

# SLAG EXCAVATION AND REMOVAL PLAN FOR PROPERTIES NEAR CAMBRIDGE, OHIO

*Prepared for*

Cyprus Foote Mineral Company  
Kings Mountain, North Carolina

May 14, 1997

**Woodward-Clyde**



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## **1.1 BACKGROUND AND PURPOSE OF PLAN**

The Shieldalloy Metallurgical Corporation (SMC) plant in Cambridge, Ohio ("Cambridge Plant") (Figure 1) is an operating ferroalloy production facility that opened in 1953. The plant was previously owned and operated by Foote Mineral Company (FMC) until its sale to SMC in 1987. Cyprus Minerals Company purchased FMC from FMC's parent company, Newmont Mining Corporation, in 1988, one year after Newmont had sold the Cambridge plant to SMC. Following the sale of FMC to Cyprus Minerals Company, FMC's name was changed to Cyprus Foote Mineral Company ("Cyprus Foote").

All of the alloy production processes conducted at the Cambridge Plant resulted in the production of slag. Based on production process information, some of the slag produced at the Cambridge plant contained low levels of naturally occurring radioactivity from the alloy feed materials. Some of the slag from the plant apparently was sold or given away for off-site use as fill material, primarily in the 1980s.

A 1994 study by the US Nuclear Regulatory Commission (NRC) concluded that the slag from the Cambridge plant does not pose an immediate health and safety risk to residents because of its physical nature and the low level of radiation involved. Cyprus Foote conducted NRC-approved Phase I and Phase II Investigations of residential properties with slag in 1994 and 1995, respectively. These investigations confirmed that the slag exhibits little, if any, radioactivity, and that it is safe and presents no short- or long-term health risks to previous or current residents.

In December 1996, the United States District Court for the Southern District of Ohio, Honorable George C. Smith, gave final approval to a settlement reached by Cyprus Foote and class member residents of Guernsey County, Ohio. The settlement resolves a class action lawsuit that had been filed on behalf of residents who own or live on property containing slag produced at the Cambridge plant.

Under the terms of the settlement, slag will be excavated and removed from seven residential properties. Additional residential properties are being evaluated in accordance with a February

28, 1997 Phase III Work Plan. The number of properties designated for slag removal may change depending on the results of the Phase III Investigation. This Slag Excavation and Removal Plan describes the technical approach and scope of work for removal of slag from the subject properties.

## 1.2 DESCRIPTION OF SUBJECT PROPERTIES

Based on the terms of the settlement, the seven properties listed in the table below are currently slated for slag removal. Property maps showing the property layout and the locations of slag to be removed are presented in Figures 2 through 8.

Property Identification Designation	Property Address	Location of Slag to be Removed		
		driveway and/or parking area	home foundation	other
STRAW	66865 Barrett Hill Road; Cambridge, Ohio		X	
O-5	7311 Brick Church Road; Cambridge, Ohio	X		
O-7	10167 Catalpa Street; Byesville, Ohio	X		
O-17	20026 Gregg Street; Senecaville, Ohio	X		yard fill
O-19	58815 Grisak Road; Byesville, Ohio	X	X	
O-29	9170 Lucasburg Road; Byesville, Ohio	X		
O-47	10215 Sycamore Road; Byesville, Ohio	X		

Property STRAW was characterized by the NRC (April 22, 1994 NRC Report No. 999-90003/94032(DRSS)). The remaining six properties were characterized for the NRC in 1994 by the Oak Ridge Institute for Science and Education (ORISE). Properties O-5, O-19, and O-47 underwent additional characterization during subsequent Cyprus Foote investigations. Information regarding these properties is presented in the August 19, 1994 ORISE Survey Report, the January 1995 Phase I Report, and the August 1995 Phase II Report.

The excavation protocol is expected to result in the removal of the slag together with some of the adjacent soil. The estimated ranges of the volume of material to be excavated and removed from



each property are listed in the table below. The total estimated excavation volume ranges from 750 to 1,260 cubic yards.

Property Identification Designation	Estimated Volume Range of Material to be Excavated and Removed (cubic yards)	
	Low End	High End
STRAW	30	50
O-5	190	300
O-7	40	60
O-17	20	60
O-19	270	290
O-29	70	260
O-47	130	240
TOTAL	750	1,260

### 1.3 TECHNICAL APPROACH

The slag at the subject properties will be excavated and removed. The slag removal activities will consist of the following principal tasks:

- Site Preparation
- Excavation and Removal of Slag
- Post-Excavation Surveys
- Site Restoration

The majority of areas from which slag is to be removed are easily accessed driveways or parking areas. At property STRAW (Figure 2), the slag is located beneath the concrete floor of a small home annex. Slag removal from this property will, at a minimum, require demolition and replacement of the concrete floor. At property O-19 (Figure 6), slag is located in a driveway and

around the home foundation. The extent of demolition required at property O-19, if any, will depend on the extent of slag beneath the home foundation.

The slag at the subject properties is visually distinguishable from the surrounding soil. Therefore, visual inspection will be used to determine that the slag has been removed. Post-excavation gamma surface scans will be performed in the excavation areas as a supplement to the visual observations.

The excavated material from each property will be transported to a staging area until a final disposal alternative is identified. One possible staging area is the Cambridge Plant.

Site restoration may consist of a variety of activities, including replacement of removed slag with gravel-sized construction material (e.g., crushed limestone or river gravel), landscape repair, building repair/reconstruction, and utility repair/reconnection.

## **1.4 PROJECT ORGANIZATION**

Woodward-Clyde Consultants will serve as the general contractor for this project. Slag excavation and removal will be performed by a qualified contractor. The post-excavation surveys will be performed by Auxier & Associates, Inc.

## **2.1 HEALTH AND SAFETY**

All excavation activities and post-excavation surveys will be performed in accordance with a project-specific health and safety plan that accounts for the types of field activities and the radionuclide testing results from previous investigations. Personnel will not enter excavations deeper than four feet for any reason due to the potential risk of collapse of the excavation walls.

## **2.2 SITE PREPARATION**

The goal at each property will be to remove the slag while minimizing disruption to the property and residents. Property owners will have provided authorization for site access and will be given advance notice of planned activities prior to initiation of field work. In addition, any permits or authorizations required by state law or local ordinance will be obtained.

The majority of areas from which slag is to be removed are easily accessed driveways or parking areas (Figures 3 through 8). Slag located around the homes at the STRAW and O-19 properties will be accessed by means of selective demolition, as needed. Site preparation activities for all properties will include, at a minimum, locating utility lines (e.g., water, gas, electric, sewers). If necessary, utility lines will be shut off and (or) removed to facilitate slag excavation and ensure worker safety.

At property STRAW, the slag is located beneath the concrete floor of a small dining room annex with dimensions of 16 feet by 14 feet (Figure 2). According to a US NRC inspection report, the foundation of the annex consists of a 3 foot-high cinder block wall on a concrete footer. The inside of the foundation was filled with slag. A concrete floor slab 3 to 4 inches thick covers most of the slag except for a small area under a stove covered by a wood floor. The upper portion of the house's basement wall borders the slag. The walls of the basement are ceramic block, and the slag is accessible through a window in the basement wall that opens to the area beneath the annex. Removal of the slag from beneath the annex will require, at a minimum, temporary relocation of the stove and adjacent cabinet and bar fixtures, and removal and replacement of the wood and concrete floors.



At property O-19 (Figure 6), slag is located around the home foundation. The extent of slag beneath the footers and basement floor has not been determined. During the site preparation phase, exploratory boreholes and test pits will be made at property O-19 to evaluate the extent of slag beneath the foundation. The ultimate disposition of the house will depend on the vertical and horizontal extent of the slag around the foundation. Demolition of the house or its components (e.g., basement floor) will be performed only to the extent necessary to access the slag and only after consultation with the home owner.

### **2.3 EXCAVATION AND REMOVAL OF SLAG**

After site preparation activities have been completed, the contractor will mobilize its personnel and equipment and the slag will be excavated and removed. The boundaries of the slag-filled areas are typically gradational with adjacent soil. Therefore, to ensure thorough removal of the slag, the excavation procedure is expected to include removal of some of the adjacent soil. For example, a thin layer of soil may be removed from beneath the slag layers in driveways and parking areas. Excavation will continue until the slag is removed.

The slag at the subject properties is visually distinguishable from the surrounding soil. Therefore, visual inspection will be used to determine that the slag has been removed. Slag removal will be completed based primarily upon visual observation. Post-excavation gamma surface scans will be performed in excavation areas as a supplement to the visual observations. The procedures for post-excavation surveys are presented in Section 2.4.

The excavated material from each property will be transported to a staging area until a final disposal alternative is identified. Transportation will comply with applicable State of Ohio and U.S. Department of Transportation regulations.

### **2.4 POST-EXCAVATION SURVEYS**

In addition to visual inspection as discussed in Section 2.3, post-excavation gamma surveys will be performed in the excavation areas. Gamma radiation surveys will be performed at the ground surface of the excavated area, and radiation levels will be recorded on a scale drawing. The surface gamma

radiation survey will be performed by moving a gamma-ray scintillator in a serpentine pattern while advancing slowly (less than one meter per second) across the excavated area. The detector will be kept as close to the ground surface as is practical. The width of the serpentine pattern will be about 1 meter and the excavated area will be scanned in parallel paths at about 1 meter intervals, thus providing representative coverage of the surface. Identification of locations having elevated direct radiation levels will be based on detectable increases above natural background levels in the audible signal from the survey meter. Elevated gamma radiation levels, if identified, will be noted on the scale drawing, and additional visual inspections of the specific areas will be performed. Additional excavation will be performed if warranted.

Surveys of deep excavations will be performed using long cables to allow access to the bottom and side surfaces and (or) by performing gamma scans of soil collected in backhoe buckets. Personnel will not enter excavations deeper than four feet due to the potential risk of collapse of the excavation walls.

In accordance with standard industry practice, all field instrumentation will be calibrated against certified radionuclide sources traceable to the National Institute of Standards and Technology (NIST) prior to use during this investigation. Calibration certificates will be issued and maintained for all field survey equipment. Background and response checks will be performed on field instrumentation at the beginning and end of each day in the field, or at the beginning and end of their use at each property. In accordance with standard industry practice, response checks must agree within +/-20% of the calibrated efficiency. If an instrument fails a response check, it will be tagged out-of-service and replaced with a new instrument. All data from a failed instrument will be rechecked up to the last source check. Documentation will be maintained for all background and response checks. Field data sheets and calculations will undergo an independent peer review by personnel with relevant technical qualifications.

## **2.5 SITE RESTORATION**

The goal of site restoration will be to repair or restore property landscape, drainage patterns, and structures to conditions like those that existed prior to slag removal. Site restoration may consist of a variety of activities, including replacement of removed slag with gravel-sized construction

material (e.g., crushed limestone or river gravel), landscape repair, building repair/reconstruction, and utility repair/reconnection.

Damaged lawn areas will be restored by reseeding and (or) resodding. Utility lines (e.g., gas, water, electricity, sewer) will be restored and re-activated, as needed. Any outdoor features removed during the course of slag removal (e.g., sidewalks, steps) will be repaired or replaced. Any building structures, appliances, or internal and external decor removed at properties O-19 and STRAW will be repaired or replaced.

## **2.6 SLAG REMOVAL REPORT**

Upon completion of slag removal and site restoration activities, a report will be prepared which documents the slag excavation and removal activities, site restoration activities, and the results of post-excavation surveys.

## **SECTION THREE**

### **Project Schedule**

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Site preparation activities, slag excavation and removal, and post-excavation surveys are expected to be completed by the end of June 1997. This schedule assumes the staging of offsite slag at the Cambridge Plant.

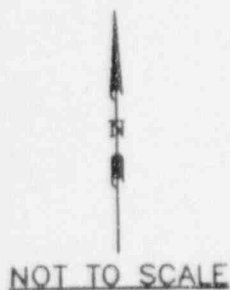
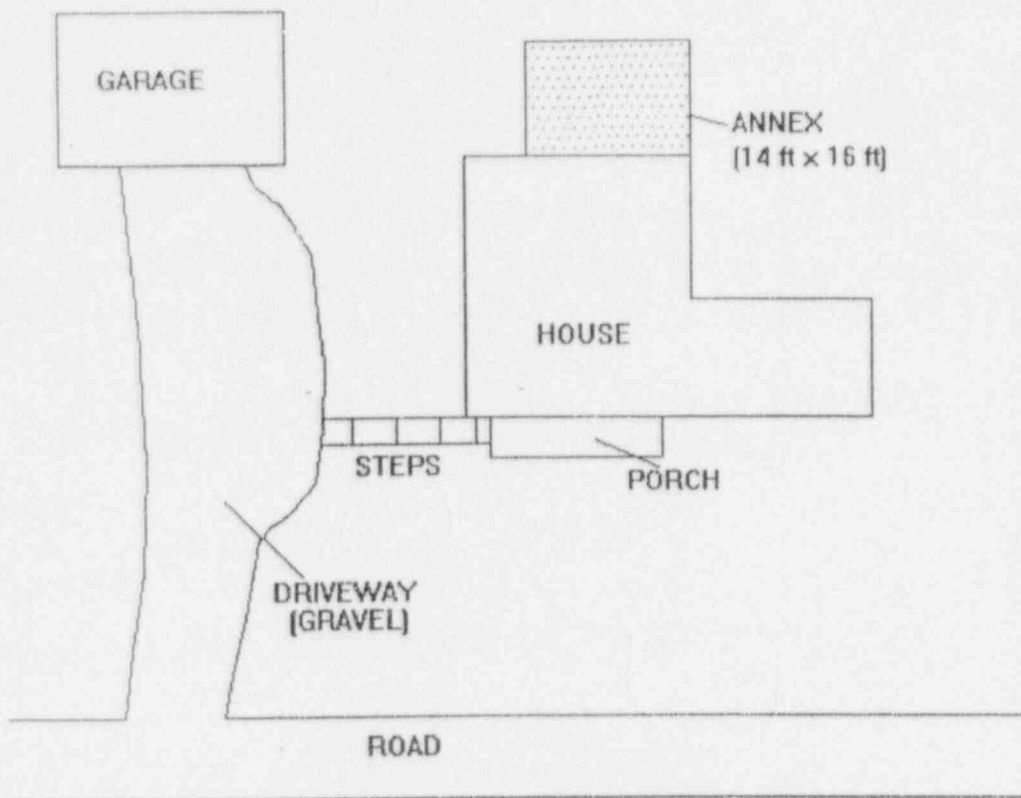
## Figures


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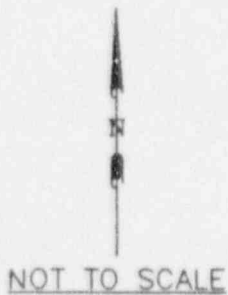
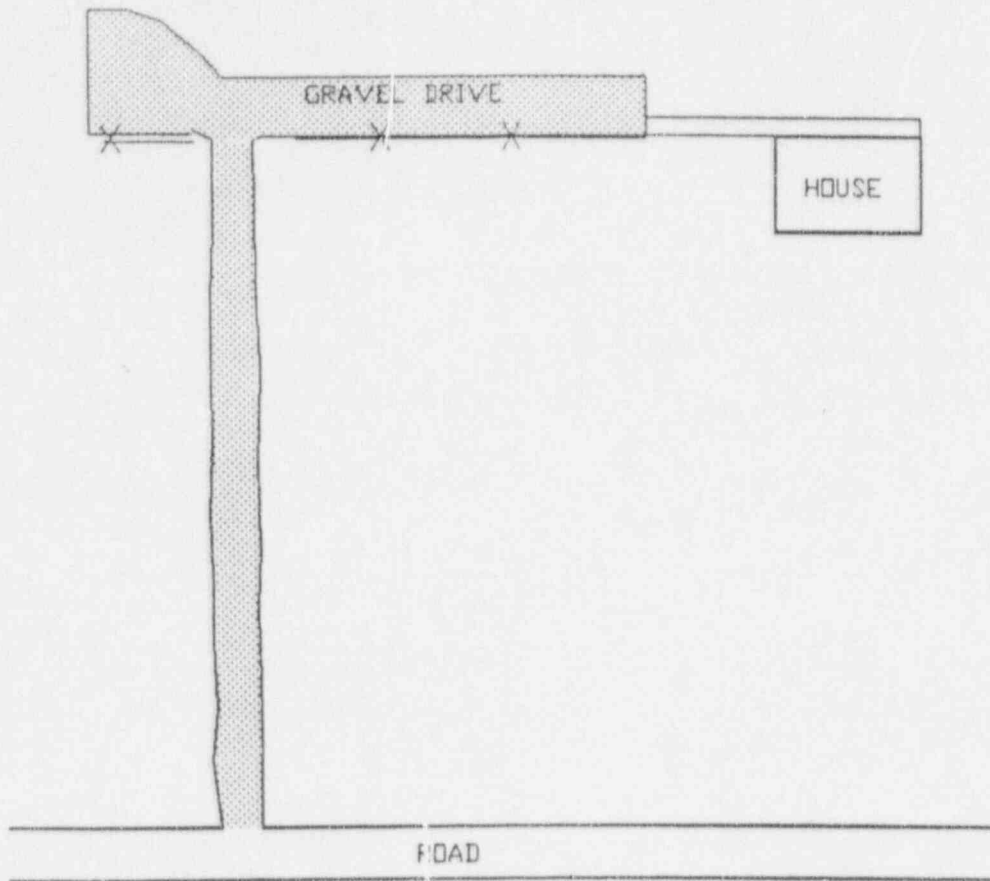



FIG. NO.
1




 Location of Slag to be Removed

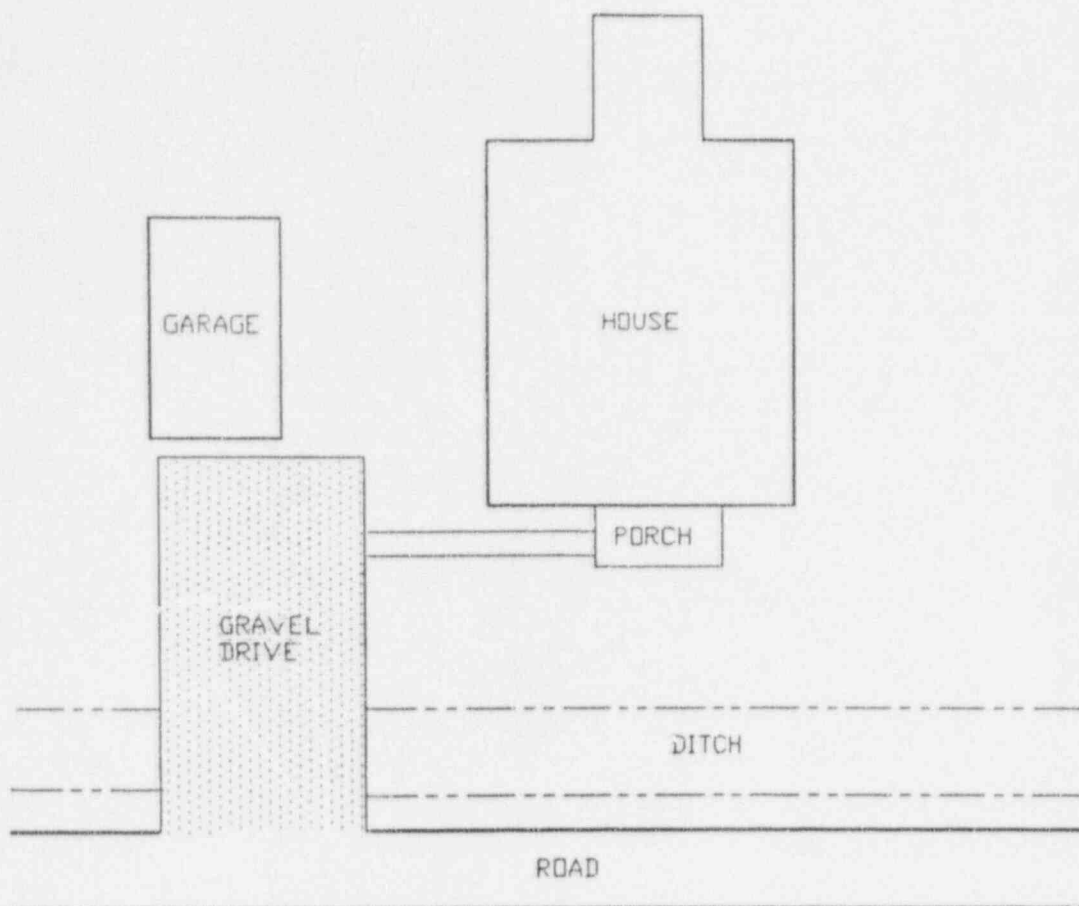
CYPRUS FOOTE MINERAL COMPANY CAMBRIDGE, OHIO		PROJECT NO. 4E0103
<b>Woodward-Clyde</b>  <b>Consultants</b> <small>Engineering &amp; sciences applied to the earth &amp; its environment</small>		
DRN. BY: RET DSGN. BY: RET CHKD. BY: <i>RET</i>	Property Layout and Slag Locations, Property STRAW	FIG. NO. 2



 Location of Slag to be Removed

Source: modified from August 19, 1994  
ORISE Survey Report

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<b>Woodward-Clyde</b>  <b>Consultants</b> <small>Engineering &amp; sciences applied to the earth &amp; its environment</small>		
DRN. BY: JST DSGN. BY: JST CHKD. BY:	<b>Property Layout and Slag Locations, Property O-5</b>	FIG. NO. <b>3</b>



NOT TO SCALE



Location of Slag to be Removed

Source: modified from August 19, 1994  
ORISE Survey Report

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4E08103

**Woodward-Clyde**  
**Consultants**

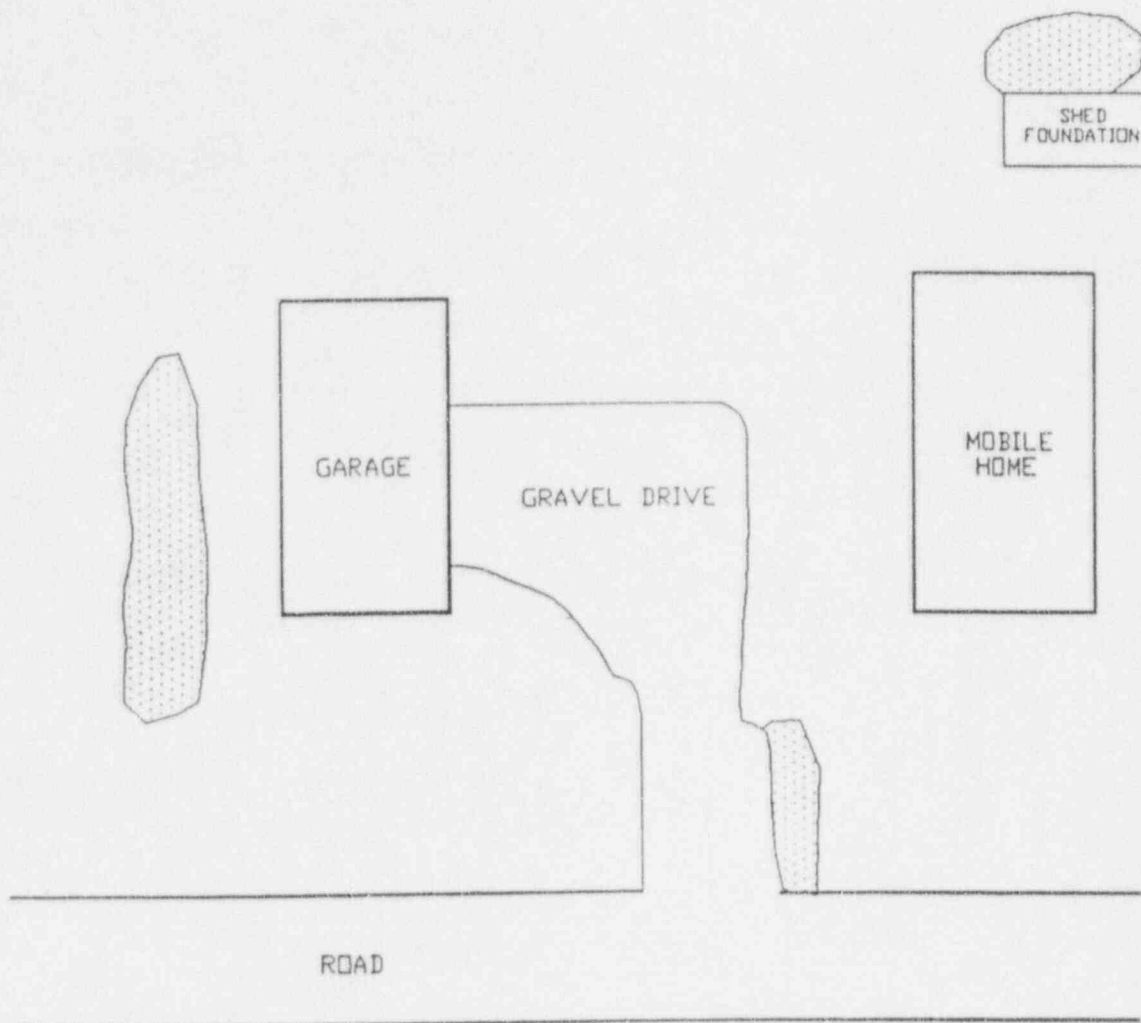



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DRN. BY: RET  
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CHKD. BY: [signature]



Property Layout and  
Slag Locations, Property O-7

FIG. NO.  
4

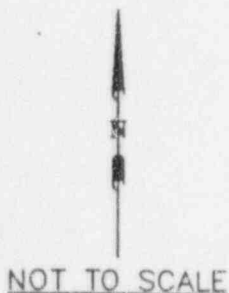
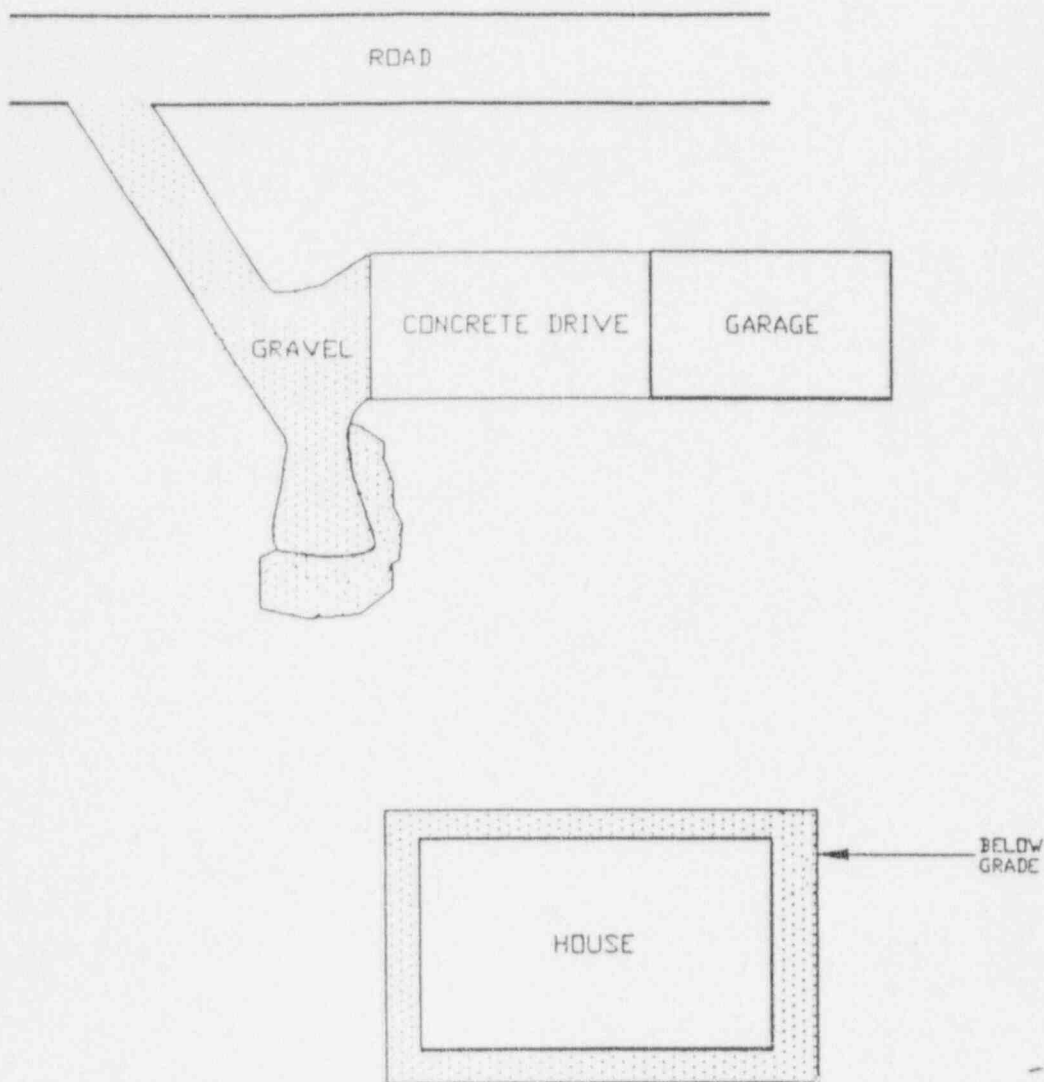



 Location of Slag to be Removed

Source: modified from August 19, 1994  
ORISE Survey Report


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<b>Woodward-Clyde</b>  <b>Consultants</b> <small>Engineering &amp; sciences applied to the earth &amp; its environment</small>		
DRN. BY: RET DSGN. BY: RET CHKD. BY: 	Property Layout and Slag Locations, Property O-17	FIG. NO. 5

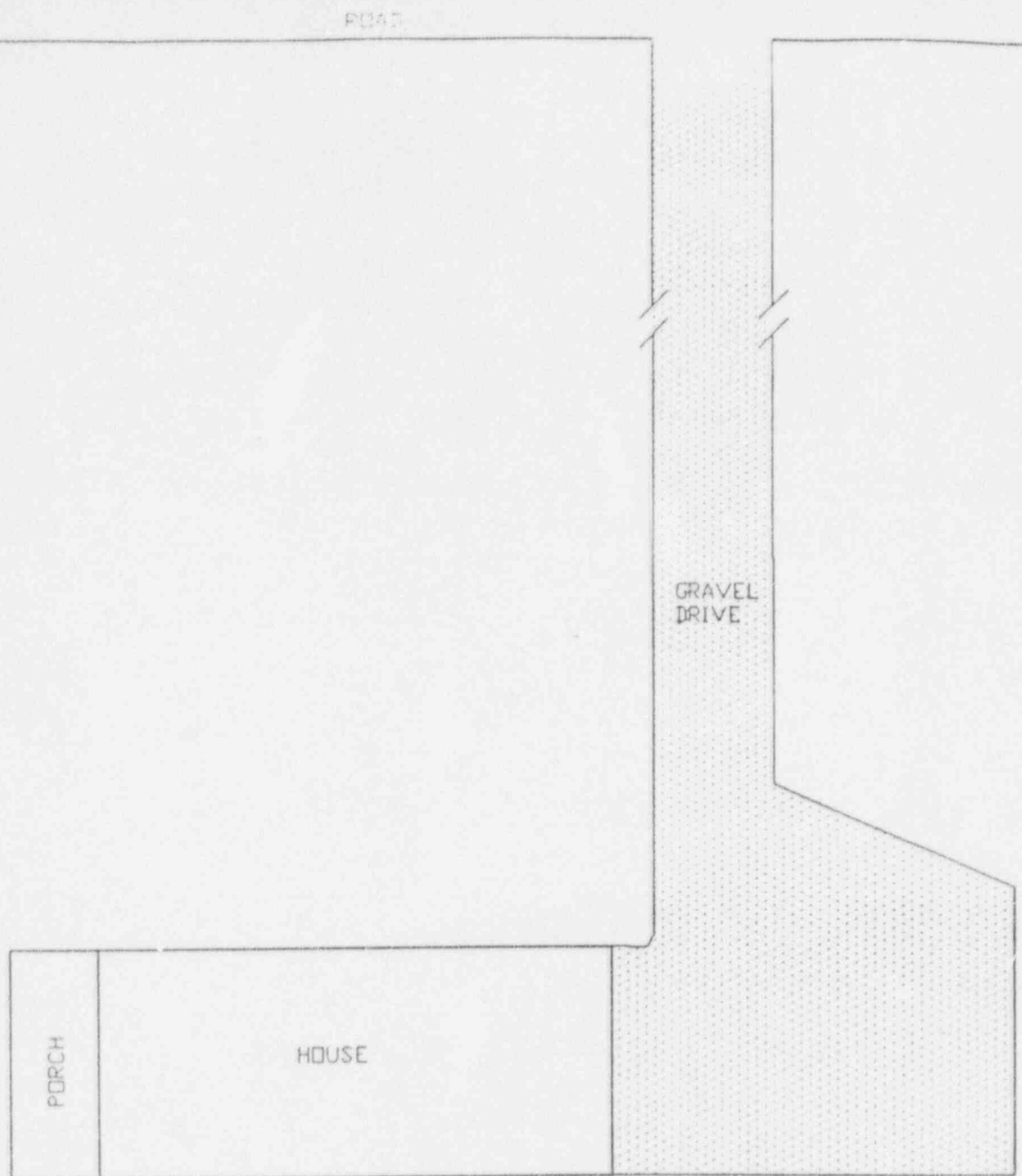




 Location of Slag to be Removed


Source: modified from August 19, 1994  
ORISE Survey Report

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DRN. BY: RET DSGN. BY: RET CHKD. BY:	<b>Property Layout and Slag Locations, Property O-19</b>	FIG. NO. <b>6</b>



NOT TO SCALE

Source: modified from August 19, 1994  
ORISE Survey Report

 Location of Slag to be Removed

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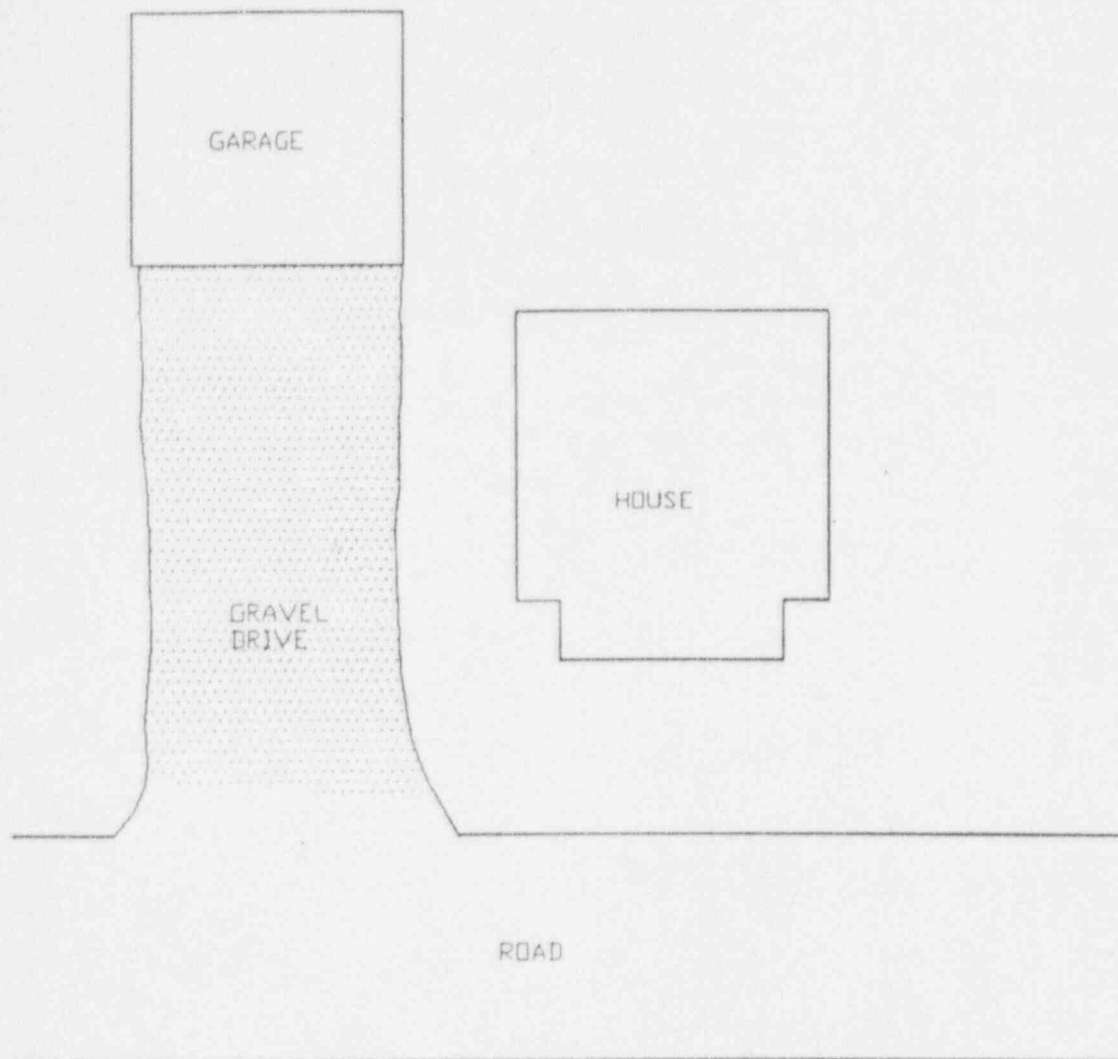


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DRN. BY: R&T  
DSGN. BY: R&T  
CHKD. BY:

Property Layout and  
Slag Locations, Property O-29

FIG. NO.  
7



Location of Slag to be Removed

NOT TO SCALE

Source: modified from August 19, 1994  
ORISE Survey Report

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CHKD. BY: RET

Property Layout and  
Slag Locations, Property O-47

FIG. NO.  
8