DEPARTMENT OF ENERGY
ALBUQUERQUE OPERATIONS OFFICE
CONTRACT NO. DE-AC04-83AL18796

Draft
Radiological and Engineering Assessment

Vicinity Property No. SLC 050

Remedial Actions
Contractor
for the
Uranium Mill Tailings
Remedial Actions
Project

MORRISON
KNUDSEN

Vicinity Property No. _____

MORRISON KNUDSEN

DOCUMENT TRANSMITTAL

MORRISON-KNUDSEN Co., Inc.
P.O. BOX 9136
ALBUQUERQUE, NEW MEXICO 87119

Trans. No. MK-3050-SLC-0057

Contract No. 3050

PROJECT: UMTRA
CLIENT: U.S. DEPARTMENT OF ENERGY

Date July 27, 1984

TO: U.S. NUCLEAR REGULATORY COMM.
7915 EASTERN AVENUE
SILVER SPRINGS, MD 20910

ATT: Mr. Claude Flory

APPROVED FOR CONSTRUCTION/FABRICATION	A
INFORMATION ONLY	B
APPROVAL ACTION REQUESTED	C
DISAPPROVAL-RESUBMIT	D
APPROVAL WITH COMMENTS	E

REMARKS Attached is one (1) copy of the Draft REA for SLC-050. If comments are not forwarded to M. Matthews of DOE by August 7, 1984, we will assume your concurrence.

TRANSMITTED ☒ HEREWITH ☐ UNDER SEPARATE COVER

DRAWING SPECIFICATION OR ITEM NUMBER	REV. NUMBER	NUMBER OF COPIES	TITLE OR DESCRIPTION	ACTION
SLC-050		1	Draft REA SLC-050	C
lmv			WM Record File WM Project 4	
			Docket No.	
Attachment			PDR ✓	
			LPDR	
			Distribution:	
cc: J. Morley			CFlory	
M. Matthews			(Return to WM, 623 SS)	CF

ADDRESSEE: SIGN & RETURN COPY NO. 2 TO ABOVE ADDRESS

MORRISON-KNUDSEN

BY: [signature]

TITLE VICINITY PROPERTY MANAGER

THE ABOVE LISTED DOCUMENTS HAVE BEEN RECEIVED BY:

COMPANY NAME USNRC

NAME & TITLE Cathy Cudd, Reference Asst

DATE REC'D. 7/30/84

Retrack Date: 7/27/84 Reg Mail

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DRAFT

THE RADIOLOGICAL AND ENGINEERING ASSESSMENT

FOR

SALT LAKE CITY PROPERTY

SL-050

July 25, 1984

PREPARED FOR

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT OFFICE

UNITED STATES DEPARTMENT OF ENERGY

PREPARED BY

MORRISON-KNUDSEN COMPANY, INC.

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FIGURES

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APPENDICES

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Property SL-050 is a commercial property located at 2575 South 300 West Street and owned by R&W Dairy.

1.2 Evaluation and Recommendation

1.2.1 Residual Radioactive Material Involvement

Outdoor contamination covers the full extent of the property to an approximate depth of 4 feet.

1.2.2 Recommended Remedial Action Option

The recommended option is to provide complete decontamination of the property in stages while maintaining the property owner in business on his own property.

1.2.3 Estimated Costs

The estimated cost of the recommended option is $4,926,000.00.

2.0 ENGINEERING FIELD SURVEY

2.1 Property Description

2.1.1 Property Use and Occupancy

Property SL-050 is a commercial property located at 2575 South 300 West St. and owned by R & W Dairy. The map in Figure 2.1 illustrates the property's vicinity location.

2.1.2 Legal Description

The legal description as recorded with the Salt Lake County Recorder's Office in Deed Book No. 1897, Page 238 and Deed Book 5250, Page 1480 follows:

Beginning at a point South 0° 04' 30" East 307.75 feet and North 89° 45' 10" East 242.35 feet from the Northwest corner of Lot 3, Block 39, Ten Acre Plat "A", Big Field Survey and running thence North 0° 14' 50" West 172.86 feet, thence North 89° 45' 10" East 252.0 feet, thence South 0° 14' 50" East 172.86 feet, thence South 89° 45' 10" West 252.0 feet to the point of beginning.

Together with a right of way for ingress and egress over and across the following described property:

Beginning at a point on the East line of Second West Street, said point being South 0° 04' 30" East 288.75 feet from the Northwest corner of Lot 3, Block 39, Ten Acre Plat "A", Big Field Survey and running thence North 89° 45' 10 " East 242.29 feet, thence South 0° 14' 50" East 15 feet, thence South 89° 45' 10" West 242.34 feet, thence North 0° 04' 30" West 15 feet to the point of beginning.

Parcel A

Beginning at a point South 0° 04' 30" East 307.75 feet and North 89°45'10" East 524.35 feet from the Northwest corner of Lot 3, Block 39, Ten Acre Plat "A", Big Field Survey and running thence North 0°14'50" West 173.86 feet, thence North 89°45'10" East 60.00 feet; thence South 0°14'50" East 173.86 feet; thence South 89°45'10" West 60.0 feet to the point of beginning.

Parcel C

Beginning at a point South 0°04'30" East 134.89 feet and North 89°45'10" East 332.15 feet from the Northwest corner of Lot 3, Block 3, Block 39, Ten Acre Plat "A", Big Field SUrvey and running thence North 0°14'50" West 10.20 feet; thence

North 89°45'10" East 159.80 feet; thence South 0°14'50: East 9.20 feet; thence North 89°45'10" East 31.98 feet; thence South 0°14'50" East 1.00 feet; thence South 89°45'10" West 191.78 feet to the point of beginning.

2.1.3 Bordering Properties

The lot is zoned for light industrial use. It is located in a commercial area less than one mile northeast of the old Vitro mill tailings site. The property is bounded on the north, east, south, and on the west by commercial properties. A right-of-way allows access to 300 West Street.

2.2 Existing Facilities and Structures

2.2.1 Structures

There are three principal structures on the property. The buildings are designated as the office and manufacturing building, the freezer and storage building, and the dairy garage building.

The office and manufacturing building is located at the center of the property. It is a two-story concrete block building. The building contains manufacturing facilities for ice cream production, related mechanical equipment areas, office areas, a small cooler and freezer, and storage rooms.

The freezer and storage building is located at the east side of the property. It is a concrete block building with concrete slab floors. The building in internally divided by a concrete blockwall into two parts. The north side is a freezer which operates at minus 20 degrees F. It has a protective foundation and slab which includes ventilation and insulation to prevent the foundation subgrade from freezing and heaving. The south side is a dry storage area, which is constructed on a ventilated concrete slab, with future provision for upgrading it as a freezer. The southeast corner of the building contains a maintenance area for servicing dairy trucks and equipment.

The dairy garage is located at the south side of the property. It is a metal frame building with a concrete slab. The north wall is concrete block and the south wall is wood siding. This building is outside of the contaminated area.

An overhead refrigerated conveyor is located at the north side of the property. It connects the office and manufacturing building to the freezer building.

The entire yard area is surfaced with either asphalt or concrete, as shown on the Site Plan, Figure 4.1.

2.2.2 Utilities

Utilities are serviced to the property as follows:

Electric Power - From North and South Property Lines
Telephone - Overhead from pole line north of dairy garage
Water - From 300 West Street
Gas - From 300 West Street
Sewer - To 300 West Street

Research of the utilities for this property included field surveys, public records, and former construction drawings. Utilities are shown on Figure 4.1. Some of these utilities may be in use, abandoned in place, or removed.

2.2.3 Site Plan and Survey Data

See Figure 4.1 for a site plan of the property. Property photos are presented in Figures 2.2 and 2.3. Property survey data is shown in Table 2.1.

TABLE 2.1

COMMERCIAL/INSTITUTIONAL

PROPERTY SURVEY DATA

GENERAL:

Facility Name: R & W Dairy

Address: 2575 South 300 West Street

Owner: R & W Dairy

Occupancy: Employees/Occupants (Full Time): 18

Employees/Occupants (Part Time): _____

Remarks: 18 Employees Working on Property Fulltime

Number of Truck Drivers is Unknown

PROPERTY DESCRIPTION:

Structure: (Identify) Office and Manufacturing Building

: SQ FT _____ Levels 2

: Construction Type Concrete Block

: Foundation Elevated Concrete Slab Over Earth Fill

Remarks:

Structure: (Identify) Freezer and Storage Building

: SQ FT _____ Levels 1

: Construction Type Concrete Block

: Foundation Concrete Slab - Insulated

Remarks: Third Building is Metal Frame Garage with Concrete Slab on Grade

TABLE 2.1

COMMERCIAL/INSTITUTIONAL

PROPERTY SURVEY DATE

Facility Name: R & W Dairy

PROPERTY DESCRIPTION:

Driveway/Access: Concrete: _____ Asphalt: X Gravel: _____

Remarks: _____

Sidewalks: Concrete: _____ Asphalt: _____

Remarks: None

Fences: Chain link North Side Mesh _____ Wood _____

Remarks: _____

Grounds: Lawn None

Trees None

Shrubs None

Grading Flat

Soil Type _____

Remarks All Yard Area is Either Asphalt or Concrete

TABLE 2.1

COMMERCIAL/INSTITUTIONAL

PROPERTY SURVEY DATA

Facility Name: R & W Dairy

UTILITIES: Heating: Gas X Electric X Oil _____

Hot Water _____ Other _____

Remarks: _____

_____

Air Conditioning: Elec. Heating Pump _____ Gas _____

Evap. Cooler _____ Other _____

Remarks: _____

_____

Electric Line Location: From North and South Property Lines

_____

Gas Line Location: From 300 West Street

_____

Water Line Location: From 300 West Street

_____

Sewer Line Location: To 300 West Street

_____

Telephone Line Location: From Pole Line North of Garage

_____

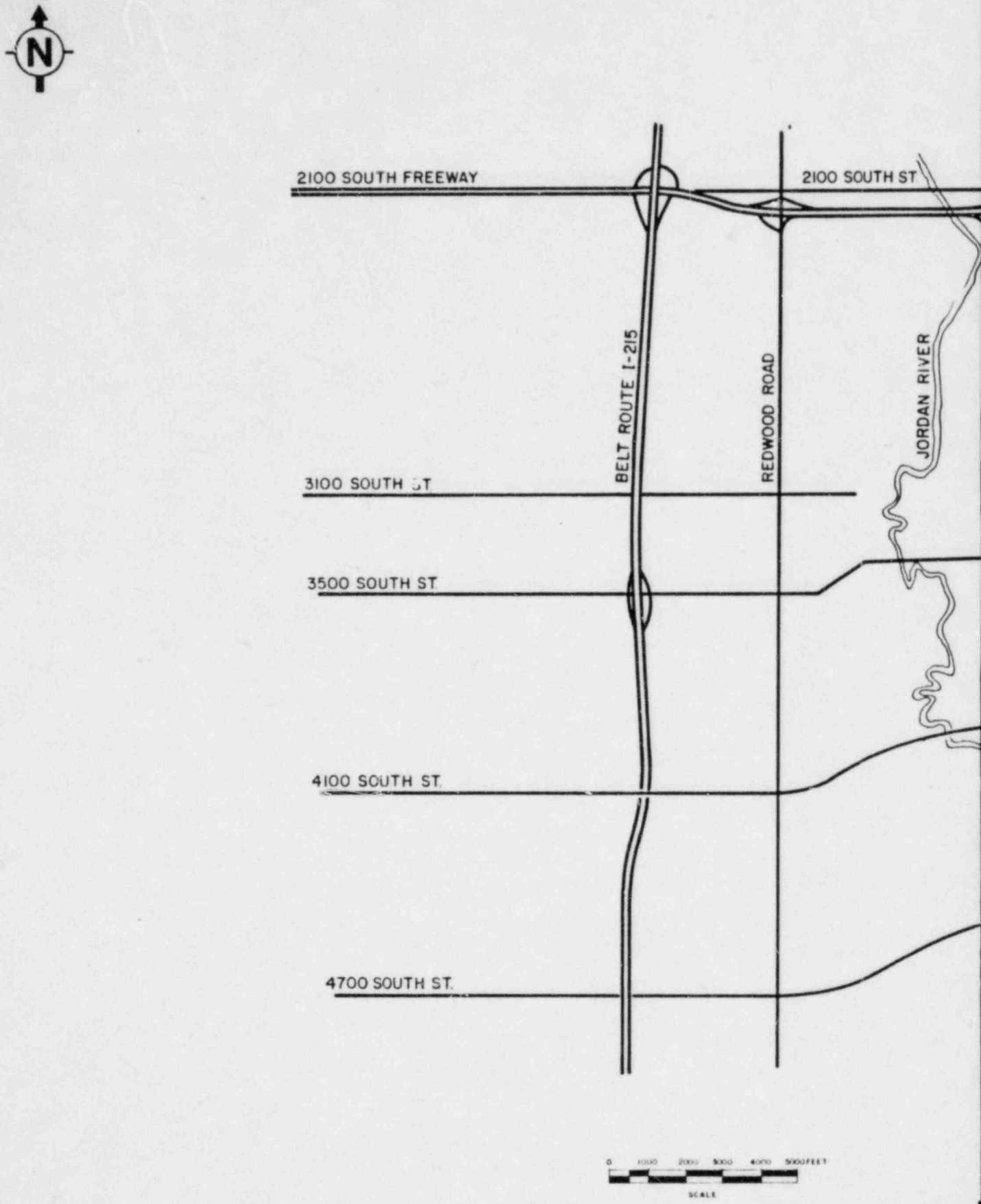
BUILDING CODES AND ZONING:

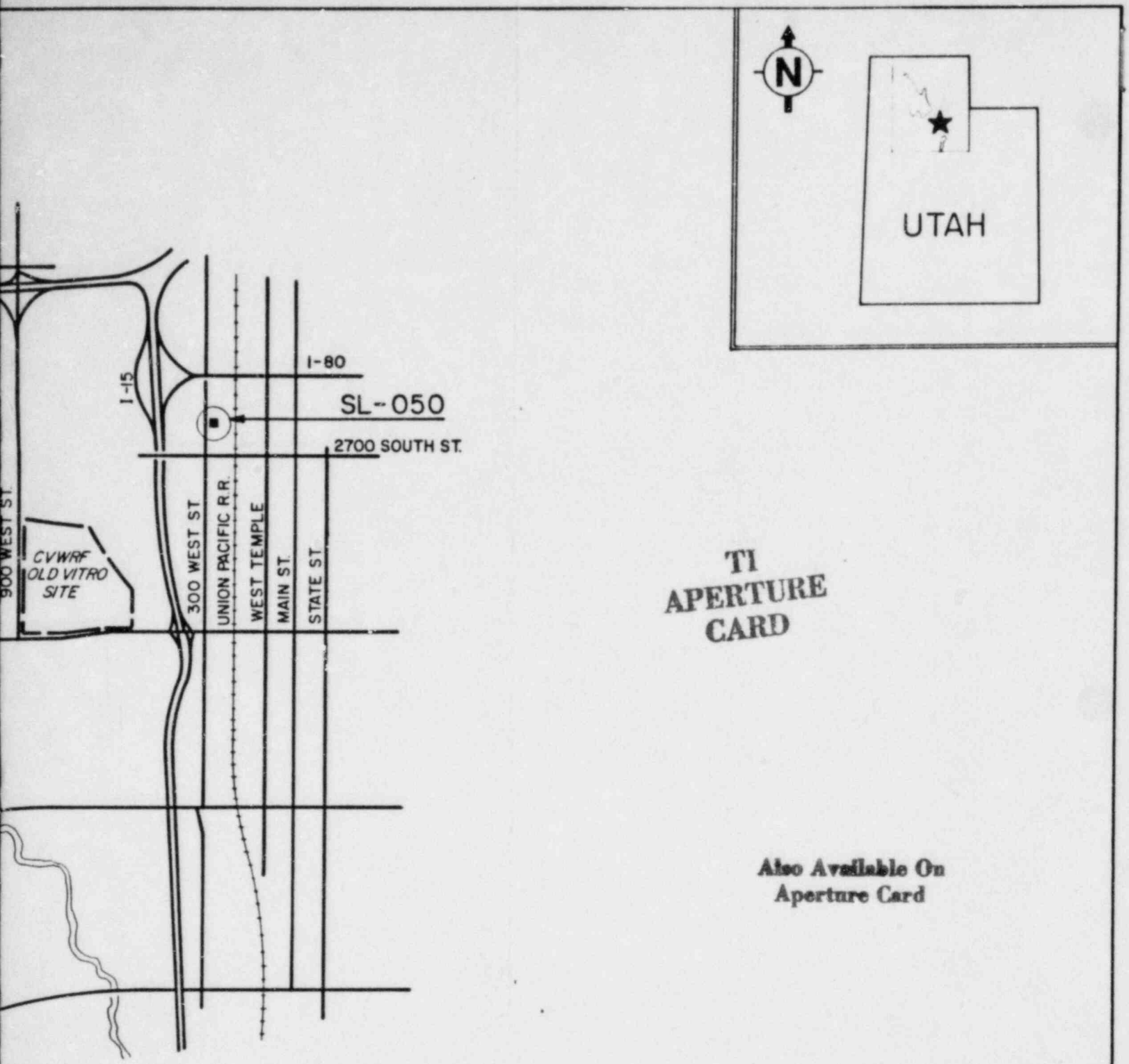
Building Code: UBC X BOCA _____

Remarks: _____

Zoning Jurisdiction: Salt Lake

Present Facility Zoning: Light Industrial


N
2100 SOUTH FREEWAY
2100 SOUTH ST.
BELT ROUTE I-215
REDWOOD ROAD
JORDAN RIVER
3100 SOUTH ST.
3500 SOUTH ST.
4100 SOUTH ST.
4700 SOUTH ST.
0 1000 2000 3000 4000 5000 FEET
SCALE



U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED | DRAWN TLE
CHECKED
REVIEWED
RECOMMENDED
APPROVED | DATE | DOE PROJECT MANAGER | DATE | DOE PROJECT ENGINEER | DATE

FIGURE 2.1
VICINITY MAP SL-050
SALT LAKE COUNTY, UTAH
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

MORRISON KNUDSEN

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. SL-050-005 REV. A

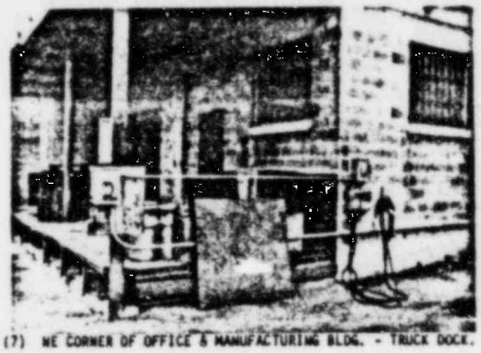
NO.	DATE	REVISIONS	DRAWN BY	CHECKED BY	APPROVAL LOE	APPROVAL DH	PROJ. ENG	APPROVAL DOE
A	7/13/84	DRAFT REA SUBMITTAL	TLE					

(1) WEST SIDE OF OFFICE & MANUFACTURING BLDG.

(2) WEST SIDE OF OFFICE & MANUFACTURING BLDG. - NOTE WELL LOCATION.

(3) NORTH SIDE OF OFFI

(6) SE CORNER OF OFFICE & MANUFACTURING BLDG. - TRUCK DOCK.



(7) NE CORNER OF OFFICE & MANUFACTURING BLDG. - TRUCK DOCK.

(8) SOUTH SIDE OF OFFI - OFF

(11) SOUTH SIDE OF OFFICE & MANUFACTURING BLDG. - TANKS ON ROOF.

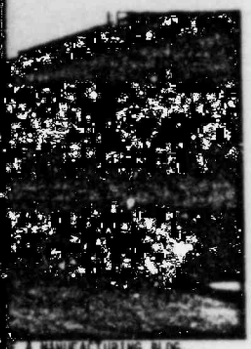
(12) NORTH SIDE OF DAIRY GARAGE & RIGHT OF WAY.

(13) SOUTH SIDE

(16) WEST SIDE OF FREEZER - TRUCK DOCK.

(17) WEST SIDE OF DRY STORAGE BLDG.

(18) WEST SIDE OF DRY

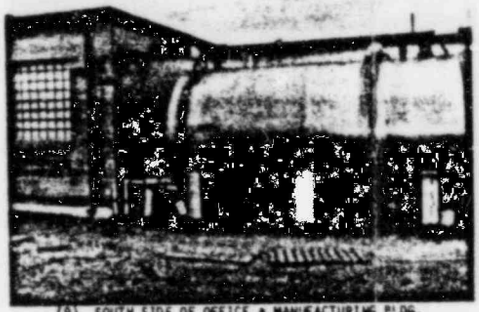


& MANUFACTURING BLDG.

(4) NORTH SIDE OF OFFICE & MANUFACTURING BLDG - TRUCK DOCK.

(6) NE CORNER OF OFFICE & MANUFACTURING BLDG.

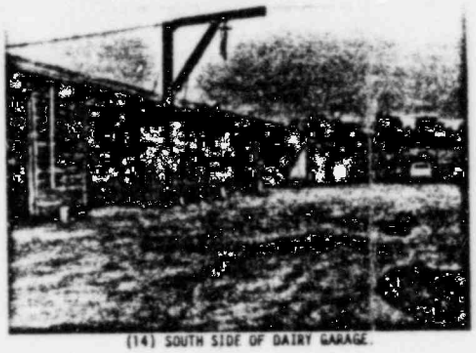
& MANUFACTURING BLDG.
E ENTRY.



(9) SOUTH SIDE OF OFFICE & MANUFACTURING BLDG.
- TANK ON ROOF.

(10) NORTH SIDE OF OFFICE & MANUFACTURING BLDG.
- TANK ON ROOF.

DAIRY GARAGE.



(14) SOUTH SIDE OF DAIRY GARAGE.

(16) WEST SIDE OF FREEZER - TRUCK DOCK.

STORAGE & MAINT. BLDG.

(19) ENCLOSED CONVEYOR - NORTH SIDE OF PROPERTY.

(20) ENCLOSED CONVEYOR ENTERING FREEZER.

NO.	DATE	REVISIONS	DRAWN BY	CHECKED BY	APPROV. LOE	APPROV. DH	PROJ ENG	APPROV. DOE
A	7/3/84	DRAFT REA SUBMITTAL	TLE					

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED / DRAWN: TLE
CHECKED:
REVIEWED:
RECOMMENDED:
APPROVED — DATE — DOE PROJECT MANAGER — DATE — DOE PROJECT ENGINEER — DATE

FIGURE 2.2

EXTERIOR DETAILED PHOTOS SL-050

SALT LAKE COUNTY, UTAH
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

MORRISON KNUDSEN

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. SL-050-120 REV. A

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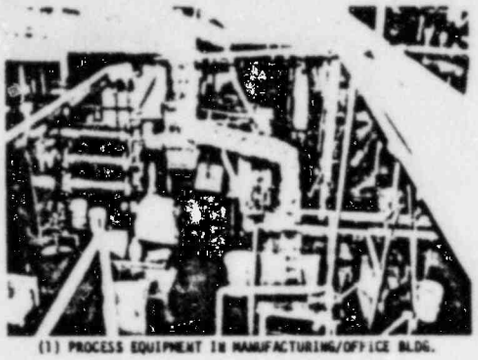
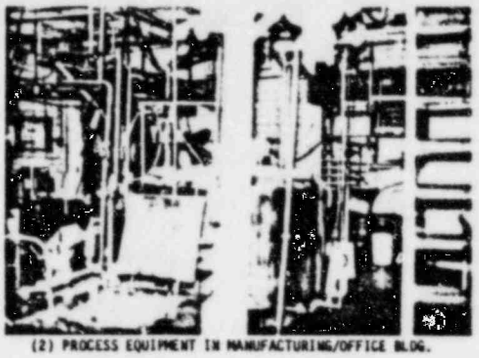


(1) PROCESS EQUIPMENT IN MANUFACTURING/OFFICE BLDG.



(2) PROCESS EQUIPMENT IN MANUFACTURING/OFFICE BLDG.

(3) MILK/MIX TANKS IN MA

(6) STORAGE ROOM IN MANUFACTURING/OFFICE BLDG.

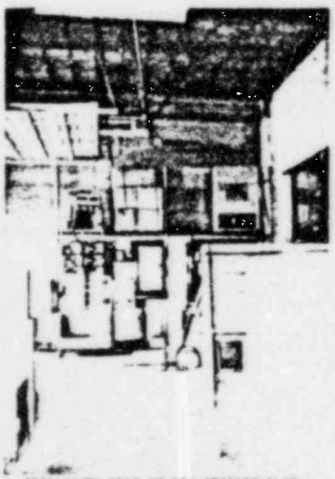
(7) STORAGE ROOM IN MANUFACTURING/OFFICE BLDG.

(8) COOLER IN MANUFA

(11) MECH. RM. IN MANUFACTURING/OFFICE BLDG.

(12) MECH. RM. IN MANUFACTURING/OFFICE BLDG.

(13) OFFICE IN MANUFA



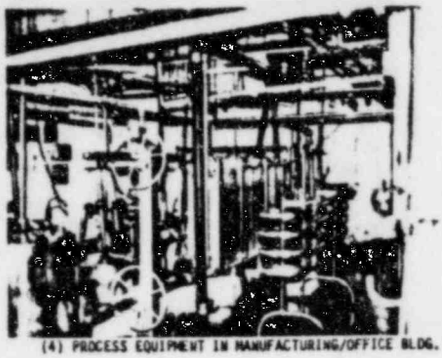
(16) SOUTH SIDE OF DRY STORAGE BLDG.

(17) NORTH SIDE OF DRY STORAGE BLDG.

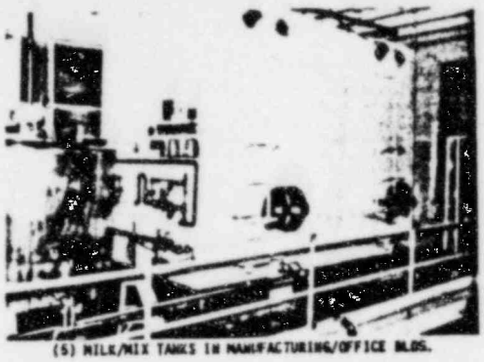
(18) WEST SIDE OF FREEZER BLDG.

(19) ENTRY INTO FR

UFACTURING/OFFICE BLDG.

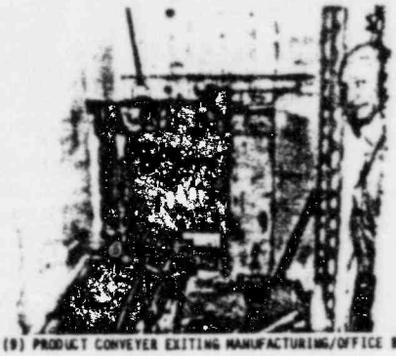


(4) PROCESS EQUIPMENT IN MANUFACTURING/OFFICE BLDG.



(5) MILK/MIX TANKS IN MANUFACTURING/OFFICE BLDG.

TURING/OFFICE BLDG.

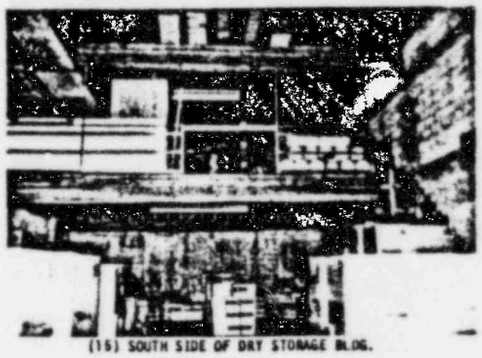


(9) PRODUCT CONVEYER EXITING MANUFACTURING/OFFICE BLDG.

(10) FREEZER IN MANUFACTURING/OFFICE BLDG.

TURING/OFFICE BLDG.

(14) OFFICE IN MANUFACTURING/OFFICE BLDG.



(15) SOUTH SIDE OF DRY STORAGE BLDG.

EZER (WEST SIDE)

(20) PRODUCT CONVEYER ENTRY INTO FREEZER BLDG.

(21) RAPID FREEZE ROOM OF FREEZER BLDG.

NO.	DATE	REVISIONS	DRAWN BY	CHECKED BY	APPROVAL LOE	APPROVAL DH	PROJ ENG	APPROVAL DOE
A	7/3/84	DRAFT REA SUBMITTAL	TLE					

U. S. DEPARTMENT OF ENERGY

ALBUQUERQUE, NEW MEXICO

DESIGNED / DRAWN: TLE

CHECKED: Hyndhamer

REVIEWED: Hyndhamer

RECOMMENDED: Hyndhamer

APPROVED ____ DATE ____ DOE PROJECT MANAGER ____ DATE ____ DOE PROJECT ENGINEER ____ DATE ____

FIGURE 2.3

INTERIOR DETAILED PHOTOS SL-050

SALT LAKE COUNTY, UTAH

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

MORRISON KNUDSEN

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. SL-050-125 REV. A

8408200342-D3

3.0 RADIOLOGICAL SURVEY AND ASSESSMENT

The contaminated area identified in the inclusion survey (Results of the Radiological Survey at Property SL-050, ORNL, July 1983) has previously been surveyed by Ford, Bacon & Davis, Inc. (FB&D). Chapter 3 of this preliminary Radiological and Engineering Assessment is attached as Appendix A of this document. The present assessment provides a re-interpretation of the FB&D and ORNL gamma radiation data in and near Buildings C and D, identified as the office and manufacturing building and the freezer and storage building, respectively. No new gamma survey data were collected for this assessment. Additional borehole information has been collected in the dairy access right-of-way area and along the south side of Building C. These data have confirmed the recommendations found in the FB&D preliminary REA.

3.1 Gamma Exposure Rate Survey

3.1.1 Survey Method

The outdoor and indoor contaminated areas identified in the inclusion survey (Radiological Survey at Salt Lake City Site, Vicinity Property SL-050, ORNL, July 1983) were surveyed in accordance with the methods described by Ford, Bacon & Davis (see Appendix A).

3.1.2 Survey Results

Outdoor surface gamma readings on the property, as shown in Appendix A, range from 9 to 160 micro R/hr (Table 3.1). This may be compared with the background for the Salt Lake City site of about 10 micro R/hr.

Surface gamma readings inside Building C range from 5.4 to 70 micro R/hr and inside Building D from 7.6 to 44 micro R/hr. The locations of these measurements are found on the drawings included with the basic data found in Appendix A.

3.2 Borehole Surveys

3.2.1 Survey Method

A gasoline-powered auger was used to drill 4-inch diameter holes in the access road to the dairy area. The holes were surveyed in compliance with the RAC UMTRA Procedure 018.

3.2.2 Survey Results

Contamination was found in 4 of the 5 outdoor holes. The location and depth of the contamination is described in Table 3.1.

3.3 Radon/Radon Daughter Surveys

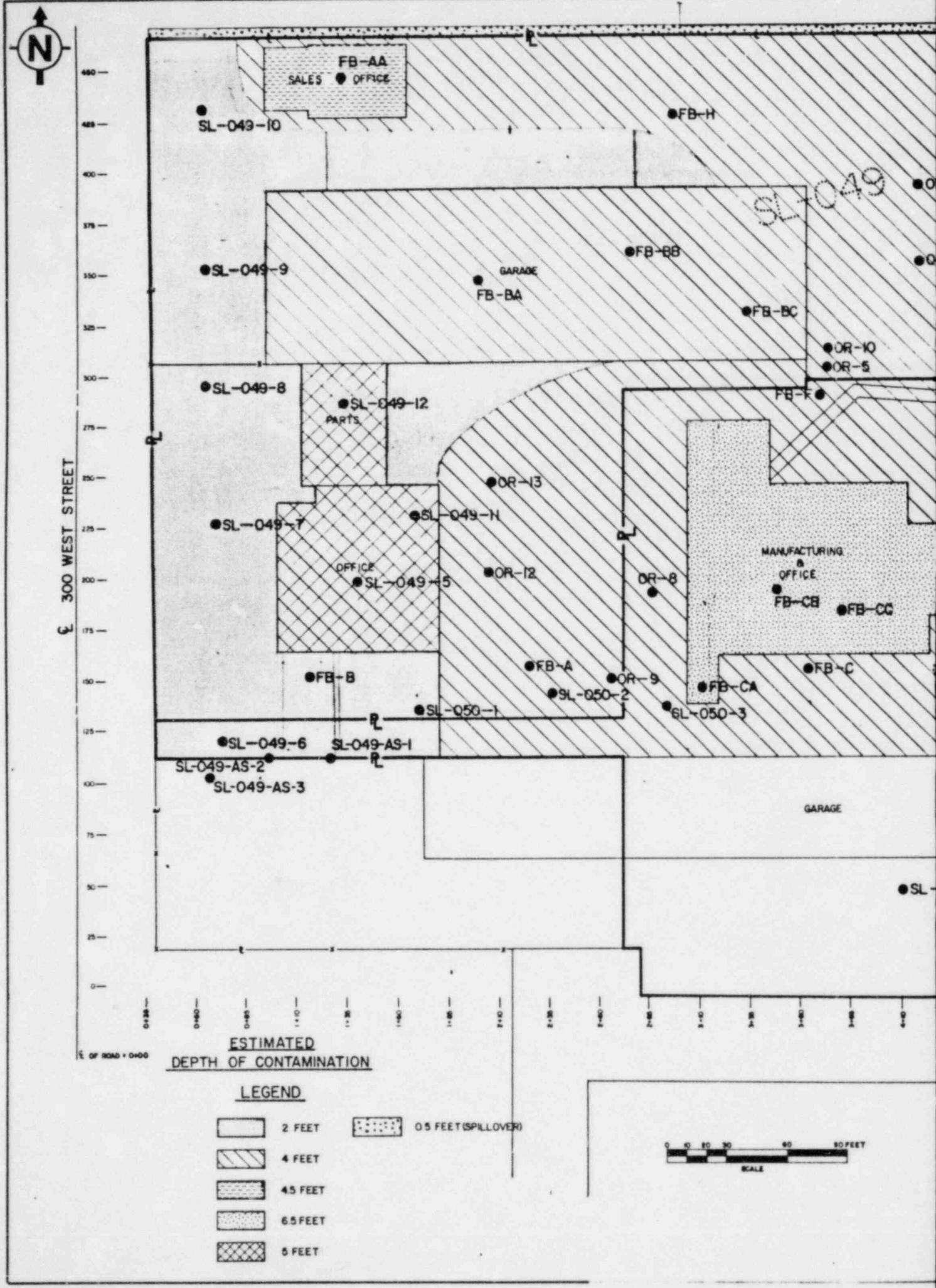
No new radon/radon daughter surveys were performed inside buildings during the present surve' .

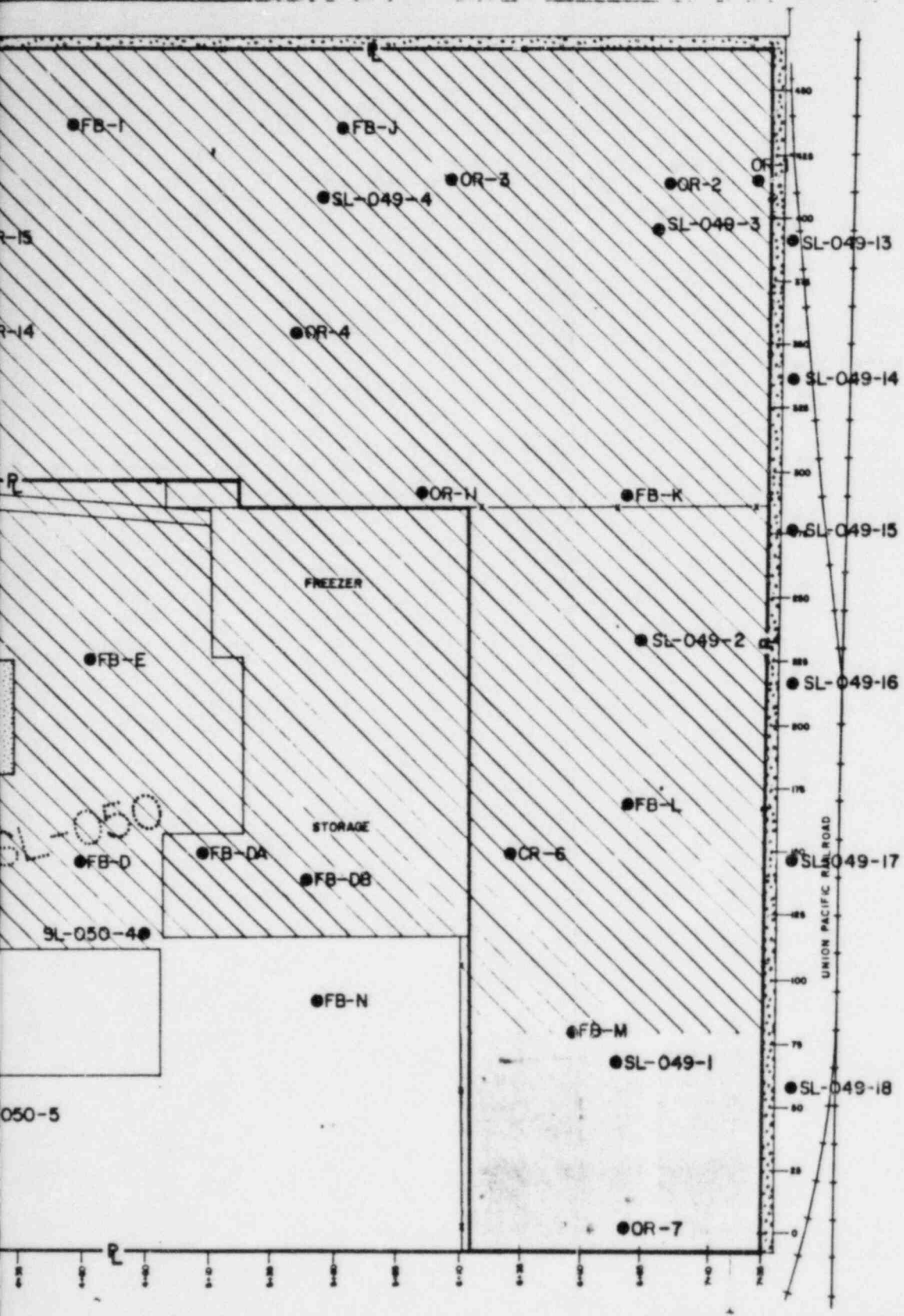
3.4 Extent of Contamination

The entire area of SL-050 is contaminated. Figure 3.1 shows the estimated depth of contamination in various areas. In this figure, borehole locations marked "OR__" were drilled by ORNL; "FB__" were by FB&D; and "SL-050-__" were by MK/CNSI.

Table 3.1
BOREHOLE SURVEY
Property SL-050

HOLE	CONTAMINATION DEPTH
1	0-30"
2	0-42"
3	0-42"
4	0-42"
5	None


N
FB-AA
SALES
OFFICE
SL-049-10
FB-H
SL-049-9
GARAGE
FB-BA
FB-BB
FB-BC
OR-10
OR-5
FB-F
SL-049-8
SL-049-12
PARTS
OR-13
SL-049-11
SL-049-7
OFFICE
SL-049-5
OR-12
OR-8
MANUFACTURING
&
OFFICE
FB-CB
FB-CC
FB-A
OR-9
FB-C
FB-CA
SL-050-2
SL-050-3
FB-B
SL-050-1
SL-049-6
SL-049-AS-1
SL-049-AS-2
SL-049-AS-3
GARAGE
300 WEST STREET
ESTIMATED
DEPTH OF CONTAMINATION
LEGEND
2 FEET
0.5 FEET (SPILLOVER)
4 FEET
4.5 FEET
6.5 FEET
5 FEET
SCALE



LEGEND

● FB-12 BORING LOCATIONS AND DESIGNATIONS

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

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CHECKED
REVIEWED
RECOMMENDED
APPROVED | DATE | DOE PROJECT MANAGER | DATE | DOE PROJECT ENGINEER | DATE

FIGURE 3.1

RADIOLOGICAL SURVEY DATA SL-050

SALT LAKE COUNTY, UTAH
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

NO.	DATE	REVISIONS	DRAWN BY	CHECK BY	APPRVL LOE	APPRVL DH	PROJ ENG	APPRVL DOE
A	5/1984	RAFT REA SUBMITTAL	WBC					

MORRISON KNUDSEN

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. SL-050-027 REV. A

4.0 ENGINEERING ASSESSMENT

Engineering options were formulated and evaluated based on the radiological and engineering assessment for this property. Factors forming the basis of the evaluation were: The extent and location of the contamination, construction costs, and required demolition and constructibility for the various options. Results of the evaluation are detailed below.

4.1 Evaluation of Options

4.1.1 Options

Five options were evaluated for vicinity property SL-050.:

Option 1 - No action should be taken for property SL-050. Since the property has been designated for remedial action by law, this option is not considered as an acceptable alternative.

Option 2 - Purchase the Dairy, including property, structures, equipment and truck fleet. See Figure 4.1, Site Plan, for the layout of the property. Auction all process and mechanical equipment as well as truck fleet. Demolish all existing structures on the property, except the Dairy garage. Excavate and remove all foundation concrete and floor slabs. Remove all asphalt and concrete surfacing in yard areas. Excavate all contaminated soil on the property. Plug and terminate all underground utilities, or remove to property line if contaminated. Fill, compact and grade the entire property with clean backfill, thus restoring the property as a lot with one large garage on the site. Sell the property.

Option 3 - See Figure 4.2 for the conceptual layout of this option. Partially decontaminate the property. This includes exterior decontamination and construction of a new office building at the east end of the existing Dairy garage.

Remove all asphalt and concrete surfacing in yard areas. Excavate all contaminated soil in yard areas. Fill, compact and grade with clean backfill. Replace asphalt and concrete per original limits. Remove 40 feet from the east end of the Dairy garage. Construct a single story concrete block building (40' x 50') for office use adjacent to the Dairy garage. Upgrade existing ventilation systems to reduce radon gas concentrations in the manufacturing building.

This option does not accomplish full compliance with current EPA regulations. There are approximately 18 full time employees working in the Dairy complex. This includes seasonal employment fluctuations, but does not include employed drivers who do not normally work on the premises. Of the 18 employees, 11 work in the manufacturing area, 5 in the office and 2 in the freezer. This option would relocate 5 employees to a decontaminated work area. Eleven employees would continue to work in the manufacturing area at reduced radon gas concentrations. Two employees would continue to work in the existing freezer.

Since only partial contamination is accomplished, this option is not acceptable to the property owner.

Option 4 - Partially decontaminate the property. This option is similar to Option 3, but also includes decontamination of the freezer and storage building. Remove all asphalt and concrete surfacing in yard areas. Excavate all contaminated soil in yard areas. Fill, compact and grade with clean backfill. Replace asphalt and concrete per original limits. Construct a (40' x 50' single story concrete block building for office use at the east end of the existing Dairy garage. Decontaminate the freezer and storage building in two phases, and reverse their positions. Excavate storage area slab and contaminated soil, then replace with insulated/ventilated foundation and slab. Relocate loading dock. Transfer refrigeration equipment to new freezer area and relocate refrigerated conveyor. Excavate original freezer foundation and contaminated soil, then replace with a ventilated concrete slab, thus converting it to a storage area capable of being converted to a freezer in the future. Upgrade existing ventilation systems to reduce radon gas concentrations in the manufacturing building.

This option does not accomplish full compliance with current EPA Regulations. This option would relocate 5 employees to a decontaminated area. The two employees in the freezer would be working in a decontaminated area, also. Eleven employees would continue to work in the manufacturing area at reduced radon gas concentrations.

Since only partial contamination is accomplished, this option is not acceptable to the property owner.

Option 5 - See Figure 4.3 for a conceptual layout of this option. This option provides complete decontamination of the property in stages, while maintaining the property owner in business and on his own property. Remove all asphalt and concrete surfacing in yard areas. Remove the east end of the Dairy garage building. Excavate all contaminated soil in yard areas then fill, compact, grade with clean backfill, and then replace asphalt and concrete. Construct a new two-story concrete block building in the area south of the freezer and storage building. The new building will replace the existing office and manufacturing building. Relocate the office equipment and move the inventory from the storage building into the new storage building. Decontaminate the freezer and storage building in two phases, reversing their positions. Excavate storage area slab and contaminated soil, then replace with insulated/ventilated foundation and slab. Excavate original freezer foundation and contaminated soil, then replace with a ventilated foundation and slab, thus converting it to storage area. Relocate loading dock. Transfer refrigeration equipment to new freezer area. Relocate refrigerated conveyor temporarily. The relocated conveyor will be utilized temporarily until the new manufacturing building is ready for production work. At that time, the conveyor will be removed permanently.

Re-route underground well piping from existing location to new building. Move storage inventory from new building to new storage area. Move manufacturing equipment to new building. Provide additional equipment and materials as required to establish the new facility. Demolish the existing office and manufacturing building. Excavate and remove all foundation concrete and floor slabs. Excavate all contaminated soil, fill, compact, grade with clean backfill and asphalt.

4.1.2 Other Considerations

Consideration was given to the possibility of phased decontamination of the office and manufacturing building. Possible scenarios included room by room excavation and decontamination while shifting and relocating process equipment within the building or within temporary adjacent buildings. These scenarios were abandoned as feasible options. The existing ties between mechanical, electrical, and process equipment including tanks and cooler rooms are such that the manufacturing operation must be considered as a unit, and cannot be shifted as components without significant disruptions to normal business activities.

Consideration was given to the use of an adjacent property for permanent relocation of the Dairy. The Dairy owners identified potential use of the structures on an adjacent property during an interview. These scenarios were not included in this report, because the scope of work represented an expansion of building sizes and was beyond the purpose of this report.

4.1.3 Costs

Estimated costs for the options are detailed in Tables 4.1 thru 4.4. Costs include labor, material, equipment, supplies, excavation, removal, restoration, insurance, subcontractors overhead and profit, and contingency. All costs are listed in 1984 dollars.

The following is a summary of the costs:

Option	Cost
2	5,165,000
3	363,000
4	1,383,000
5	4,926,000

The purchase cost of the Dairy (Option 2) utilizes a rough value of $5 million. This is consistent with the value in a preliminary REA ($4.8 million), as well as the value suggested by the Dairy owners in an interview. An appraisal by the Utah Department of Transportation values the Dairy at approximately $2.6 million. The value of $5 million is used in this report to represent the "worst case" cost. Alternately, if the cost of $2.6 million were used, then the cost of Option 2 may be reduced by the difference between the two valuations.

4.2 Recommendation

The recommended remedial action for this property is Option 5. This option provides complete decontamination of the property in stages, while maintaining the property owner in business and on his own property.

Options 3 and 4 are less costly, although they do not accomplish full compliance with current EPA regulations. Consideration should be given to health effects, potential use of supplemental standards and waivers when evaluating these options.

Option 2 is difficult to evaluate at this time because of the discrepancy between purchase costs as identified by the owner and as appraised by the Utah Department of Transportation. Discussions should commence between DOE and the owners prior to evaluation of the total cost of this option.

TABLE 4.1
OPTION 2 COSTS

Activity	Unit Price	Quantity	Estimated Cost
Interior Office & Manufacturing Building Demolition:			
Reinf Conc Slab	3.00	12,000 sf	$ 36,000
Reinf Conc Ftg	245.00	180 cy	44,100
Conc Block Bldg	1.45	12,000 sf	17,400
Excavation	3.40	2,670 cy	9,078
Interior Freezer & Storage Building Demolition:			
Reinf Conc Slab	3.00	17,700 sf	53,100
Reinf Conc Floor/Ftg	245.00	890 cy	218,050
Conc Block Bldg	1.45	17,700 sf	25,665
Excavation	3.40	2,260 cy	7,684
Removal & Storage of Equipment:			
Interior Buildings	30,974.00	LS	30,974
Site Work - Conveyor	4,309.00	LS	4,309
Site Demolition:			
Excavation	3.40	4,410 cy	14,994
Fence	2.75	150 lf	413
Asphalt	0.20	2,345 sy	469
Concrete Swale	3.00	9,850 sf	29,550
Pipe	2.20	300 lf	660
Restoration:			
Backfill	7.20	10,055 cy	72,396
Concrete Swale	3.50	880 sf	3,080
Seed & Mulch	0.40	11,860 sy	4,744
Total Direct Demolition & Restoration Costs			$572,666
Overhead & Profit (20%)			114,534
		Subtotal	687,200
Business Buy-Out			$5,000,000
Truck Fleet Salvage Value			(757,000)
Land Value			(186,000)
Plant Equipment Value			(440,000)
		Subtotal Costs	4,304,200
		Contingency (20%)	860,800
Total Costs			$5,165,000

TABLE 4.2
OPTION 3 COSTS

Activity	Unit Price	Quantity	Estimated Cost
Interior Dairy Garage			
Building Demolition:			
Metal Framed Bldg (east end)	1.45	2,000 sf	$ 2,900
Reinf Conc Slab	3.00	2,000 sf	6,000
Site Demolition:			
Asphalt	0.20	2,345 sy	469
Concrete Slabs	3.00	9,850 sf	29,550
Excavation	3.40	4,410 cy	14,994
Fence	2.75	150 lf	413
Retain & Protect Utilities	2.20	300 lf	660
New Office Building:			
New Conc Block Bldg	23.80	2,000 sf	47,600
Concrete Slab	3.85	2,000 sf	7,700
Concrete Footing	280.00	30 cy	8,400
Move in Office Equip	1,600.00	LS	1,600
Partition Walls	1.85	1,000 sf	1,850
Electrical	8,788.00	LS	8,788
Mechanical (HVAC)	10,023.00	LS	10,023
Plumbing	15,088.00	LS	15,088
Site Restoration:			
Asphalt	6.00	2,345 sy	14,070
Concrete Slabs	3.85	9,850 sf	37,923
Fence	8.20	150 lf	1,230
Backfill	7.20	3,840 cy	27,648
Structural Backfill	12.40	570 cy	7,068
Upgrading Ventilation System:			
Manufacturing Bldg (HVAC/Elect.)	8,096.00	LS	8,096
Total Direct Costs			$252,070
Overhead & Profit (20%)			50,430
	Subtotal Costs		302,500
	Contingency (20%)		60,500
			$363,000

TABLE 4.3
OPTION 4 COSTS

Activity	Unit Price	Quantity	Estimated Cost
Interior Dairy Garage			
Building Demolition:			
Metal Framed Bldg (east end)	1.45	2,000 sf	$ 2,900
Reinf Conc Slab	3.00	2,000 sf	6,000
Interior Freezer & Storage			
Building Decontamination:			
Excavation	8.30	2,295 cy	19,049
Concrete Slab	3.00	26,450 sf	79,350
Retain & Protect Until	2.20	600 lf	1,320
Remov & Stor Equip/Inv	5,301.00	LS	5,301
Site Demolition & Decontamination:			
Asphalt	0.20	2,345 sy	469
Concrete Slabs	3.00	9,850 sf	29,550
Excavation	3.40	4,410 cy	14,994
Fence	2.75	150 lf	413
Retain & Protect Utilities	2.20	300 lf	660
	Subtotal Demolition		$160,006
Storage & Freezer Restoration:			
Backfill Bldg	7.20	1,965 cy	14,148
Backfill-Dock	26.40	20 cy	528
Structural Backfill	12.40	325 cy	4,030
Ventilated Storage Slab	14.20	8,950 sf	127,090
Freezer Insul/Vent Slab	30.80	8,450 sf	260,260
Concrete Footings-Dock	280.00	50 cy	14,000
Partitions	5,050.00	LS	5,050
Replacing Equip/Inv	7,701.00	LS	7,701
Refrigeration Equip/Mech	118,578.00	LS	118,578
Electrical	51,860.00	LS	51,860
New Office Building:			
New Conc Block Bldg	23.80	2,000 sf	47,600
Concrete Slab	3.85	2,000 sf	7,700
Concrete Footing	280.00	30 cy	8,400
Move in Office Equip	1,600.00	LS	1,600

TABLE 4.3 - Cont'd.
Option 4 Costs

Activity	Unit Price	Quantity	Estimated Cost
Office Building Restoration: (continued)			
Partition Walls	1.85	1,000 sf	1,850
Electrical	8,788.00	LS	8,788
Mechanical (HVAC)	10,023.00	LS	10,023
Plumbing	15,088.00	LS	15,088
Site Restoration:			
Asphalt	6.00	2,345 sy	14,070
Concrete Slabs	3.85	9,850 sf	37,923
Fence	8.20	150 lf	1,230
Backfill	7.20	3,840 cy	27,648
Structural Backfill	12.40	570 cy	7,068
Upgrading Ventilation System:			
Manufacturing Bldg. HVAC/Elect.	8,096.00	LS	8,096
Subtotal Restoration			800,329
Total Direct Costs			$ 960,335
Overhead & Profit (20%			192,065
	Subtotal Costs		1,152,400
	Contingency (20%)		230,600
			$1,383,000

TABLE 4.4
OPTION 5 COSTS

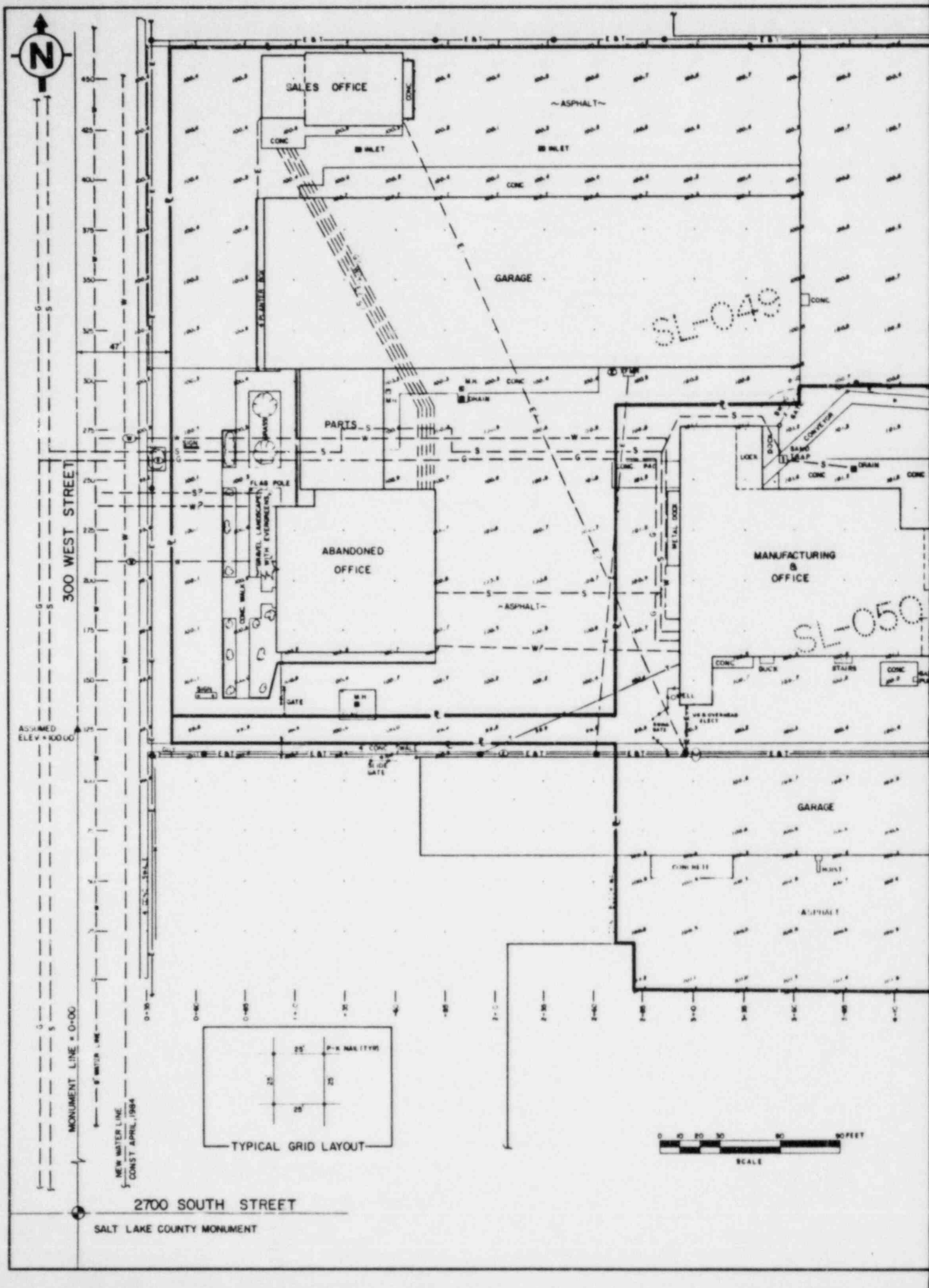
Activity	Unit Price	Quantity	Estimated Cost
Interior Dairy Garage Building Demolition:			
Metal Framed Bldg (east end)	1.45	4,500 sf	$ 6,525
Reinf Conc Slab	3.00	4,500 sf	13,500
Conc Fnd	245.00	60 cy	14,700
Interior Freezer & Storage Building Decontamination:			
Excavation	8.30	2,295 cy	19,049
Concrete Slab	3.00	26,450 sf	79,350
Foundations	245.00	325 cy	79,625
Retain & Protect Until	2.20	600 lf	1,320
Concrete Dock	245.00	50 cy	12,250
Remov & Stor Equip/Inv	5,301.00	LS	5,301
Demolition of Office & Manufacturing Building:			
Concrete Block Bldg	1.45	12,000 sf	17,400
Concrete Slab	3.00	12,000 sf	36,000
Excavation	3.40	2,670 cy	9,078
Concrete Fnds	245.00	180 cy	44,100
Site Demolition and Decontamination:			
Asphalt	0.20	2,345 sy	469
Concrete Slabs	3.00	9,850 sf	29,550
Excavation	3.40	4,410 cy	14,994
Fence	2.75	150 lf	413
Conveyor	2,901.00	LS	2,901
Retain & Protect Utilities	2.20	300 lf	660
		Subtotal Demolition	$387,185

Table 4.4 - Cont'd.
Option 5 Costs

Activity	Unit Price	Quantity	Estimated Cost
Storage & Freezer Restoration:			
Backfill Bldg	7.20	1,965 cy	14,148
Backfill-Dock	26.40	20 cy	528
Structural Backfill	12.40	325 cy	4,030
Ventilated Storage Slab	14.20	8,950 sf	127,090
Freezer Insul/Vent Slab	30.80	8,450 sf	260,260
Concrete Footings-Dock	280.00	50 cy	14,000
Partitions	5,050.00	LS	5,050
Replacing Equip/Inv	7,701.00	LS	7,701
New Office & Manufacturing Building:			
New Conc Block Bldg	23.80	14,450 sf	343,910
Concrete Footings	280.00	180 cy	50,400
Cooler Insu/Vent Slab	30.80	2,550 sf	78,540
CMU Walls	3.20	3,300 sf	10,560
Raised Floor System	13.00	5,100 sf	66,300
Office Partitions	1.85	2,600 sf	4,810
Mezzanine	23.80	4,000 sf	95,200
Electrical -			
Freezer/Storage	46,600.00	LS	46,600
Office	7,320.00	LS	7,320
Main Service	50,612.00	LS	50,612
Motors/Controls/ Cabinets	11,302.00	LS	11,302
Lights/Misc.	30,708.00	LS	30,708
Conduits/Cable	67,574.00	LS	67,574
Salvage	12,090.00	LS	12,090
Mechanical -			
Utilities	38,609.00	LS	38,609
HVAC	21,880.00	LS	21,880
Plumbing	9,286.00	LS	9,286
Freezer/Storage reversal	120,893.00	LS	120,893
Process Equip.	1,243,087.00	LS	1,243,087
Process Piping	188,756.00	LS	188,756
Site Restoration:			
Asphalt	6.00	2,400 sy	14,400
Concrete Slabs	3.85	7,600 sf	29,260
Fence	8.20	150 lf	1,230
Concrete Swale	3.50	880 sf	3,080
Backfill	7.20	6,910 cy	49,752
Structural Backfill	12.40	400 cy	4,960
	Subtotal Restoration		3,033,926

Table 4.4 - Cont'd.
Option 5 Costs

Activity	Unit Price	Quantity	Estimated Cost
Total Direct Costs			$3,421,111
Overhead & Profit (20%)			684,189
		Subtotal Costs	4,105,300
		Contingency (20%)	820,700
			$4,926,000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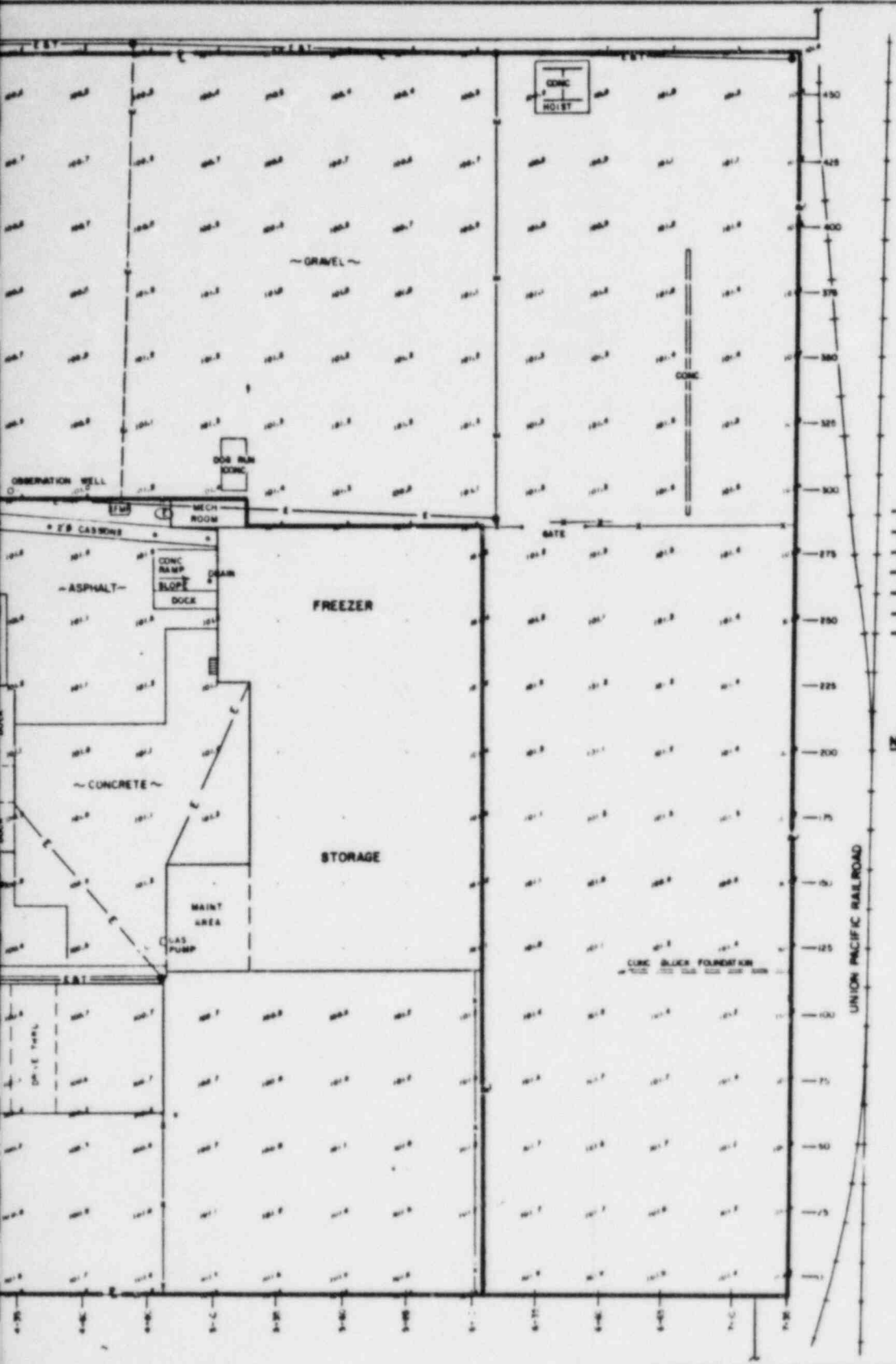

LEGEND

W	WATER LINE
G	GAS LINE
S	SEWER LINE
STM	STORM SEWER
E	ELECTRIC LINE
T	TELEPHONE LINE
℄	PROPERTY LINE
	METER
	VALVE
	PROPERTY CORNER
	POLE

NOTES: OVERHEAD SERVICE DENOTED BY SOLID LINE, UNDERGROUND SERVICE DENOTED BY DASHED LINE.

UTILITIES WITH ? DENOTE MAPPING OF OLD RECORDS OF CONSTRUCTION. THESE MAY BE IN USE, ABANDONED IN PLACE, OR REMOVED.

ELEVATIONS BASED ON ASSUMED DATUM OF ELEV 10000, LOCATED ON GRID AT 0+00, 125 NORTH.

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED
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REVIEWED
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APPROVED DATE DOE PROJECT MANAGER DATE DOE PROJECT ENGINEER DATE

FIGURE 4.1

SITE PLAN SL-050

SALT LAKE COUNTY, UTAH

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

MORRISON KNUDSEN

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. SL-050-035 REV. A

NO.	DATE	REVISIONS	DRAWN BY	CHECKED BY	APPROVED LOE	APPROVED DH	PROJ ENG	APPROVED DOE
A	5/5/88	DRAFT REA SUBMITTAL	TLE					

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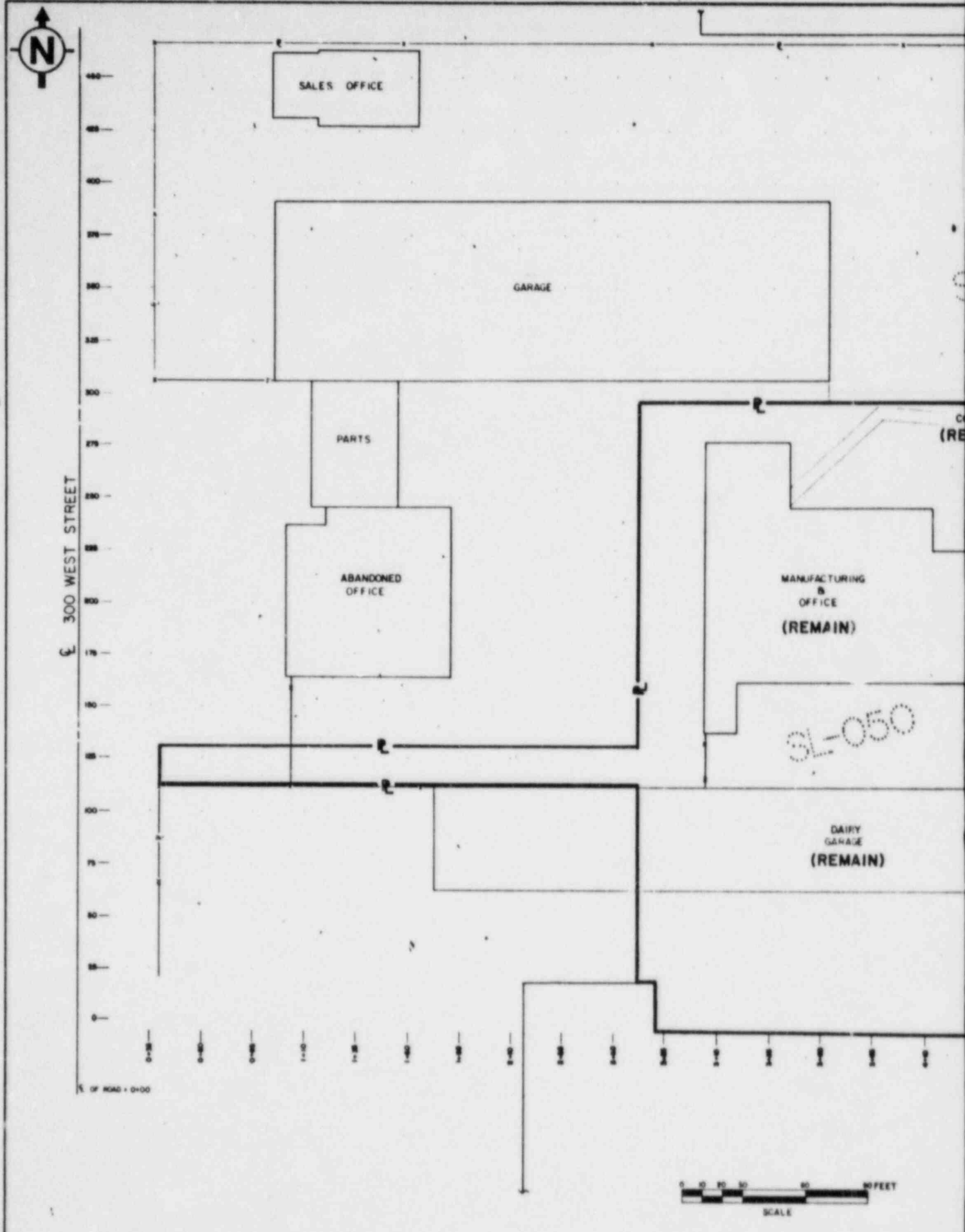
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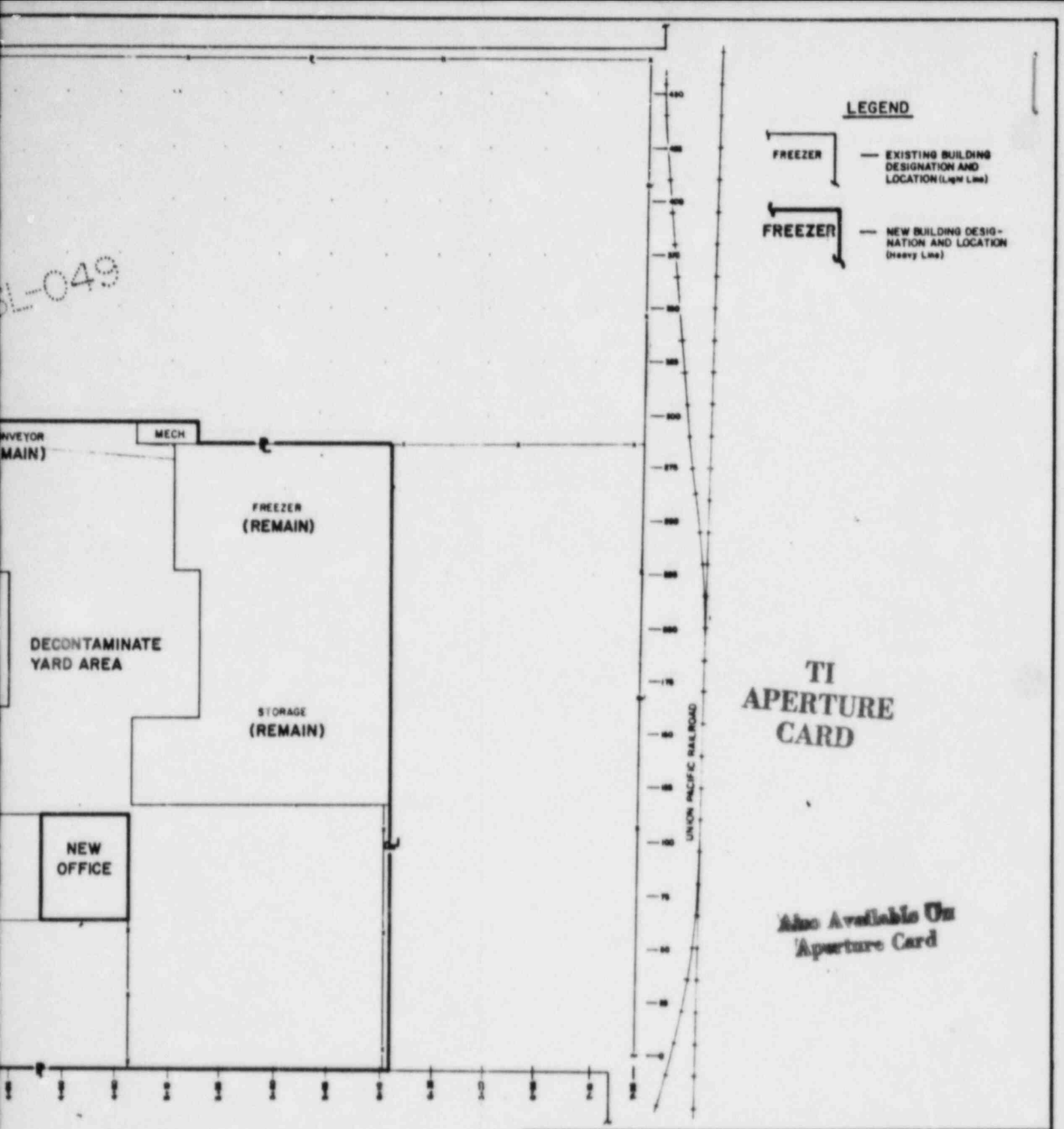


SL-049

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

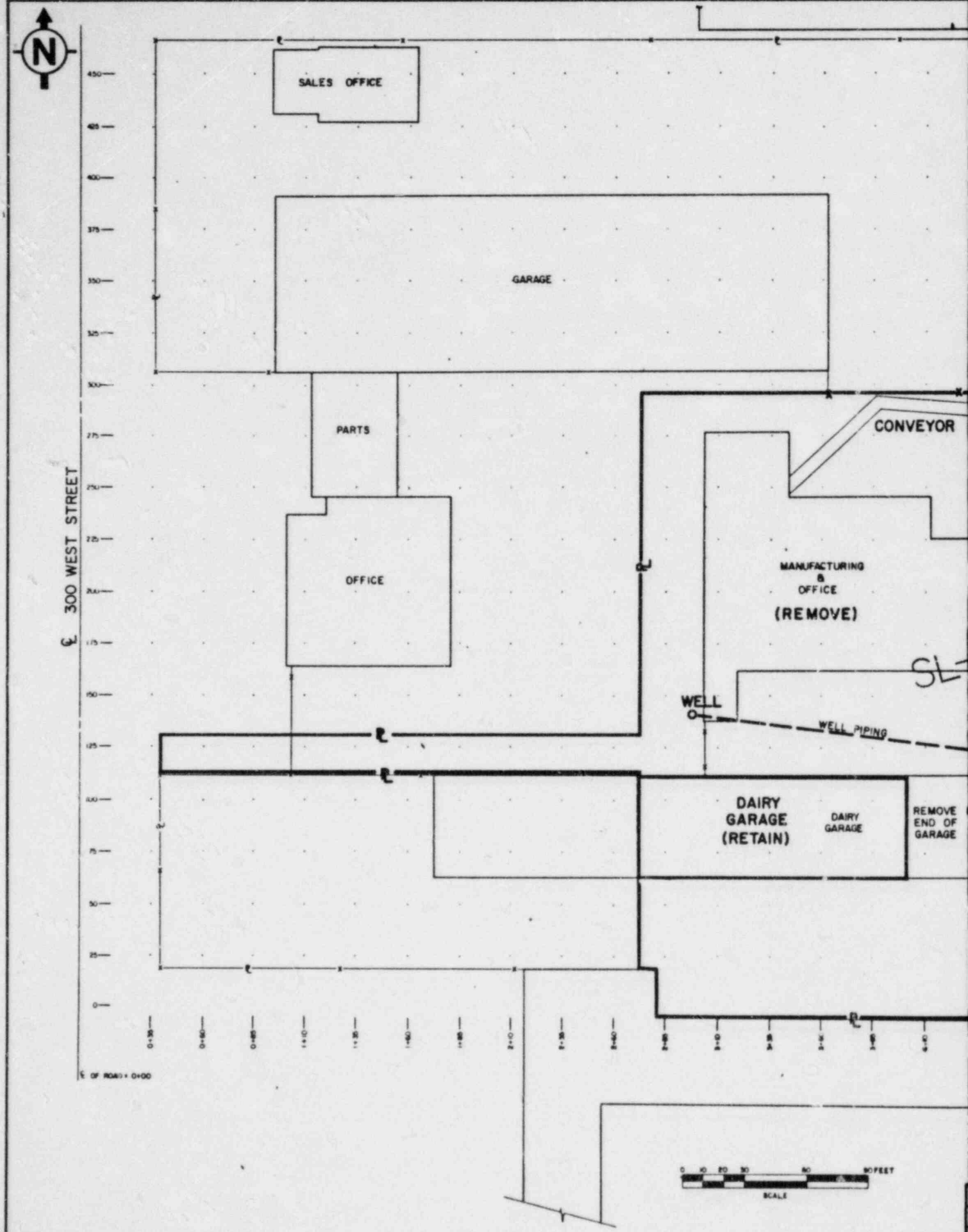
FIGURE 42
OPTION 3 SL-050
SALT LAKE COUNTY, UTAH
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

NO.	DATE	REVISIONS	DRAWN BY	CHECKED BY	ENGINEERING APPROVAL	CONSTRUCTION APPROVAL	PROJECT ENGINEER	QUALITY ASSURANCE APPROVAL
A	7/3/84	DRAFT REA SUBMITTAL	TLE					

APPROVED | DATE | DOE PROJECT MANAGER | DATE | DOE PROJECT ENGINEER | DATE

MORRISON KNUDSEN

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. SL-050-070 REV. A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GARAGE
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END OF
GARAGE
℄ 300 WEST STREET
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
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0+25
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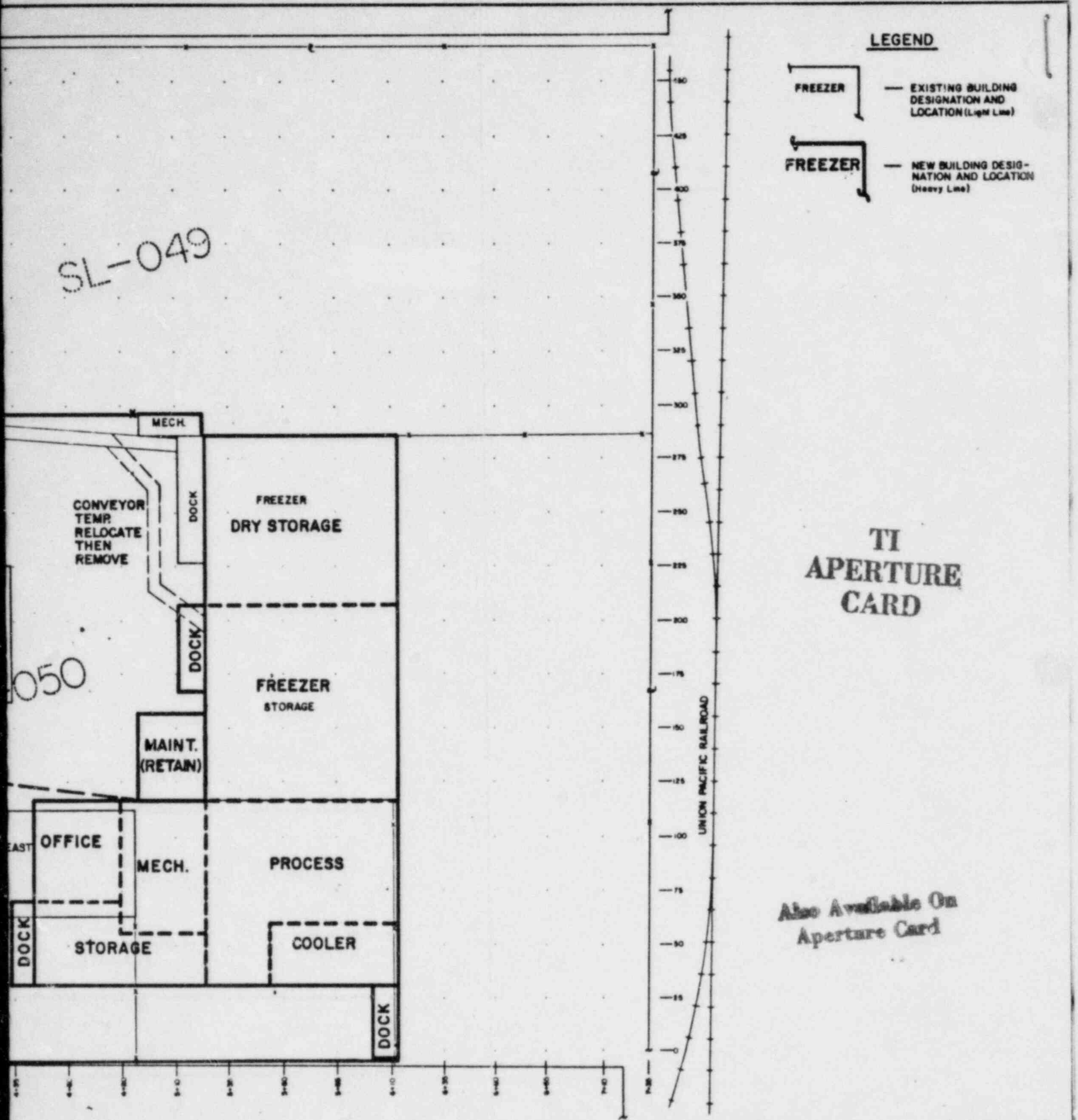


TI APERTURE CARD

Also Available On Aperture Card

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED / DRAWN: TLE	FIGURE 43
CHECKED	OPTION 5 SL-050
REVIEWED	SALT LAKE COUNTY, UTAH
RECOMMENDED	URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT
APPROVED	DATE / DOE PROJECT MANAGER / DATE / DOE PROJECT ENGINEER / DATE

NO.	DATE	REVISIONS	DRAWN BY	CHECK BY	APPROVAL	APPROVAL	APPROVAL	APPROVAL
A	7/3/84	DRAFT REA SUBMITTAL	TLE					

MORRISON KNUDSEN

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. SL-050-075 REV. A

8408200342-07

APPENDIX A

FORD, BACON & DAVIS RADIOLOGICAL SURVEY

CHAPTER 3

RADIOLOGICAL SURVEY

3.1 INTRODUCTION

Several types of radiological data were collected to determine the extent of contamination from uranium mill tailings at the R & W Dairy and White Trucks Properties. Oak Ridge National Laboratory (ORNL) performed most of the measurements,[3] while FBDU performed additional measurements for confirmation of the ORNL results and for further delineation of the extent of contamination. Radiological surveys performed include gamma exposure measurements, soil and air sampling, and borehole gamma loggings. The survey data, summarized results, and estimated extent of contamination are given in this chapter.

3.2 GAMMA EXPOSURE SURVEY

3.2.1 R & W Dairy Co. Property

The Environmental Protection Agency (EPA) has established an Interim Environmental Protection Standard for Uranium Mill Tailings in 40 CFR 192.12 of 20 μR/hr above background (this value applies to interior areas only). In the Salt Lake City area, background external gamma radiation is approximately 8 μR/hr.

The gamma exposure survey performed by ORNL on the R & W Dairy property was based on a 50-ft grid outdoors. Indoors, measurements were taken on various grid sizes. The NaI scintillometers (micro-R meters) utilized for the survey were cross calibrated with a pressurized ion chamber detector. Results of the ORNL outdoor survey are shown in Figure 3-1 and summarized in Table 3-1A. FB&DU conducted a surface and 1 m gamma exposure survey that substantially verified the ORNL results. The FB&DU measurements are shown in Figure 3-2. The gridpoint values at 1 m above the ground ranged from 9 to 110 μR/hr and averaged 28 μR/hr (about 3 times the Salt Lake background). At the ground surface the grid point values ranged from 9 to 200 μR/hr with an average of 41 μR/hr (or approximately 4 to 5 times the Salt Lake background). Results of the ORNL indoor survey at R & W Dairy are shown in Figures 3-3 and 3-4, and summarized in Table 3-1A.

In Building C, gamma exposure measurements are within the EPA Interim Standards value of 20 μR/hr above background in rooms 1, 2, 4 and 7, while all other rooms had various readings above the EPA guideline. Gamma readings obtained at grid points are shown in Figure 3-3. The maximum reading was 100 μR/hr in room 6. This reading was obtained within a grid block and does not appear in Figure 3-3.

In Building D, most gamma exposure measurements were below EPA guidelines as shown in Figure 3-4. The highest reading was 120 μR/hr in the greasepit of the garage section. This reading was obtained within a grid block and does not appear in Figure 3-3. The average waist level reading in Building D was 18 μR/hr.

3.2.2 White Trucks Property

The gamma exposure survey performed by ORNL on the White Truck property was based on a 50-ft grid outdoors. Indoors, measurements were taken at random locations. The NaI scintillometers (micro-R meters) utilized for the survey were cross calibrated with a pressurized ion chamber.

Results of the ORNL outdoor gamma survey are shown in Figure 3-1 and summarized in Table 3-1B. The grid point values at 1 m above the ground surface ranged from 6 to 160 μR/hr and averaged 35 μR/hr. At the ground surface the grid point values ranged from 6 to 180 μR/hr with an average of 44 μR/hr (or approximately 5 to 6 times the Salt Lake City background).

Results of the ORNL indoor gamma survey at the White Truck property are shown in Figures 3-5 and 3-6 and summarized in Table 3-1B. In Building A, the paint shop exhibited 1 m gamma exposure readings of 20 to 50 μR/hr with the average being 31 μR/hr (or approximately 3 to 4 times the Salt Lake City background). The sales office in Building A showed 1 m gamma exposure measurements ranging from 7 to 12 μR/hr and averaging 9 μR/hr. Although these are relatively low readings, the sales office is expected to overlie the zone of contamination. The low readings can be explained by the 1 m difference in elevation between the raised office floor and the outside ground. In Building B, the service garage had 1 m gamma exposure readings ranging from 7 to 47 μR/hr and averaging 20 μR/hr. The parts room of this building ranged from 9 to 16 μR/hr with an average of 12 μR/hr. The main office complex averaged 10 μR/hr at the floor surface. Elevated gamma readings imply that both Buildings A & B overlie the zone of contamination.

FR&DU also obtained "delta" measurements outdoors at the R & W Dairy and White Trucks properties. A NaI(Tl) scintillometer was positioned with it unshielded and toward the ground. Two readings were obtained, with and without a 0.5-in.-thick lead shield interposed between the detector and the ground. The difference between the two sets of readings, called "delta", is also displayed in Figure 3-7. The relative values of the delta measurements are of utility in establishing the lateral extent of contamination in the basement area.

3.3 BOREHOLE SURVEY

3.3.1 R & W Dairy Co. Property

On the R & W Dairy property, ORNL augered and sampled 3

boreholes, while FB&DU augered 10 boreholes. All borehole locations are shown on Figure 3-8, and the borehole sample data are listed in Tables 3-2A and 3-2B. Results from the 13 boreholes indicate that contamination exists to an average depth of 4 ft outdoors. In Building C, where three boreholes were augered, only one hole was able to penetrate down 6.5 ft to the bottom of the contaminated zone. The extra depth of contamination is accounted for by the fact that Building C is elevated approximately 2.5 ft above the surrounding ground level. In Building D, only 2 boreholes could be augered and only in the south section of the building, due to a permaseal frost lining underneath the freezer section. The two holes augered in Building D indicate contamination down to a depth of 4.5 ft.

3.3.2 White Trucks Property

On the White Trucks property, ORNL and FB&DU each augered 13 boreholes. All borehole locations are shown on Figure 3-8, and the borehole sample data are listed in Tables 3-3A and 3-3B. Of the 25 boreholes augered outdoors, the depth of contamination varies from less than 2 ft to 4.5 ft with an average being about 4 ft. In Building A, one borehole was augered in the paint shop area, which exhibited contamination to a depth of 4.5 ft. No boreholes were augered in the sales office section due to the 4-ft space under the floor. In Building B, 3 boreholes were augered in the service garage area, which averaged 4 ft in depth to the bottom of the contamination layer. So as not to interrupt ongoing business, boreholes were not augered in the office area of Building B.

3.4 RADON/RADON DAUGHTER CONCENTRATIONS

3.4.1 R & W Dairy Co. Property

In Building C, all radon daughter concentrations were above EPA guidelines, as seen in Table 3-4A. Five instantaneous radon measurements ranging from 14 to 36 pCi/l, were made by ORNL. Continuous radon measurements were made using Wrenn Chambers in Building C, which exhibited daily averages ranging from 4 to 40 pCi/l. Integrated measurements made by ORNL using a PERM closely agreed with the Wrenn Chamber results.

Radon daughter concentrations were made at five locations in Building C. The geometric mean of these measurements exceeded the 0.015 WL guideline as seen in Table 3-4A. The average of the 5 measurements was 0.08 working levels (WL).

3.4.2 White Trucks Property

The results of ONRL radon and radon daughter measurements are summarized in Table 3-4B. In Building A, instantaneous samples, continuous monitors (Wrenn Chambers), and integrating monitors (PERMs) were used to measure radon.

Radon daughter measurements ranged from 0.32 to 0.42 WL, which is much greater than the EPA Interim Standard of 0.015 WL. The measurements in Building A in the sales office area were all taken during the winter months. Decreased ventilation during the winter could contribute greatly to the radon and radon daughter concentrations and therefore the summer months are expected to show much lower concentrations. In Building B, all radon measurements were below 3 pCi/l, and the single radon progeny measurement taken within the service garage was below the EPA limit of 0.015 WL. The fact that the airborne concentrations of radon and radon daughters were within guidelines should not be interpreted to mean that Building B is not contaminated--it probably reflects more effective ventilation within the building.

3.5 EXTENT OF CONTAMINATION

3.5.1 R & W Dairy Co. Property

On the R & W Dairy property, contamination outdoors covers the full extent of the property as shown in figure 3-8 and averages approximately 4 ft in depth. In Building C, where the floor level is about 2.5 ft higher than the ground level outside, the contamination is believed to extend down to about 6.5 ft in depth from the floor surface throughout the whole building. Although Building D is at ground level, contamination extends down to 4 ft.

Although not confirmed, there is probably some contamination existing underneath foundation footings. This is based on previous experience at one other location where uranium mill tailings were used as backfill prior to excavation for footings. Whether or not complete decontamination of the footings is warranted (which would require underpinning) depends on the extent of contamination.

3.5.2 White Trucks Property

As seen in Figure 3-8, the entire property owned by White Trucks is considered to be contaminated. Outdoors, contamination varies from less than 2 ft deep to as deep as 4.5 ft on the northeast border of the property, averaging approximately 4 ft. In Building A, the depth of contamination under the paint shop section is 4.5 ft. However, this estimate was based on only one borehole. In Building B, based on 3 boreholes, the average depth of contamination was 4 ft under the service area floor. The main office complex and the parts room are raised about 2.5 ft higher than ground level. This additional 2.5 ft plus the approximately 2 ft in depth under the ground level yields a the total depth of contamination under the parts room and main office complex of about 6.5 ft depth. Also, the foundations surrounding the buildings may be contaminated down to the footings due to backfilling at the time of construction.

TABLE 3-1A

EXTERNAL GAMMA EXPOSURE MEASUREMENTS AT THE R&W DAIRY PROPERTY

Survey Technique	Location	Number of Measurements	Range of Values (μR/hr)	Geometric Mean and Standard Deviation $\bar{X}_g$:S_g
External Gamma Exposure Rate at 1 m Above Surface (μR/hr)	Outdoor Grid	24	9-110	21:2
	Building C	188	5-62	11:2
	Building D	56	7-36	16:2
External Gamma Exposure Rate at the Surface (μR/hr)	Outdoor Grid	24	9-200	27:2
	Building C	186	4-70	11:2
	Building D	55	8-44	17:2
Maximum External Gamma Exposure Measurement at the Surface (μR/hr)	Outdoor Grid	21	60-400	150:2
	Building C	81	7-100	19:2
	Building D	17	16-120	30:2

TABLE 3-1B

ORNL EXTERNAL GAMMA EXPOSURE
MEASUREMENTS AT THE WHITE TRUCK PROPERTY

Survey Technique	Location	Number of Measurements	Range of Values	Standard Deviation $\overline{X}_g$:S_g
External Gamma Exposure Rate at 1 m Above Surface (μR/hr)	Outdoor Grid Points	117	6-160	25:2.3
	Bldg A	20	7-50	8.6:1.1
	Bldg B	139	7-47	19:1.5
External Gamma Exposure Rate at the Surface (μR/hr)	Outdoor Grid Points	117	6-180	29:2.5
	Bldg A	20	7-54	8.2:1.2
	Bldg B	134	8-59	21:1.6
Maximum External Gamma Exposure Measurement at the Surface Within Grid Blocks (μR/hr)	Outdoor Grid Blocks	87	10-400	95:2.4
	Bldg A	8	40-160	63:1.6
	Bldg B	97	8.8-120	33:1.6

TABLE 3-2A

FB&DU BOREHOLE GAMMA LOGGING RESULTS
AT THE R & W DAIRY CO. PROPERTY

Borehole Designation[a]	Depth (ft)	Gamma Log (cpm)
FB-C	0	4850
	1	39300
	2	19300
	3	4260
	3.5	3284
	4	
FB-D	0	4560
	1	25500
	2	40200
	3	4100
	4	1650
	4.5	1610
	5	
FB-E	0	4260
	1	18900
	2	13300
	3	170000
	4	3610
	4.5	2820
	5	
FB-F	0	5210
	1	20400
	2	125000
	3	22900
	4	3810
	4.5	2720
FB-L	0	12600
	1	97600
	2	30700
	3	3620
	4	2580
FB-M	0	2720
	1	4460
	2	1310
	3	1270
	4	1390

TABLE 3-2A (Cont)

Borehole Designation[a]	Depth (ft)	Gamma Log (cpm)
FB-N	0	600
	1	672
	2	782
	3	1140
	4	1260
	5	1200
FB-CA	0	10300
	1	51600
	2	54100
	Asphalt	
FB-CB	0	
	1	Uncompacted
	2	
	3	
	4	
	5	
FB-CC	0	1350
	1	3480
	2	14500
	3	22700
	4	112000
	5	16200
	6	3090
	7	2530
FB-DA	0	17800
	1	28900
	2	129000
	3	15000
	4	3260
	4.5	3610
FB-DB	0	4730
	1	8220
	2	26500
	3	137000
	4	10400
	4.5	5330
	5	

[a]Borehole locations shown in Figure 3-8.

TABLE 3-2B

ORNL BOREHOLE SOIL SAMPLING RESULTS
AT THE R & W DAIRY CO. PROPERTY

Borehole Designation[a]	Depth (ft)	Ra-226 Concentration (pCi/g)
OR-6	0	63
	0.9 - 1.5	450
	46 - 53	47
OR-7	0	3.4
	0.7	16
	1.4	5.4
OR-8	0	220
	2.1	330
	2.3 - 2.6	89
OR-9	0	21
	1.1 - 1.9	470
	1.9 - 2.2	58
OR-11	0	160
	1.0	210
OR-17	0.3 - 0.5	110
	2.5	400
	3.2 - 3.3	17

[a]Borehole locations shown in Figure 3-8.

TABLE 3-3A

FB&DU BOREHOLE GAMMA LOGGING RESULTS
AT THE WHITE TRUCKS PROPERTY

Borehole Designation[a]	Depth (ft)	Gamma Log (cpm)
FB-A	0	
	1	8120
	2	98200
	3	55700
	4	5670
	4.5	4820
	5	3920
FB-B	0	
	1	4100
	2	3720
	3	1980
	4	1280
	4.5	1070
	5	1110
FB-G	0	
	1	6130
	2	35100
	3	148000
	4	13900
	5	2650
		3240
FB-H	0	3860
	1	42700
	2	94700
	3	9280
	4	2540
	5	2290
FB-I	0	
	1	7590
	2	62100
	3	26400
	3.5	4030
	4	3900
FB-J	0	16100
	1	129000
	2	49000

TABLE 3-3A (Cont)

Borehole Designation[a]	Depth (ft)	Gamma Log (cpm)
	3	5290
	4	3890
	5	1800
FB-K	0	8240
	1	72400
	2	48200
	3	6250
	4	2110
	5	1800
FB-L	0	
	1	12600
	2	97600
	3	30700
	4	3620
		2580
FB-M	0	2720
	1	4400
	2	1310
	3	1270
	4	1390
FB-N	0	600
	1	672
	2	782
	3	1140
	4	1260
	5	1200
FB-AA	0	8080
	1	14400
	2	138000
	3	57200
	4	4930
	5	3240
FB-BA	0	5260
	1	28600
	2	71800
	3	62900
	4	7230
	5	

TABLE 3-3A (Cont)

Borehole Designation[a]	Depth (ft)	Gamma Log (cpm)
FB-BB	0	5430
	1	20600
	2	92600
	3	37500
	4	3840
	5	2470
FB-BC	0	
	1	5680
	2	34700
	3	75600
	4	7510
	5	3160

[a]Borehole locations shown in Figure 3-8.

TABLE 3-3B

ORNL BOREHOLE SOIL SAMPLING RESULTS
AT THE WHITE TRUCKS PROPERTY

Borehole Designation[a]	Depth (ft)	Ra-226 Concentration (pCi/g)
OR-1	0	19
	1.8	370
	2.5	59
OR-2	0	64
	1.4	400
	2.8	74
OR-3	0	1.6
	1.4	400
	1.8 - 2.2	4.5
OR-4	0	16
	1.2	490
	1.4 - 2.2	23
OR-5	0	18
	1.3 - 1.8	400
	1.8 - 2.2	6.0
OR-10	0	130
	0.75	97
OR-12	0.16 - 0.33	440
	1.5	480
	3.2 - 3.3	41
OR-13	0.16 - 0.33	4.5
	1.5	22
OR-14	0.16 - 0.33	66
	1.5	390
	3.3 - 3.5	3.0
OR-15	0.16 - 0.33	81
	2.0	380
	3.1 - 3.3	11

TABLE 3-3B (Cont)

Borehole Designation[a]	Depth (ft)	Ra-226 Concentration (pCi/g)
OR-16	0.16 - 0.33	41
	2.5	430
	3.4 - 3.6	8.3

[a]Borehole locations shown in Figure 3-8.

TABLE 3-4A

ORNL RADON AND RADON DAUGHTER CONCENTRATION MEASUREMENTS AT THE R & W DAIRY CO. PROPERTY

Survey Technique	Location	Number of Measurements	Range (pCi/l)	Geometric Mean and Standard Deviation (pCi/l)
Instantaneous Radon Concentration (pCi/l)	Bldg C	5	14-36	26:1.5
	Bldg D (freezer & office)	3	13-29	18:1.5
	(warehouse)	2	1.8-3.7	2.6:1.7
Continuous Radon Concentration (pCi/l)	Bldg C, Room 5			
	Dec. 1980	45	7.6-23	13:1.3
	Jan. 1981	171	3.7-19	12:1.4
	Bldg C, Hallway B			
	Dec. 1980	45	6.4-25	13:1.4
	Jan. 1981	171	4.4-40	15:1.3
			(WL)	(WL)
Radon Daughter Concentration (WL)	Bldg C	5	0.055-0.1	0.080:--
	Bldg D (freezer & office)	2	0.011-0.072	0.028:--
	(warehouse)	1	0.011	

TABLE 3-4B

ORNL RADON AND RADON DAUGHTER CONCENTRATION MEASUREMENTS AT THE WHITE TRUCKS PROPERTY

Measurement Type	Location	Number of Measurements	Range (pCi/l)	Arithmetic Mean (pCi/l)
Instantaneous Radon Concentration (pCi/l)	Bldg A - Sales Office (Rm 1)	1		45
	Bldg B- Service Garage	3	1.3-2.5	2.0
	Bldg B - Main Office	2	1.6-2.7	2.2
Continuous Radon Concentration (pCi/l)	Bldg A- Sales Office (Rm 1)	28 (Dec 1980)	45-95	
	Sales Office (Rm 3)	28 (Dec 1980) 170 (Jan 1981)	50-100 17-130	84 76
			(WL)	(WL)
Radon Daughter Concentration (WL)	Bldg A - Sales Office (Rm 1)	3	0.32-0.39	0.36
	Sales Office (Rm 3)	2	0.39-0.42	0.41
	Bldg B - Service Garage	1		0.01

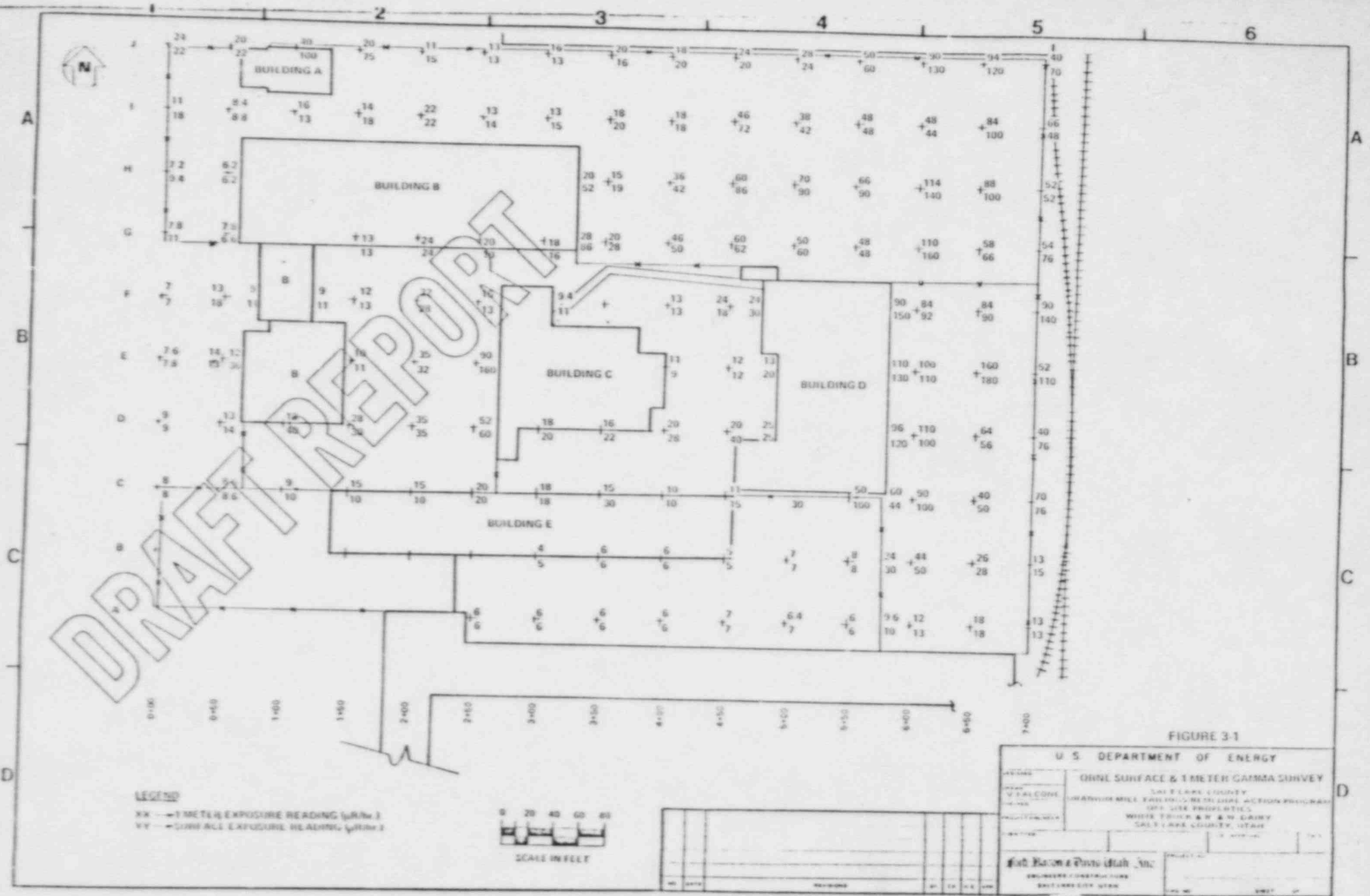

BUILDING A
BUILDING B
BUILDING C
BUILDING D
BUILDING E
DRAFT REPORT
LEGEND
XX — 1 METER EXPOSURE READING (μR/hr.)
YY — SURFACE EXPOSURE READING (μR/hr.)
SCALE IN FEET
U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO
SALT LAKE COUNTY
GRAND JUNCTION REMEDIAL ACTION PROGRAM
OFF-SITE PROPERTIES
WHITE TOWER & K & N DAIRY
SALT LAKE COUNTY, UTAH

FIGURE 3-1

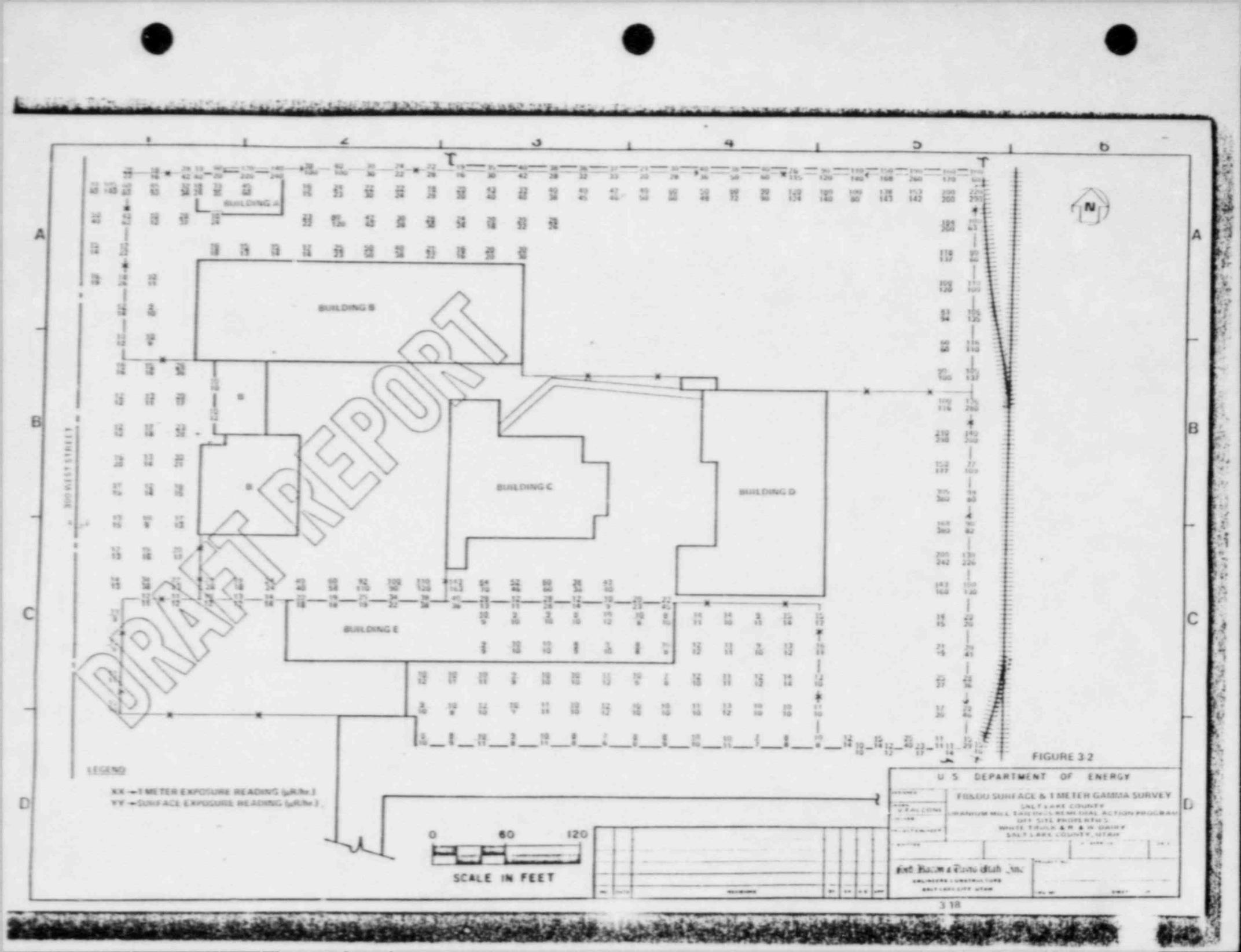

BUILDING A
BUILDING B
BUILDING C
BUILDING D
BUILDING E
300 WEST STREET
N
DRAFT REPORT
LEGEND
XX — 1 METER EXPOSURE READING (μR/hr.)
YY — SURFACE EXPOSURE READING (μR/hr.)
0
60
120
SCALE IN FEET
U S DEPARTMENT OF ENERGY
FRHDU SURFACE & 1 METER GAMMA SURVEY
SALT LAKE COUNTY
URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM
OFF SITE RESIDENCES
WHITE TRUCK & R & W DAIRY
SALT LAKE COUNTY, UTAH

FIGURE 3.2

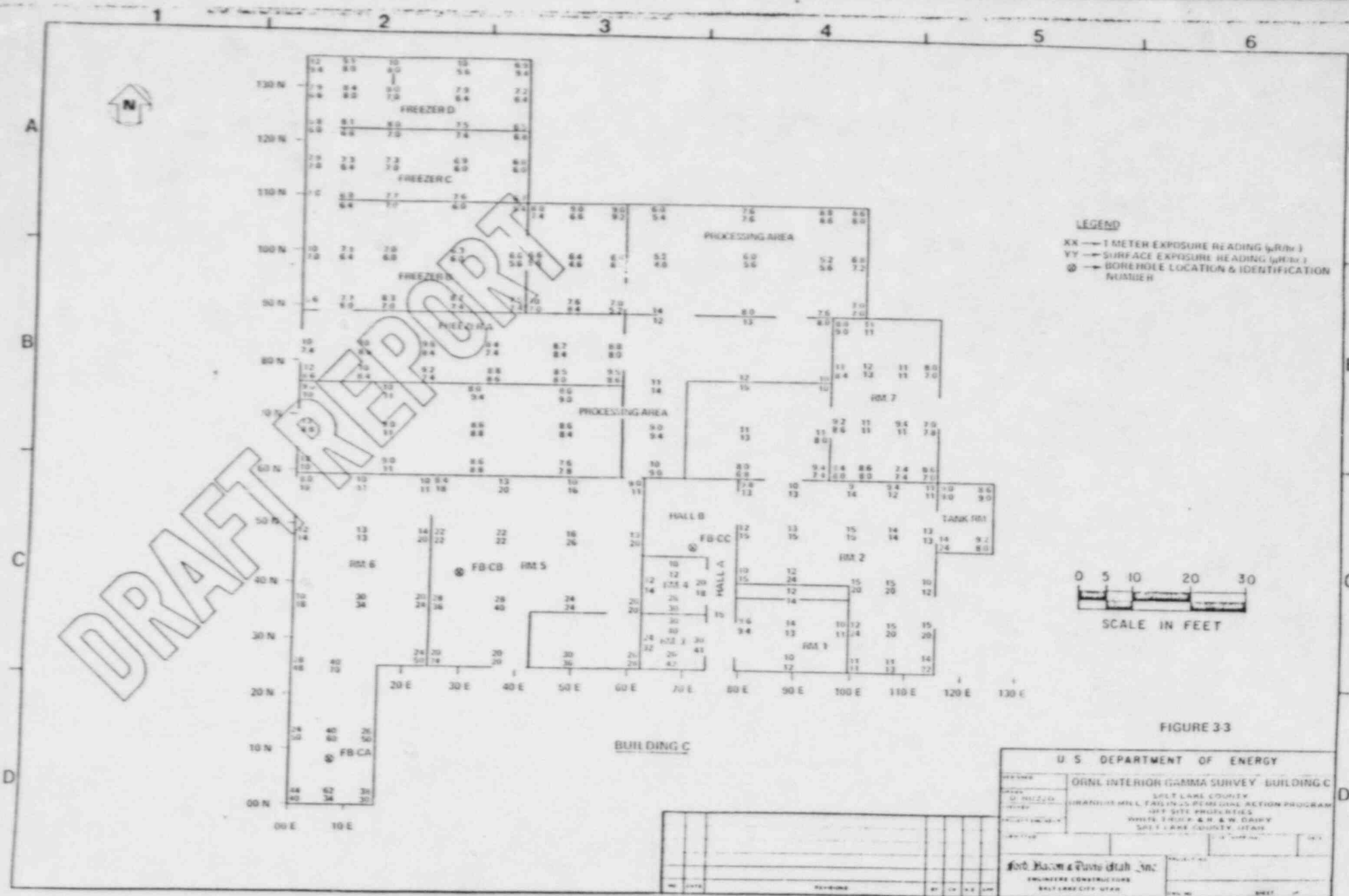

DRAFT REPORT
FREEZER D
FREEZER C
FREEZER B
FREEZER A
PROCESSING AREA
PROCESSING AREA
RM 7
RM 6
RM 5
RM 2
RM 1
HALL B
HALL A
TANK RM
FB-CA
FB-CB
FB-CC
LEGEND
XX — 1 METER EXPOSURE READING (μR/hr)
YY — SURFACE EXPOSURE READING (μR/hr)
Ø — BOREHOLE LOCATION & IDENTIFICATION NUMBER
0 5 10 20 30
SCALE IN FEET
BUILDING C
U.S. DEPARTMENT OF ENERGY
ORNL INTERIOR GAMMA SURVEY BUILDING C
SALT LAKE COUNTY
GRANDVIEW HILL FAIRLANES REMEDIAL ACTION PROGRAM
OFF SITE PROPERTIES
WHITE TRUCK & R & W DAIRY
SALT LAKE COUNTY, UTAH

FIGURE 3-3

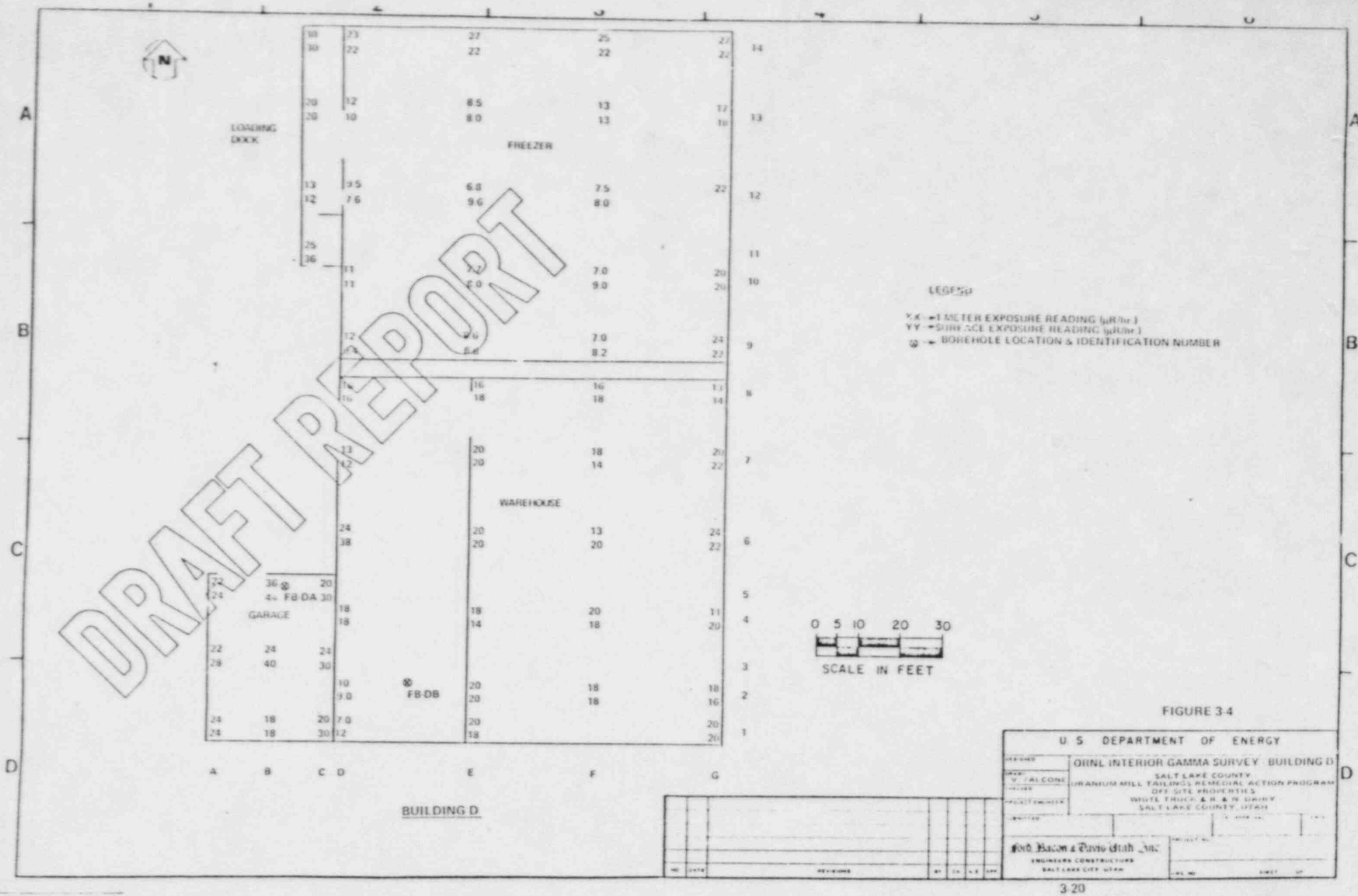


FIGURE 3-4

U. S. DEPARTMENT OF ENERGY

ORNL INTERIOR GAMMA SURVEY - BUILDING D
SALT LAKE COUNTY
URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM
OFF SITE PROPERTIES
WHITE TRUCK & R & N DAIRY
SALT LAKE COUNTY, UTAH

V. FALCONE

Ford, Bacon & Davis Utah Inc.
ENGINEERS CONSTRUCTORS
SALT LAKE CITY, UTAH

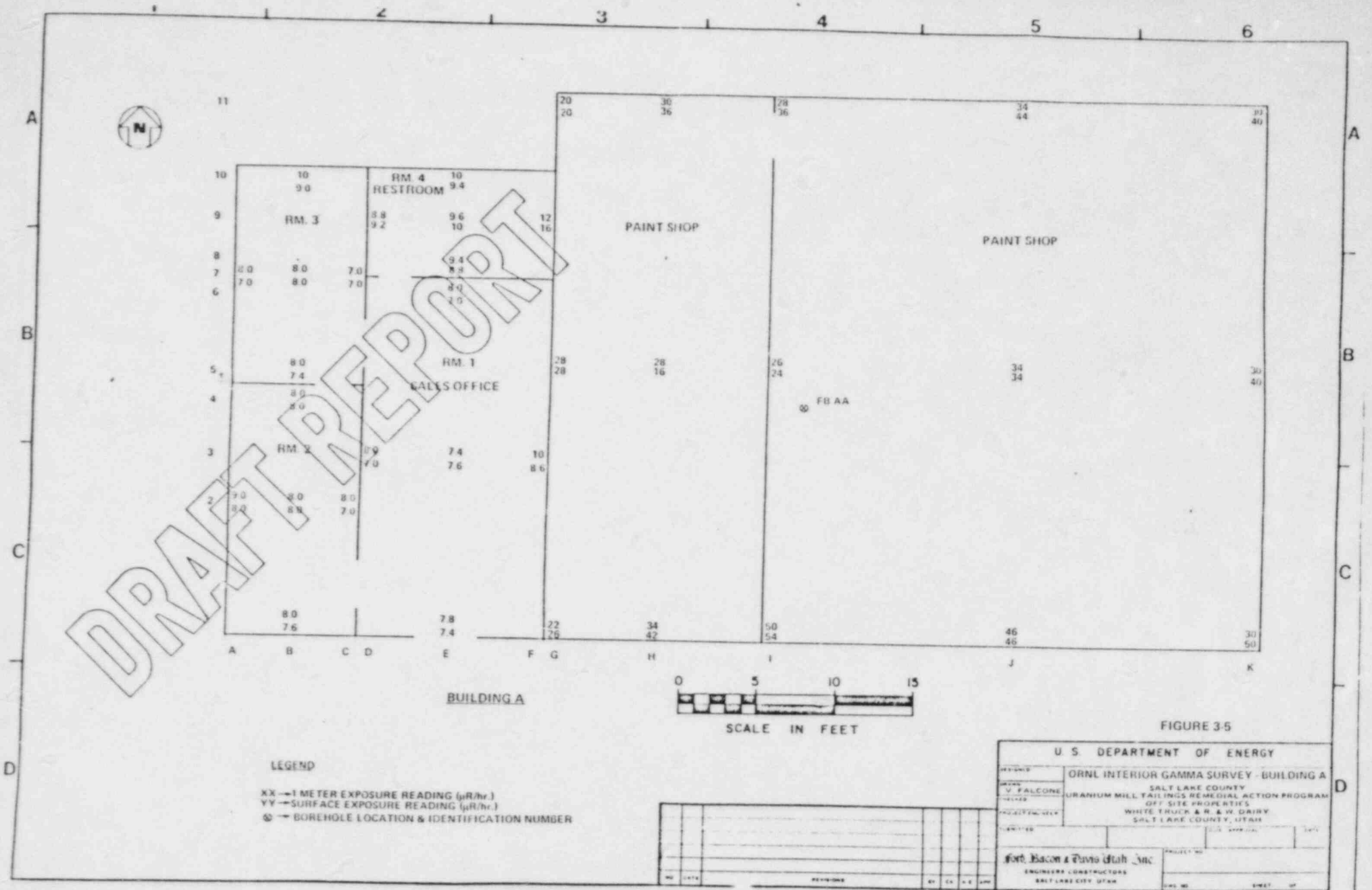

RM. 4
RESTROOM
RM. 3
RM. 1
SALES OFFICE
RM. 2
PAINT SHOP
PAINT SHOP
FB AA
DRAFT REPORT
BUILDING A
0 5 10 15
SCALE IN FEET
LEGEND
XX → 1 METER EXPOSURE READING (μR/hr.)
YY → SURFACE EXPOSURE READING (μR/hr.)
⊗ → BOREHOLE LOCATION & IDENTIFICATION NUMBER
U. S. DEPARTMENT OF ENERGY
ORNL INTERIOR GAMMA SURVEY - BUILDING A
SALT LAKE COUNTY
URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM
OFF SITE PROPERTIES
WHITE TRUCK & R. & W. DAIRY
SALT LAKE COUNTY, UTAH
V. FALCONE
Ford, Bacon & Davis Utah Inc
ENGINEERS CONSTRUCTORS
SALT LAKE CITY, UTAH

FIGURE 3-5

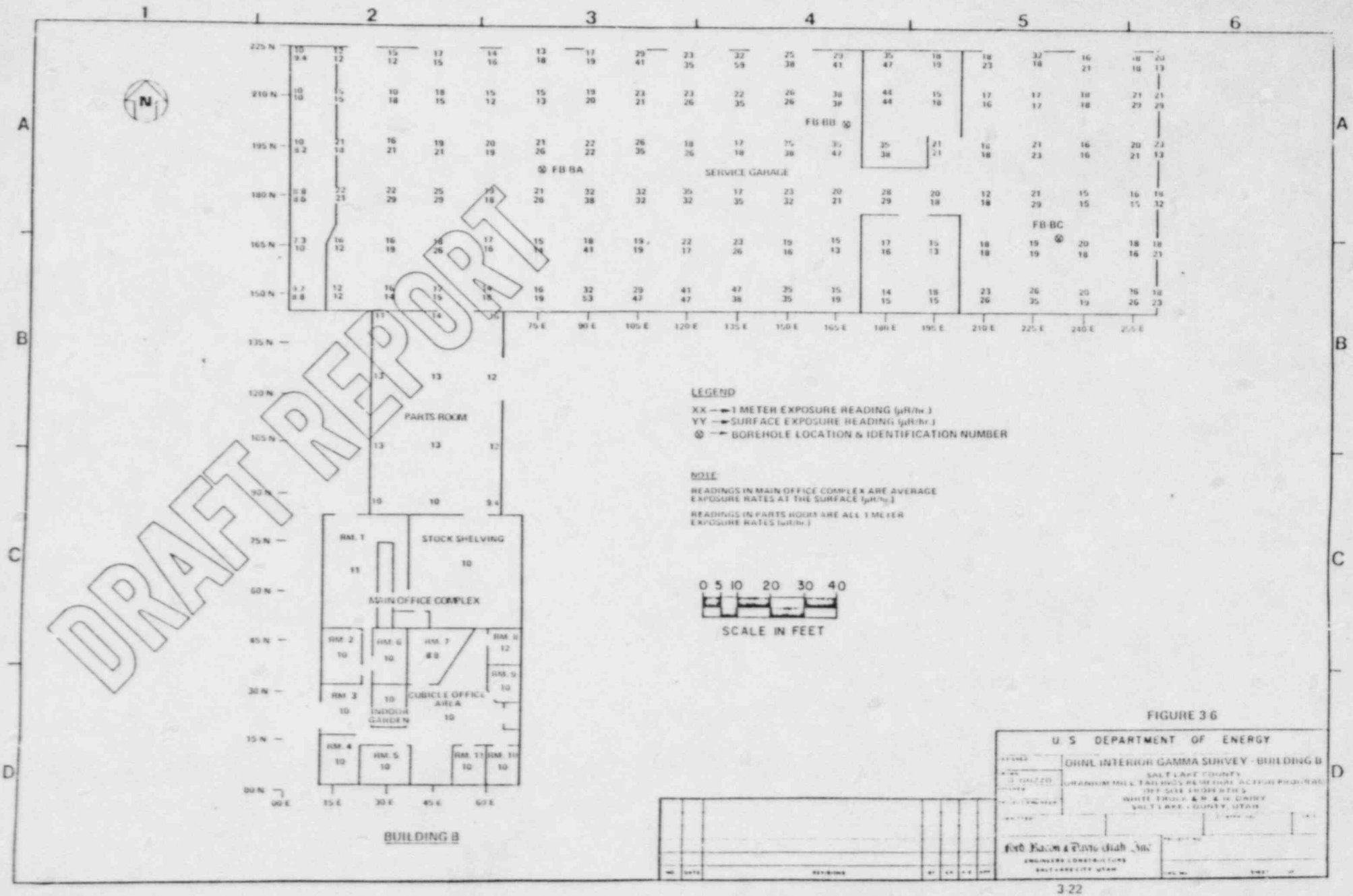


FIGURE 3.6

U S DEPARTMENT OF ENERGY

ORNL INTERIOR GAMMA SURVEY - BUILDING B

SALT LAKE COUNTY

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

VITRO SITE (VICINITY)

WHITE MESA & MILL SITE

SALT LAKE COUNTY, UTAH

Ford Bacon & Davis Utah Inc

ENGINEERS CONSTRUCTORS

SALT LAKE CITY UTAH

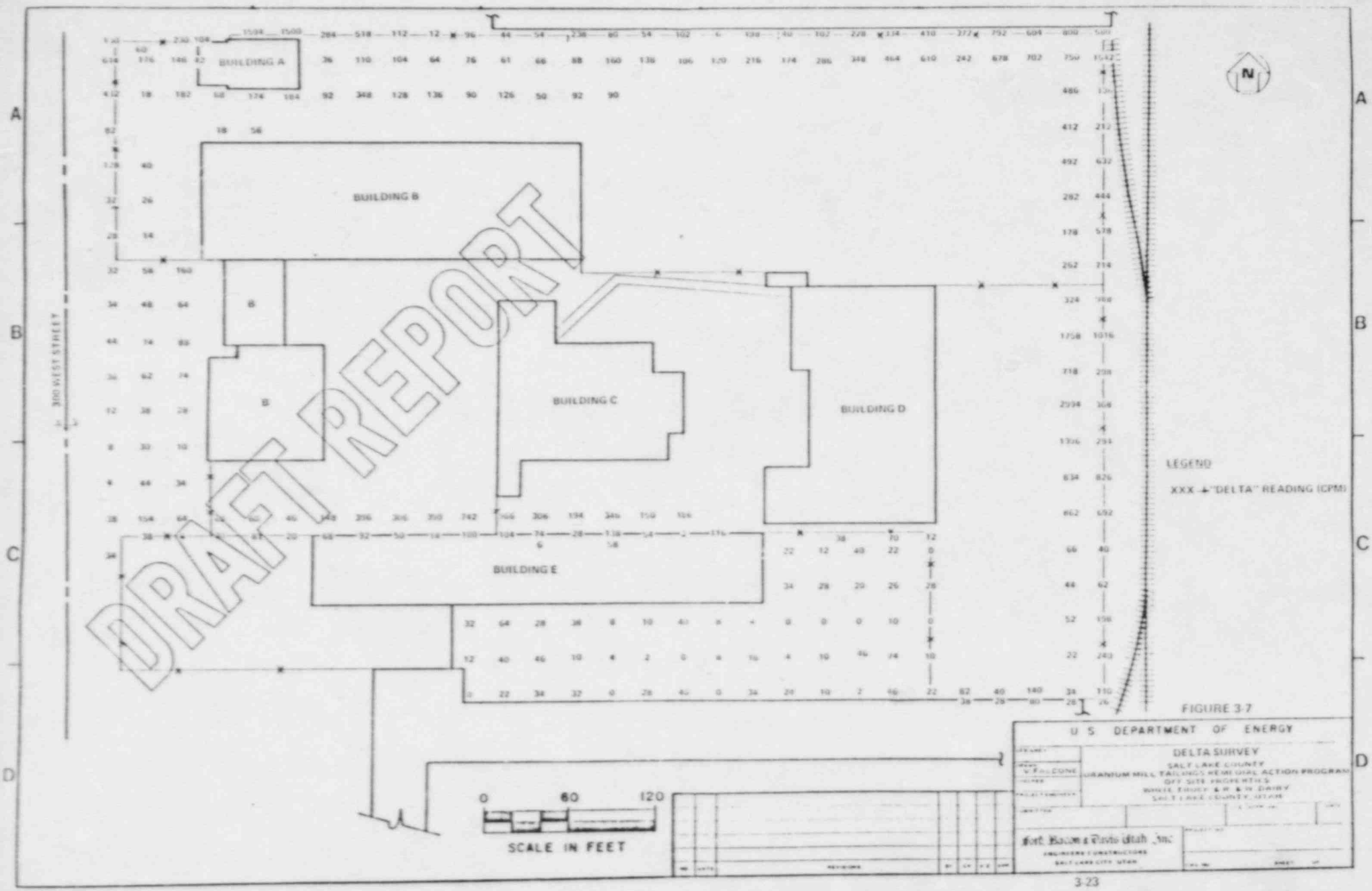

BUILDING A
BUILDING B
BUILDING C
BUILDING D
BUILDING E
300 WEST STREET
LEGEND
XXX = "DELTA" READING (CPM)
N
0
60
120
SCALE IN FEET
DRAFT REPORT
U S DEPARTMENT OF ENERGY
DELTA SURVEY
SALT LAKE COUNTY
URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM
OFF SITE PROPERTIES
SALT LAKE COUNTY, UTAH

FIGURE 3-7

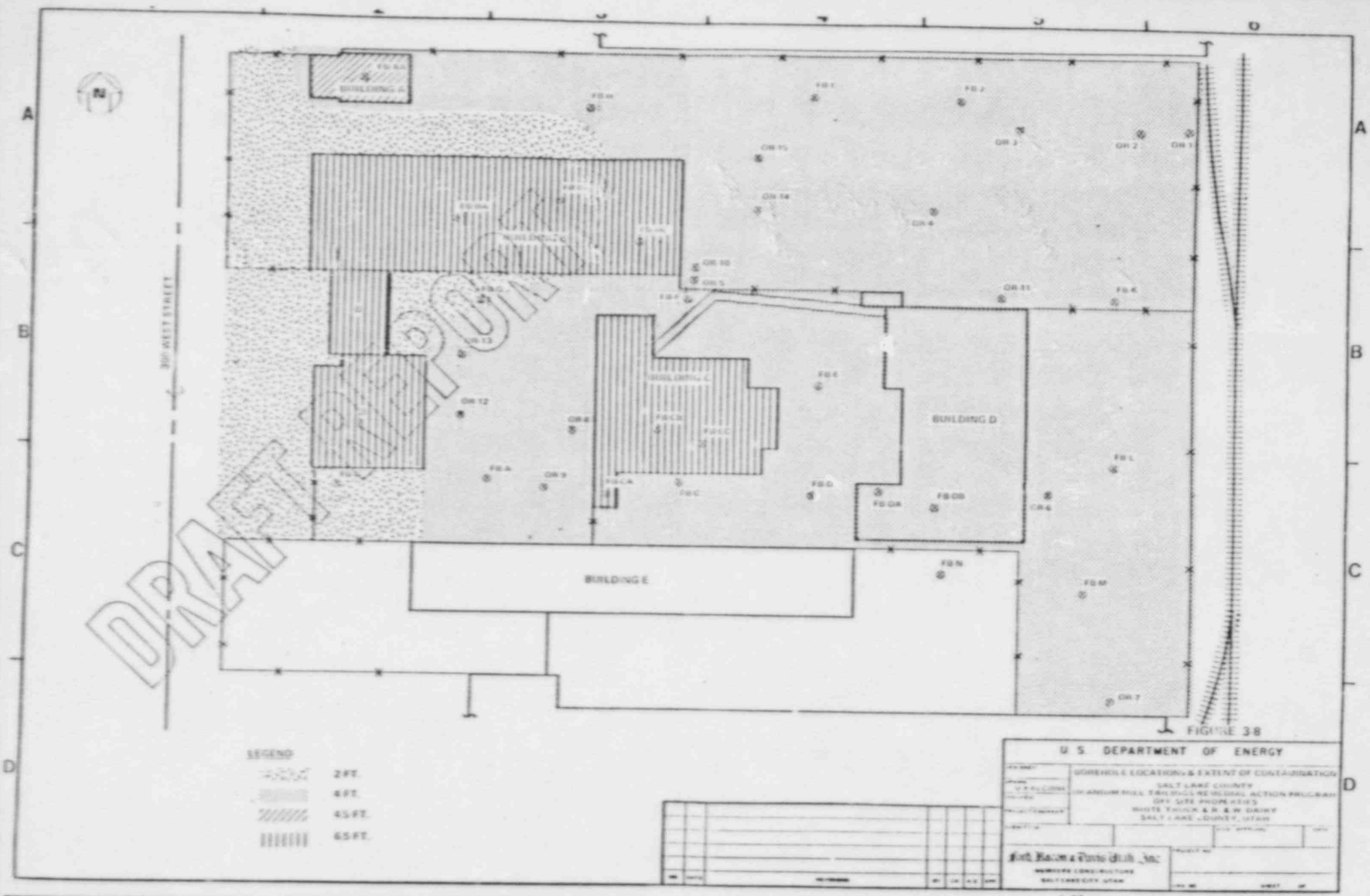


FIGURE 38

U. S. DEPARTMENT OF ENERGY

BOREHOLE LOCATIONS & EXTENT OF CONTAMINATION
SALT LAKE COUNTY
URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM
OFF SITE PROPERTIES
WHITE TRUCK & R & W PAINT
SALT LAKE COUNTY, UTAH

MORRISON KNUDSEN

PROPERTY SURVEY SKETCH

Sheet 3 of 3

SITE LOCATION SLO-50 R&W Dairy

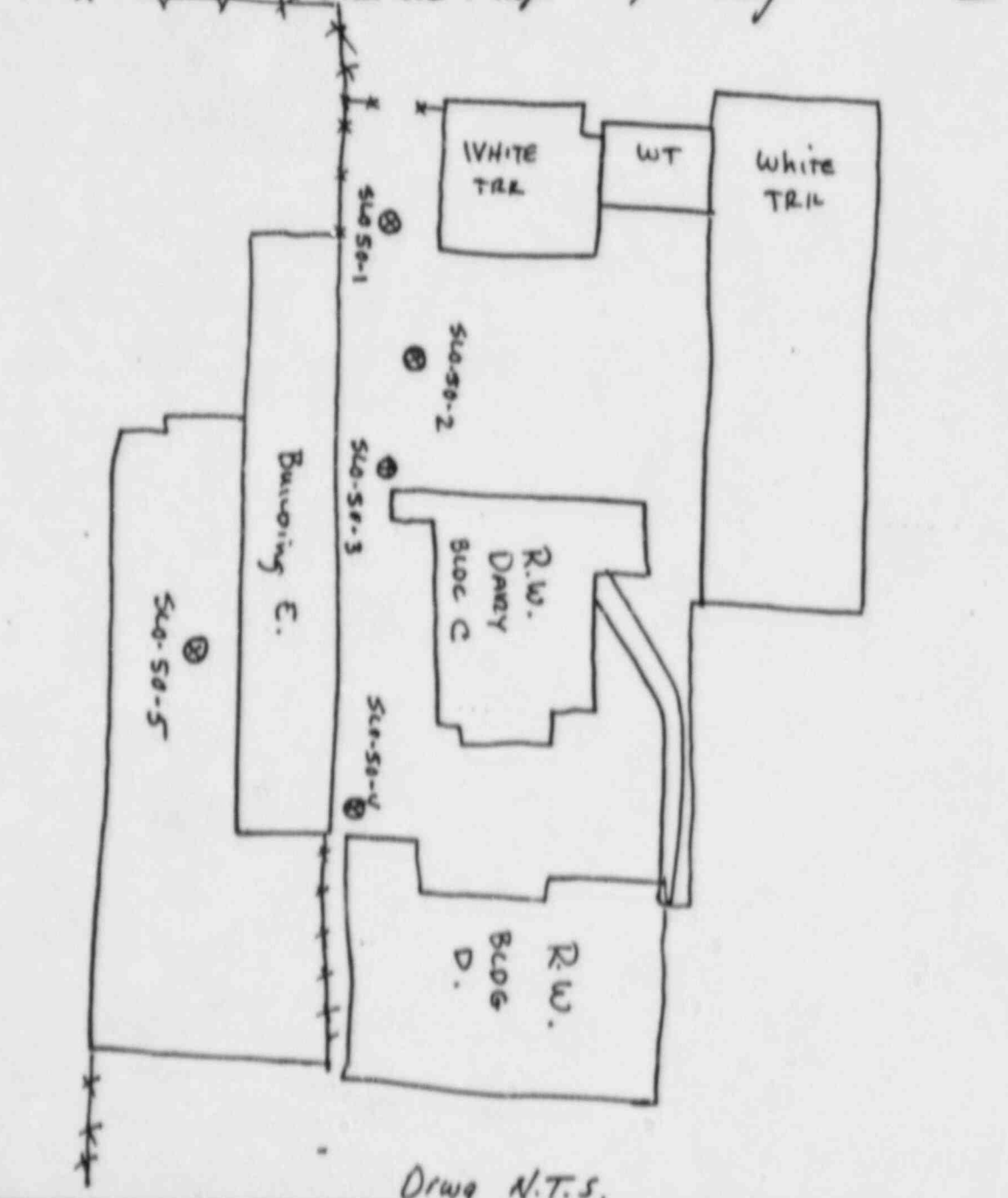
ADDRESS 300 WEST -

PROPERTY TYPE _____ LOT NO. _____

OWNER _____

SKETCH COMPLETED BY Ray Nelson DATE _____

Confirmation Borehole Location Map R&W Dairy North →



Drwg N.T.S.

Form VP-02-C

BOREHOLE LOG

Logging Crew: RAY Nelson
Jeff Manship.

Sheet 1 of 3 Page 1

Date: 4-30-84

Property ID: SLO-50 R&W Dairy.

Instrument CAN No.

Area:

Notes:
1. All holes are 4" Dia. unless otherwise noted.
2. Record unusual conditions, such as the presence of water in boreholes and depth, casing type and thickness if used, concrete cores and thickness, obstructions, utilities, etc., in the remarks section.

Hole ID: SLO-50-1	Hole ID: SLO-50-2	Hole ID: SLO-50-3	Hole ID: SLO-50-4
Time Drilled: 09:30	Time Drilled: 10:00	Time Drilled: 10:30	Time Drilled: 11:00
Time Logged: 09:40	Time Logged: 10:15	Time Logged: 10:45	Time Logged: 11:15
Soil Type:	Soil Type:	Soil Type:	Soil Type:

Depth	Counts/.1min	Depth	Counts/.1min	Depth	Counts/.1min	Depth	Counts/.1min
Surface		Surface		Surface		Surface	
0"	3268	0"	3537	0"	10922	0"	7932
6"	17891	6"	27514	6"	78852	6"	64694
12"	35159	12"	51103	12"	128240	12"	115332
18"	23206	18"	53781	18"	122352	18"	95168
24"	8131	24"	46911	24"	64980	24"	37917
30"	2590	30"	41308	30"	20098	30"	12979
36"	2443	36"	21334	36"	6367	36"	5052
42"	2422	42"	Hole Collapse this level	42"	3381	42"	3041
48"	2141	48"		48"	2652	48"	2294
54"	1966	54"		54"	2470	54"	1903
60"	1950	60"		60"	2374	60"	1973
66"		66"		66"		66"	
72"		72"		72"		72"	
78"		78"		78"		78"	
84"		84"		84"		84"	
90"		90"		90"		90"	
96"		96"		96"		96"	

Remarks:

Back ground hole Average 1489 for 1 min Average of 11 Readings from 0" to 60" in 6" Depths. total Reading 16,381 ÷ 11 = 1489 All Counts 1 Min.

Form VP-02-C

BOREHOLE LOG

Logging Crew: Nelson, R
Manship, J.

Sheet 2 of 3 Page 2

Date: 4-5-1-84

Property ID: SLO-50.

Instrument CAN No. _____

Area: _____

Notes:
1. All holes are 4" Dia. unless otherwise noted.
2. Record unusual conditions, such as the presence of water in boreholes and depth, casing type and thickness if used, concrete cores and thickness, obstructions, utilities, etc., in the remarks section.

Hole ID: SLO-51-5		Hole ID:		Hole ID:		Hole ID:	
Time Drilled:		Time Drilled:		Time Drilled:		Time Drilled:	
Time Logged:		Time Logged:		Time Logged:		Time Logged:	
Soil Type:		Soil Type:		Soil Type:		Soil Type:	
Depth	Counts/.1min	Depth	Counts/.1min	Depth	Counts/.1min	Depth	Counts/.1min
Surface		Surface		Surface		Surface	
0"	944	0"		0"		0"	
6"	1119	6"		6"		6"	
12"	1126	12"		12"		12"	
18"	949	18"		18"		18"	
24"	768	24"		24"		24"	
30"	793	30"		30"		30"	
36"	912	36"		36"		36"	
42"	953	42"		42"		42"	
48"	1189	48"		48"		48"	
54"	1560	54"		54"		54"	
60"	1904	60"		60"		60"	
66"		66"		66"		66"	
72"		72"		72"		72"	
78"		78"		78"		78"	
84"		84"		84"		84"	
90"		90"		90"		90"	
96"		96"		96"		96"	

Remarks:

MORRISON-KNUDSEN COMPANY, INC.

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