is less than one standard deviation or 30% above background in all rooms.

Supporting graphics, views and data are as follows:

-Owner Information-
Owner Name(s):_____
Owner Address:_____
_____

-Outdoor Screening Data-
Exposure Rate Range(s): μR/h
Background Exposure Rate + 30%: μR/h
High Outdoor Gamma (HOG): μR/h
Point Source(*): μR/h

-Indoor Screening Data-
Exposure Rate Range(s): μR/h
Background Exposure Rate + 30%: μR/h
High Indoor Gamma (HIG): μR/h
Point Source(*): μR/h

-Soil Sample Data-

Soil Sample Number	Sample Depth (cm)	226Ra Concentration (pCi/g)	Sample Area m^2	Net Estimated Area-weighted (pCi/g)

Comments:_____
_____

_____ _____
Inclusion Survey Contractor DOE Evaluator

Figure 1. Location _____, _____.

Figure 2. Location _____, looking _____ at front of property.

Location Number _____

Table 1. Location Information

Property Information

LOCATION: _____

_____

OCCUPANT/TENANT: _____

TELEPHONE: ( ) _____ (H)

( ) _____ (B)

PROPERTY CLASSIFICATION _____

TOTAL AREA OF PROPERTY _____ m^2

STRUCTURES ON PROPERTY _____

_____

_____

Owner Information

OWNER: _____

ADDRESS: _____

_____

TELEPHONE: ( ) _____ (H)

( ) _____ (B)

Location Number: _____

Table 2. Radiological Screening Survey Results

Outdoor Screening Data

BACKGROUND EXPOSURE RATE:	_____ μR/h
BACKGROUND + 30%:	_____ μR/h
BACKGROUND EXPOSURE RATE RANGE:	_____ μR/h
EXPOSURE RATE RANGE IN CONTAMINATED REGIONS:	A: _____ μR/h B: _____ μR/h C: _____ μR/h
HIGHEST OUTDOOR GAMMA (HOG) IN CONTAMINATED REGION:	_____ μR/h
LOCATION OF HOG:	Region_____
POINT SOURCE *:	_____ μR/h
ESTIMATED AREA OF OUTDOOR CONTAMINATION BY REGION:	A: _____ m^2 B: _____ m^2 C: _____ m^2
NET ESTIMATED AREA-WEIGHTED AVERAGE BY REGION**:	A: _____ μR/h B: _____ μR/h C: _____ μR/h

*Point source measurements are discussed in 'Significance of Findings' section.

**Formula used: $$G_{AW} = \frac{\sum_{i=1}^{n} G_i A_i}{100}$$

where:
G_{AW} = the area-weighted exposure rate in [μR/h]
G_i = net average exposure rate in [μR/h]
($G_i = G_{Gross} - G_{Background}$)
A_i = area of region involved in [m^2] and,
100 = threshold area in [m^2]

Location Number: _____

Table 2. Radiological Screening Survey Results (Continued)

Indoor Screening Data

STRUCTURE DESCRIPTION OR NUMBER: _____

BACKGROUND EXPOSURE RATE: _____ μR/h

BACKGROUND + 30%: _____ μR/h

BACKGROUND EXPOSURE RATE RANGE: _____ μR/h

EXPOSURE RATE RANGE IN CONTAMINATED REGIONS:
1: _____ μR/h
2: _____ μR/h
3: _____ μR/h

HIGHEST INDOOR GAMMA (HIG) IN CONTAMINATED REGION: _____ μR/h

LOCATION OF HIG: Region_____

POINT SOURCE*: _____ μR/h

ESTIMATED AREA OF INDOOR CONTAMINATION BY REGION:
1: _____ m^2
2: _____ m^2
3: _____ m^2

NET ESTIMATED AREA-WEIGHTED AVERAGE BY REGION/ROOM**:
1: _____ μR/h
2: _____ μR/h
3: _____ μR/h

*Point source measurements are discussed in 'Significance of Findings' section.

**Formula used: $x = \frac{\sum_{i=1}^{n} G_i A_i}{9.3}$

where:

x = area-weighted gamma exposure rate [μR/h]

G_i = net gamma exposure rate in [μR/h]

A_i = area of deposit in [m^2]

9.3 = threshold area in [m^2]

(3/86)

Location Number: _____

Table 3. Extended Survey Results

Outdoor Extended Data

Soil Sample Summary

Soil Sample Number	Region Sampled	Sample Depth (cm)	^{226}Ra Concentration (pCi/g) (Canalysis)	Representative (biased) Sampling Area m^2	Net Estimated Area-Weighted Average* (pCi/g, CAW)

$$*\text{Formula used } CAW = \frac{\sum_{i=1}^{n} CiAiDi}{(100)\ (.15)}$$

where= C_{AW} = area-weighted ^{226}Ra concentration in [pCi/g]
C_i = net ^{226}Ra concentration in [pCi/g] and

($C_i = C_{analysis} - C_{background}$)
A_i = area of region that sample represents in [m^2]
D_i = thickness of sample in [m]
100 = threshold area in [m^2], and
.15 = threshold thickness in [m]

(3/86)

Location Number: _____

Table 3. Extended Survey Results (continued)

Indoor Extended Data

Radon Daughter Concentration (RDC) Data Summary

Bldg. ID	Room ID	Date	RDC (WL)	Annual Average RDC (WL)**

**Annual average (WL) determined by:_____

(3/86)

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1. J. A. Atencio
2-7. B. A. Berven
8. R. O. Chester
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11. M. L. Espegren
12. R. D. Foley
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35. Central Research Library
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39. Laboratory Records - RC
40. ORNL Patent Office
41. RSIC Library

EXTERNAL DISTRIBUTION

42. Office of Assistant Manager, Energy Research and Development, Oak Ridge Operations Office, Oak Ridge, TN 37831

43-72. Technical Information Center, Office of Scientific and Technical Information, U.S. Department of Energy, P. O. Box 62, Oak Ridge, TN 37831

73. B. Beardon, Jacobs Engineering Group, Inc., 5301 Central Avenue, Suite 1700, Albuquerque, NM 87108

74-81. J. R. Anderson, UMTRA Project Office, U.S. Department of Energy, P. O. Box 5400, Albuquerque, NM 87115.