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Document Number: 70646

WELDON SPRING SITE REMEDIAL ACTION PROJECT
MK-FERGUSON CO., INC. WO 3589 (314) 441-8086
7295 Highway 94 South
St. Charles, MO 63303

▸▸Document Type: LR-MKFW-DOEW

Originators DCN:

▸▸SUBJECT POST-REMEDIATION SAMPLING PLAN FOR THE SOUTHEAST DRAINAGE

▸▸AUTHOR GOLDKAMP, WILLIAM ▸▸TO MCCRACKEN, STEPHEN H. ▸▸DATE 7-18-97

▸▸SUBJECT CODE/WORK PACKAGE NUMBER 6/6070 WP 470

REFERENCED DOCUMENT(S)

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DOE/OR/21548-616
CONTRACT NO. DE-AC05-86OR21548

POST-REMEDIATION SAMPLING PLAN FOR THE SOUTHEAST DRAINAGE

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

JULY 1997 REV. 0

U.S. Department of Energy
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project

Prepared by MK-Ferguson Company and Jacobs Engineering Group

MK-FERGUSON
A MORRISON KNUDSEN COMPANY

Weldon Spring Site Remedial Action Project
Contract No. DE-AC05-86OR21548

Rev. No. 0

PLAN TITLE: Post-Remediation Sampling Plan for the Southeast Drainage

APPROVALS

for Gene Valett Project Manager - Quarry/Vicinity Properties	7/16/97 Date
R. Thomson Data Administration Manager	7/16/97 Date
Environmental, Safety and Health Manager	7/17/97 Date
Compliance Manager	7/17/97 Date
for J.W. Engineering Manager	7-17-97 Date
Quality Assurance Manager	07/17/97 Date
Deputy Project Director	7/17/97 Date

DOE/OR/21548-616

Weldon Spring Site Remedial Action Project

Post-Remediation Sampling Plan for the Southeast Drainage

July 1997

Revision 0

Prepared by

MK-FERGUSON COMPANY
and
JACOBS ENGINEERING GROUP
7295 Highway 94 South
St. Charles, Missouri 63304

for the

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
Under Contract DE-AC05-86OR21548

ABSTRACT

This plan specifies the locations and the analytical parameters for sampling of soils in the Southeast Drainage as part of post-remediation sampling after soil removal is completed in accordance with the *Engineering Evaluation/Cost Analysis for the Proposed Removal Action Southeast Drainage*. This work is scheduled for completion under Work Package 470. This plan describes the methods, locations, sampling frequency, and analytical parameters that will be used to collect soil samples after excavation of contaminated soils. The data results of this sampling analysis will be used to calculate the public health risk reduction (residual risk) that was achieved by remedial action in the Southeast Drainage.

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1. INTRODUCTION

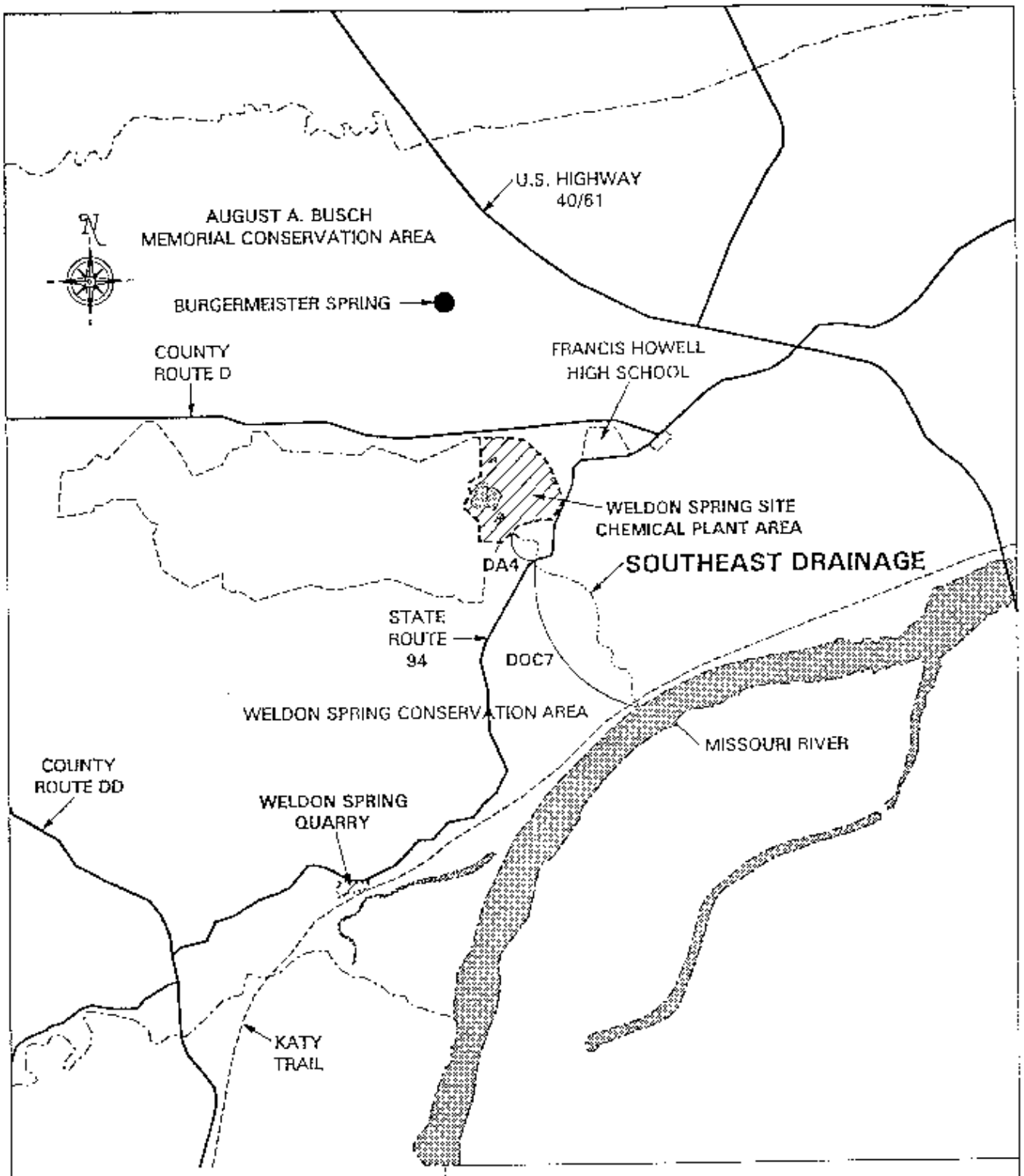
1.1 Introduction

Cleanup activities are being conducted at the Weldon Spring site in St. Charles County, Missouri, in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). The Weldon Spring site is located approximately 48 km (30 mi) west of St. Louis and consists of two noncontiguous areas; the chemical plant and the quarry (Figure 1-1).

The Southeast Drainage is a natural drainage with intermittent flow that traverses the Weldon Spring Conservation Area from the Weldon Spring Chemical Plant to the Missouri River (Figure 1-1). During past operations at the chemical plant, the Southeast Drainage received discharge from the sanitary and process sewers (Imhoff tank) and overflow from the raffinate pits. As a result, sediments and soils in the Southeast Drainage are contaminated with uranium, thorium, and radium.

A radiological characterization of the Southeast Drainage was conducted in 1985 as part of the Oak Ridge Associated Universities (ORAU) radiological survey and sampling of areas outside of the boundaries of the Weldon Spring site. The ORAU program provided a radiological survey and sampling program to determine the presence of elevated compounds at off-site locations. Based upon the results of the ORAU surveys (Ref. 2 and Ref. 3), the term "vicinity properties" was used to define small isolated areas having contamination levels above residual soil guidelines defined in Code of Federal Regulations 40 CFR 192.

The Southeast Drainage has been defined as two vicinity property areas, Department of the Army 4 (DA-4) and Missouri Department of Conservation 7 (DOC-7) (Figure 1-1). Although ORAU used two vicinity property designations for the Southeast Drainage, the drainage is contiguous; therefore, the two vicinity properties have been linked for the removal action.



LOCATION OF THE SOUTHEAST DRAINAGE AND THE WELDON SPRING CHEMICAL PLANT AREA

FIGURE 1-1

REPORT NO.: DOE/OR/21548-616		EXHIBIT NO.: A/VP/019/0395	
ORIGINATOR: JR	DRAWN BY: GLN	DATE: 5/19/97	

The Department of Energy decided to address remedial actions for the Southeast Drainage as a separate action under CERCLA (Ref. 4). An *Engineering Evaluation/Cost Analysis* (EE/CA) was prepared to evaluate the human and ecological health risks and to present cleanup alternatives for contaminated soils within the Southeast Drainage (Ref. 1). As part of the data characterization for the EE/CA, additional soil sampling was conducted in 1995 and 1996 to evaluate the current concentrations of radiological compounds in the drainage. The results of the soil characterization were used to estimate the risks and are presented in the EE/CA (Ref. 1). The results of the soil sampling program are detailed in the *Southeast Drainage Soils Sampling Report* (Ref.5).

The risk analysis presented in the EE/CA indicates that sediment and surface water contamination in the Southeast Drainage does not pose an unacceptable risk to human health (Ref. 1). The calculated risk falls within the EPA's acceptable risk range of 10^{-4} to 10^{-6}. The risk calculated is almost exclusively from radioactive contamination, primarily Ra-226 in sediments in specific areas of the drainage. The heterogeneous distribution of radioactive contamination in the drainage indicates that selective removal of contaminated areas would further reduce the risk to a potential receptor (Ref. 1). The proposed action for the Southeast Drainage is to remove select contaminated sediments above the 1×10^{-5} risk level in accessible areas of the drainage (Ref. 1). This action would be implemented to be protective of human health and the environment while minimizing environmental impacts (Ref. 1). Additional locations were also selected for removal based upon their proximity to the locations exceeding the 1×10^{-5} risk level.

1.2 Purpose

The *Southeast Drainage Post-Remediation Sampling Plan* presents the methods that will be used to determine the radiological soil concentrations remaining after designated soils are removed. The results of the post-remediation sampling will be used to calculate the risk reduction achieved from soil removal.

1.3 Scope

The scope of this plan includes sampling approximately 55 locations within the Southeast Drainage designated for soil removal. This removal action will be designed and completed under construction Work Package 470 (WP-470). This sampling plan designates the specific locations, samples, associated sample identification numbers, analytical parameters, and sampling protocol for performing and documenting the post-remediation sampling. Post-remediation samples from each location will be analyzed for the following radiological compounds: U-238, Ra-226, Ra-228, and Th-230. While some locations have been selected for sampling because they exceed the $1x10^{-5}$ risk value for one parameter, all radiological parameters will be sampled in order to calculate the final risk for all radiological compounds.

The EE/CA identified specific locations within the Southeast Drainage that exceed the 1×10^{-5} risk level where soil removal will be implemented. The $1x10^{-5}$ risk level relates to 13 pCi/g for Ra-226, 13 pCi/g for Ra-228, 290 pCi/g for U-238, and 350 pCi/g for Th-230 (Ref. 1). Additional areas were also selected for removal if they were located adjacent to or along the transport route for soil removal from the select locations. The areas designated for soil removal are listed in Table 1-1 and are shown in Figure 1-2.

Table 1-1 Soil Locations and Concentrations Exceeding 1×10^{-5} Risk Levels or Adjacent Locations Designated for Soil Removal (pCi/g)

LOCATION ID	DEPTH ID[a]	URANIUM-238	THORIUM-230	RADIUM-226	RADIUM-228
001	01A			165.0	15.1
	01B			18.2	
	02A			21.1	
005	01A				96.6
	01B		431	23.3	28.8
	01C			17.3	135.0
	02A			19.3	288.0
	02B	291		18.8	326.0
	02C				94.5
	01D			22.9	59.7
	02D			20.5	26
	03D			23.6	
	03E		492	21.1	
	03F			17	
	03H			21.5	
	04F			37.3	
	04H			43.6	57.8

Table 1-1 Soil Locations and Concentrations Exceeding 1 x 10^{-5} Risk Levels or Adjacent Locations Designated for Soil Removal (pCi/g)

LOCATION ID	DEPTH ID[a]	URANIUM-238	THORIUM-230	RADIUM-226	RADIUM-228
092	01			27.6	
	02			16.9	
093	01			19.1	
	02			15.5	
094	02			15.2	
012	01			42.2	
025	01A	741.0	384.0	363.0	
	02A	536.0		200.0	
	01D			46.2	
	01B			25.5	
	02D			15.3	
098	01		4940.0	177.0	
099	01			51.1	
	02			59.6	
	03			47.3	
101	01		625.0	259.0	18.8
	02		2220.0	80.3	
102	01	17.1	31.3	19.0	3.1
102.1	01		384.0	106.0	
	002		358.0	58.6	
103	01	331.0		32.9	
	02	326.0		18.1	
104	01			183.0	
	02			102.0	
	03			63.1	
	01D			46.2	
	02D			15.3	
105	01			26.2	
106	01			63.2	
107	01			31.4	
	02			39.5	
108	01			23.5	
	02			22.3	
	03			26.3	
108.1	01			46.8	
	02			23.4	
110	01			34.4	
110.1	01			15.8	
111	01			42.8	
112	01		1670	70.4	

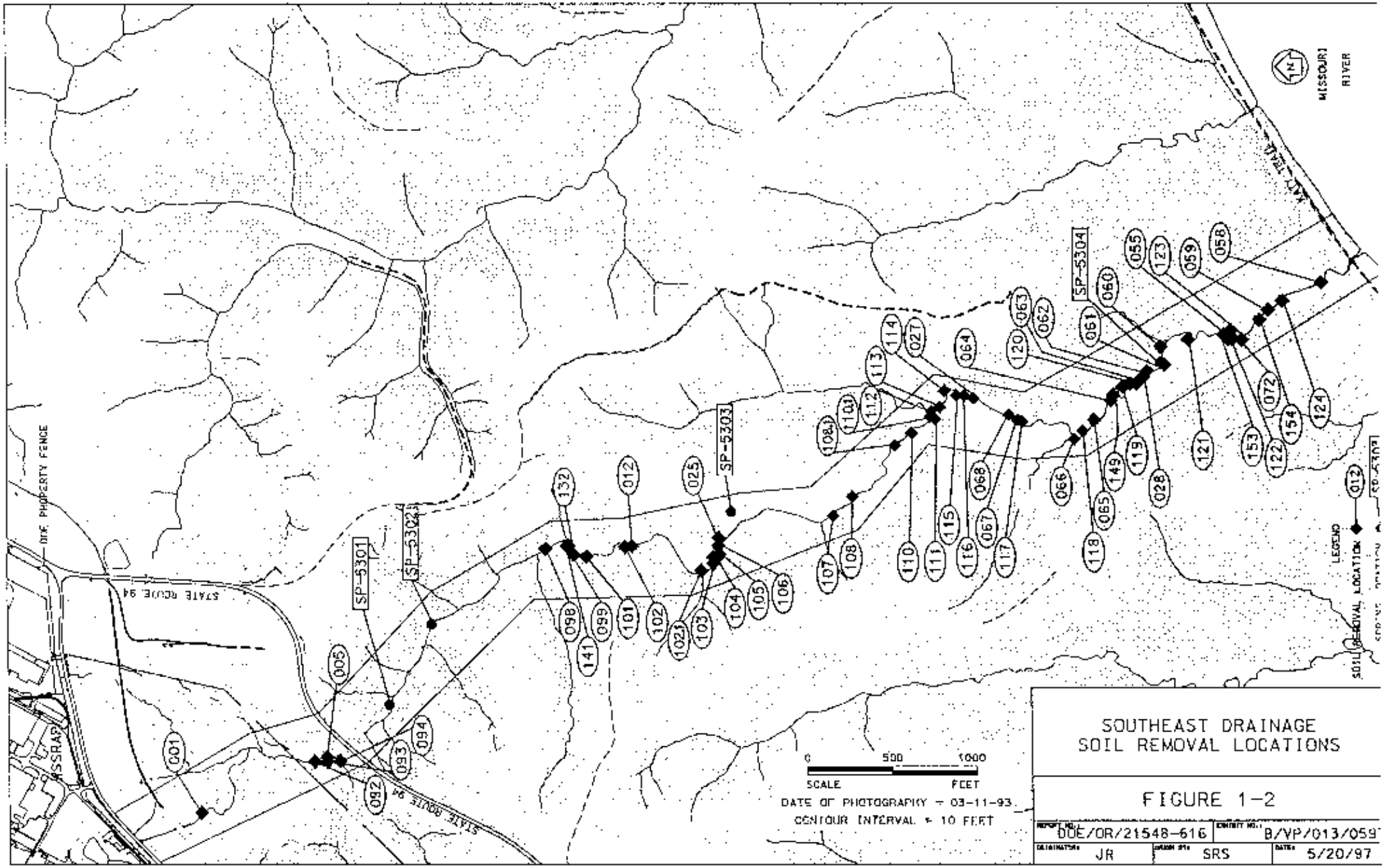
Table 1-1 Soil Locations and Concentrations Exceeding 1 x 10^{-5} Risk Levels or Adjacent Locations Designated for Soil Removal (pCi/g)

LOCATION ID	DEPTH ID[a]	URANIUM-238	THORIUM-230	RADIUM-226	RADIUM-228
113	01			18.4	
	02			69.7	
114	01			19.6	
	02			24.7	
115	01			56.5	
116	01			14.4	
	02			21.4	
117	01			98.8	
118	01			18.0	
	02			19.7	
027	01				35.7
066	01			37.9	
	02		361	19.7	
067	01			30.0	
068	01			23.1	85.8
132	01			78.5	
	02		1640.0	125.0	
141	01			63.8	
028	01			36.9	
055	01			17.9	
	02			15.7	
058	01			78.3	
058	02			31.1	
059	01			54.2	
060	02			123.0	
061	01			75.7	
062	01			14.0	
063	01			48.2	
064	01			20.5	
065	01			17.5	16.1
	02			60.8	21.8
072	01			32.9	
119	01			18.9	
	02			21.6	
120	01			77.2	
	02			124.0	
121	01			16.5	
	02			19.6	
	03			13.0	
	04			25.3	
	05			53.1	

Table 1-1 Soil Locations and Concentrations Exceeding 1 x 10^{-5} Risk Levels or Adjacent Locations Designated for Soil Removal (pCi/g)

LOCATION ID	DEPTH ID[a]	URANIUM-238	THORIUM-230	RADIUM-226	RADIUM-228
122	01	15.1	42.8	35.0	3.1
123	01			14.8	
	02			40.3	
	03			96.5	14.2
124	01		7890.0	163.0	
	02			51.2	
149	01A			15.3	
	06A			47.2	
	07A			66.3	
	01D			16.4	
153	01			21.1	
	06			46.1	
154	01			14.8	

(a) Depths are identified to 6 in. increments; 01 indicates 0-6 in. depth; 02 indicates a 6-12 in. depth; etc. A,B,C is used as indicator for a subsample taken within each location, and was typically taken in those areas greater than 25 m^2 in size.


MISSOURI RIVER
KATY TRAIL
DOE PROPERTY FENCE
STATE ROUTE 94
SP-5301
SP-5302
SP-5303
SP-5304
LEGEND
SOIL REMOVAL LOCATION
0 500 1000
SCALE FEET
DATE OF PHOTOGRAPHY - 03-11-93
CONTOUR INTERVAL = 10 FEET
SOUTHEAST DRAINAGE
SOIL REMOVAL LOCATIONS
FIGURE 1-2
DOE/OR/21548-616
B/VP/013/059
JR
SRS
5/20/97

2. SAMPLING METHODS

Post-remediation sampling will be conducted at each location where soil has been removed. Contaminated soils from each of the designated areas will be removed to the depth as designated by the engineering design drawings. Each area will be cleared, grubbed, and the contaminated soils (ranging from 6 in. to 4 ft in depth) will be removed.

Specific sampling locations for post-remediation sampling were selected by randomly placing a 10 m x 10 m grid over the remediation location. Samples will be conducted at each grid node or center location within the 10 m x 10 m grid, ensuring that at least one sample is collected at each remediation location. Sample locations are shown in Appendix A, Figures A-1 through A-10. Topographical coordinates and sampling identification numbers for each sample location are listed in Table 2-1. Sampling locations will be land surveyed for horizontal and vertical control as the remediation progresses across each remedial unit. Samples will be collected at the surveyed locations, and justification will be documented for any location that is offset greater than 5 ft.

Soil samples will be collected at each location from the remediation cut surface to a depth of 6 in. Soil samples will be collected using a hand trowel or other tool in accordance with ES&H 4.4.5, *Soil/Sediment Sampling*. Soil samples shall be collected in plastic bags and properly labeled. All soil samples transported for analysis will be surveyed with a Geiger-Mueller gamma detector, to ensure no contamination exists on outside packaging and the readings will be recorded in the field logbook or on forms from standard operating procedures. Soil samples will be analyzed for U-238, Ra-226, Ra-228, and Th-230 at the Weldon Spring on-site laboratory. Samples will be transported to the chemical plant via the designated haul route for the Southeast Drainage removal action.

Post-remediation sampling will begin as soon as excavation activities in the area permit safe entry for the surveying and sampling teams. Back filling of excavation areas will be permitted once post-remediation sampling is completed.

Sample custody control activities will be in accordance with the sample custody program for the Weldon Spring Site Remedial Action Project, which includes documentation of the methods of preservation, sample identification, recording sample location, and methods of sample

acquisition. Applicable forms required to record this information are specified in Procedures ES&H 4.1.1, *Numbering System for Environmental Samples and Sample Locations*; ES&H 4.1.2, *Chain of Custody*; ES&H 4.1.4, *Quality Control Samples for Aqueous and Soil Matrices: Definitions, Identification Codes, and Collection Procedures*; and ES&H 4.4.5.

Table 2-1 Post-Remediation Sampling Locations and Sample Identification Numbers

LOCATION ID	POST REMEDIATION SAMPLE ID	SURVEY COORDINATES	
		NORTHING	EASTING
001	SO-498001	1041137.2	754800
005	SO-498005	1040401.6	755141.8
012	SO-498012	1038618.2	756385.3
025A	SO-498025-A	1038124.8	756434.7
025B	SO-498025-B	1038092.0	756434.7
027	SO-498027	1036597.7	757268.4
028	SO-498028	1035597.1	75737.6
055	SO-498055	1035101.0	757647.7
058	SO-498058	1034580.7	757958.5
059	SO-498059	1034891.8	757800.6
060A	SO-498060-A	1035518.6	757578.3
060B	SO-498060-B	1035518.6	757545.5
061	SO-498061	1035495.7	757482.7
062	SO-498062	1035597.1	757437.6
063	SO-498063	1035654.9	757366.3
064A	SO-498064-A	1035786.2	757267.9
064B	SO-498064-B	1035819.0	757235.1
065A	SO-498065A	1035950.2	757141.1
065B	SO-498065-B	1035917.4	757141.4
066	SO-498066	1036023.6	757027.0
067	SO-498067	1036360.8	757133.6
068	SO-498068	1036403.6	757174.0
072A	SO-498072-A	1035101.0	757679.9
072B	SO-498072-B	1035133.8	757679.9
092	SO-498092	1040467.2	755141.8
093	SO-498093	1040434.4	755141.8
094	SO-498094	1040348.3	755118.8
098A	SO-495098-A	1039145.6	756345.9
098B	SO-498098-B	1039112.7	756378.7
099	SO-498099	1038993.9	756367.9
101	SO-498101	1038928.0	756335.1
102	SO-498102	1038660.6	756378.7

Table 2-1 Post-Remediation Sampling Locations and Sample Identification Numbers

102.1	SO-498102.1	1038213.1	756243.3
103	SO-498103	1038157.6	756270.6
104A	SO-498104-A	1038124.8	756336.3
104B	SO-498104-B	1038124.8	756369.7
105	SO-498105	1038092.0	756369.4
106	SO-498106	1038124.8	756401.9
107	SO-498107	1037435.4	756567.1
108	SO-498108	1037324.4	756684.2
108.1	SO-498108.1	1037042.7	757000.2
110	SO-498110	1036977.1	757065.6
110.1	SO-498110.1	1036869.9	757154.9
111A	SO-498111-A	1036837.1	757154.9
111B	SO-498111-B	1036804.2	757154.9
112	SO-498112	1036856.4	757197.5
113	SO-498113	1036806.5	757219.9
114A	SO-498114-A	1036794.5	757268.4
114B	SO-498114-B	1036827.3	757268.4
114C	SO-498114-C	1036794.6	757301.0
115	SO-498115	1036726.9	757301.2
116	SO-498116	1036663.3	757301.2
117A	SO-498117-A	1036328.0	757133.6
117B	SO-498117-B	1036295.1	757133.6
118	SO-498118	1035972.3	757080.3
119	SO-498119	1035753.4	757333.5
120	SO-498120	1035687.7	757366.3
121	SO-498121	1035358.9	757626.0
122	SO-498122	1035133.8	757614.3
123	SO-498123	1035046.8	757627.0
124	SO-498124	1034803.4	757861.2
132	SO-498132	1038961.1	756335.1
141	SO-498141	1038993.9	756367.9
149	SO-498149	1035794.9	757292.9
153	SO-498153	1035133.8	757647.1
154	SO-498154	1034941.7	757743.6

3. SAMPLE ANALYSIS AND DATA EVALUATION

3.1 Sample Analysis

The Environmental Safety and Health (ES&H) field team leader shall notify the on-site analytical laboratory at least 3 weeks before sampling begins to ensure that all post-remediation samples can be properly handled, and to ensure that the laboratory is able to adequately handle the number of samples within the requested turnaround time. Samples will be analyzed on site with 5-day sample analysis turnaround requested, except for Ra-226 which requires 28 days for analysis.

3.2 Data Evaluation

Analytical results received from the laboratory will undergo evaluation of data quality. This includes data verification performed in accordance with Procedure ES&H 4.9.1, *Environmental Monitoring Data Verification* and data validation will be performed in accordance with ES&H 4.9.2, *Environmental Monitoring Data Validation*.

After data review and verification, data results will be used to recalculate the residual risk levels remaining in the Southeast Drainage. A closure report will be prepared to document the data results.

4. QUALITY ASSURANCE

Quality control (QC) samples will be collected during the post-remediation sampling to ensure that proper field sampling and laboratory analytical procedures are being implemented.

4.1 Collection of Quality Control Samples

Quality control samples will be collected to ensure consistent and accurate performance of sample collection and laboratory analysis. Blank quality control samples monitor contaminants that could have been introduced during field collection, transportation, or laboratory preparation. Duplicate, replicate, and matrix spike samples provide a measure of analytical precision and accuracy, and show how the matrix affects analytical results and the homogeneity of the sample source. All quality control sample types listed in Table 4-1 will be collected

Table 4-1 Field Quality Control Sample Summary

QUALITY CONTROL SAMPLE TYPE	FREQUENCY[a]	PURPOSE
Matrix Duplicate	1 per 20 (5%) samples or 1 per 14 days	Monitors the precision of laboratory measurements for a given matrix. Matrix duplicates are used for inorganic parameters (DU).
Secondary Duplicate (Split Sample)	1 per month.	Compares the primary laboratory with the secondary laboratory, providing an additional check on the performance of the primary laboratory.
Field Replicate	1 per month	Monitors field conditions that may affect the reproducibility of samples collected from a given location.
Equipment Blank (non-dedicated equipment only)	1 per 20 (5%) samples	Monitors the effectiveness of decontamination procedures used on non-dedicated sampling equipment.
Deionized Water Blank	1 per month.	Monitors the purity of distilled water used for field blanks and decontamination of sampling equipment.

Per WSSRAP Procedure ES&H 4.1.4.

5. REFERENCES

1. Argonne National Laboratory. *Engineering Evaluation/Cost Analysis for the Proposed Removal Action at the Southeast Drainage Near the Weldon Spring Site, Weldon Spring, Missouri*. DOE/OR/21548-584. Prepared for the U. S. Department of Energy, Weldon Spring Site Remedial Action Project. Weldon Spring, MO. October 1995.

2. Boerner, A.J. *Radiological Survey of the August A. Busch and Weldon Spring Wildlife Areas Weldon Spring Site, St. Charles County, Missouri*, Final Report. Prepared by Oak Ridge Associated Universities, for U.S. Department of Energy, Division of Remedial Action Projects. April 1986.

3. Deming, E.J. *Radiological Survey U.S. Army Reserve Property Weldon Spring Site, St. Charles County, Missouri*, Final Report. Prepared for U.S. Department of Energy, Division of Remedial Action Projects, by Oak Ridge Associated Universities. January 1986.

4. Department of Energy. *Record of Decision for Remedial Action at the Chemical Plant Area of the Weldon Spring Site*. DOE/OR/21548-376. Oak Ridge Field Office. St. Charles, MO. September 1993.

5. MK-Ferguson Company and Jacobs Engineering Group. *Southeast Drainage Soils Sampling Report*. Rev. 0. DOE/OR/21548-650. Prepared for the U. S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. January 1997.

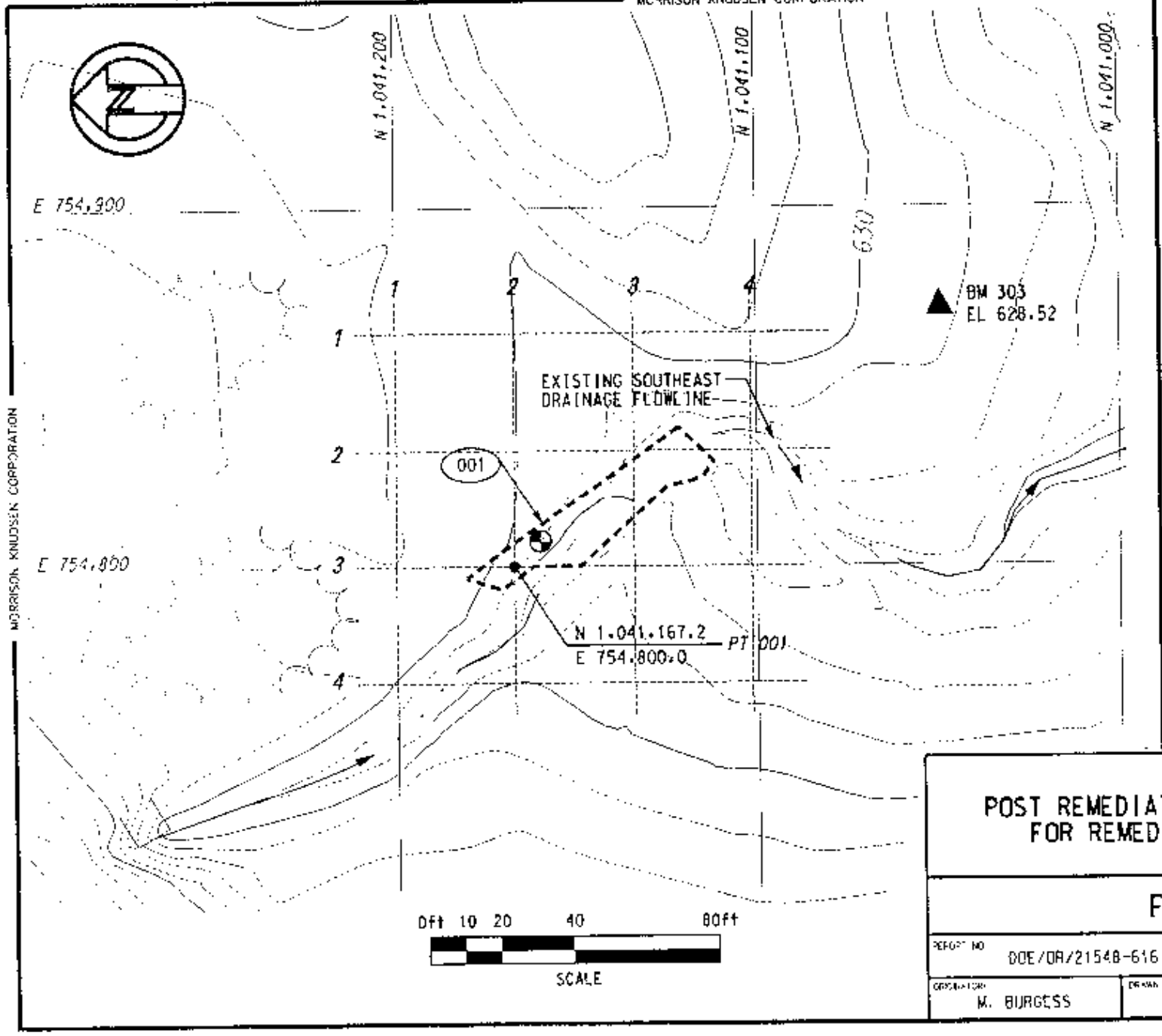
CODE OF FEDERAL REGULATIONS

40 CFR 192, *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings*

PROCEDURES

ES&H 4.1.1, *Numbering System for Environmental Samples and Sampling Locations*
ES&H 4.1.2, *Chain of Custody*
ES&H 4.1.4, *Quality Control Samples for Aqueous and Soil Matrices: Identification Codes, and Collection Procedures*
ES&H 4.4.5, *Soil/Sediment Sampling*
ES&H 4.9.1, *Environmental Monitoring Data Verification*
ES&H 4.9.2, *Environmental Monitoring Data Validation*

APPENDIX A
Post-Remediation Sampling Locations



LEGEND

001 — CONTAMINATION BOUNDARY & ID NO.

ORIGINAL SOIL SAMPLE LOCATION

BENCHMARK

N 1,035,355.3 / E 757,434.4 — PT 001 — POST REMEDIATION SAMPLING LOCATION & POINT NO.

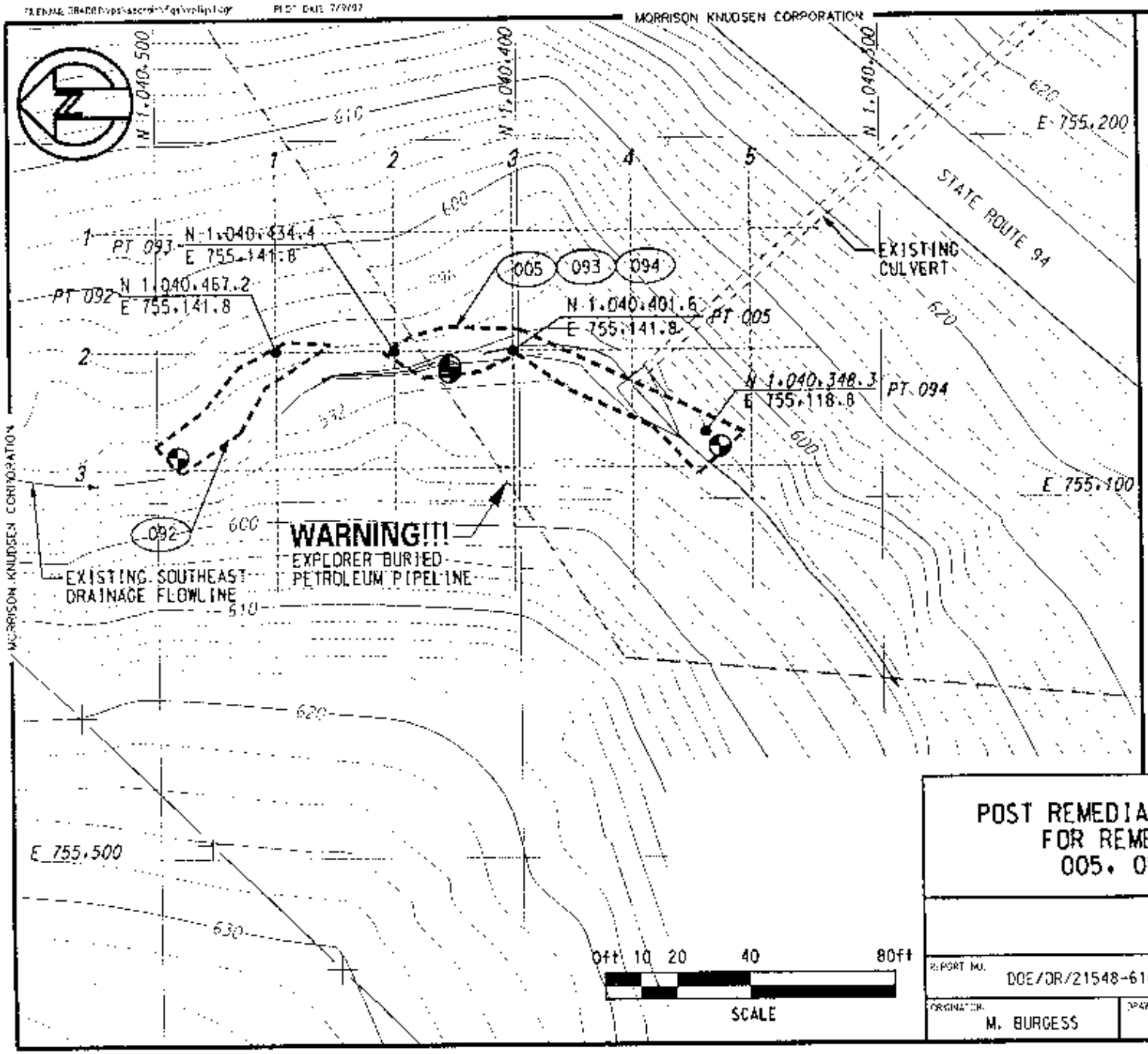
10 METER BY 10 METER GRID (OR 32.808 FT BY 32.808 FT)

POST REMEDIATION SAMPLING LOCATION FOR REMEDIATION LOCATION 001

FIGURE A-1

REPORT NO. DOE/OR/21548-616	WKES DOCUMENTATION NO.	
ORIGINATOR M. BURGESS	DRAWN BY K. RAMOS	DATE JULY 1997

MORRISON KNUDSEN CORPORATION



LEGEND

001 — CONTAMINATION BOUNDARY & ID NO.

ORIGINAL SOIL SAMPLE LOCATION

BENCHMARK

N 1,035,355.3 E 757,434.4 PT 001 — POST REMEDIATION SAMPLING LOCATION & POINT NO.

10 METER BY 10 METER GRID (OR 32.808 FT BY 32.808 FT)

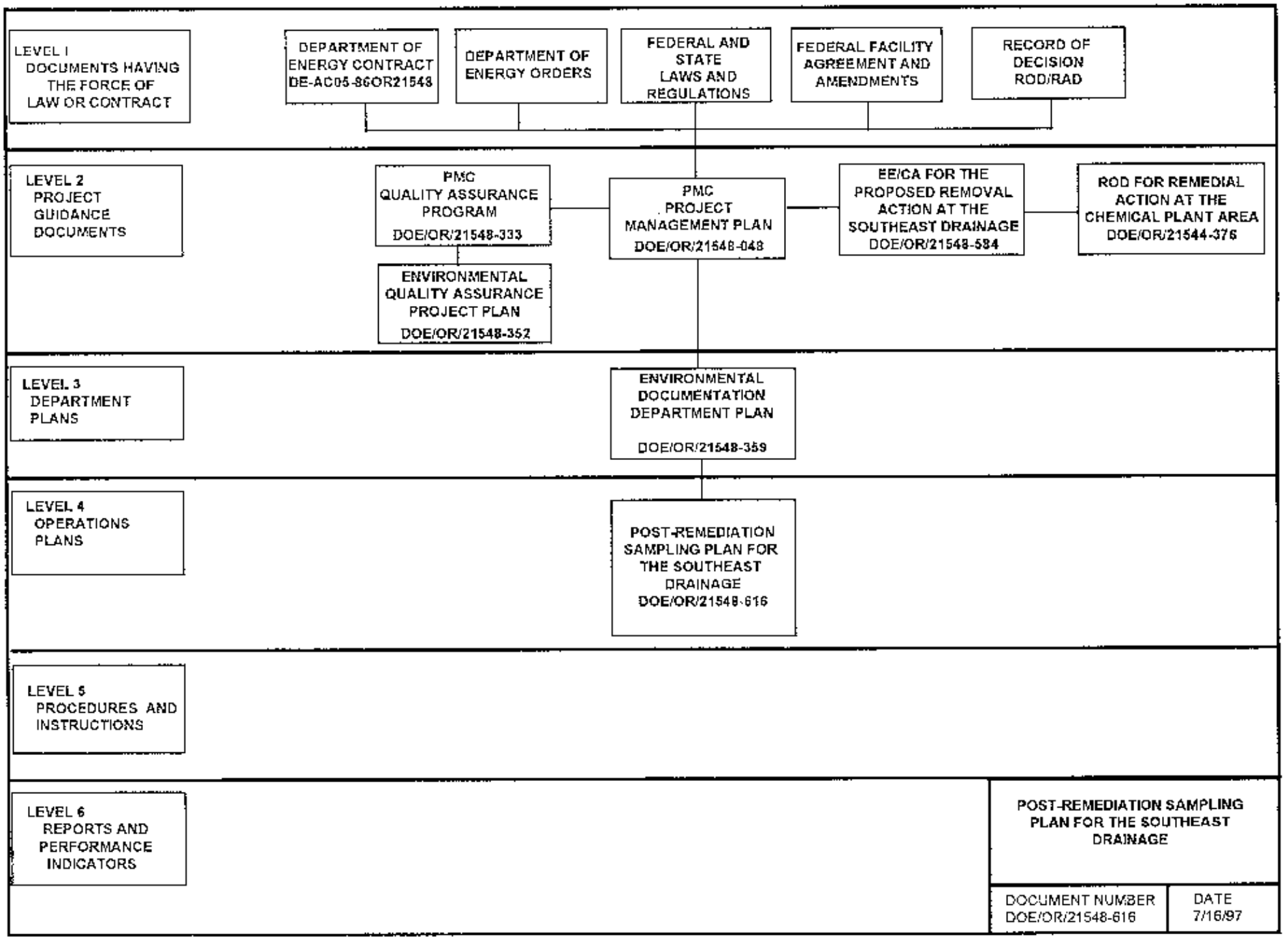
POST REMEDIATION SAMPLING LOCATION FOR REMEDIATION LOCATIONS 005, 092, 093 AND 094

FIGURE A-2

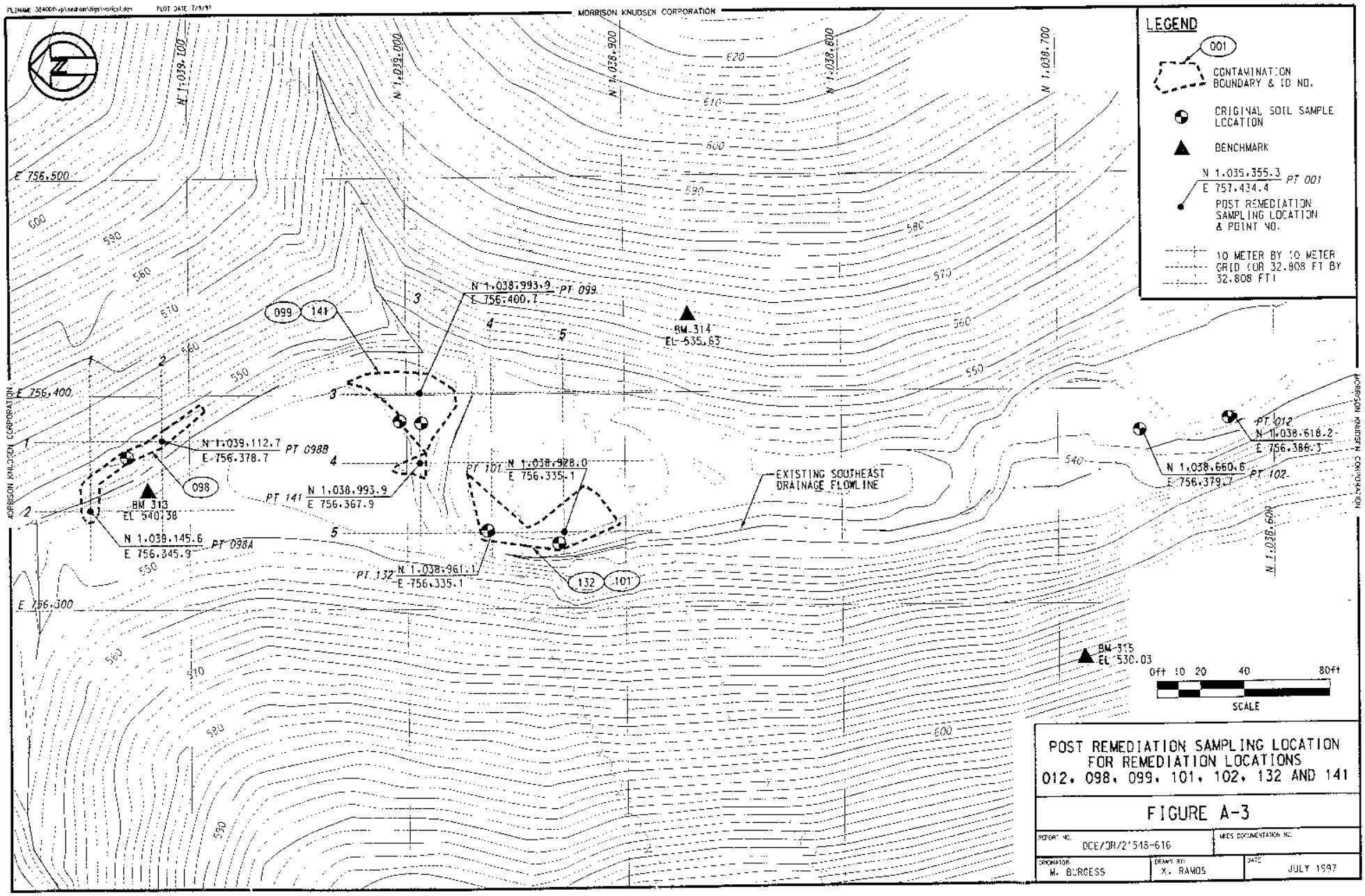
REPORT NO.	MKFS DOCUMENTATION NO.	
DOE/OR/21548-616		
ORIGINATOR: M. BURGESS	DRAWN BY: K. RAMOS	DATE: JULY 1997

MORRISON KNUDSEN CORPORATION

APPENDIX B
Document Hierarchy



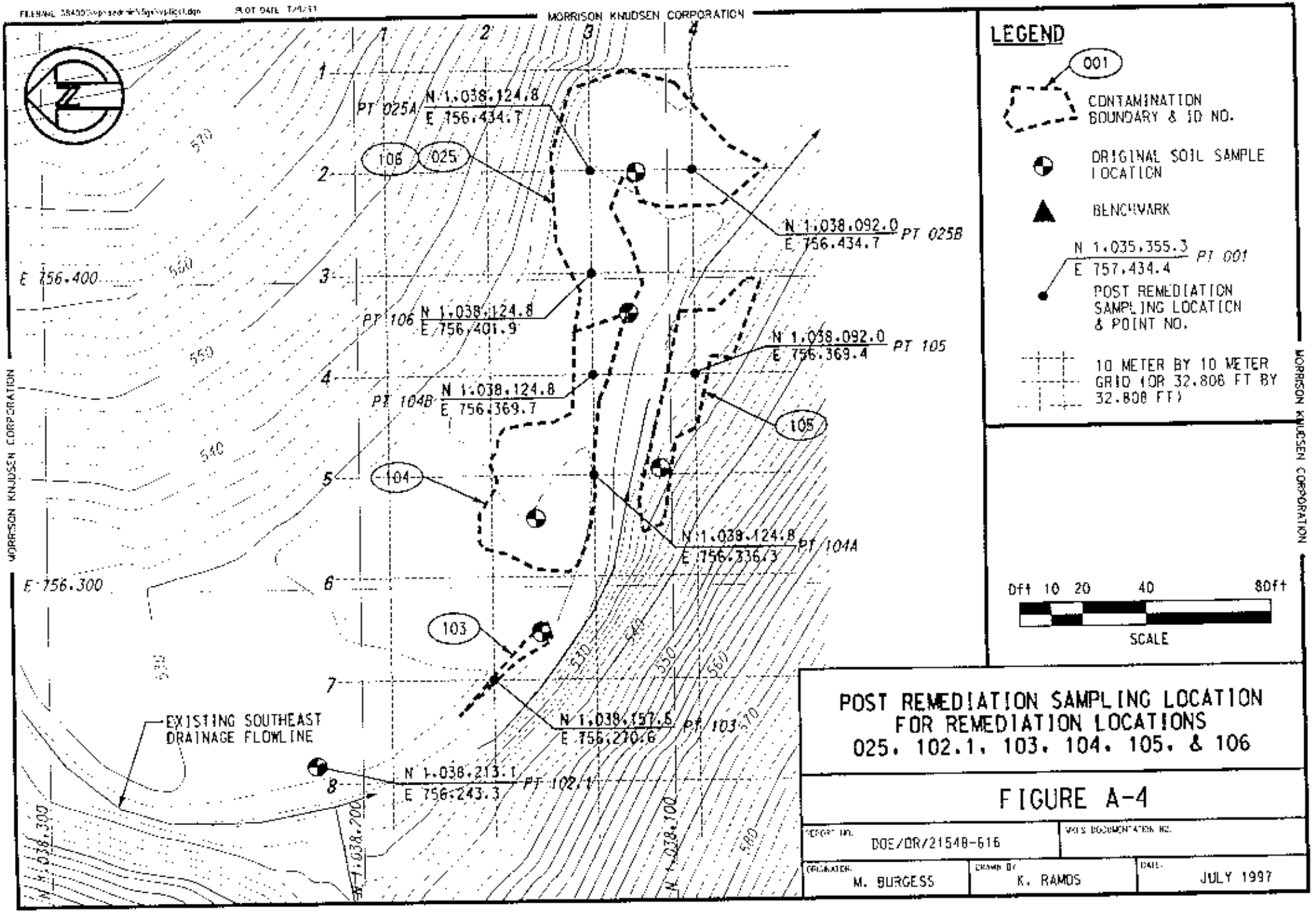
M:\USERS\SCHALK\SOUTHEAST.PPT

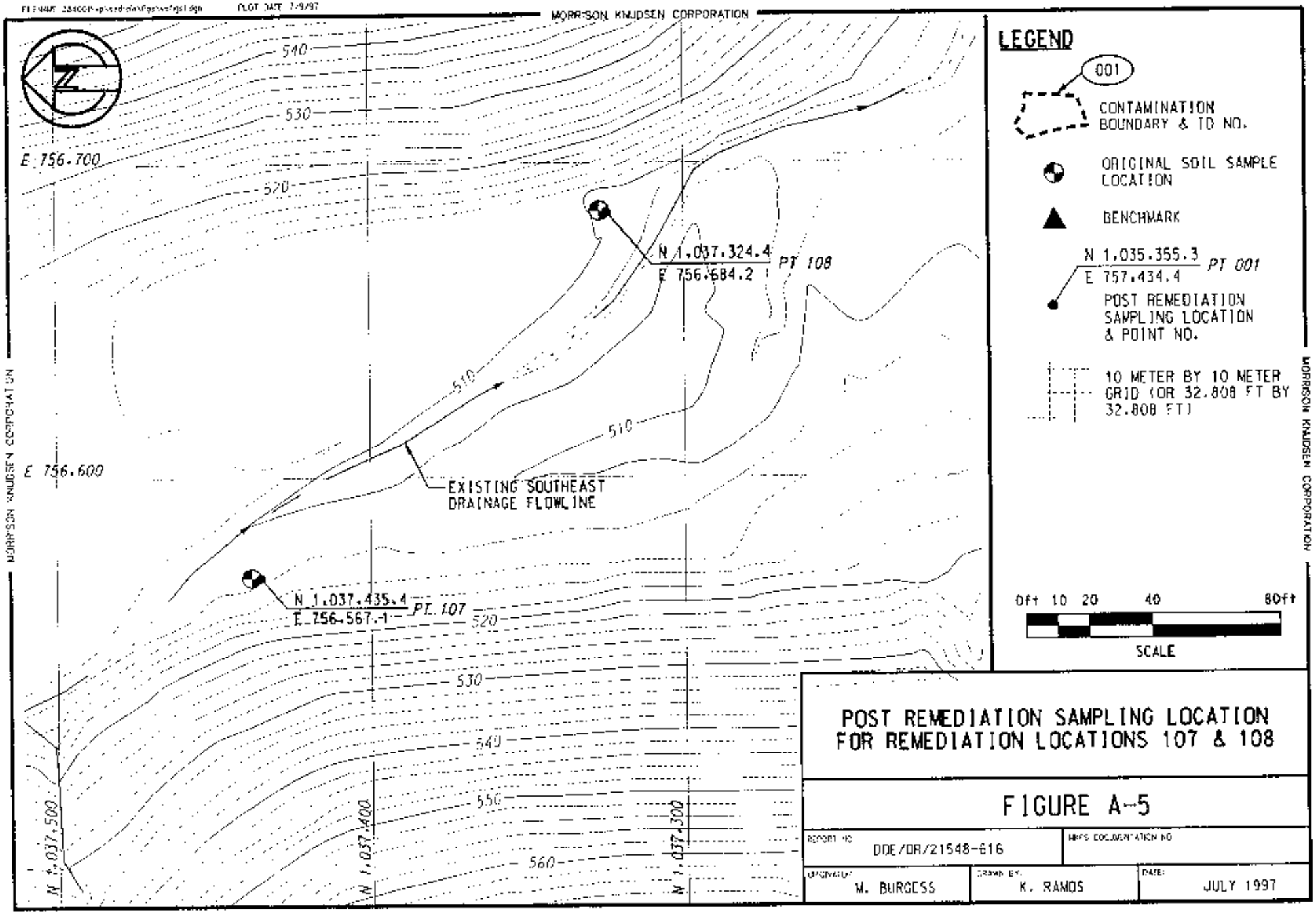


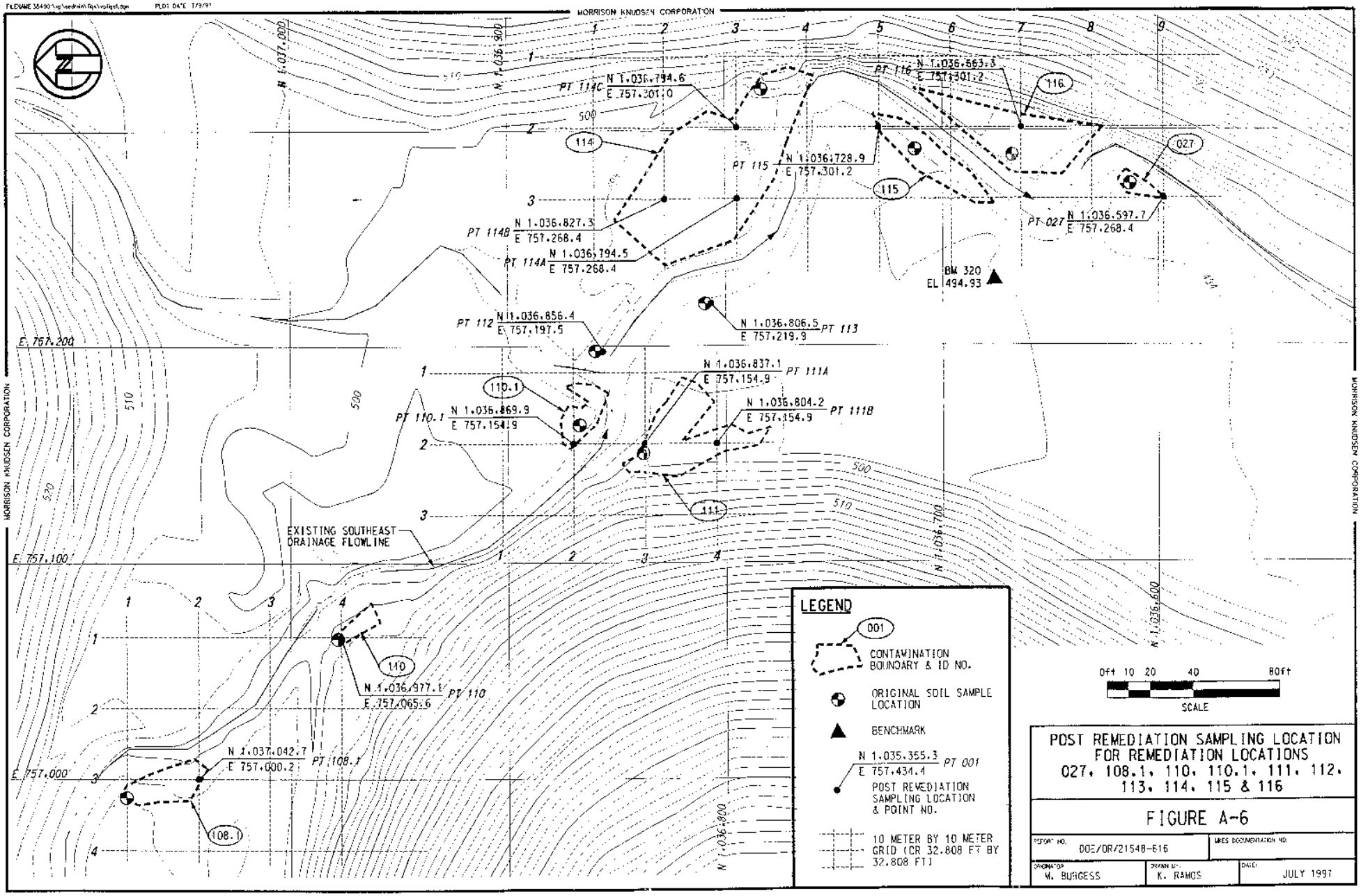
POST REMEDIATION SAMPLING LOCATION FOR REMEDIATION LOCATIONS 012, 098, 099, 101, 102, 132 AND 141

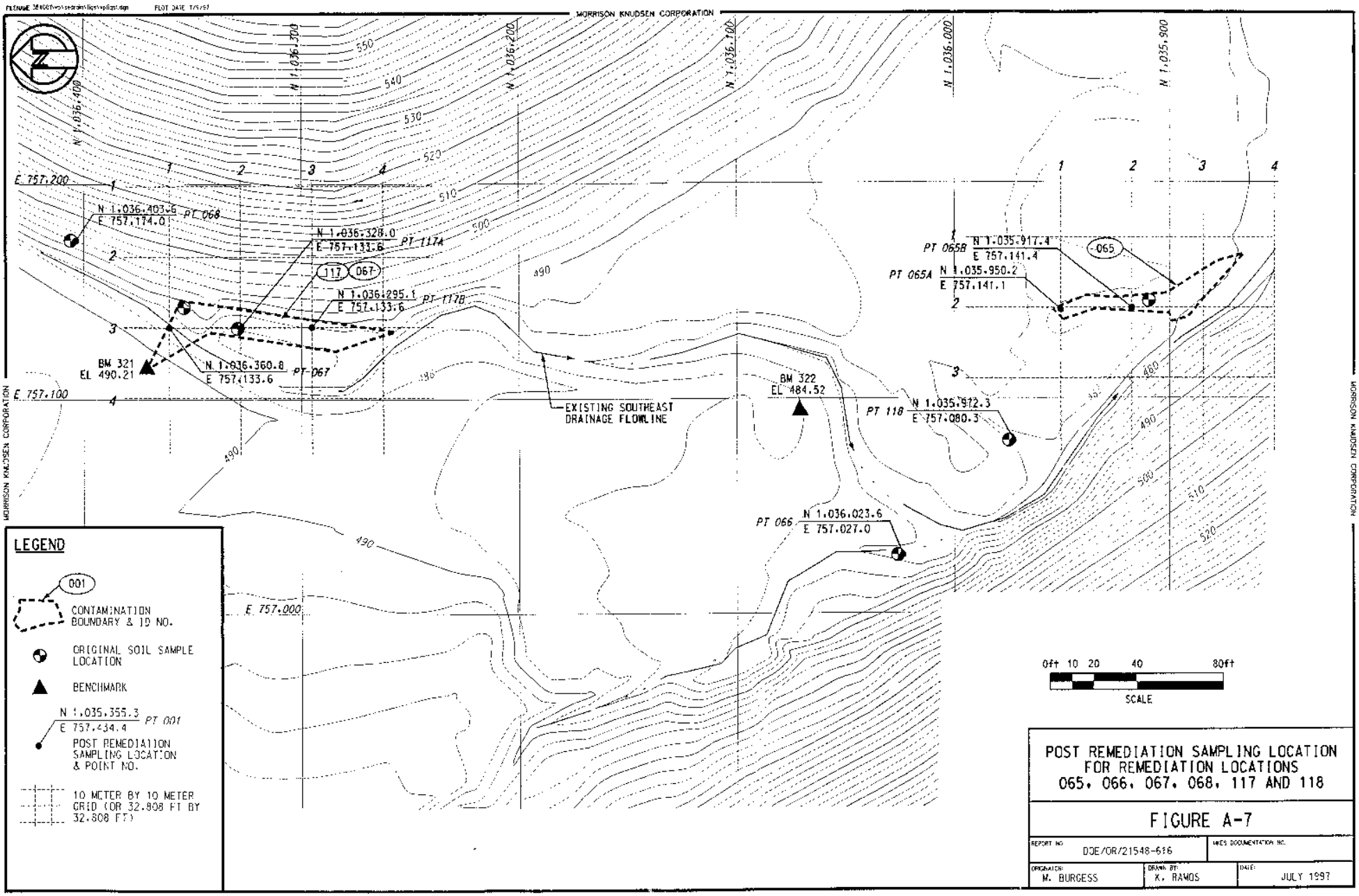
FIGURE A-3

REPORT NO.	MKS DOCUMENTATION NO.	
DOE/OR/2'548-616		
ORIGINATOR: M. BURGESS	DRAWN BY: X. RAMOS	DATE: JULY 1997


MORRISON KNUDSEN CORPORATION
LEGEND
001
CONTAMINATION BOUNDARY & ID NO.
ORIGINAL SOIL SAMPLE LOCATION
BENCHMARK
N 1,035,355.3
E 757,434.4
PT 001
POST REMEDIATION SAMPLING LOCATION & POINT NO.
10 METER BY 10 METER GRID (OR 32.808 FT BY 32.808 FT)
0ft 10 20 40 80ft
SCALE
PT 025A N 1,038,124.8 E 756,434.7
N 1,038,092.0 E 756,434.7 PT 025B
PT 106 N 1,038,124.8 E 756,401.9
N 1,038,092.0 E 756,369.4 PT 105
PT 104B N 1,038,124.8 E 756,369.7
N 1,038,124.8 E 756,336.3 PT 104A
N 1,038,157.6 E 756,270.6 PT 103
N 1,038,213.1 E 756,243.3 PT 102.1
EXISTING SOUTHEAST DRAINAGE FLOWLINE
E 756,400
E 756,300
N 1,038,300
N 1,038,200
N 1,038,100
106
025
105
104
103
POST REMEDIATION SAMPLING LOCATION FOR REMEDIATION LOCATIONS 025, 102.1, 103, 104, 105, & 106
FIGURE A-4
REPORT NO. DOE/OR/21548-616
WBS DOCUMENTATION NO.
ORIGINATOR M. BURGESS
DRAWN BY K. RAMOS
DATE JULY 1997


MORRISON KNUDSEN CORPORATION
540
530
520
510
510
520
530
540
550
560
E 756,700
E 756,600
N 1,037,500
N 1,037,400
N 1,037,300
N 1,037,324.4
E 756,684.2
PT 108
N 1,037,435.4
E 756,567.1
PT 107
EXISTING SOUTHEAST DRAINAGE FLOWLINE
LEGEND
001
CONTAMINATION BOUNDARY & ID NO.
ORIGINAL SOIL SAMPLE LOCATION
BENCHMARK
N 1,035,355.3
E 757,434.4
PT 001
POST REMEDIATION SAMPLING LOCATION & POINT NO.
10 METER BY 10 METER GRID (OR 32.808 FT BY 32.808 FT)
0ft 10 20 40 80ft
SCALE
POST REMEDIATION SAMPLING LOCATION FOR REMEDIATION LOCATIONS 107 & 108
FIGURE A-5
REPORT NO. DOE/OR/21548-616
MKFS DOCUMENTATION NO.
ORIGINATOR M. BURGESS
DRAWN BY K. RAMOS
DATE JULY 1997

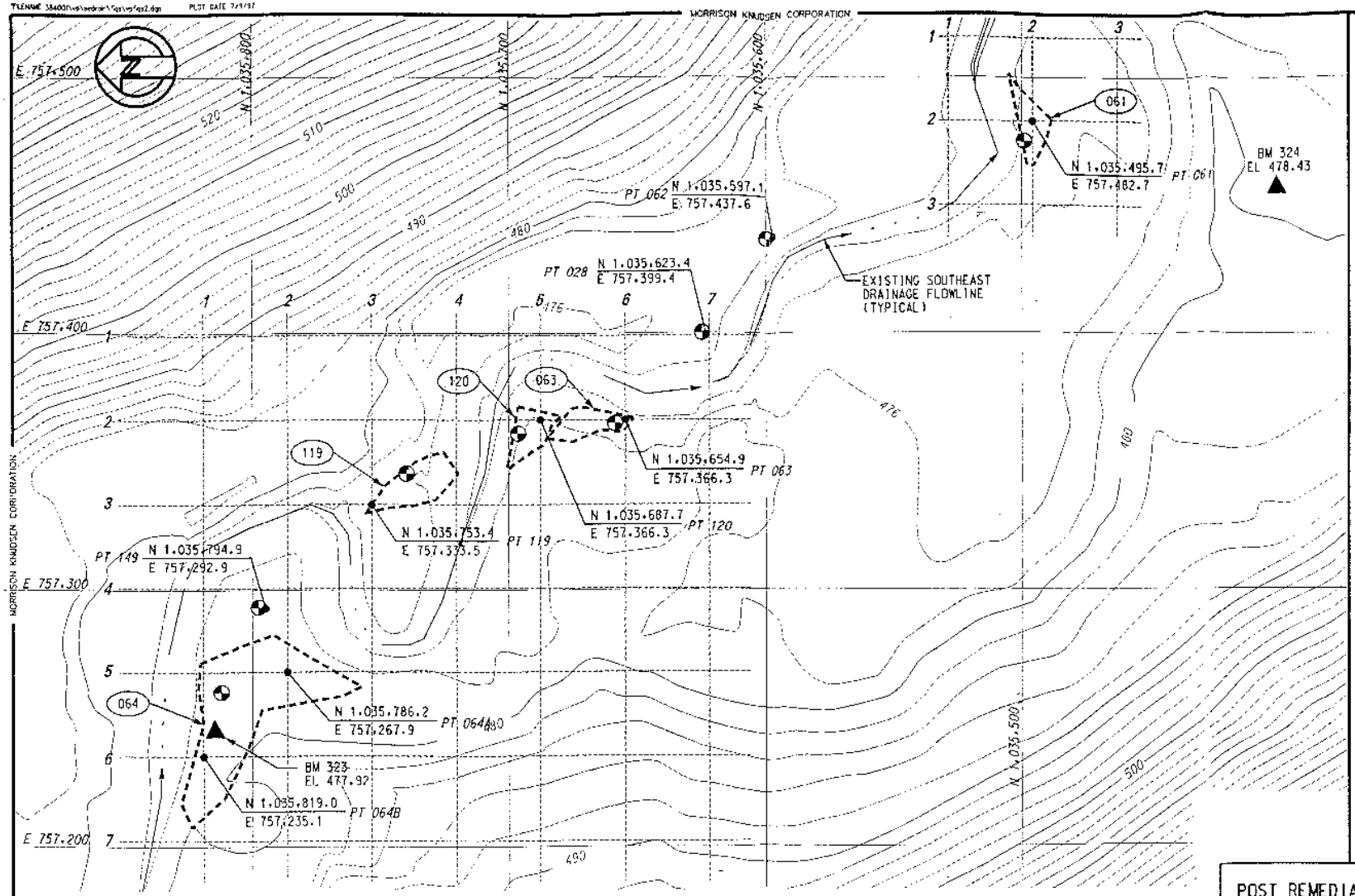

MORRISON KNUDSEN CORPORATION
N 1,037,000
N 1,036,900
N 1,036,800
N 1,036,700
N 1,036,600
E 757,200
E 757,100
E 757,000
PT 114C N 1,036,794.6 E 757,301.0
PT 116 N 1,036,663.3 E 757,301.2
PT 115 N 1,036,728.9 E 757,301.2
PT 114B N 1,036,827.3 E 757,268.4
PT 114A N 1,036,794.5 E 757,268.4
PT 027 N 1,036,597.7 E 757,268.4
PT 112 N 1,036,856.4 E 757,197.5
PT 113 N 1,036,806.5 E 757,219.9
PT 111A N 1,036,837.1 E 757,154.9
PT 111B N 1,036,804.2 E 757,154.9
PT 110.1 N 1,036,869.9 E 757,154.9
PT 110 N 1,036,977.1 E 757,065.6
PT 108.1 N 1,037,042.7 E 757,000.2
BM 320 EL 494.93
EXISTING SOUTHEAST DRAINAGE FLOWLINE
114
115
116
027
110.1
111
110
108.1
LEGEND
001
CONTAMINATION BOUNDARY & ID NO.
ORIGINAL SOIL SAMPLE LOCATION
BENCHMARK
N 1,035,355.3 E 757,434.4 PT 001
POST REMEDIATION SAMPLING LOCATION & POINT NO.
10 METER BY 10 METER GRID (OR 32.808 FT BY 32.808 FT)
0ft 10 20 40 80ft
SCALE
POST REMEDIATION SAMPLING LOCATION FOR REMEDIATION LOCATIONS 027, 108.1, 110, 110.1, 111, 112, 113, 114, 115 & 116
FIGURE A-6
REPORT NO. DOE/OR/21548-616
UMES DOCUMENTATION NO.
ORIGINATOR W. BURGESS
DRAWN BY K. RAMOS
DATE JULY 1997



POST REMEDIATION SAMPLING LOCATION FOR REMEDIATION LOCATIONS 065, 066, 067, 068, 117 AND 118

FIGURE A-7

REPORT NO: DOE/OR/21548-636		MKES DOCUMENTATION INC.
ORIGINATOR: M. BURGESS	DRAWN BY: K. RAMOS	DATE: JULY 1997



LEGEND

- 001 — CONTAMINATION BOUNDARY & ID NO.
- ORIGINAL SOIL SAMPLE LOCATION
- BENCHMARK
- N 1,035,355.3 / E 757.434.4 — PT 001 — POST REMEDIATION SAMPLING LOCATION & POINT NO.
- 10 METER BY 10 METER GRID (OR 32.808 FT BY 32.808 FT)

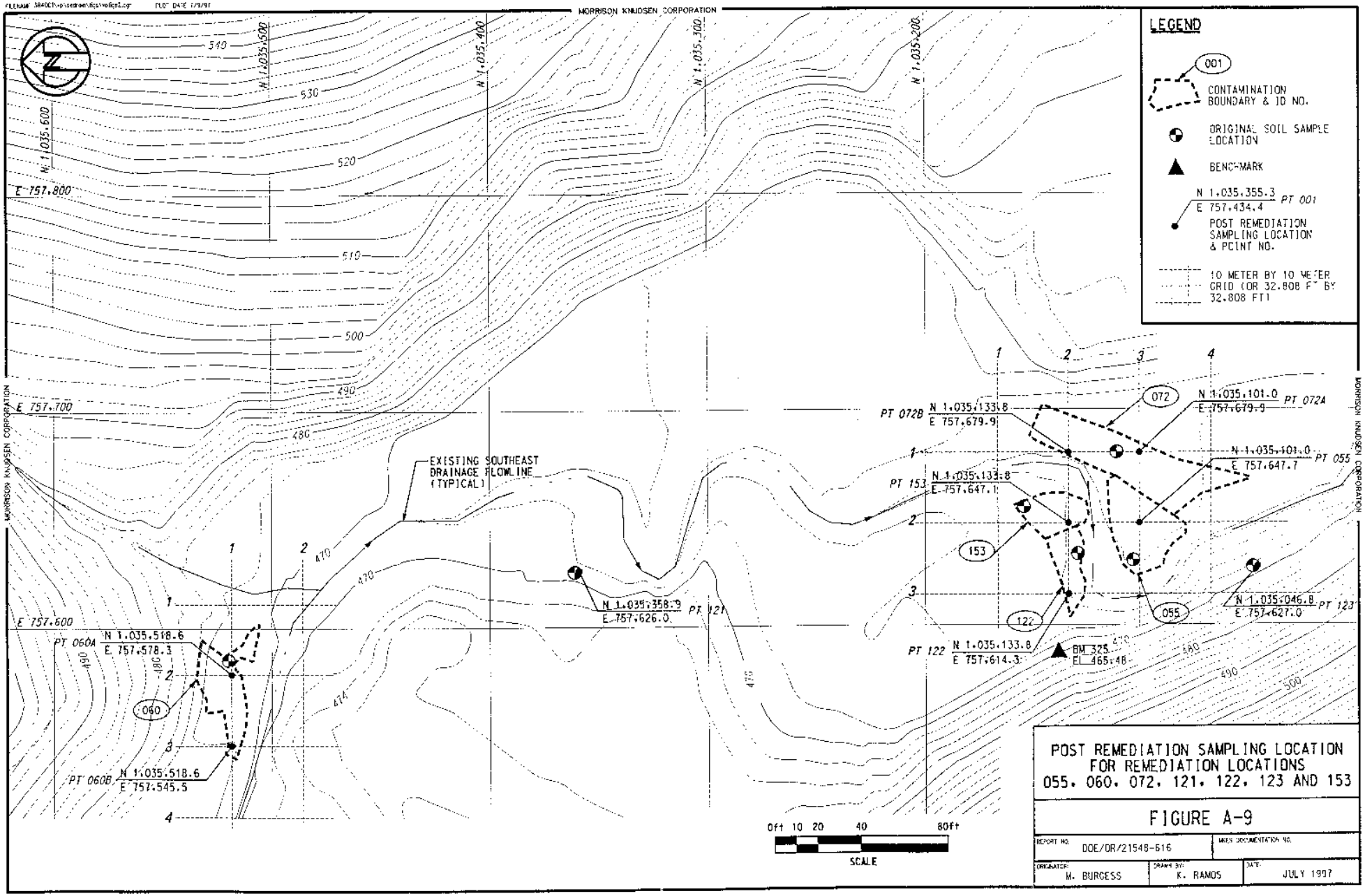
0ft 10 20 40 80ft
SCALE

POST REMEDIATION SMAPLING LOCATION FOR REMEDIATION LOCATIONS 028, 061, 062, 063, 064, 119, 120 AND 149

FIGURE A-8

REPORT NO.	WES DOCUMENTATION NO	
DESIGNATOR: M. BURGESS	DRAWN BY: X. RAMOS	DATE: JULY 1997

MORRISON KNUDSEN CORPORATION

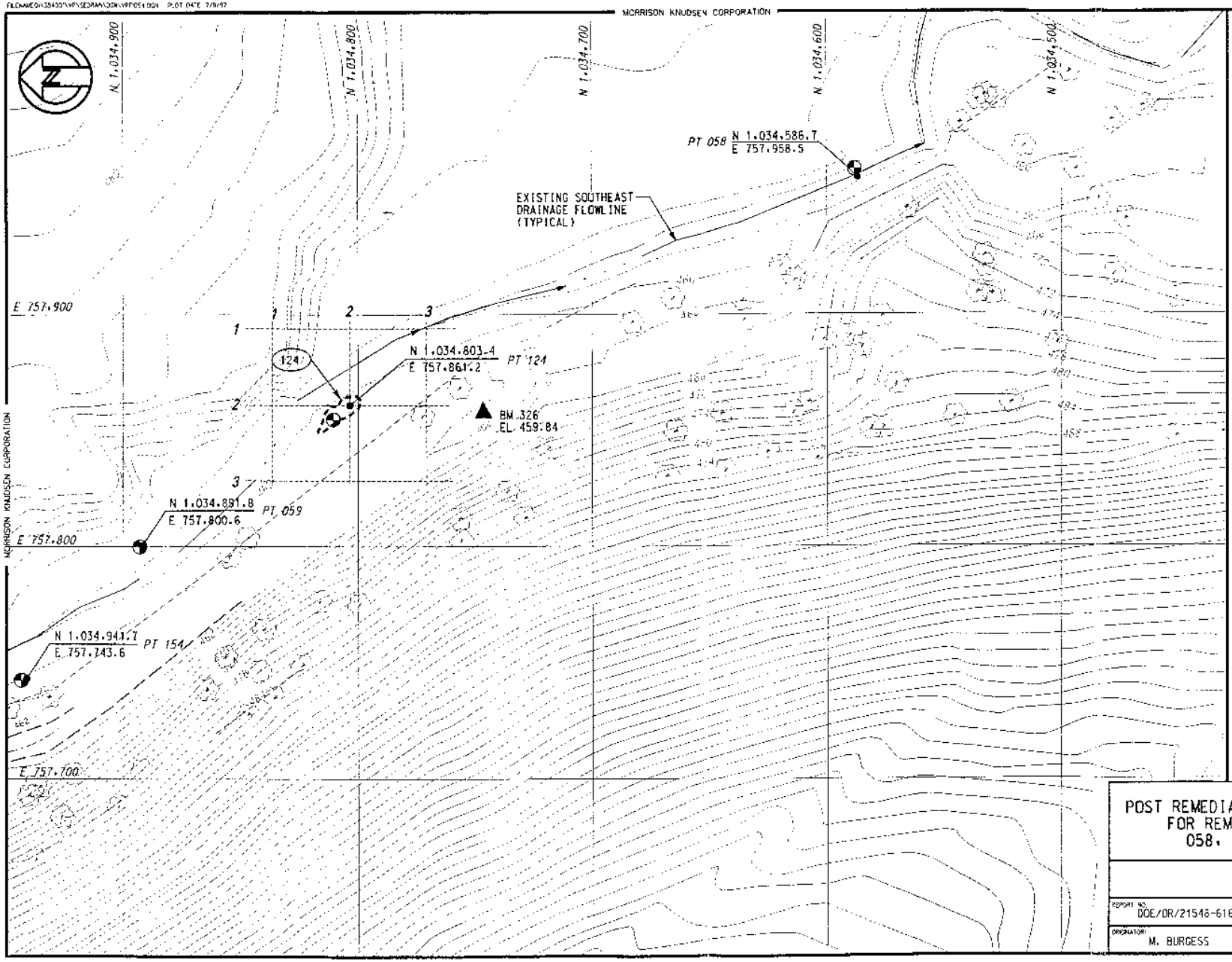


POST REMEDIATION SAMPLING LOCATION FOR REMEDIATION LOCATIONS 055, 060, 072, 121, 122, 123 AND 153

FIGURE A-9

REPORT NO. DOE/OR/21548-616		MKES DOCUMENTATION NO.
ORIGINATOR: M. BURGESS	DRAWN BY: K. RAMOS	DATE: JULY 1997

MORRISON KNUDSEN CORPORATION



LEGEND

- 001 — CONTAMINATION BOUNDARY & ID NO.
- ORIGINAL SOIL SAMPLE LOCATION
- BENCHMARK
- N 1,035,355.3 / E 757,434.4 PT 001 — POST REMEDIATION SAMPLING LOCATION & POINT NO.
- 10 METER BY 10 METER GRID (OR 32.808 FT BY 32.808 FT)

0ft 10 20 40 80ft
SCALE

POST REMEDIATION SAMPLING LOCATION FOR REMEDIATION LOCATIONS 058, 059, 124 AND 154

FIGURE A-10

REPORT NO.	UKTS DOCUMENTATION NO.	
DOE/OR/21548-616		
ORIGINATOR: M. BURGESS	DRAWN BY: K. RAMOS	DATE: JULY 1997

MORRISON KNUDSEN CORPORATION