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Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

M-K FERGUSON CO.
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DEC 16 1987
WSSRAP CONTRACT 3589

December 11, 1987

Ms. Katherine Biggs, Chief
Environmental Review Branch
U. S. Environmental Protection Agency
Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

Dear Ms. Biggs:

PLAN FOR THE SAMPLING AND ANALYSIS OF LAKE AND STREAM SEDIMENTS

Enclosed are four copies of the Final Sampling Plan for Lake and Stream Sediments influenced by the Weldon Spring Chemical Plant drainage. All of your July 6, 1987, comments have been incorporated and the sampling effort is scheduled to begin in January 1988.

If you have any questions, please call.

Sincerely,

R. R. Nelson

R. R. Nelson
Project Manager
Weldon Spring Site
Remedial Action Project

Enclosures

cc:
Dave Bedan, MDNR, w/enclosures (4 copies)
Jack Hammond, MK-F, w/o enclosure

DOE/OR/21548-006

United States Department Of Energy

W.S.S.R.A.P.

PLAN FOR THE SAMPLING AND ANALYSIS OF LAKE AND STREAM SEDIMENTS INFLUENCED BY THE WELDON SPRING CHEMICAL PLANT DRAINAGE

NOVEMBER, 1987

WELDON SPRING SITE REMEDIAL ACTION PROJECT

PLAN FOR THE SAMPLING & ANALYSIS OF LAKE & STREAM SEDIMENTS INFLUENCED BY THE WELDON SPRING CHEMICAL PLANT DRAINAGE

NOVEMBER, 1987

PLAN FOR THE SAMPLING & ANALYSIS OF LAKE & STREAM SEDIMENTS INFLUENCED BY THE WELDON SPRING CHEMICAL PLANT DRAINAGE

PREPARED FOR:

UNITED STATES DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS OFFICE
UNDER CONTRACT NO. DE-AC05-86OR21548

PREPARED BY:

MK-FERGUSON COMPANY
AND
JACOBS ENGINEERING GROUP, INC.
ROUTE 2, HIGHWAY 94 SOUTH
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NOVEMBER, 1987

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1.0 INTRODUCTION

This document presents the Field Sampling and Analysis Plan for the collection of sediments from lakes and streams influenced by drainage from the Weldon Spring Site. The plan describes the scope of activities to be performed by the Project Management Contractor (PMC) and its subcontractors during sediment collection and analysis.

Results of this study and any subsequent sediment investigations will be incorporated into the Site Characterization Report. In addition, the risks associated with any discovered contaminant deposition will be assessed as part of the Environmental Impact Statement.

1.1 Background

A survey of sediments near the Weldon Spring Site will be performed in 1988. Surface drainage from most of the combined Weldon Spring Chemical Plant (WSCP) and Weldon Spring Raffinate Pit (WSRP) areas flows in a northerly direction, toward Lakes 35 and 36 on the August A. Busch Memorial Wildlife Area (Busch Area) (Figure 1.1). The remaining surface drainage flows southward down a drainage easement to the Missouri River, through the Weldon Spring Wildlife Area (WSWA). The drainage easement also carried process and sanitary sewer outfall to the Missouri River.

The 7,000-acre Busch Area and 7,200-acre WSWA are managed by the Missouri Department of Conservation and are open throughout the year to the general public. Several of the intermittent streams draining portions of the WSCP/WSRP areas are losing streams. A portion of this drainage resurfaces at Burgermeister Spring which is upstream from Lake 34 on the Busch Area. Radiological activity above background was detected in the waters of these three lakes at levels ranging from 11 pCi/L to 36 pCi/L (DOE, 1986 Environmental Monitoring Report).

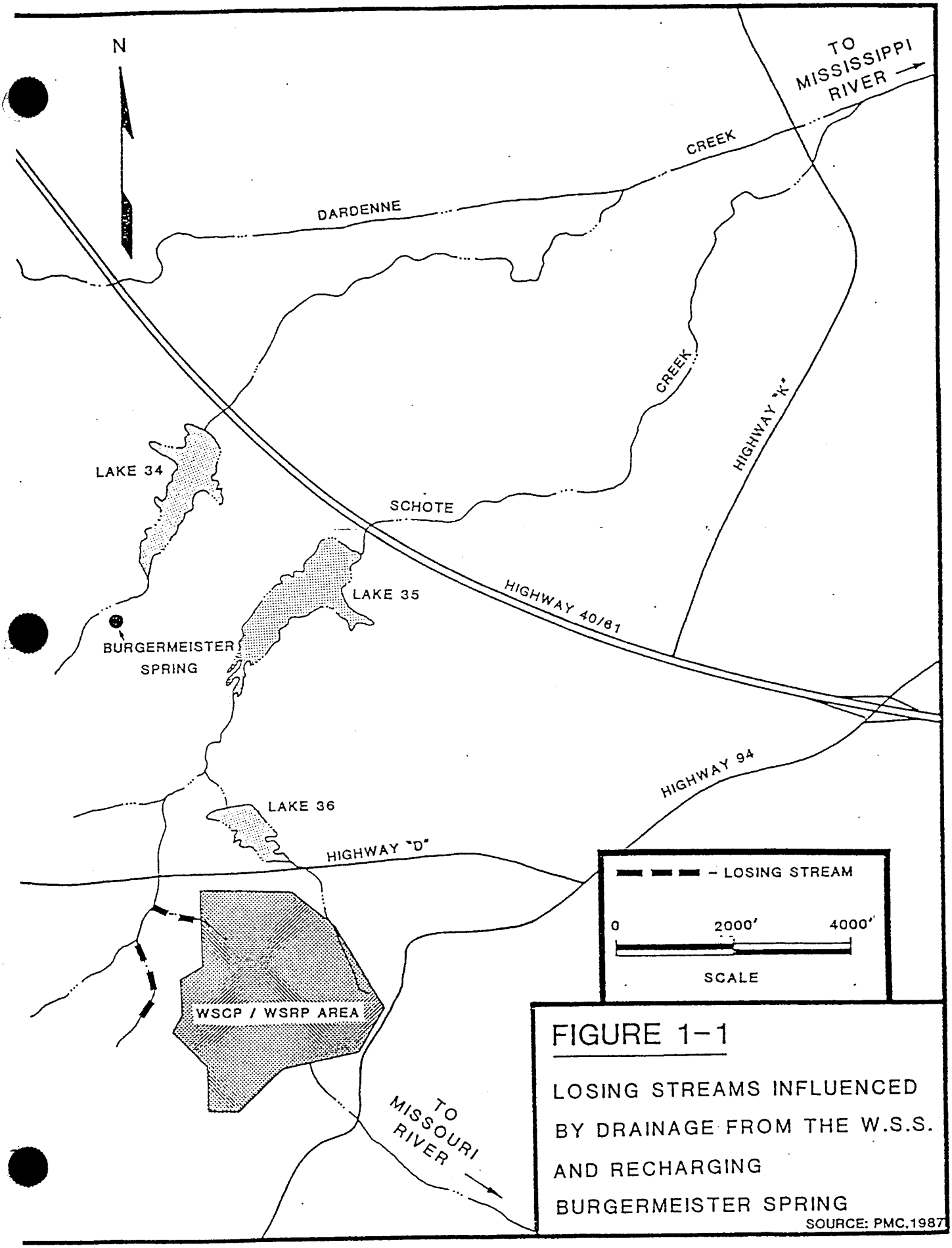


FIGURE 1-1

LOSING STREAMS INFLUENCED BY DRAINAGE FROM THE W.S.S. AND RECHARGING BURGERMEISTER SPRING

SOURCE: PMC,1987

In addition, limited lake and stream sediment sampling conducted in 1986 (ORAU: Radiological Survey of the August A. Busch and Weldon Spring Wildlife Areas.) and in 1978 (Rykman, Edgerly, Tomlinson and Associates: Phase III Report: Assessment of Deposition Alternatives) indicated uranium activity in several lake and stream sediment samples exceeding the remedial action guidelines of 60 pCi/g for U-238 and U-234 respectively. These data suggest that the underlying sediments in these lakes may require remedial action.

In addition, five sediment samples were collected in 1983 from Dardenne Creek by a local citizens group and analyzed for radiological parameters. While analyzed results of these samples technically indicated background levels, the report concludes that samples from downstream of the WSS exhibited higher activity than background. However, insufficient quality control analyses do not allow adequate assessment of the validity of the report's conclusion. In August of 1987, eight sediment samples were collected from the proposed NPDES storm water discharge points around the perimeter of the WSS. Samples were collected from the top 6 inches of sediment from each outfall. The data indicate above background levels of uranium, nitroaromatics and several semi-volatiles related to coal burning.

Nitroaromatics are also known to be present in the soil at the WSCP/WSRP area. Tributary and receiving streams from these areas as well as the drainage easement, also may be contaminated and require investigation. Lakes 35 and 36 drain into Schote Creek which joins Dardenne Creek just east of Highway K. Lake 34 flows directly into Dardenne Creek just west of Highway K. Dardenne Creek, in turn, flows north to the Mississippi River.

1.2 Objectives

The purpose of this activity is to determine the extent and magnitude of potential chemically and radiologically contaminated sediment under off-site streams and surface water bodies. This determination will be performed by the collection and analysis of a significant number of samples to limit uncertainty and achieve a proper level of confidence required to evaluate the no action and various remedial action alternatives. Limited analysis for PCB's, semi-volatiles and metals will also be performed to document any presence of these compounds in sediments compared to background.

The field sampling and analysis activities will comply with all applicable WSSRAP procedures including:

- Soil/Sediment Sampling
- Sample Number
- Chain of Custody
- Sample Packaging and Shipment
- Decontamination

1.3 Overview of Program

This sampling effort will determine the uranium activity and nitroaromatic, PCB's, semi-volatiles, and metals concentrations in lake and stream sediments influenced by the WSS drainage. Areas receiving direct runoff or subsurface recharge will be considered in this study. Based on data from the RETA report and knowledge of the types of materials processed during uranium refinement, radium-226, thorium-230, and thorium-232 activity levels exceeding DOE remedial action guidelines in these sediments are not expected. However, at least 30 percent of all sediment samples collected will be analyzed for these additional radiological parameters.

Stream sediments below the Busch Area Lakes (with the exception of 2 locations) will not be sampled for nitroaromatics, PCB's, semi-volatiles, or metals since contaminated sediment should have settled in the lakes. Since no documentation exists for chemical species in the lake sediments, a single composite sample from each of 3 six inch sediment intervals will be collected. These composites, coupled with results from upstream locations, should confirm the absence of these compounds.

Table 1.1 describes the area, the number of sampling stations, and estimated number of samples, and analysis to be performed on each sample. Samples will be collected from a total of 66 stations.

TABLE 1.1

SUMMARY OF PROPOSED LAKE & STREAM SEDIMENT SAMPLING PROGRAM(1)

AREA	NO. OF SAMPLING STATIONS	TOTAL NUMBER OF SAMPLES (2)	ANALYTICAL PARAMETERS
Lakes 34, 35, & 36	10 (per lake)	90 30 9 9 Composites	Uranium Nitroaromatics Radium & Thorium PCBs, Semi-volatiles, Metals
Lake 37	3	9 3 3 1 Composite	Uranium Nitroaromatics Radium & Thorium PCBs, Semi-Volatiles, Metals
Dardenne Creek & Peruque Creek	12	36 12	Uranium Radium & Thorium
Schote Creek	10	30 24 10 24	Uranium Nitroaromatics Radium & Thorium PCBs, Semi-volatiles, Metals
Burgermeister Spring, and Stream	5	15 12 5 12	Uranium Nitroaromatics Radium & Thorium PCBs, Semi-volatiles, Metals
Southeast Drainage Easement	6	18 18 6 18	Uranium Nitroaromatics Radium & Thorium PCBs, Semi-volatiles, Metals

1 - Based on 3 six-inch-interval composites per location
2 - 5% of samples will be submitted for Duplicate Analysis

Source: WSSRAP, 1987.

2.0 SAMPLING PROGRAM

Samples will be collected from several depth intervals at each location. Each interval will be a maximum of six inches thick, beginning with the 0 to 6 inch interval. A minimum of three depth intervals will be collected at each location, if sediments are 18 inches thick and recoverable. Samples will be collected by a subcontractor to the Project Management Contractor (PMC) using a PMC-approved method based on the criteria stated below. Sampling equipment will be thoroughly decontaminated between samples following EPA guidance documents.

After collection, the samples will be packaged and shipped to the subcontractor's laboratory for analysis. Field data shall be recorded on the Sediment Sampling Data Form (Figure 2-1) which records all relevant sample collection data, such as depth of sample, analytical parameters, location diagram, etc. Completed forms will be included in the final data report as an appendix.

The exact sampling methods and procedures will be supplied by the selected subcontractor for approval by the DOE before sampling commencement. In order to avoid limiting competition among potential subcontractors, exact methods have not been defined. However, in the Technical Instructions to potential bidders, EPA procedures, WSSRAP Standard Operating Procedures, and applicable guidance documents have been provided. Bidders have been instructed to propose sampling methods which will comply with both EPA and DOE requirements.

FIGURE 2-1

WELDON SPRING SITE REMEDIAL ACTION PROJECT (WSSRAP)
Route 2, Highway 94 South, St. Charles, Missouri 63303
Phone (314) 441-8086 Telecopy (314) 447-0803

Sediment Sampling Data Form

Sample Number: _____ Date: _____

Location: _____

_____

Personnel: _____ Time: _____

_____

Sample Collection Method: Pipe Post Hole Digger Other

Decon of Sampling Equipment Performed _____

Sample Type: Depth Composite Grab Other _____

Height (Ft) of Water Above Sample

Depth of Sample: _____ to _____ inches

Analysis to be Performed: _____

Location Diagram:

Description of Sample

_____

_____

_____

_____

_____

_____

Sample Container(s) _____ # of Containers _____

Sample Preservation _____

MK-Ferguson - Project Management Contractor

2.1 Sampling Locations

Sampling locations have been selected in both lakes and streams as described below. The rationale for sampling each location is presented in Table 2-1.

2.2 Stream Sampling Locations

Stream sediments will be collected at, or as near as possible to, the marked locations for each stream. Areas of sediment deposition will be sampled preferentially. Depth interval samples will be taken at stream locations to the extent possible, depending on sediment type and depositional environment. Samples from locations near highway crossings will be taken far enough upstream of the crossing to avoid influences from casual private dumping.

2.2.1 Schote Creek

Sediment samples will be collected from 10 locations (SD-4001 to SD-4010) shown on Figure 2-2.

2.2.2 Unnamed Tributary To Dardenne Creek

Five locations (SD-4011 to SD-4015) along the Burgermeister Spring stream will be sampled. The approximate locations are shown in Figure 2-2.

2.2.3 Dardenne Creek

Sediment samples will be collected from 11 locations (SD-4016 to SD-4026) along Dardenne Creek. An additional background sample (SD-4027) will be collected from Peruque Creek. These locations are shown in Figure 2-3.

TABLE 2-1

STREAM SEDIMENT REMEDIAL INVESTIGATIONS

LOCATION NO.	LOCATION DESCRIPTION	SAMPLING RATIONALE
*SD-4001	Inflow to Lake 36 - 100' north of Highway D	Assess sediment prior to entering lake
*SD-4002	Ash Pond drainage 100' west of DOE fence	Assess sediment in outfall stream
*SD-4003	Unnamed tributary to Schote Creek	Establish background conditions
*SD-4004	Unnamed tributary to Schote Creek just south of Army Reserve Training Area	Assess sediment entering Busch Area
*SD-4005	Schote Creek - 200' east of Ahden Knight Memorial Lake	Establish background conditions
*SD-4006	Lake 36 outfall stream north of gravel road	Assess sediment below lake
*SD-4007	Schote Creek - 600' above Lake 35	Assess sediment prior to entering Lake 35
*SD-4008	Schote Creek at Hwy 40-61	Assess sediment below Lake 35
SD-4009	Schote Creek at Weldon Spring Rd.	Assess sediment in populated area
SD-4010	Schote Creek at Highway K	Assess sediment below Lake 35
*SD-4011	Stream above Burgermeister Spring	Establish background conditions
*SD-4012	Burgermeister Spring	Assess sediment in source area

TABLE 2-1

STREAM SEDIMENT REMEDIAL INVESTIGATIONS

LOCATION NO.	LOCATION DESCRIPTION	SAMPLING RATIONALE
*SD-4013	Burgermeister Spring Stream midway between Spring & Lake 34	Assess sediment prior to entering lake
*SD-4014	Lake 34 outfall stream at Hwy 40	Assess sediment below Lake 34
SD-4015	Stream at Henning Road	Assess sediment in populated area
SD-4016	Dardenne Creek at Hopewell Road	Establish background conditions
SD-4017	Dardenne Creek at Hwy DD	Establish background conditions
SD-4018	Dardenne Creek at Lake 33	Establish background conditions
SD-4019	Dardenne Creek at Hwy 40	Establish background conditions
SD-4020	Dardenne Creek at Hwy K	Assess Burgermeister Spring stream sediment impact
SD-4021	Dardenne Creek at Schote Creek	Assess combined sediments
SD-4022	Dardenne Creek at Hwy N	Assess sediment conditions
SD-4023	Dardenne Creek at St. Peters Rd.	Assess sediment in populated area
SD-4024	Dardenne Creek at Mexico Road	Assess sediment in populated area
SD-4025	Dardenne Creek at St. Peters	Assess sediment in populated area
SD-4026	Dardenne Creek at Kampville	Assess sediment in populated area

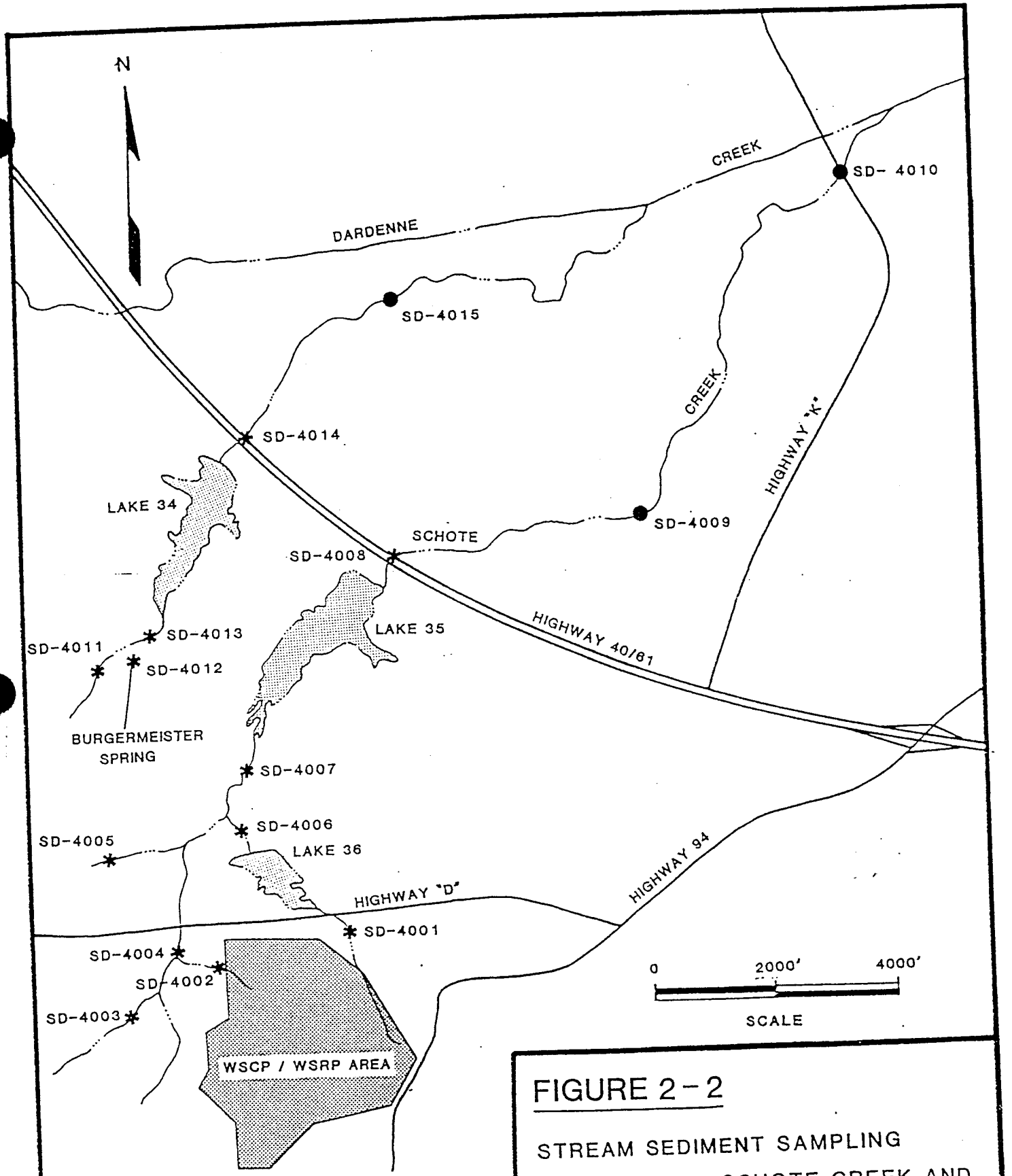
TABLE 2-1

STREAM SEDIMENT REMEDIAL INVESTIGATIONS

LOCATION NO.	LOCATION DESCRIPTION	SAMPLING RATIONALE
SD-4027	Peruque Creek at Hwy 79	Establish background in Mississippi River alluvial stream
*SD-4061	Drainage Easement	Assess sediment in Wildlife Area
*SD-4062	Drainage Easement	Assess sediment in Wildlife Area
*SD-4063	Drainage Easement	Assess sediment in Wildlife Area
*SD-4064	Drainage Easement	Assess sediment in Wildlife Area
*SD-4065	Drainage Easement	Assess sediment in Wildlife Area
*SD-4066	Drainage Easement	Assess sediment in Wildlife Area

Source: WSSRAP, 1987.

*Location to be sampled for nitroaromatics, PCB's, Semi-volatiles, and CLP Metals



● - URANIUM SAMPLING 33% RADIUM, THORIUM ANALYSIS

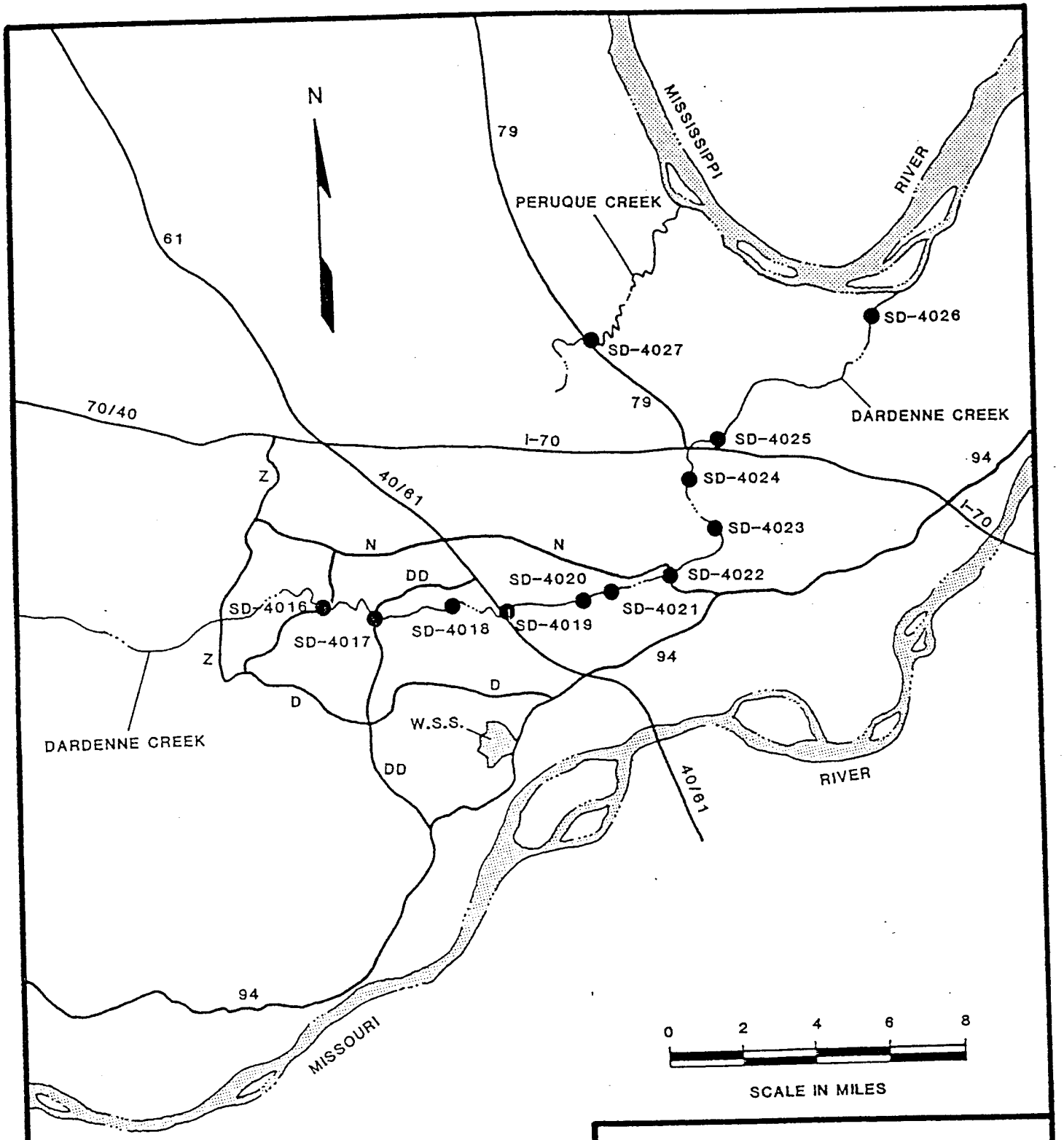
✱ - LOCATION TO BE ANALYZED FOR U, CLP METALS, PCB's, AND SEMIVOLATILES

FIGURE 2-2

STREAM SEDIMENT SAMPLING LOCATIONS. - SCHOTE CREEK AND BURGERMEISTER SPRING STREAM -

LAKE AND STREAM SEDIMENT SAMPLING PLAN.

SOURCE: PMC,1987



● - URANIUM SAMPLING LOCATION
33% RADIUM, THORIUM ANALYSIS

FIGURE 2-3

STREAM SEDIMENT SAMPLING LOCATIONS. - DARDENNE CREEK -

LAKE AND STREAM SEDIMENT SAMPLING PLAN.

SOURCE: PMC,1987

2.2.4 Southeast Drainage Easement

Six locations (SD-4061 to SD-4066) along the drainage easement will be sampled. The locations are shown on Figure 2-4.

2.3 Lake Sampling Locations

Samples will be collected from 10 locations in each of the three affected lakes. Three background locations will be sampled in Lake 37 on the Busch Area. The approximate locations within the lakes are shown in Figures 2-5, 2-6, 2-7 and 2-8 for Lakes 34, 35, 36 and 37 respectively. At all locations, measurements of water depth and depth of sediment will be recorded on the Sediment Sampling Data Form (Figure 2-1) during sample collection. All samples will be analyzed for natural uranium. At least three samples per lake will be analyzed for radium-226 and thorium-230. One-third of all lake sediment samples will be analyzed for nitroaromatics. Three composite samples will be prepared from Lake 34, 35 and 36 respectively. One composite sample will be prepared from Lake 37. Each composite will be prepared by combining sediments from three to four sampling locations and sediments from the same sampling interval (i.e. 0-6", 6-12" etc.) Each composite will be analyzed for PCB's, semi-volatiles and metals.

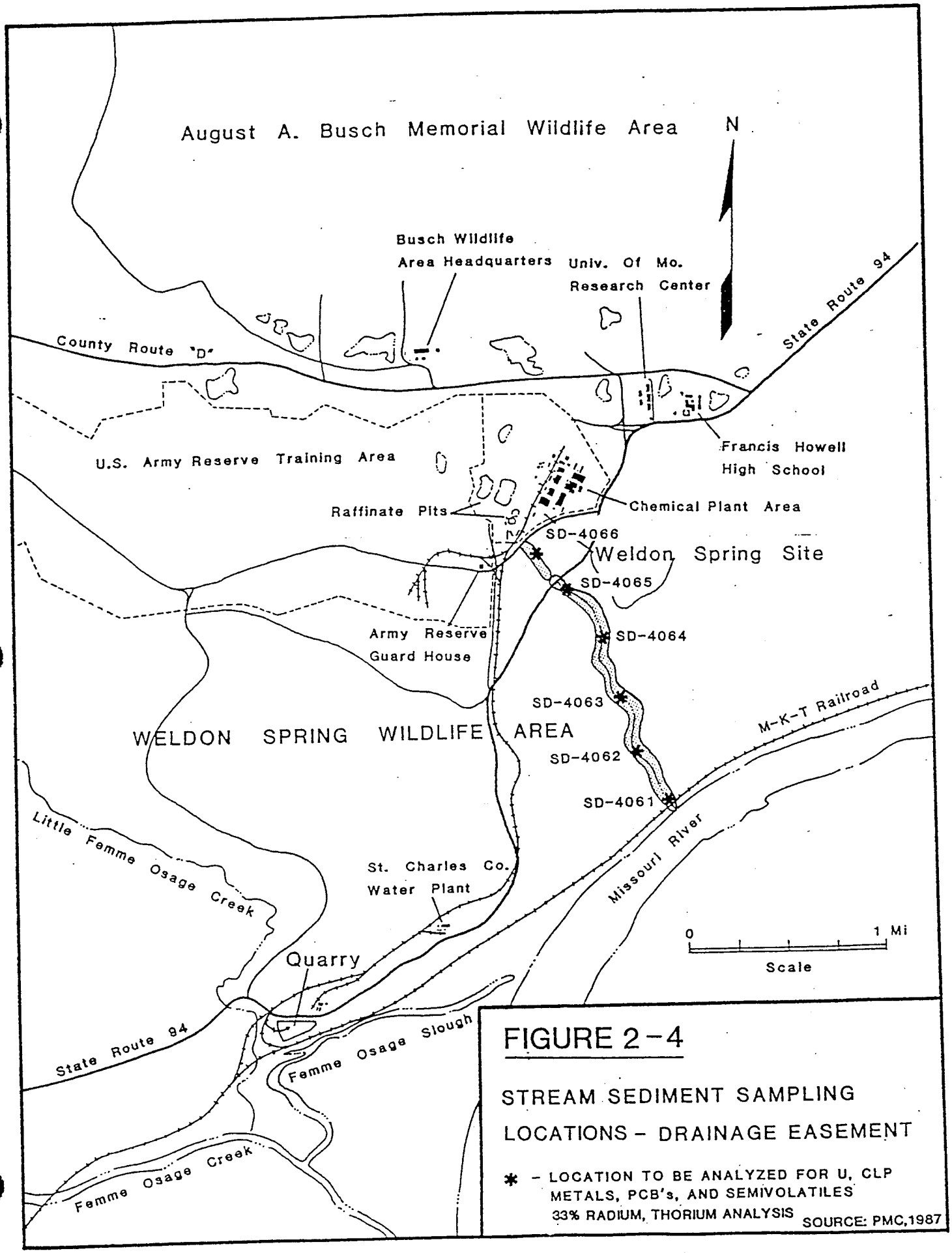
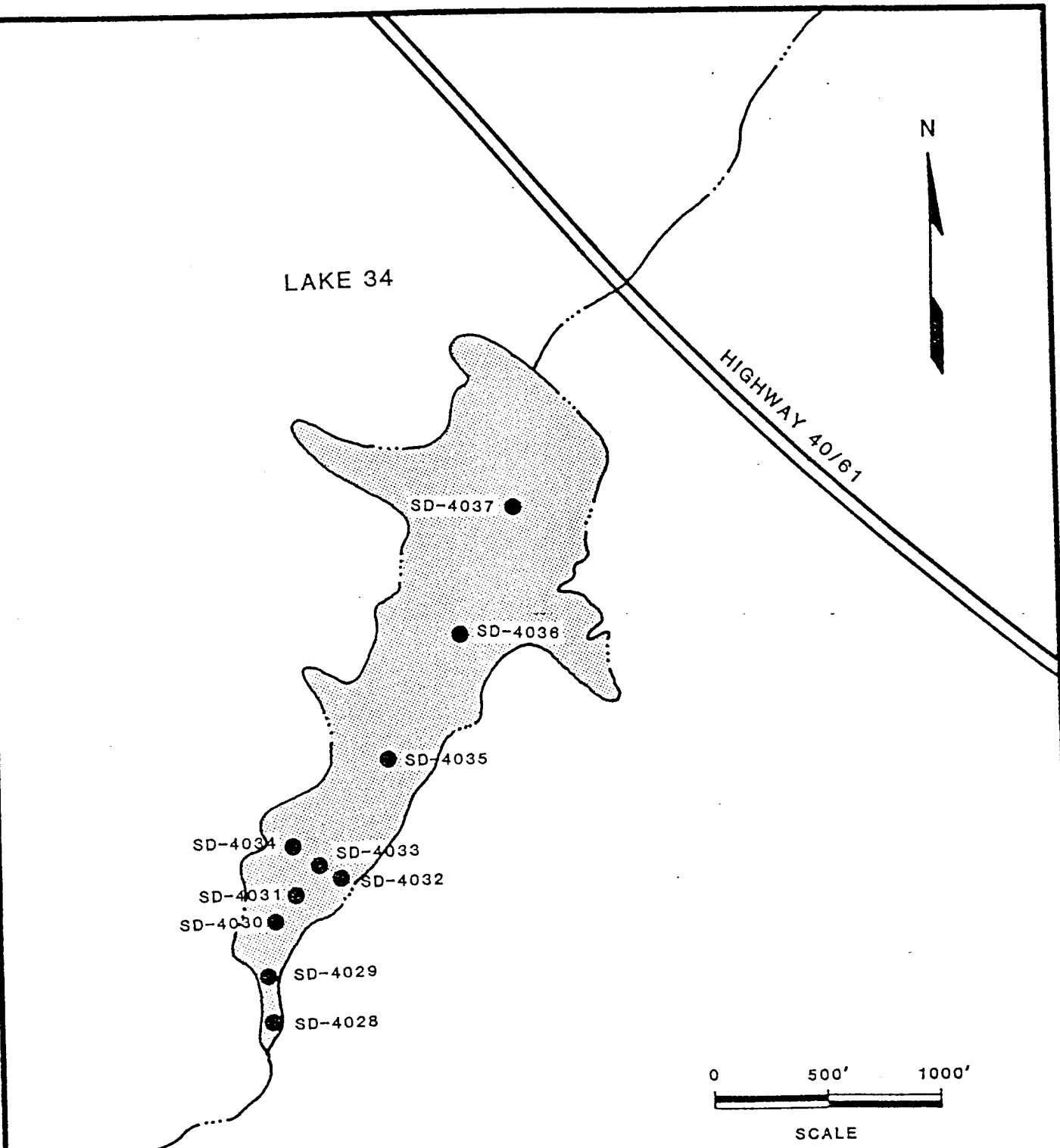


FIGURE 2-4

STREAM SEDIMENT SAMPLING LOCATIONS - DRAINAGE EASEMENT

* - LOCATION TO BE ANALYZED FOR U, CLP METALS, PCB's, AND SEMIVOLATILES 33% RADIUM, THORIUM ANALYSIS

SOURCE: PMC,1987



● - URANIUM SAMPLING LOCATION
33% RADIUM, THORIUM ANALYSIS

FIGURE 2-5

SEDIMENT SAMPLING LOCATIONS IN LAKE 34 ON THE BUSCH AREA

SOURCE: PMC,1987

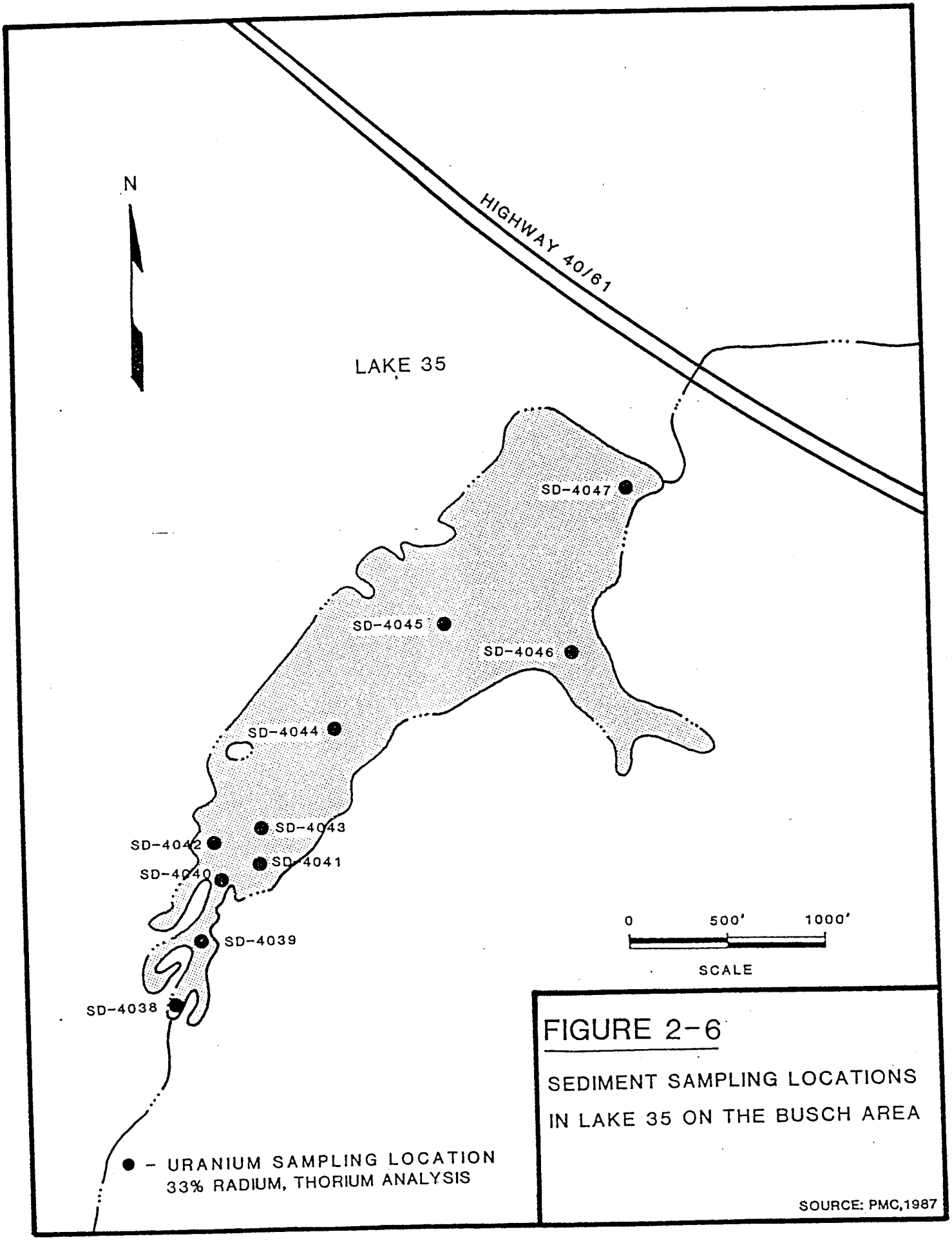


FIGURE 2-6

SEDIMENT SAMPLING LOCATIONS IN LAKE 35 ON THE BUSCH AREA

SOURCE: PMC,1987

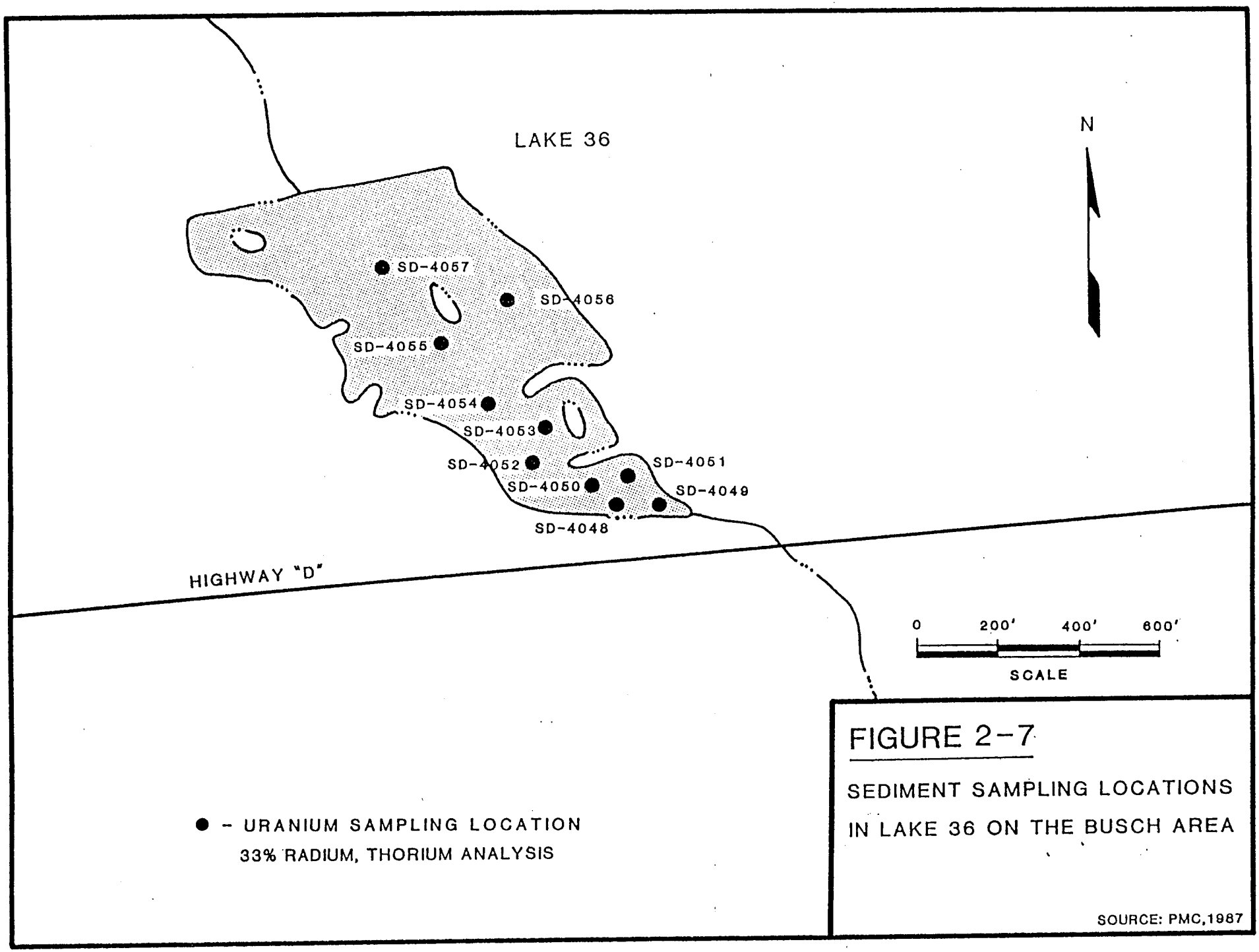
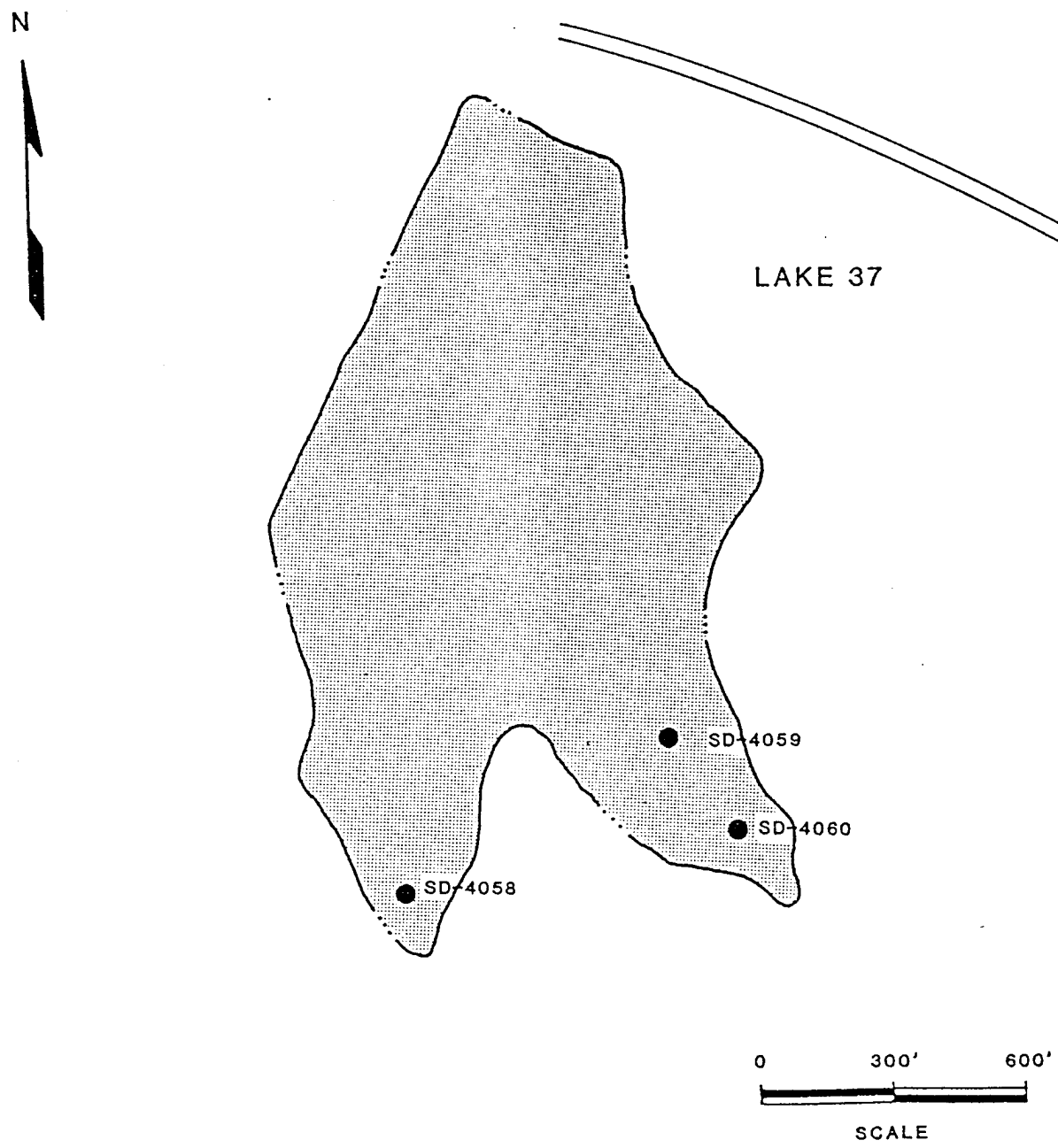


FIGURE 2-7

SEDIMENT SAMPLING LOCATIONS IN LAKE 36 ON THE BUSCH AREA

SOURCE: PMC,1987



● - URANIUM SAMPLING LOCATION
33% RADIUM, THORIUM ANALYSIS

FIGURE 2-8

SEDIMENT SAMPLING LOCATIONS IN LAKE 37 ON THE BUSCH AREA

SOURCE: PMC,1987

3.0 ANALYTICAL PROCEDURES

Samples will be analyzed as described in Table 1.1. Metals and semi-volatiles analyses will be performed using methodology, chain of custody, and detection limits required in the USEPA Contract Laboratory Program Statement of Work. Nitroaromatic analyses will be performed according to USATHAMA methodology. Radiologic parameters will be determined following the methods and meeting the minimum detection and accuracy limits shown in Table 3-1.

TABLE 3-1

DETECTION LIMITS FOR RADIOLOGICAL PARAMETERS

SPECIES	METHODS	DETECTION LIMITS	ACCURACY * (95% CONFIDENCE LEVEL)
Uranium,Natural	EPA 908/ASTM	5 pCi/g	± 30% at 30 pCi/g
Radium-226	EPA 904	1 pCi/g	± 30% at 5 pCi/g
Thorium-230	EERF 00/07	1 pCi/g	± 30% at 5 pCi/g
Thorium-232	EERF 00/07	1 pCi/g	± 30% at 5 pCi/g

Source: WSSRAP, 1987.

* All activities reported on a dry weight basis.

4.0 QUALITY ASSURANCE

The integrity of all sediment samples shall be maintained in accordance with WSSRAP ES&H Standard Operating Procedure No. 4.01.02 (Chain of Custody). A minimum of 5 percent of the total number of samples shall be duplicates to assess analytical precision.

5.0 DATA DOCUMENTATION

Proper documentation is a fundamental element for quality assurance of this program. All sampling activities including sampling location, identification, sampling techniques and methods, decontamination procedures, and shipment of samples will be extensively documented in the field on a daily basis.

5.1 Sample Collection

Prior to sample collection, the sample location will be checked to verify that the sampling ID code used corresponds to the sampling plan station. For each sample collected, a Sediment Sampling Data Form will be completed. The data form (Figure 2.1) includes the name(s) of the person(s) collecting the sample, the time of collection, the mechanism for sampling, depth of sample, location, and discription of the sample. Sample numbering will be as defined in ES&H WSSRAP SOP 4.01.01 (Environmental Numbering System).

5.2 Chain of Custody

Custody of Samples will be maintained and documented from the time of collection to completion of analysis and reporting of data. Chain of Custody procedures are specified in the ES&H WSSRAP Standard Operating Procedure 4.01.02 (Chain of Custody).

5.3 Field Notebook

All field sampling activities will be documented through written entries into a field notebook. Field activities will be logged in on a daily and event-oriented basis.

Entries will be as detailed as possible so that, at a later date, the reader could reconstruct each event without reliance on the

memories of the field team members.

All field notebooks will be hardbound with numbered pages. Responsibility for note-taking will be assigned to specific field team personnel. Each notebook will be identified by the project-specific information recorded on the front cover:

Project Name:	WSSRAP Lake/Stream Sediment Characterization
Start Date:	
End Date:	
Responsibility:	Name of person to whom the notebook is assigned.

Entries into the notebook will contain a variety of information. At the beginning of each entry, the date, start time, weather, all field personnel present, level of personal protection being used onsite, and the signature of the person making the entry will be entered. The names of property owners approached for access, agency personnel present, and all field sampling team personnel will be recorded in the field notebook.

All measurements made and samples collected will be recorded. All entries will be made in waterproof ink and no erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark. Wherever a sample is collected or a measurement is made, a detailed description of the location of the station, which includes compass and distance measurements, shall be recorded. The film roll number and number of photographs taken of the station will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

5.4 Photographs

Photographs will be taken of each sampling location at the time

of sampling (except lake locations). These photographs will document the position of each location in relation to local surroundings and prominent reference points. Photographs will be taken of groups of soil sampling locations where each location is clearly visible. The frame, roll number and compass heading (e.g., N, NE, NW, etc.) of each picture will be logged into the field sampling notebook along with the other site location information.

In addition to documenting each sampling location with photographs a photographic record also will made of the sediment collected at each location. A reference (such as a ruler) and identification label will be used to identify the sample, depth and physical description of the interval sampled.

6.0 REPORTING REQUIREMENTS

After the analytical results are received from the laboratory, a data report will be prepared to present the findings from this study and to interpret the data. This report will show actual sampling locations, sampling method, field data, and analytical results. It will also be used to make recommendations regarding further sampling and/or continued monitoring. This report will provide information from which a decision can be made regarding the necessity for cleanup of sediment in these surface water bodies.