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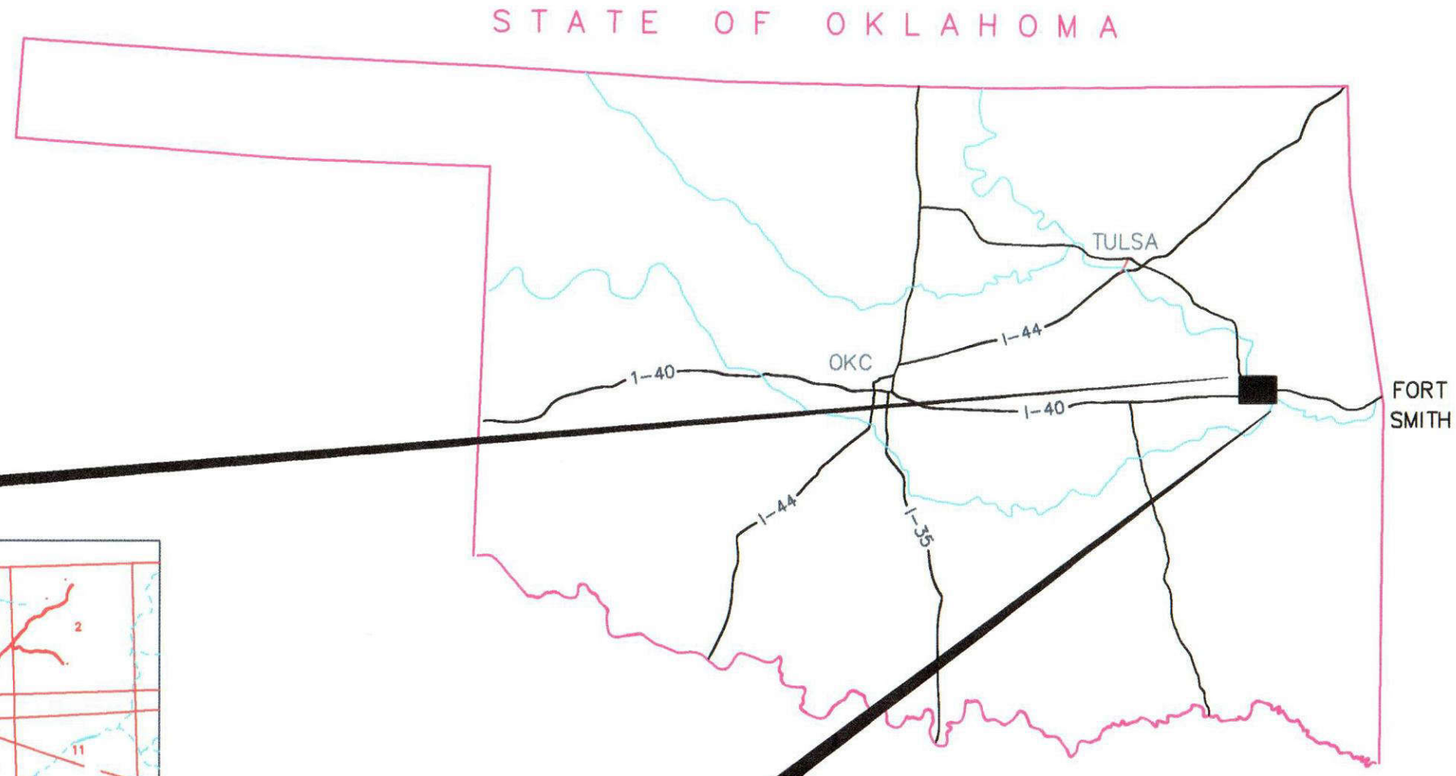
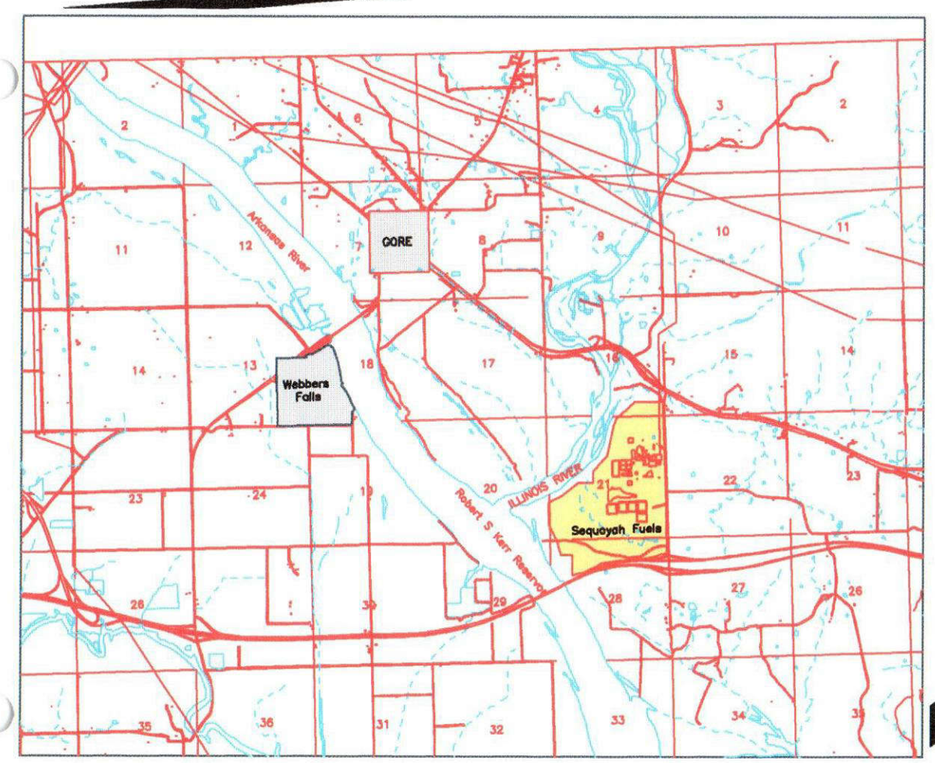
List of Attachments

ATTACHMENT	TITLE
I	Ft. Smith and Tulsa STAR Data
II	Structures and Equipment Survey Results
III	Impacted Material Volume and Activity Estimates
IV	Data Quality Assessments

Figures

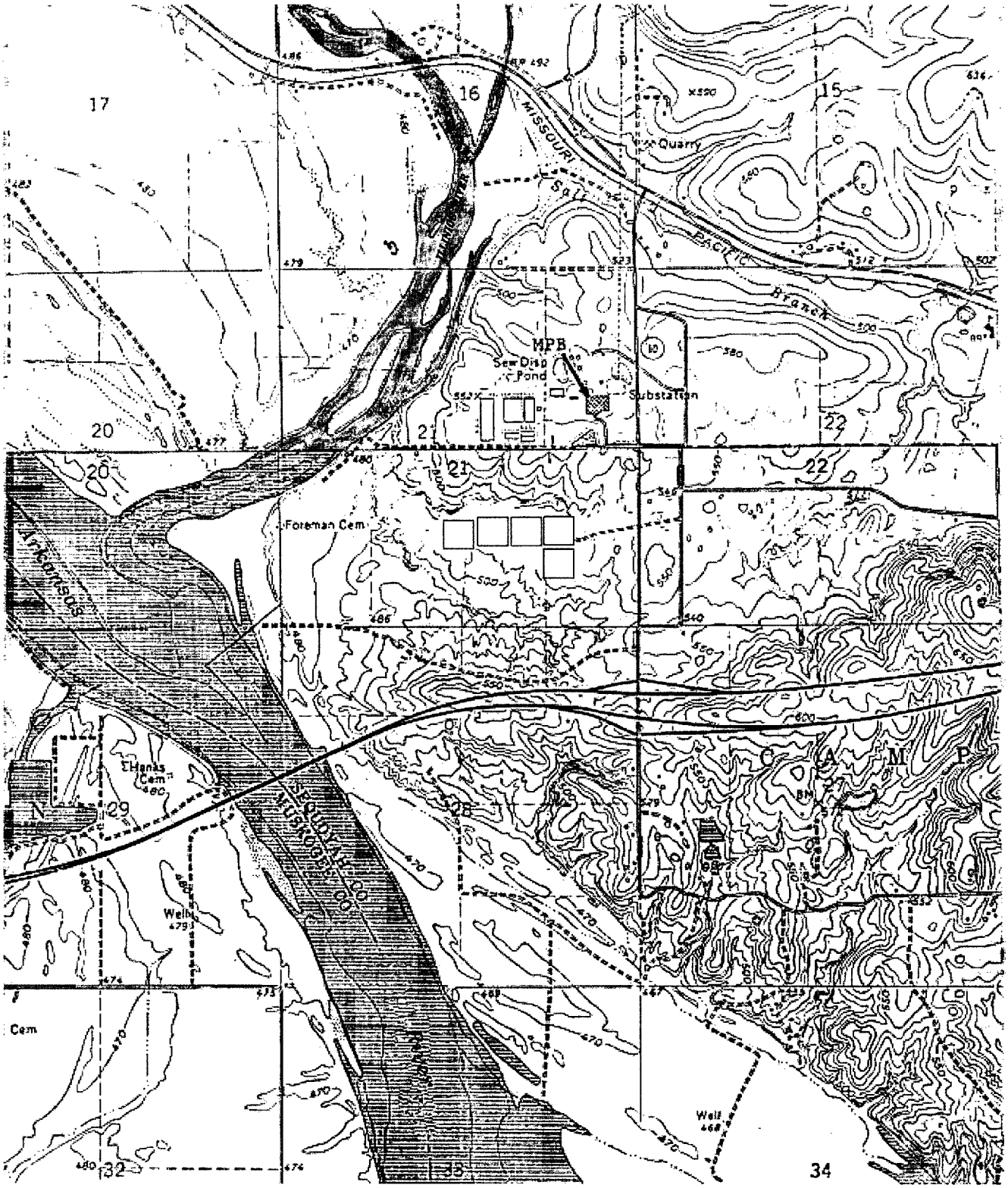


LOCATION MAP



SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: FACILITY LOCATION MAP	
PREPARED BY: SFC	FILENAME: SFC0005A
REVIEWED BY: KS	FIGURE NO. 1
DATE: 11/23/98	

c01

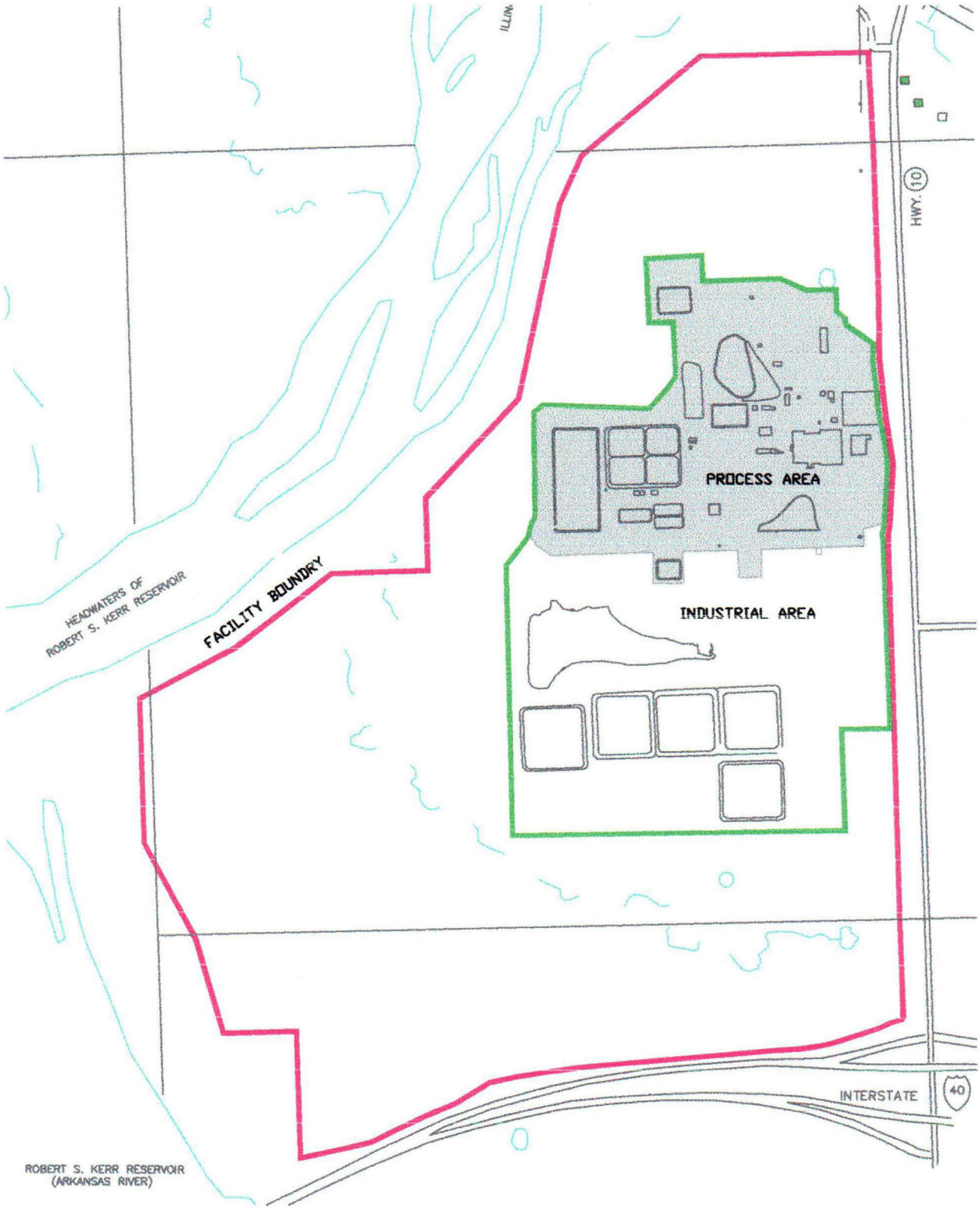


-N-

SCALE

1 Mile

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: TOPOGRAPHIC MAP	
PREPARED BY: SFC	FILENAME: SFC0026A
REVIEWED BY: KS	FIGURE NO. 2
DATE: 11/11/98	



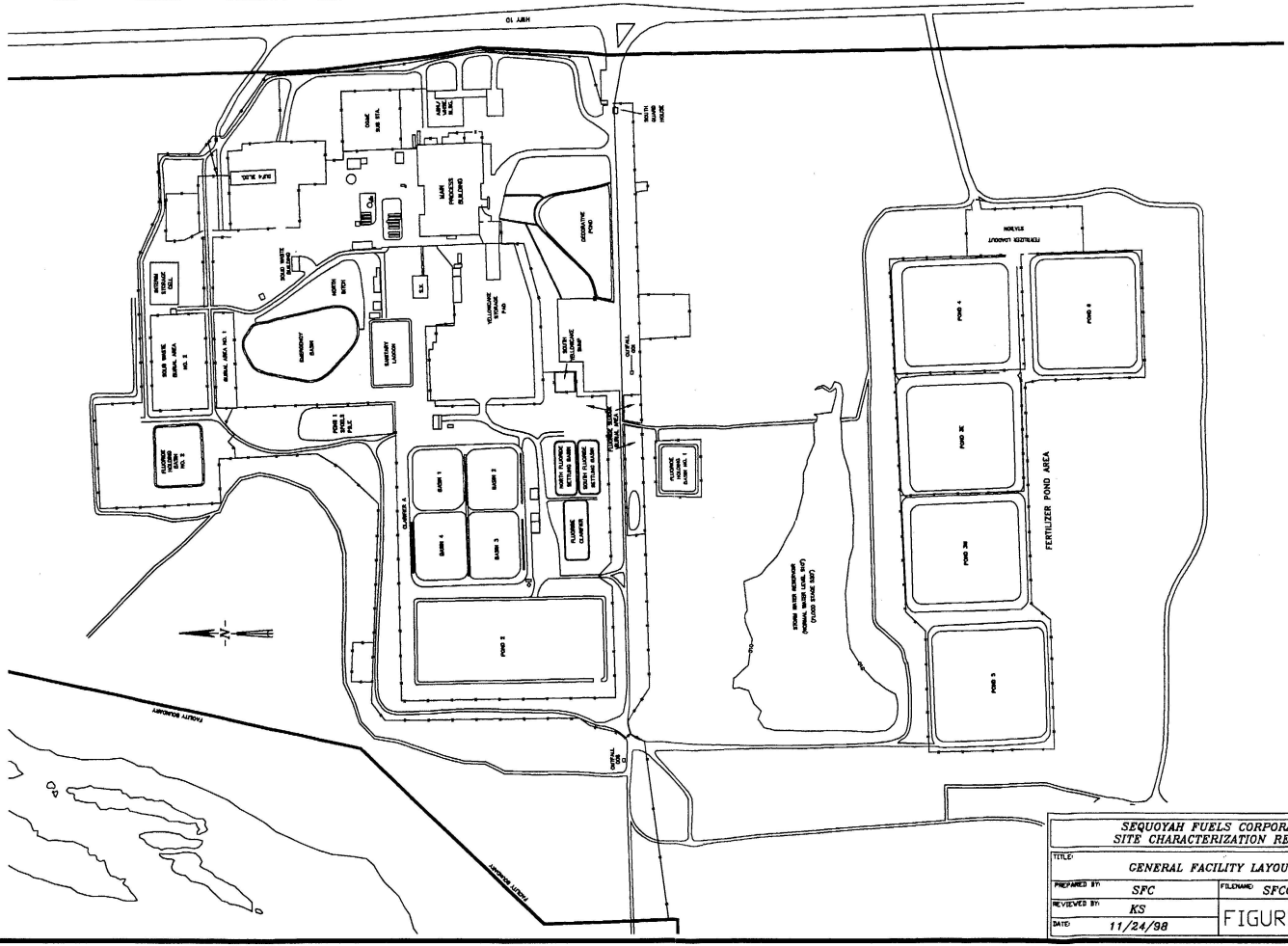
LEGEND

- PROCESS AREA
- FACILITY BOUNDARY
- INDUSTRIAL AREA PERIMETER

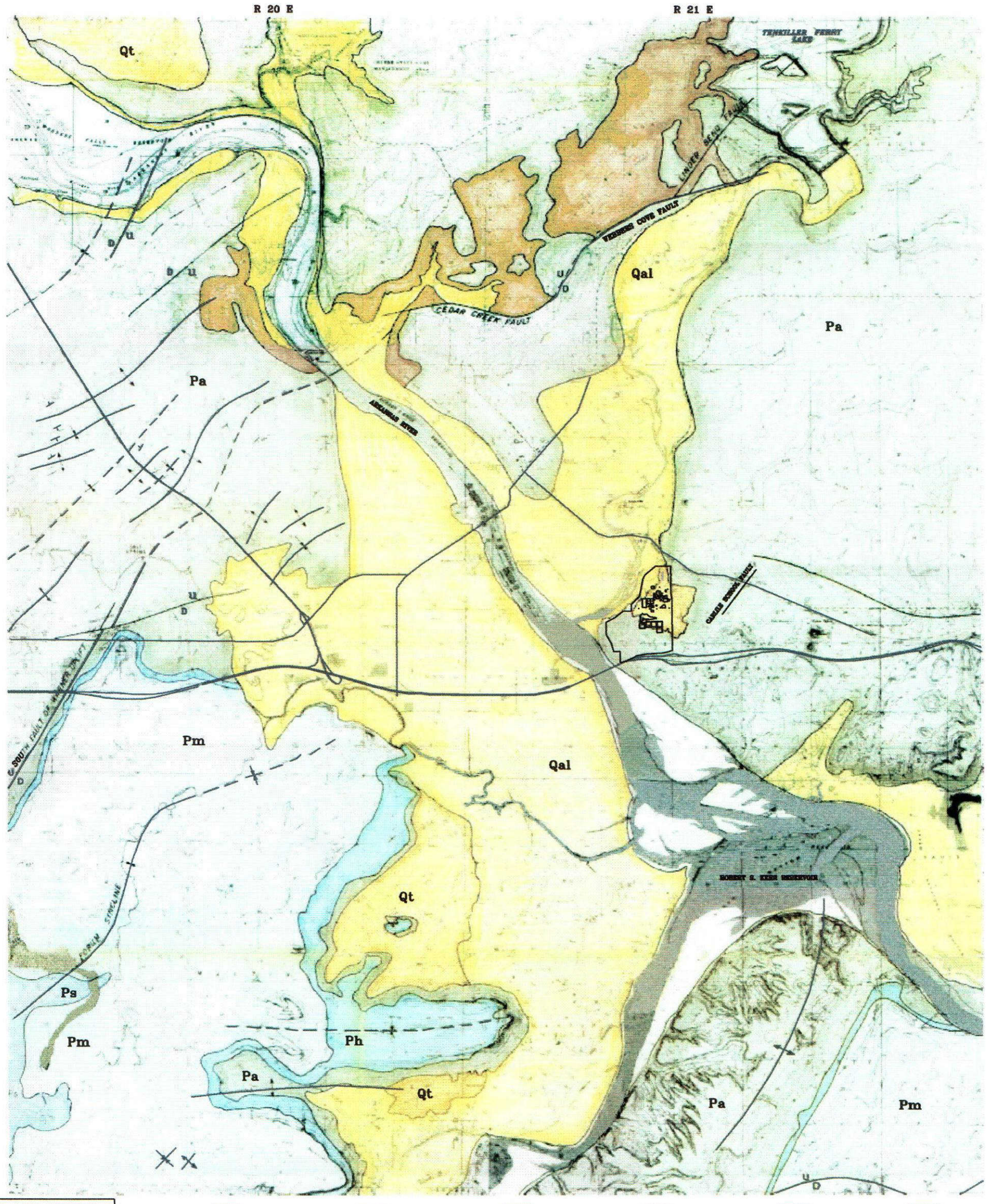
0 500 1000 2000

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: SFC FACILITY AREA DESIGNATIONS	
PREPARED BY: SFC	FILENAME: SFC0006B
REVIEWED BY: KS	FIGURE NO. 3
DATE: 11/24/98	

C02



SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: GENERAL FACILITY LAYOUT	
PREPARED BY: SFC	FILENAME: SFC0001A
REVIEWED BY: KS	FIGURE NO. 4
DATE: 11/24/98	



Alluvium
Gravel, Sand, Silt, and clay. Yeilds large amounts of water of good quality along the Arkansas River.

Terrace Deposits
Gravel, Sand, Silt, and clay. Yeilds small to moderate amounts of water of good quality along the Arkansas River; smaller amounts elsewhere.

Savanna Formation
Shale, Sandstone, and Coal. Yeilds limited amounts of water of poor quality.

McAlester Formation
Shale and Sandstone. Yeilds limited amounts of water of poor quality.

Hartshorne Formation
Sandstone and Coal. Yeilds limited amounts of water of poor quality.

Atoka Formation
Shale and Sandstone. Yeilds limited amounts of water of poor quality.

Pre Atoka
Limestone and Shale. Yeilds small to moderate amounts of water of fair to good quality.

After M.V. Marcher 1969

McALESTER	Cameron ss Lequire ss Warner ss McCurtain sh Hartshorne ss	QUATERNARY	Qal	ALLUVIUM
			Qt	TERRACE SAND AND GRAVEL
ATOKA	Blackjack sh ss Webbers Falls ss Dirty Ck ss Georges' Fork ss Pope Chapel ss Coody ss	PENNSYLVANIAN	Ps	SAVANNA FORMATION
			Pm	MCALESTER FORMATION
			Ph	HARTSHORNE FORMATION
			Pa	ATOKA FORMATION
				PRE-ATOKA

Philip A. Chenoweth
CONSULTING GEOLOGIST
TULSA, OKLAHOMA

WEBBER FALLS AREA
MUSKOGEE, SEQUOYAH & HASKELL CO.S, OKLAHOMA

GEOLOGIC MAP

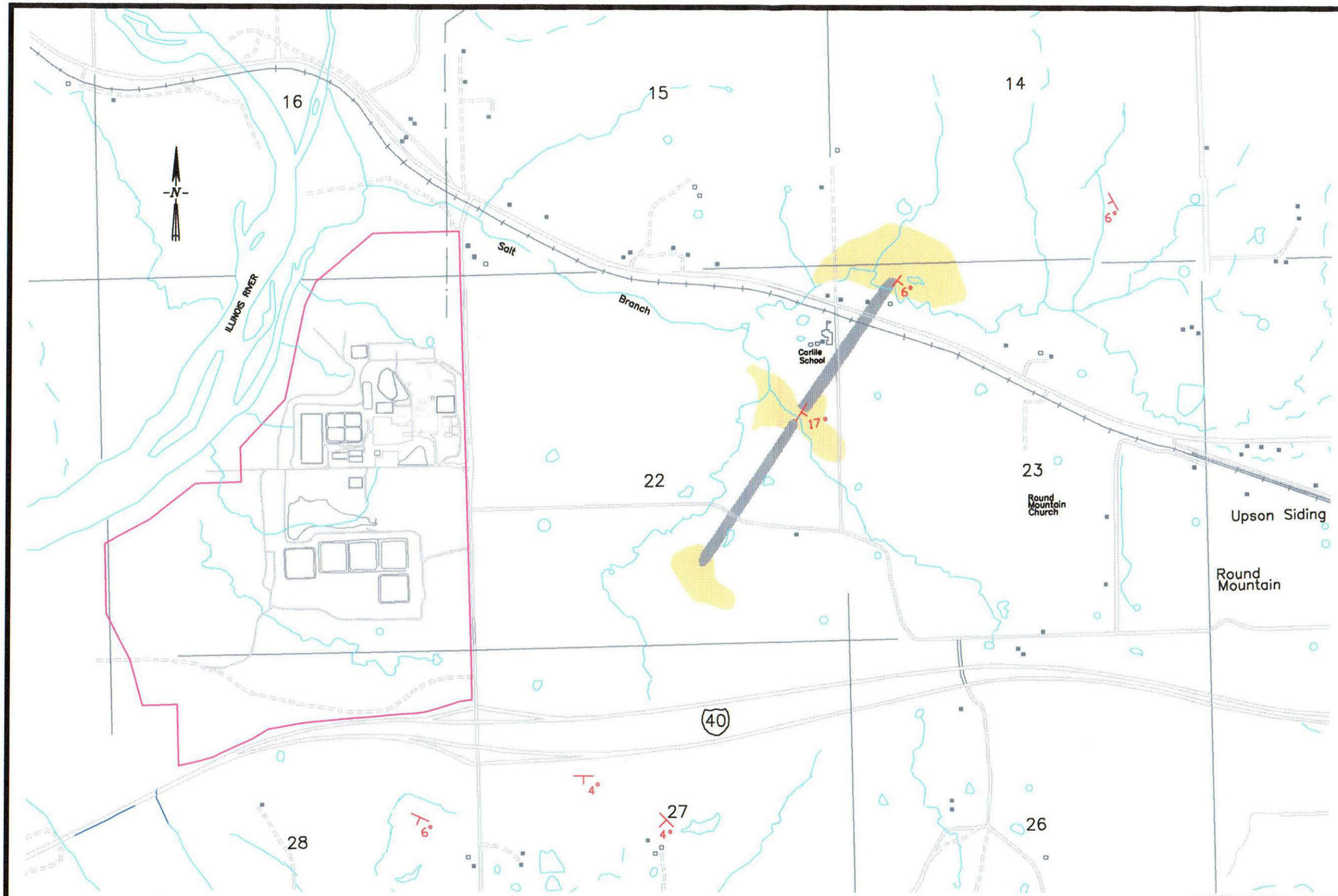
1 inch = 4000 feet — JULY 1985

SEQUOYAH FUELS CORPORATION
SITE CHARACTERIZATION REPORT

TITLE: GEOLOGIC MAP
PREPARED BY: SFC
REVIEWED BY: KS
DATE: 11/23/98
FILENAME: SFC0065A

FIGURE NO. 5

C03

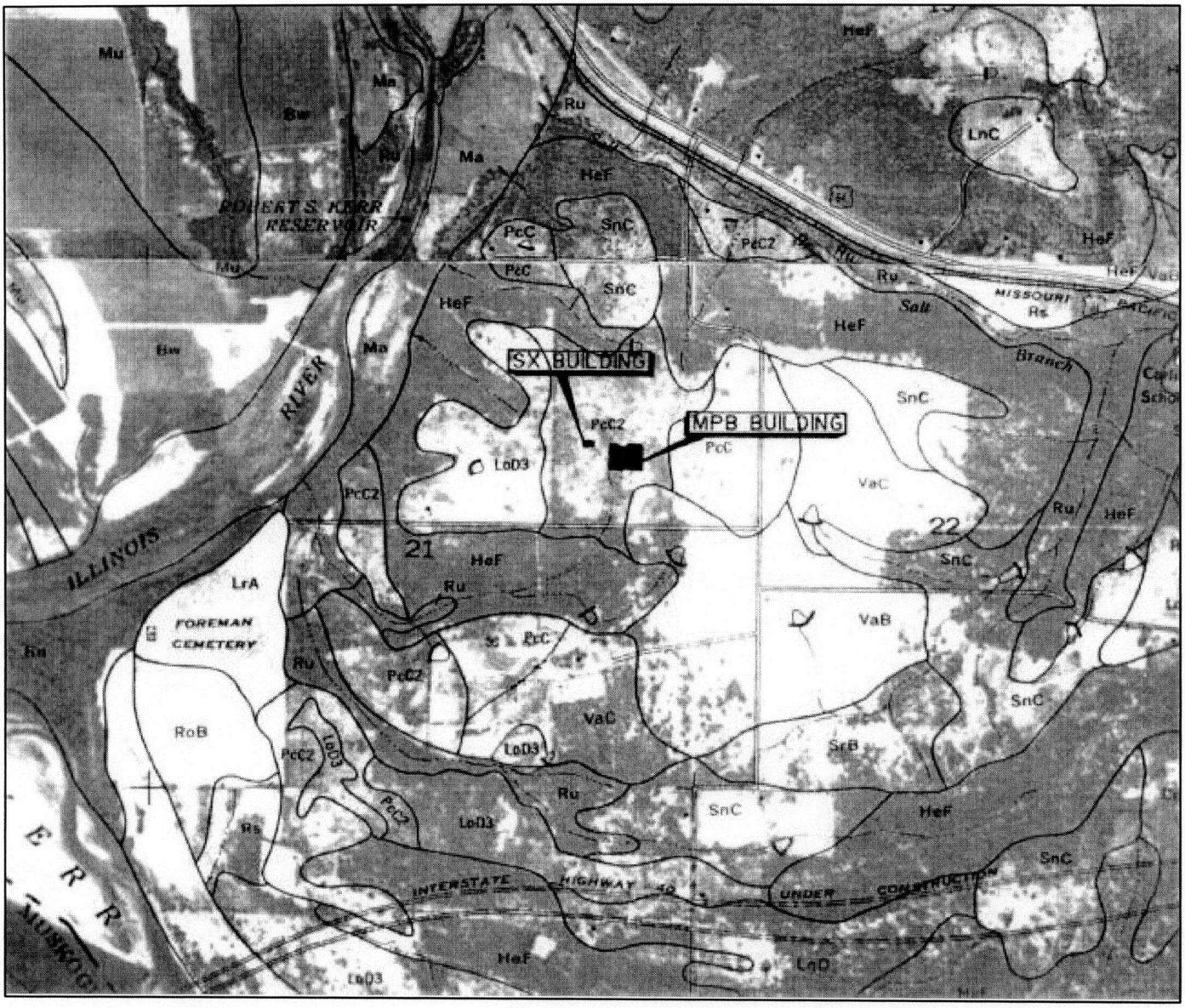


Lt. Gray indicates location of Carlile fault zone.

Tan indicates areas along the fault zone where streams have truncated the zone and deposited alluvial flood plains.

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: CARLILE SCHOOL FAULT	
PREPARED BY: SFC	FILENAME: SFC0025A
REVIEWED BY: KS	FIGURE NO. 6
DATE: 11/4/98	

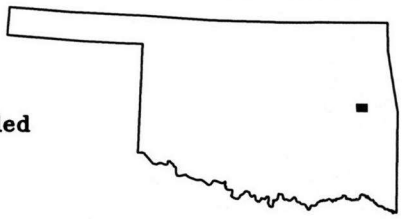
c04



LEGEND

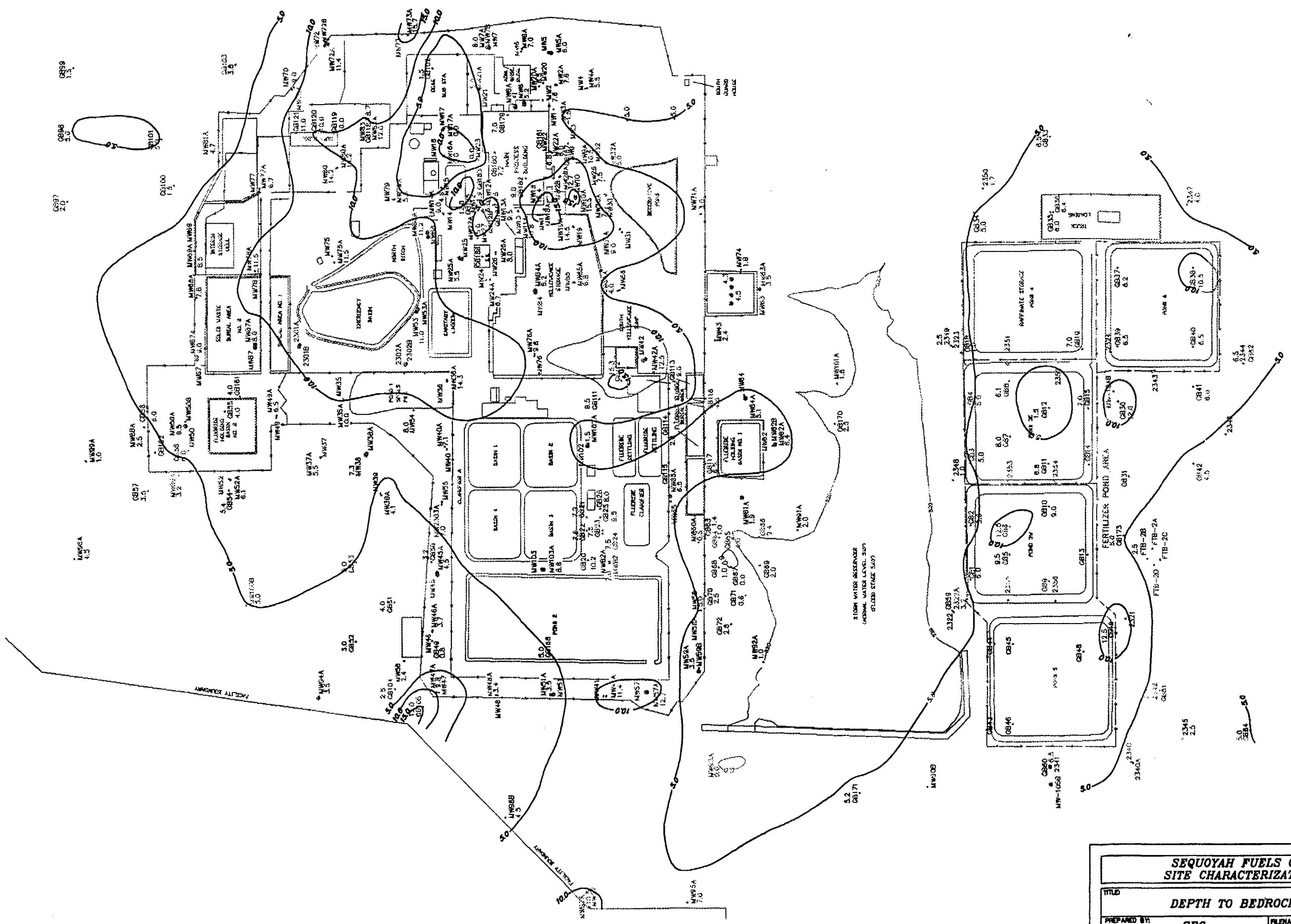
PcC2	Pickwick loam, 2-5% slopes, eroded
PcC	Pickwick loam, 3-5% slopes
LoD3	Linker & Stigier soils, 2-8% slopes severly eroded
SnC	Spiro silt loam, 2-5% slopes
HeF	Hector-Linker-Enders comlex, 5-40% slopes
VaB	Vian silt loam, 1-3% slopes
VaC	Vian silt loam, 3-5% slopes
Ma	Mason silt loam

STATE OF OKLAHOMA

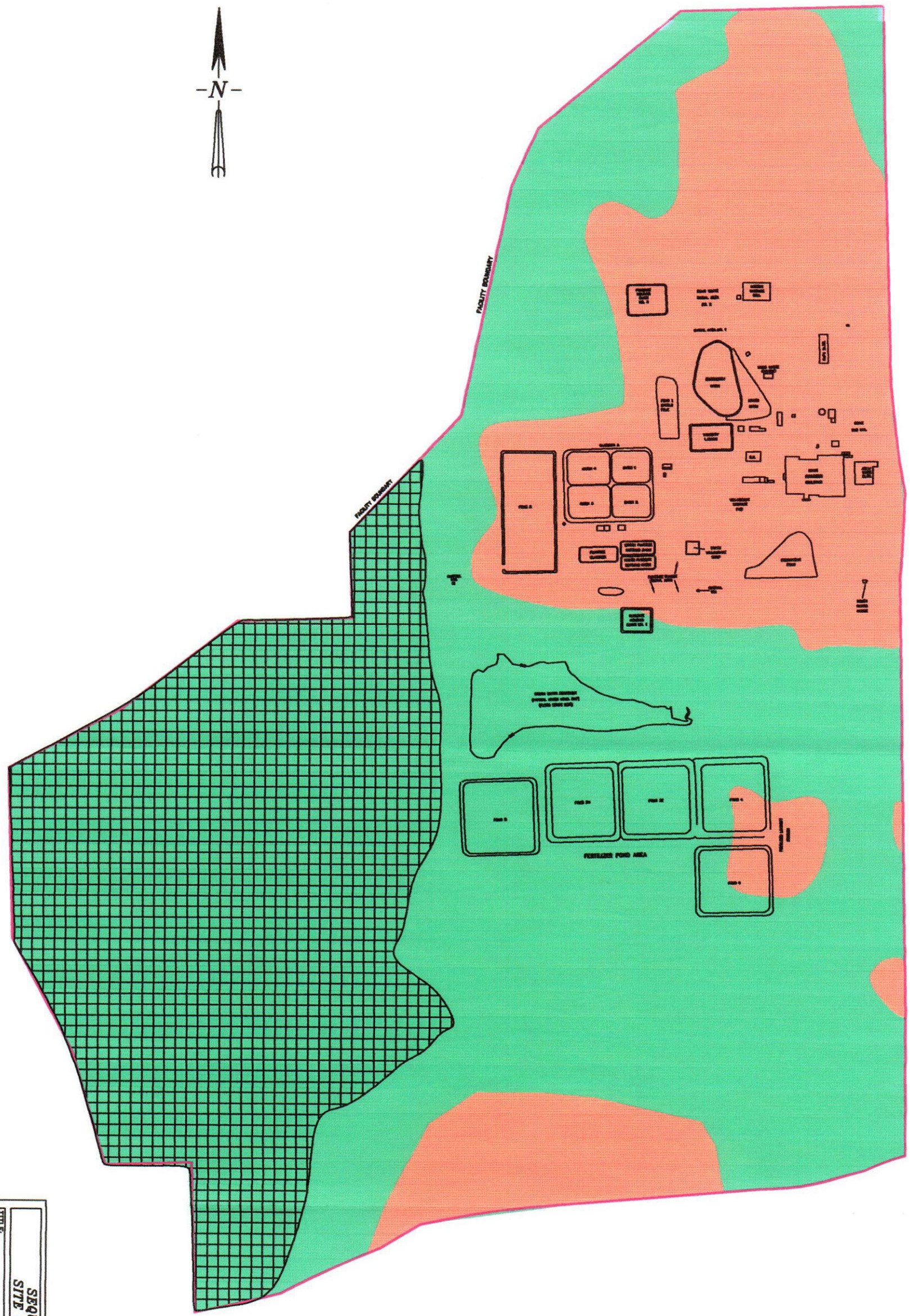


-N-

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: AREA SOILS MAP	
PREPARED BY: SFC	FILENAME: SFC0027A
REVIEWED BY: KS	FIGURE NO. 7
DATE: 11/24/98	



SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: DEPTH TO BEDROCK ISOPACH	
PREPARED BY: SFC	FILENAME: SFC0011B
REVIEWED BY: KS	FIGURE NO. 8
DATE: 11/11/98	

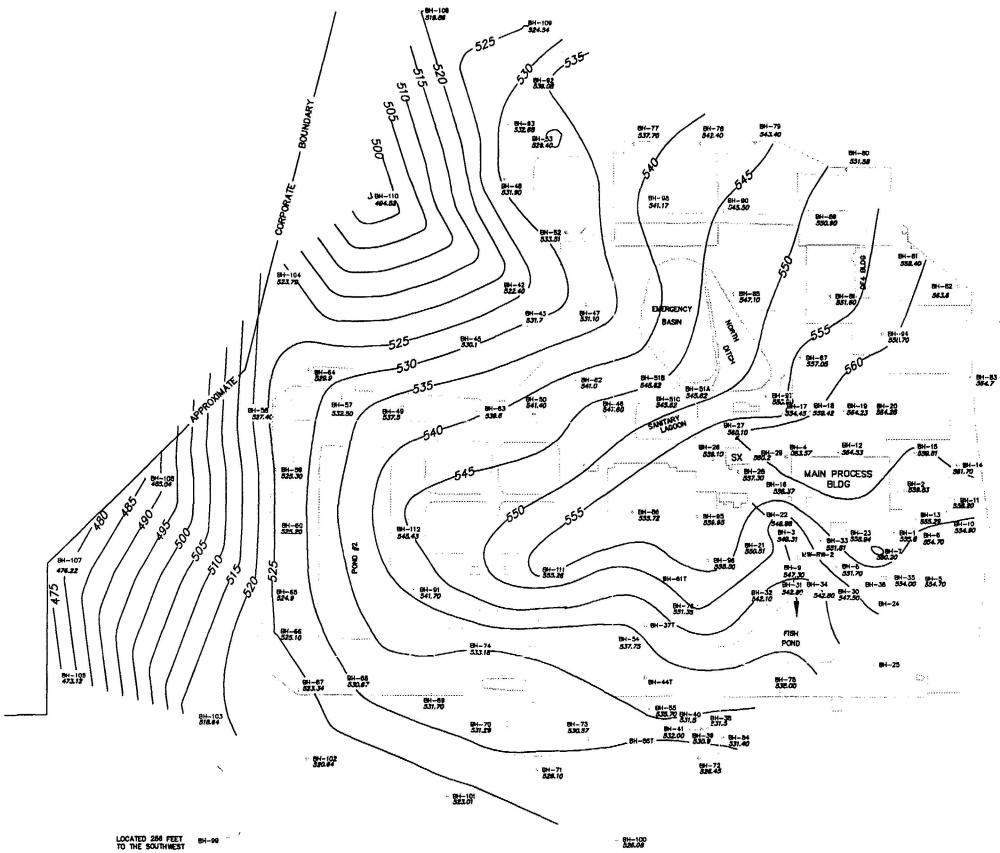


LEGEND

- Unit 1 Shale
- Units 2 thru 4
- Alluvial Deposits Overlying Unit 4 Shale

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: BEDROCK GEOLOGY MAP	
PREPARED BY: SFC	FILENAME: SFC0028B
REVIEWED BY: KS	
DATE: 01/10/2000	FIGURE NO. 9

C05



-N-

LEGEND

BH-82 543.6 — LOCATION OF LITHOLOGICAL CHARACTERIZATION BORING AND ELEVATION OF BEDROCK SURFACE, FEET AMSL

555 — STRUCTURE CONTOUR SHOWING ELEVATION OF TOP OF BEDROCK SURFACE, FEET AMSL

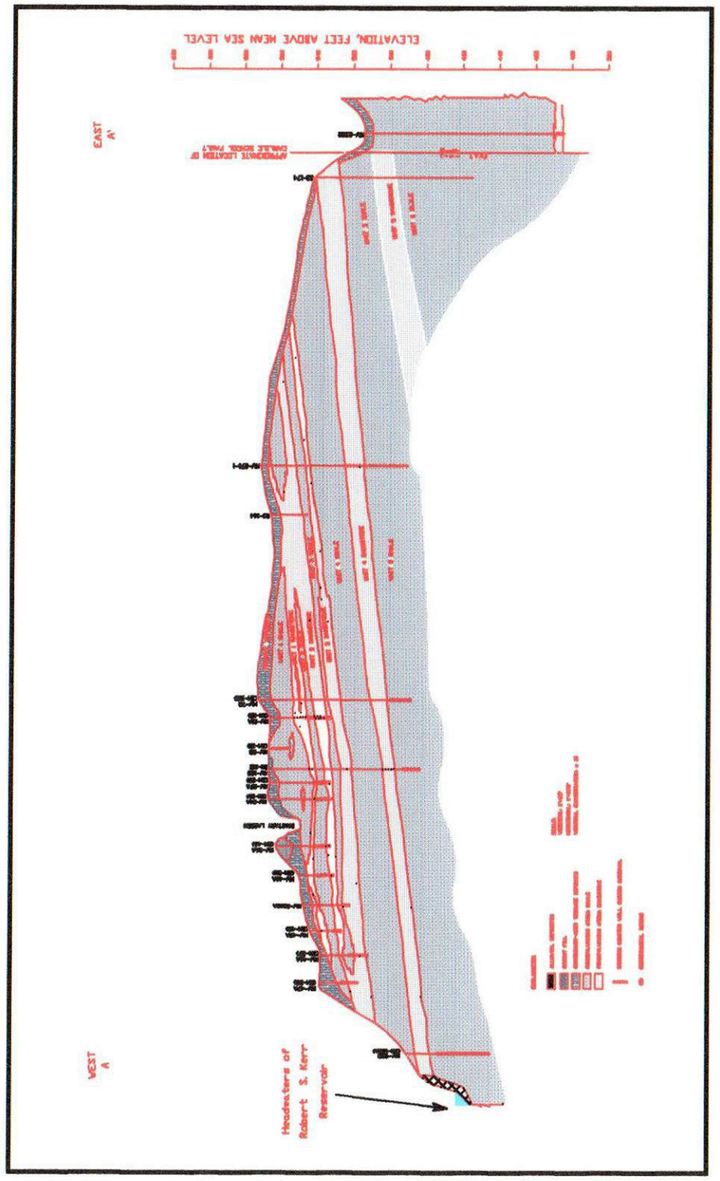
CONTOUR INTERVAL 5.0 FEET

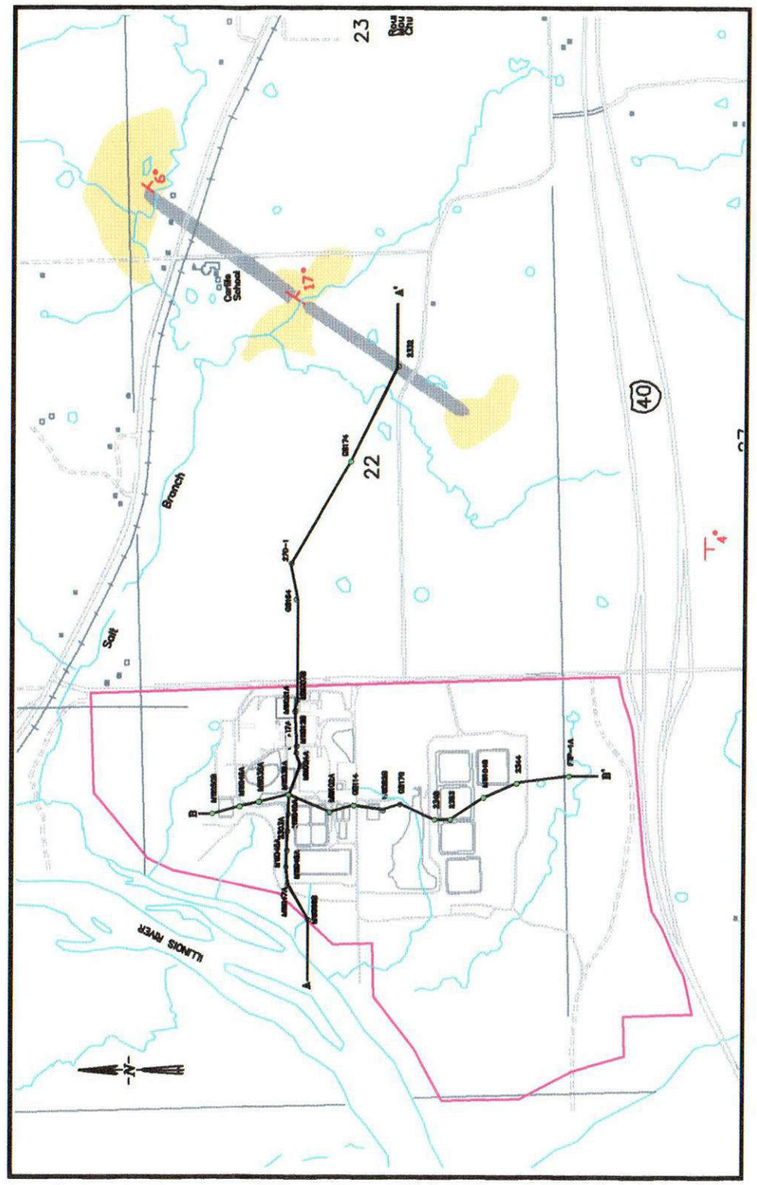
POSSIBLE PALEOCHANNEL (EROSIONAL SURFACE ON BEDROCK)

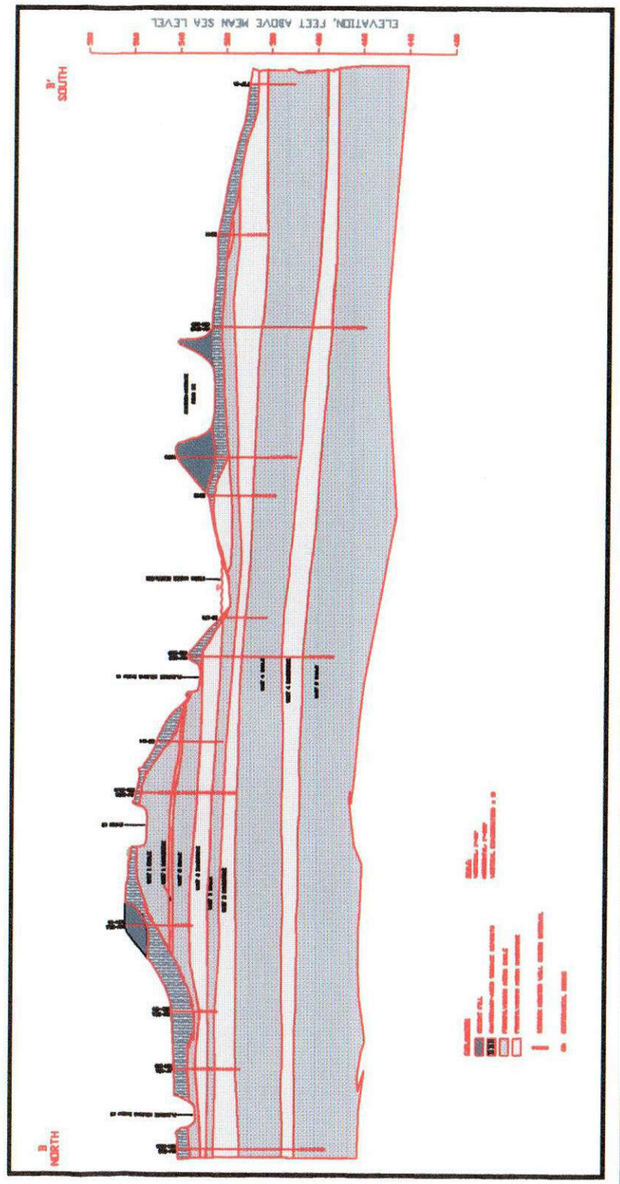
SCALE

0' 100' 200' 300' 600'

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: TOP OF BEDROCK STRUCTURE MAP	
PREPARED BY: SFC	FILENAME: SFC0029A
REVIEWED BY: KS	FIGURE NO. 10
DATE: 11/23/98	

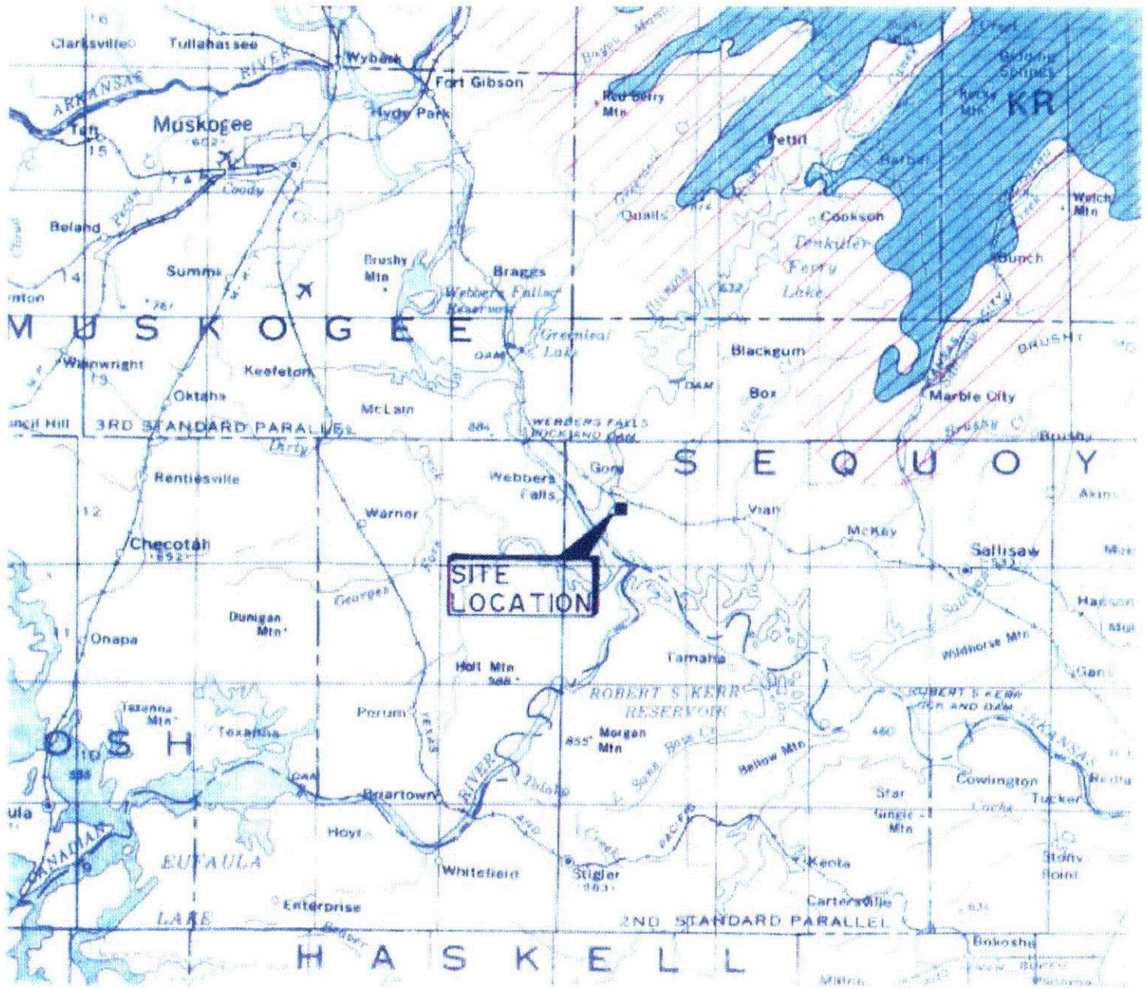




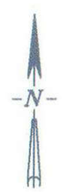


SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
GEOLOGIC CROSS SECTIONS	
SFC	SFC0033A
KS	FIGURE NO. 11
11/24/98	

C06



AFTER K.S. JOHNSON, 1983



LEGEND

RECHARGE AREAS

Patterns of red lines on the map show known or potential recharge areas for the various bedrock aquifers.

Recharge Areas This pattern shows areas that are known to be part of the recharge area for a bedrock aquifer: includes outcrops of the aquifer and of overlying porous and permeable rocks hydraulically connected with the aquifer.

Potential Recharge Areas This pattern shows areas that may be part of the recharge area for a bedrock aquifer: includes areas where confining strata may contain pathways for downward movement of water to the aquifer, and safety zones (generally extending 4 miles beyond the known limits of the aquifer) that may overlie unknown extensions of the aquifer or rocks hydraulically connected with the aquifer.

BEDROCK AQUIFERS

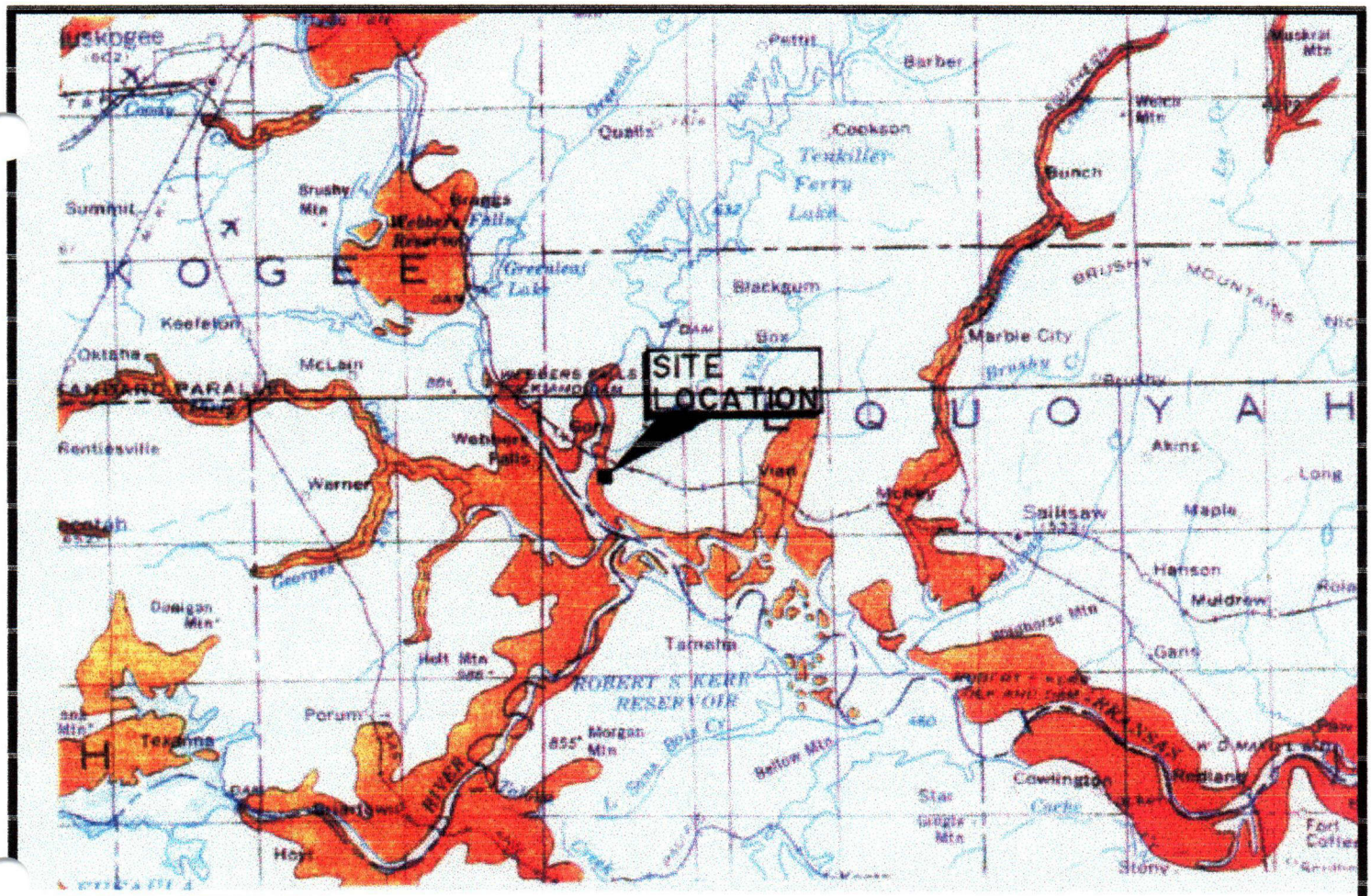
Colored areas on the map show distribution of bedrock aquifers, which are the rock units generally considered favorable or moderately favorable for development of ground-water resources. Bedrock aquifers are listed below by geologic age from oldest to youngest. References, listed at the end of each aquifer description, include Hydrologic Atlases (HA) and Other Reports that provide more detailed information. All references are given in a 4-page pamphlet that accompanies K.S. JOHNSON'S map.

KR

Keokuk and Reeds Spring Formations (Mississippian in age). This northeastern Oklahoma unit, also referred to as the "Boone Formation" or "Boone Chert," consists of limestone and cherty limestone beds that locally are fractured or cavernous. Thickness ranges from 250 ft. in south) to about 400 fL in north. Wells consistently yield more than 3 gpm, and some yield as much as 50 gpm. Water is of good quality (generally less than 500 mg/L dissolved solids) although typically it is hard. Recharge areas include outcrops of aquifer and of overlying Mississippian limestones and shales above aquifer. Potential recharge areas include areas in northwest where aquifer underlies younger Pennsylvanian rocks; also areas that extend 4 miles west and south of aquifer limits. Reference: HA-1, HA-2; also Other Reports 33, 38, 44, 49, 51, 61.

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: BEDROCK AQUIFERS AND RECHARGE AREAS NEAR FACILITY	
PREPARED BY: SFC	FILENAME: SFC0034A
REVIEWED BY: KS	FIGURE NO. 12
DATE: 11/23/98	

C07



AFTER K.S. JOHNSON, 1983

EXPLANATION

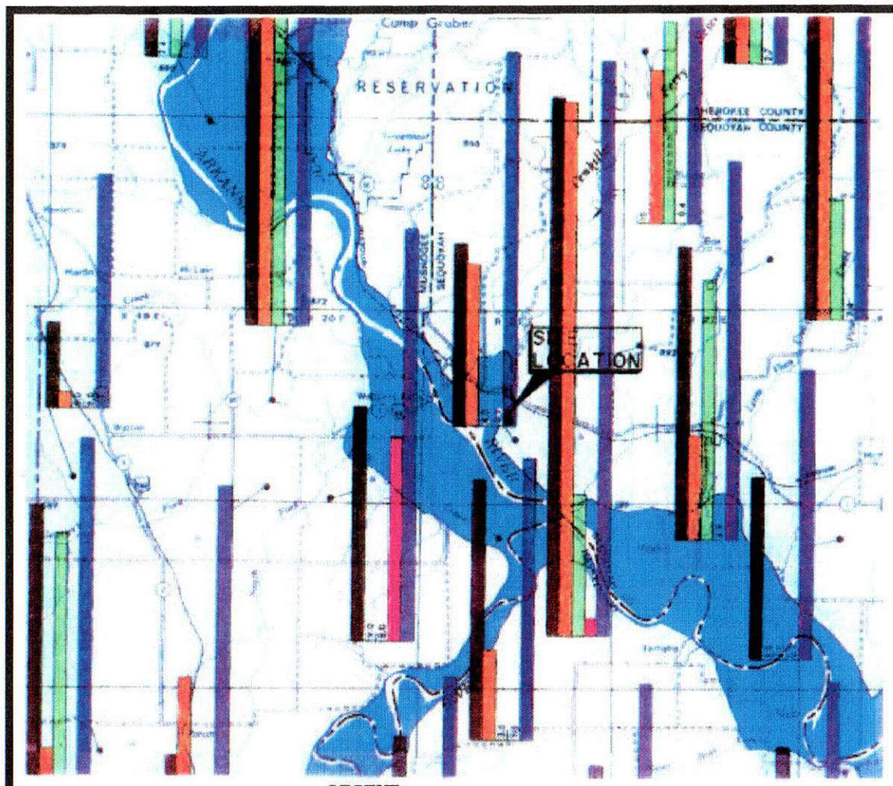
Alluvium and Terrace Deposite (Quaternary in age). Unconsoliated deposites of sand, silt, clay, and gravel that occured along or adjacent to modern and ancient rivers and streams. Thickness generally ranges from 10 to 50 ft. (Locally as much as 100 ft.). Wells generally yeild 10 to 500 gpm of water(locally several thousand gpm). and most water is of good quility (less than 1,000 mg/L). Recharge areas are essentially the same as distribution of the alluvium and terrace deposites.

STATE OF OKLAHOMA

N

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: ALLUVIAL AQUIFERS NEAR FACILITY	
PREPARED BY: SFC	FILENAME: SFC0035A
REVIEWED BY: KS	FIGURE NO. 13
DATE: 11/23/98	

C07A



LEGEND

Chemical quality of water generally good to excellent

This area includes alluvium along the Arkanas and Canadian Rivers and some terrace deposits in Tulsa, Wagoner, and Muskogee Counties. Hardness is the most troublesome chemical characteristic; 90 percent of the water samples tested were hard or very hard. The total disolved solids was low to moderate; less than 5 percent of the samples exceeded 500 ppm. Except at a few places, sulfate, chloride, and nitrate concentrations were low. Because of the low to moderate sodium and disolved-solids contents, most of the water from these deposits is suitable for irrigation.

Summary of Available Chemical Data

	CONCENTRATION (PPM) MAXIMUM	MEDIAN	MINIMUM	HUMDER OF ANALYSES
Hardness	640	255	26	44
Sulfate	198	32	0.0	44
Chloride	62	15	0.8	44
Nitrate	65	0.7	0.0	38
Total dissolved solides	702	335	86	44

Chemical quality of water fair to good

This area is underlain by the Keokuk and Reeds Spring Formations and older rocks. Hardness is the most troublesome chemical characteristic; 70 percent of the water samples tested were hard or very hard. (38) percent of the samples had a total dissolved solid content greater than 500 ppm. The sulfate, chloride, and nitrate contents are generally low, except locally.

Summary of Available Chemical Data

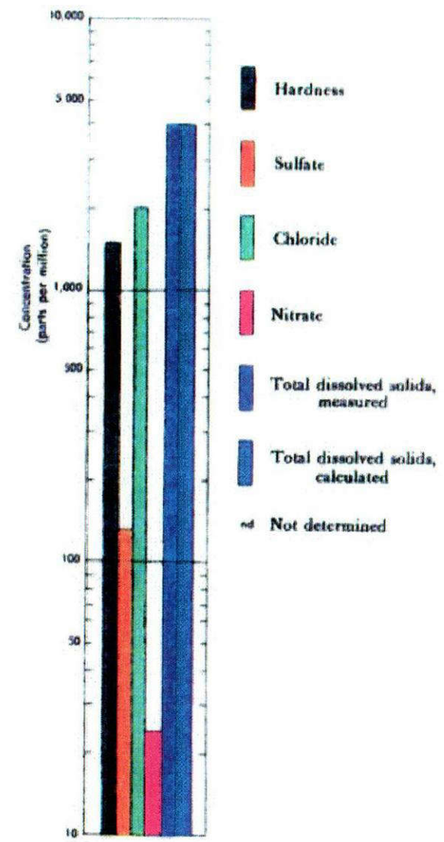
	CONCENTRATION (PPM) MAXIMUM	MEDIAN	MINIMUM	Number OF ANALYSES
Hardness	1,172	162	20	47
Sulfate	840	14	0.0	47
Chloride	840	16	0.2	47
Nitrate	62	2.2	0.0	47
Total dissolved solids	2,300	320	50	47

Chemical quality of water generally poor to fair

This area is underlain by shale, siltstone, and sandstone and some terrace deposits. Of the water samples tested, 57 percent contain more than 250 ppm sulfate, 10 percent contained more than 250 ppm chloride, and 53 percent contained more than 500 ppm total dissolved solids. Four samples contained more than 45 ppm nitrate; two of these were taken from wells that are apparently polluted. Water from sandstone is least highly mineralized ed, whereas that from shale, particularly shale that contains coal beds, is most highly mineralized.

Summary of Available Chemical Data

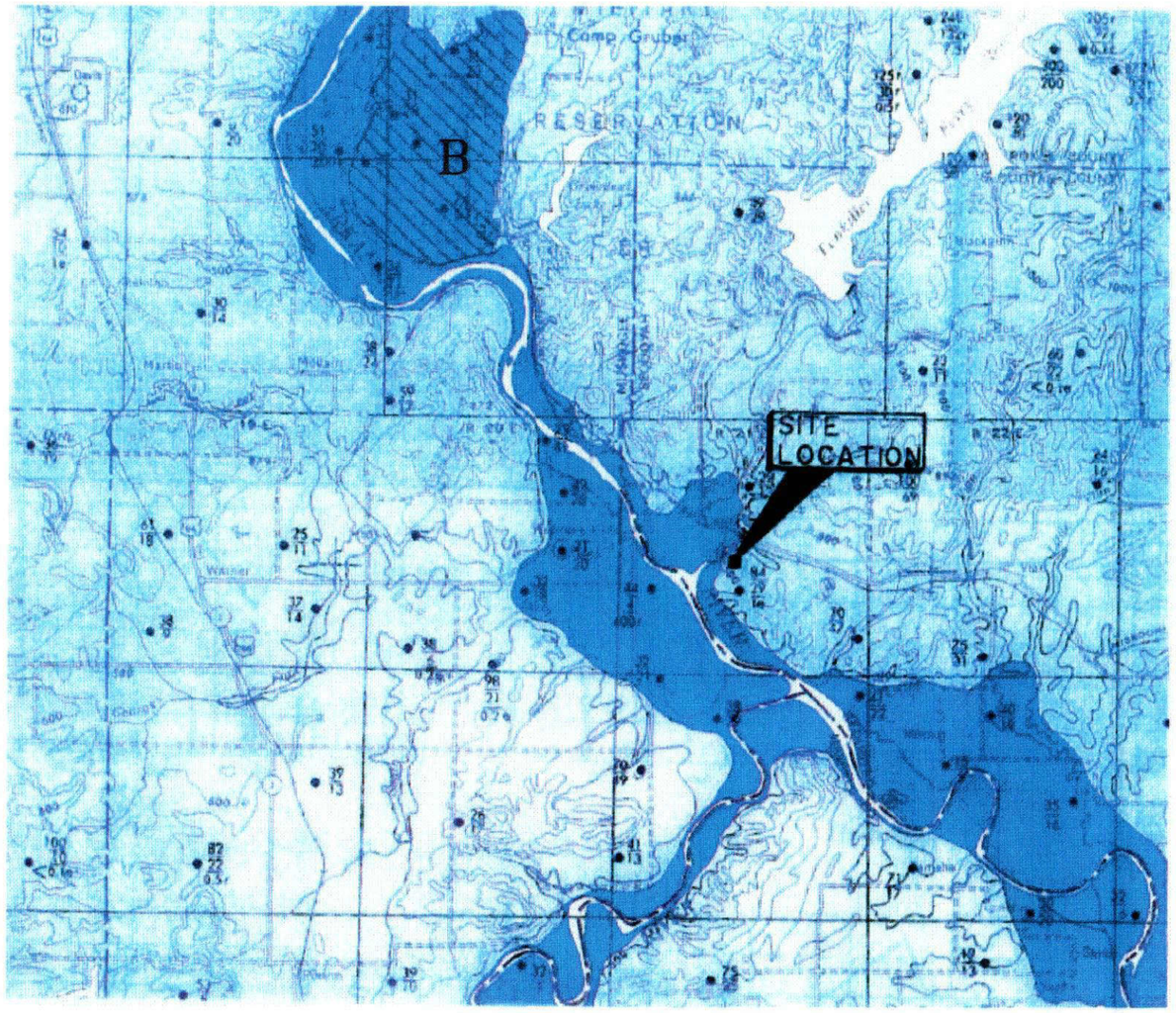
	Concentration (PPM) MAXIMUM	MEDIAN	MINIMUM	NUMBER of ANALYSES
Hardness	3,020	144	4.0	83
Sulfate	3,150	36	4.2	84
Chloride	715	44	2.0	84
Nitrate	82	1.6	0.0	82
Total dissolved solids	5,160	581	63	84



Concentration of selected dissolved solids in water from wells and springs. Concentrations of 10 ppm or less are shown by numbers in the appropriate column of the graph.

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: CHEMICAL QUALITY OF GROUNDWATER NEAR FACILITY	
PREPARED BY: SFC	FILENAME: SFC0036A
REVIEWED BY: KS	FIGURE NO. 14
DATE: 11/23/98	

C08



AFTER M.V.MARCHER, 1969

LEGEND

Most favorable for groundwater supplies

This area includes alluvium along the Arkansas and Canadian Rivers and some terrace deposits along the Arkansas River. Wells In alluvium along the Arkansas River are reported to yield up to 900 gpm (gallons per minute); larger yields might be obtained locally. Alluvium along the Canadian River is untested, but yields comparable to those from alluvium of the Arkansas River probably could be obtained. Area B, shown by diagonal lines near Braggs, is underlain by terrace deposits, up to 90 feet thick, that may yield up to 100 gpm.

Moderately favorable for groundwater supplies

This area is underlain by the Keokuk and Reeds Spring Formations and, in T. 13 N., R. 23 E., by rocks of Pre-Mississippian age. Wells in the Keokuk and Reeds Spring Formations are re_ Ported to yield as much as 20 gpm and, locally, more. A few springs yield several hundred gallons per minute. Some of the limestones and sandstones, particularly the Burgen Sandstone in T. 13 N., R. 23 E., and in the vicinity of Qualls, are reported to yield UP to 20 gpm.

Least favorable for groundwater supplies

The area is underlain by shale, siltstone, and sandstone of Pennsylvanian age and by terrace deposits mainly along the shores of Eufaula Reservoir. Most wells in the shale, siltstone, and sandstone yield only a fraction of a gallon per minute to a few gallons per minute. A few wells are reported to yield as much as 20 gpm. In local areas, terrace deposits along Eufaula Reservoir may yield 10 gpm or possibly more.

Spring
Number beside spring symbol is yield in gallons per minute. e= estimated yield. Yield data obtained in 1966.

Well
Upper number is depth of the well in feet; middle number is depth to water in feet below land surface in 1966 and 1967; lower number is yield of the well in gallons per minute. e= estimated value, r = reported value, f = flowing well. + height of water level above ground level, u= unknown.

N

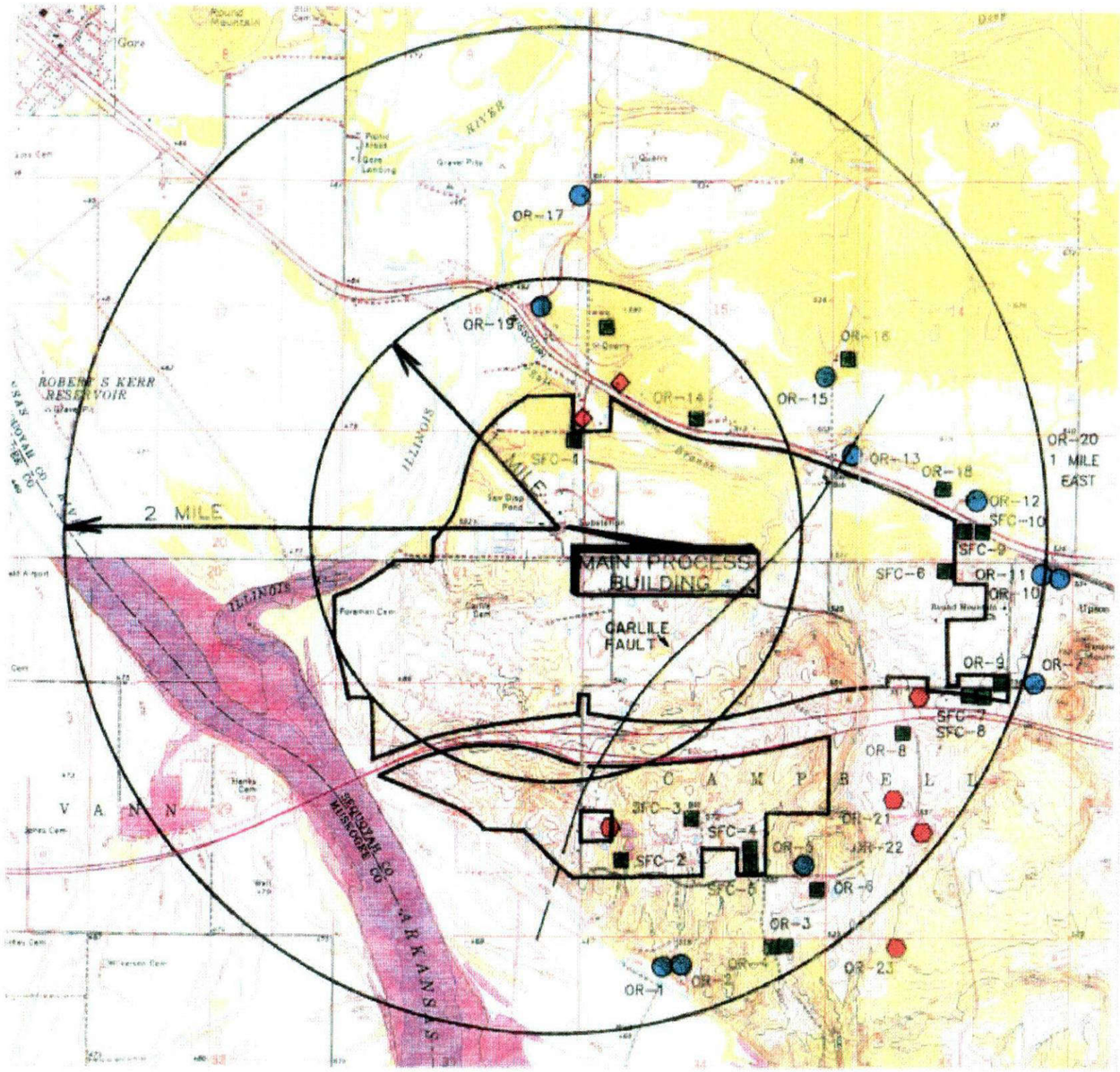
STATE OF OKLAHOMA

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: AVAILABILITY OF GROUNDWATER NEAR FACILITY	
PREPARED BY: SFC	FILENAME: SFC0037A
REVIEWED BY: KS	FIGURE NO. 15
DATE: 11/23/98	

C09

R 21 E

T 12 N



AFTER U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE GORE, OKLAHOMA, REVISED 1974

LEGEND

- WATER WELL IN USE
- WATER WELL NOT IN USE
- REFUSED SFC SAMPLE REQUEST ON MAY 9-10, 1991
- UNABLE TO OBTAIN SAMPLE

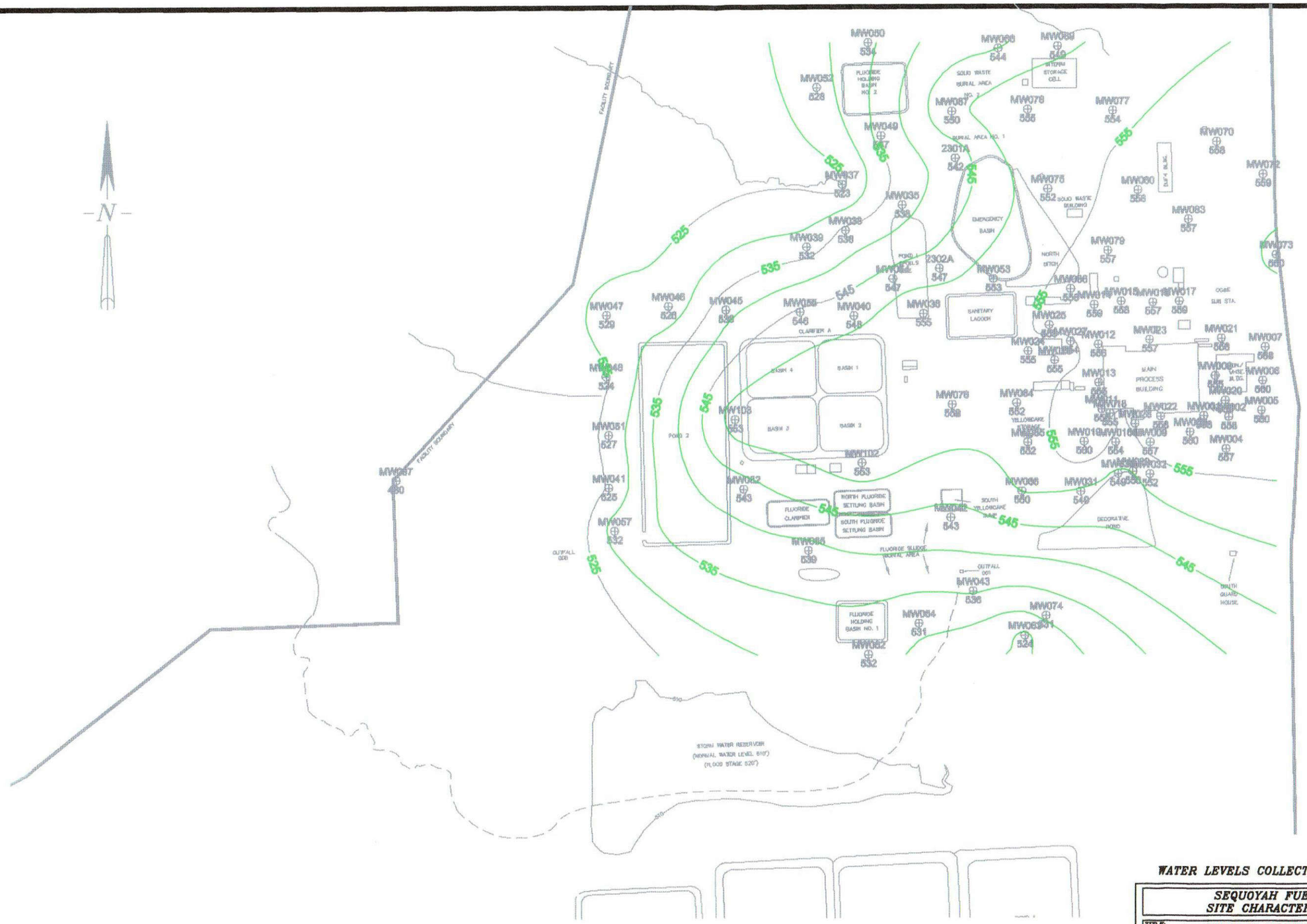
OR: OFFSITE RESIDENT DOMESTIC WELL

SFC: OLD WATER WELL ON SEQUOYAH FUELS CORPORATION PROPERTY

STATE OF OKLAHOMA

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: WATER WELL SURVEY LOCATION MAP	
PREPARED BY: SFC	FILENAME: SFC0038A
REVIEWED BY: KS	FIGURE NO. 16
DATE: 11/23/98	

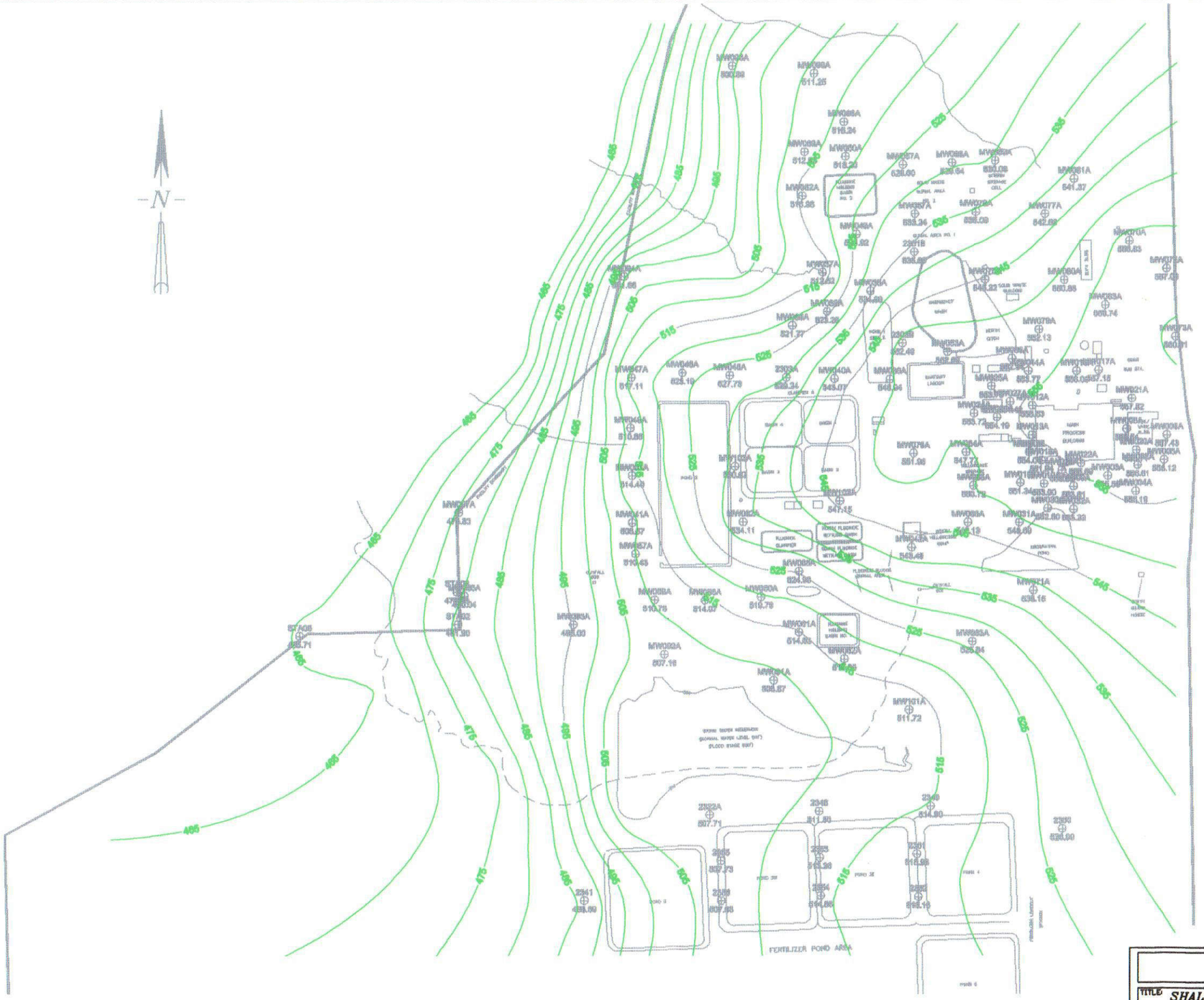
C10



WATER LEVELS COLLECTED IN MARCH 1998

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: TERRACE GROUNDWATER SYSTEM POTENTIOMETRIC SURFACE MAP	
PREPARED BY: SFC	FILENAME: SFC0030A
REVIEWED BY: KS	FIGURE NO. 17
DATE: 11/23/98	

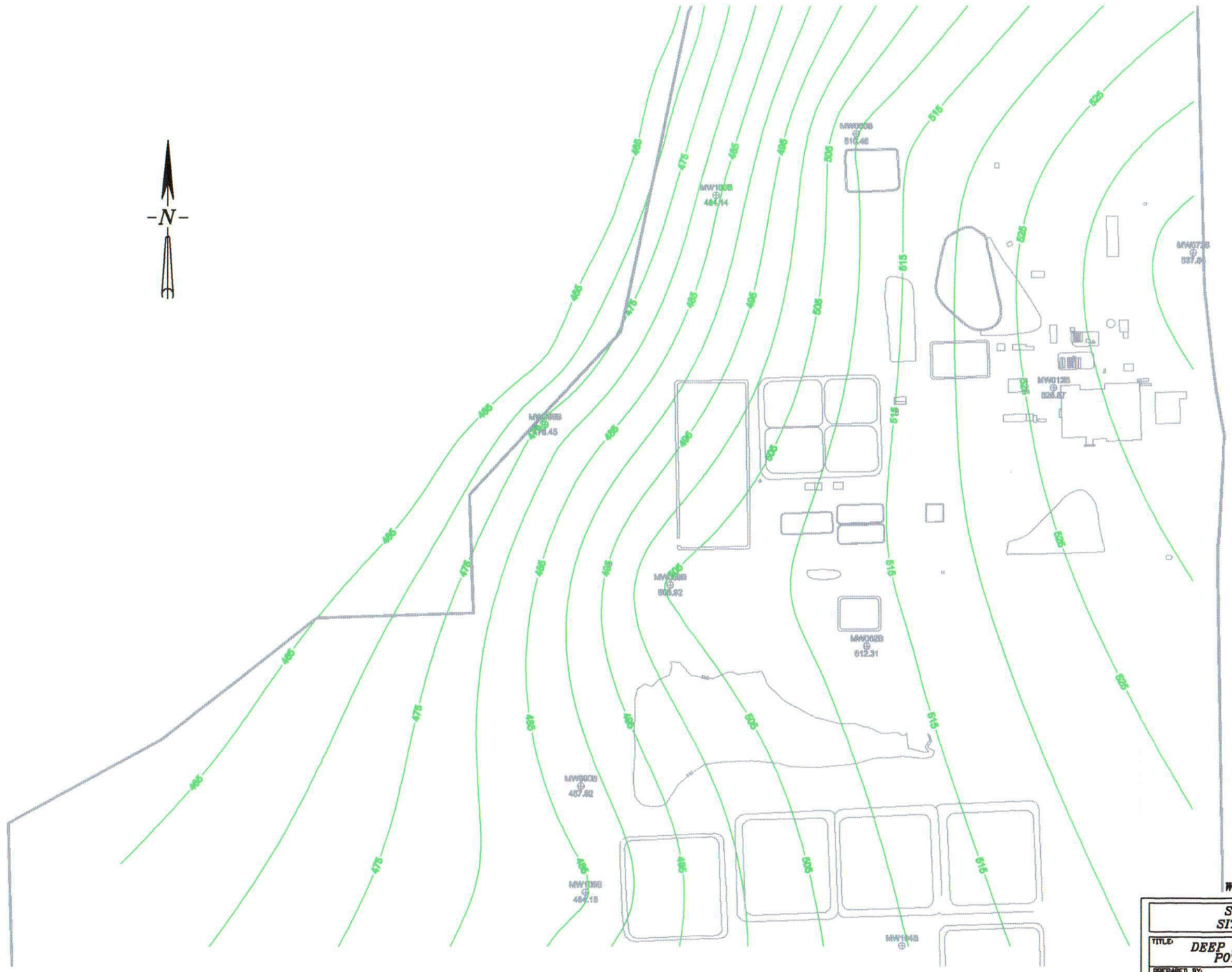
C11



Water levels collected in March 1998

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: SHALLOW BEDROCK GROUNDWATER SYSTEM POTENTIOMETRIC SURFACE MAP	
PREPARED BY: SFC	FILENAME: SFC0031A
REVIEWED BY: KS	FIGURE NO. 18
DATE: 11/23/98	

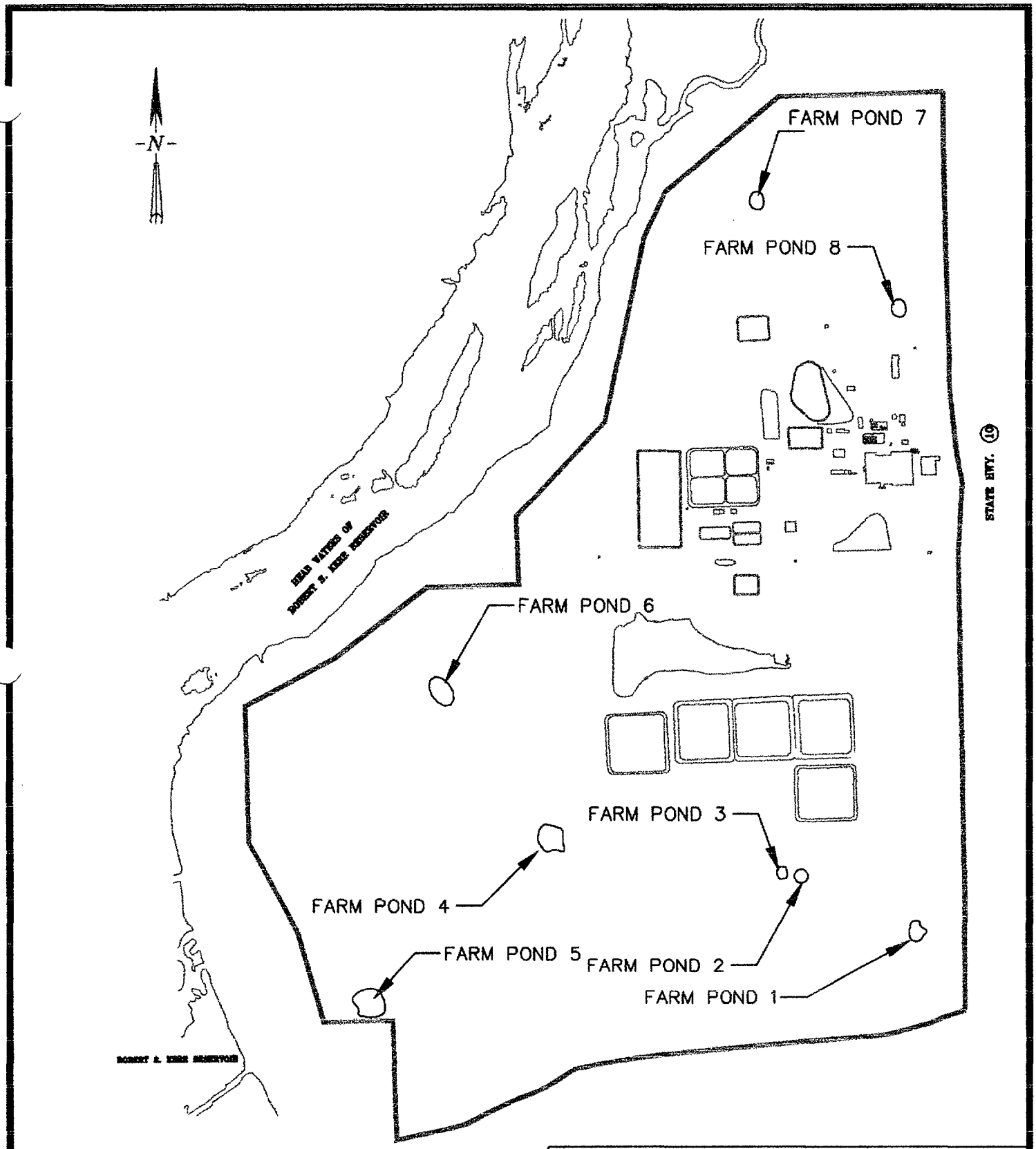
C12



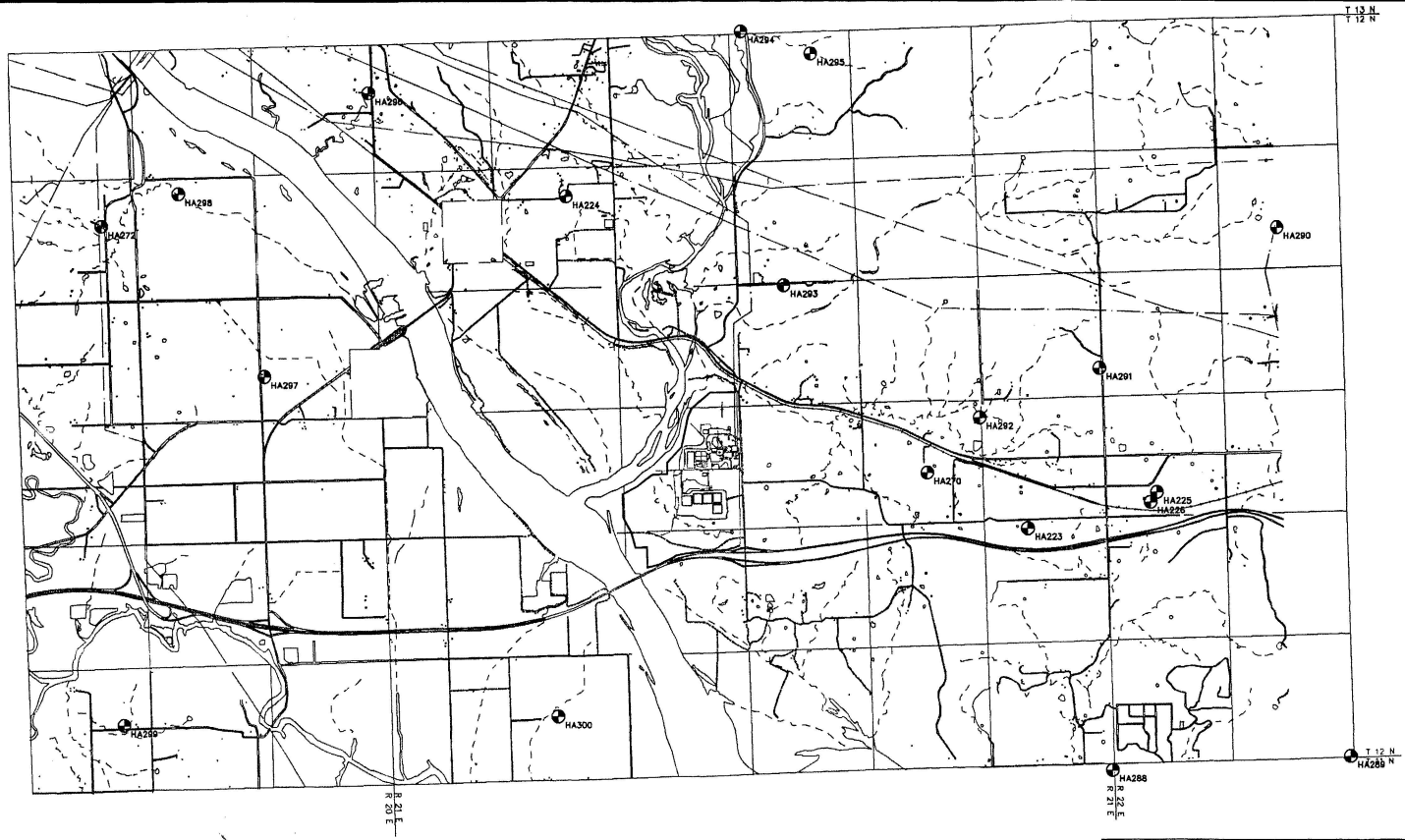
Water levels collected in March 1998

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: DEEP BEDROCK GROUNDWATER SYSTEM POTENTIOMETRIC SURFACE MAP	
PREPARED BY: SFC	FILENAME: SFC0032A
REVIEWED BY: KS	FIGURE NO. 19
DATE: 11/23/98	

C13



SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: FARM POND LOCATIONS ON FACILITY	
PREPARED BY: SFC	FILENAME: SFC0039A
REVIEWED BY: KS	FIGURE NO. 20
DATE: 11/18/98	



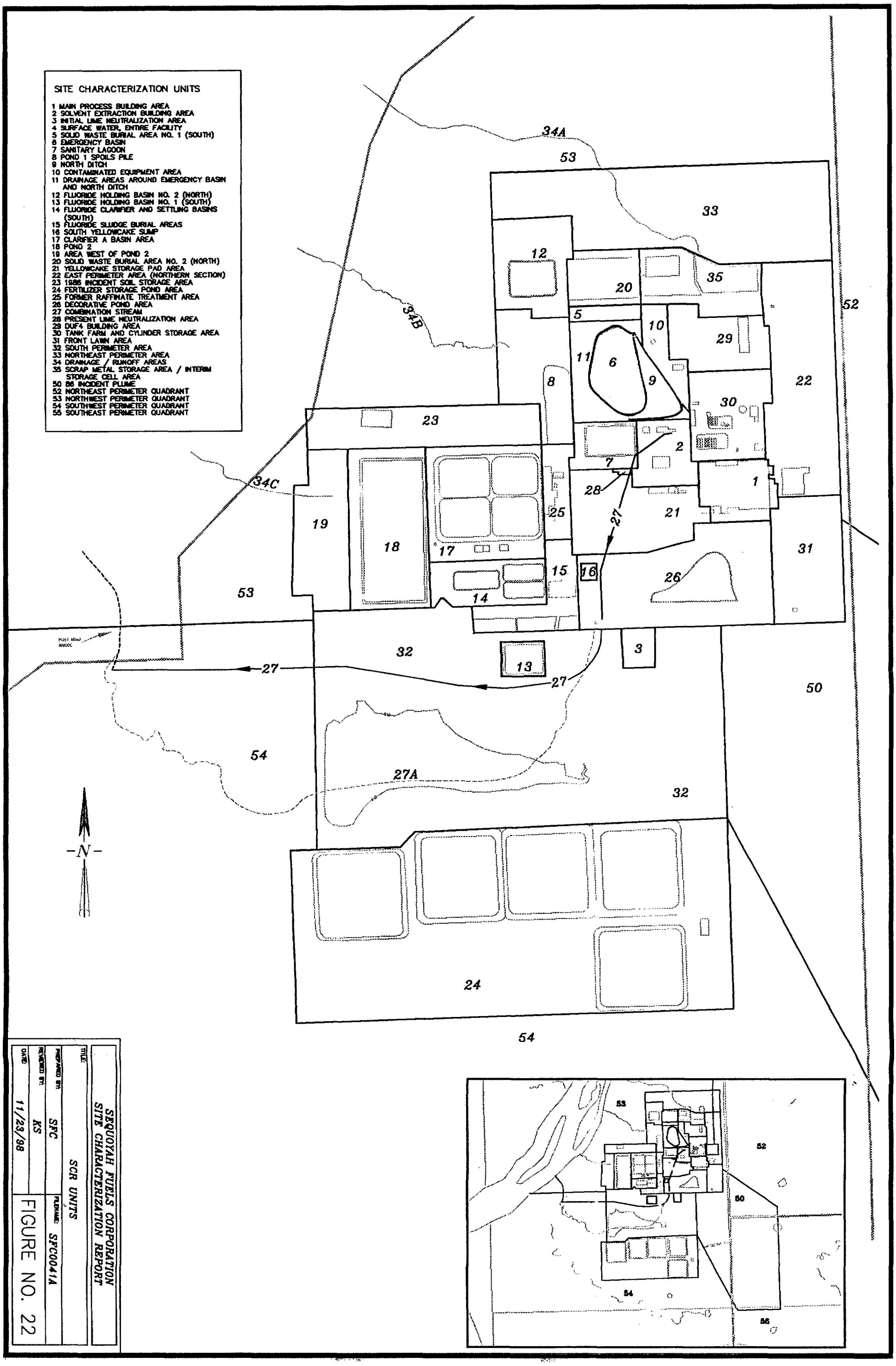
HA307 & HA308 ARE LOCATED APPROXIMATELY
12 MILES WEST OF MAIN PROCESSING PLANT.

0 2000 4000 8000

SEQUOYAH FUELS CORPORATION SITE CHARACTRIZATION REPORT	
TITLE: BACKGROUND SAMPLE LOCATIONS	
PREPARED BY: SFC	FILENAME: SFC0040A
REVIEWED BY: KS	FIGURE NO. 21
DATE: 11/23/98	

SITE CHARACTERIZATION UNITS

1 MAIN PROCESS BUILDING AREA
2 SOLVENT EXTRACTION BUILDING AREA
3 INITIAL LIME NEUTRALIZATION AREA
4 SURFACE WATER, ENTIRE FACILITY
5 SOLID WASTE BURIAL AREA NO. 1 (SOUTH)
6 EMERGENCY BASIN
7 SANITARY LAGOON
8 POND 1 SPOILS PILE
9 NORTH DITCH
10 CONTAMINATED EQUIPMENT AREA
11 DRAINAGE AREAS AROUND EMERGENCY BASIN AND NORTH DITCH
12 FLUORIDE HOLDING BASIN NO. 2 (NORTH)
13 FLUORIDE HOLDING BASIN NO. 1 (SOUTH)
14 FLUORIDE CLARIFIER AND SETTLING BASINS (SOUTH)
15 FLUORIDE SLUDGE BURIAL AREAS
16 SOUTH YELLOWCAKE SUMP
17 CLARIFIER A BASIN AREA
18 POND 2
19 AREA WEST OF POND 2
20 SOLID WASTE BURIAL AREA NO. 2 (NORTH)
21 YELLOWCAKE STORAGE PAD AREA
22 EAST PERIMETER AREA (NORTHERN SECTION)
23 1986 INCIDENT SOIL STORAGE AREA
24 FERTILIZER STORAGE POND AREA
25 FORMER RAFFINATE TREATMENT AREA
26 DECORATIVE POND AREA
27 COMBINATION STREAM
28 PRESENT LIME NEUTRALIZATION AREA
29 DUF4 BUILDING AREA
30 TANK FARM AND CYLINDER STORAGE AREA
31 FRONT LAWN AREA
32 SOUTH PERIMETER AREA
33 NORTHEAST PERIMETER AREA
34 DRAINAGE / RUNOFF AREAS
35 SCRAP METAL STORAGE AREA / INTERIM STORAGE CELL AREA
50 86 INCIDENT PLUME
52 NORTHEAST PERIMETER QUADRANT
53 NORTHWEST PERIMETER QUADRANT
54 SOUTHWEST PERIMETER QUADRANT
55 SOUTHEAST PERIMETER QUADRANT

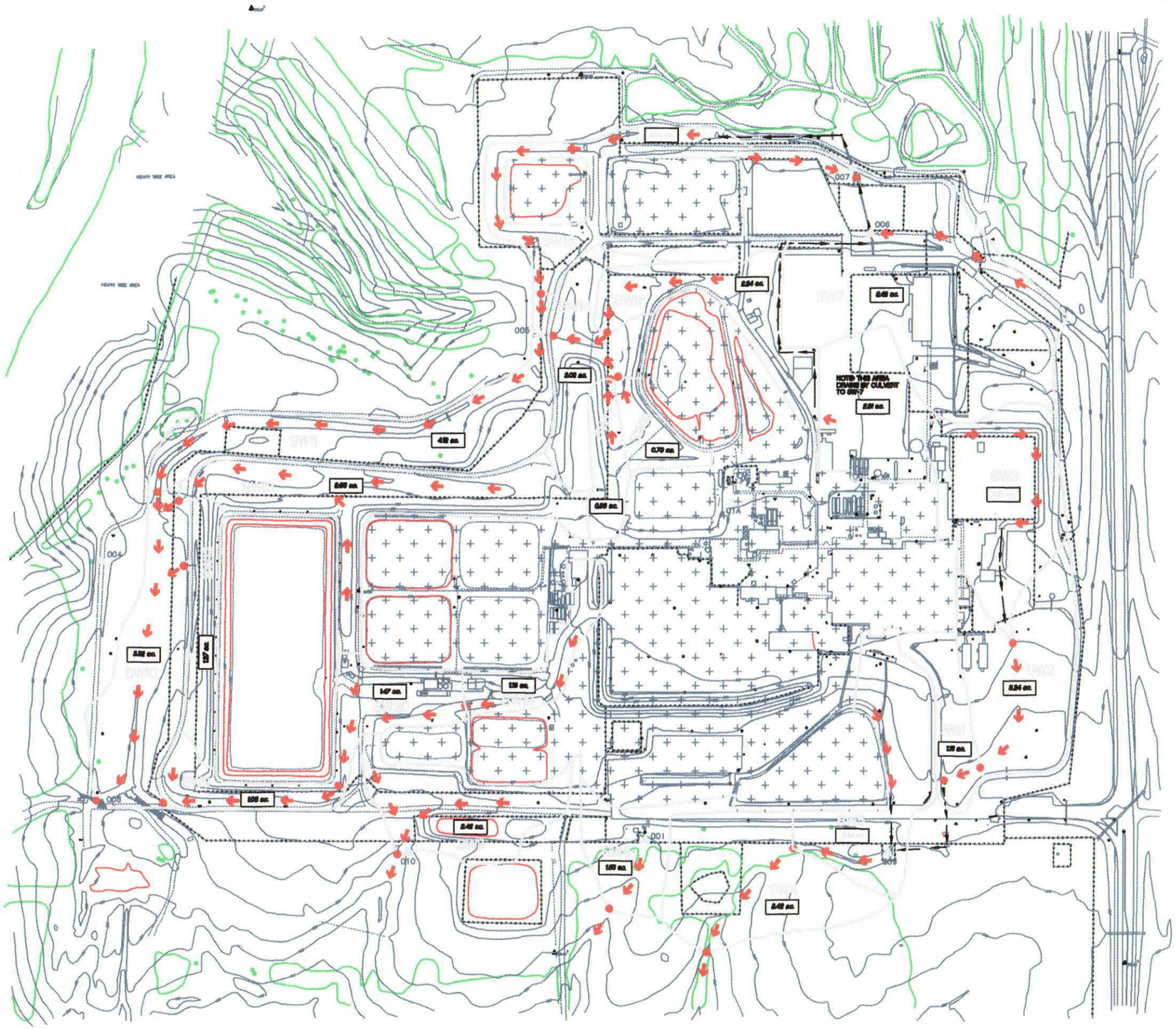


SEQUOYAH FUELS CORPORATION
SITE CHARACTERIZATION REPORT

TITLE: SCR UNITS

PREPARED BY: SFC
REVIEWED BY: KS
DATE: 11/23/98
FILENAME: SFC0041A

FIGURE NO. 22



N

SCALE 1" = 100' FEET

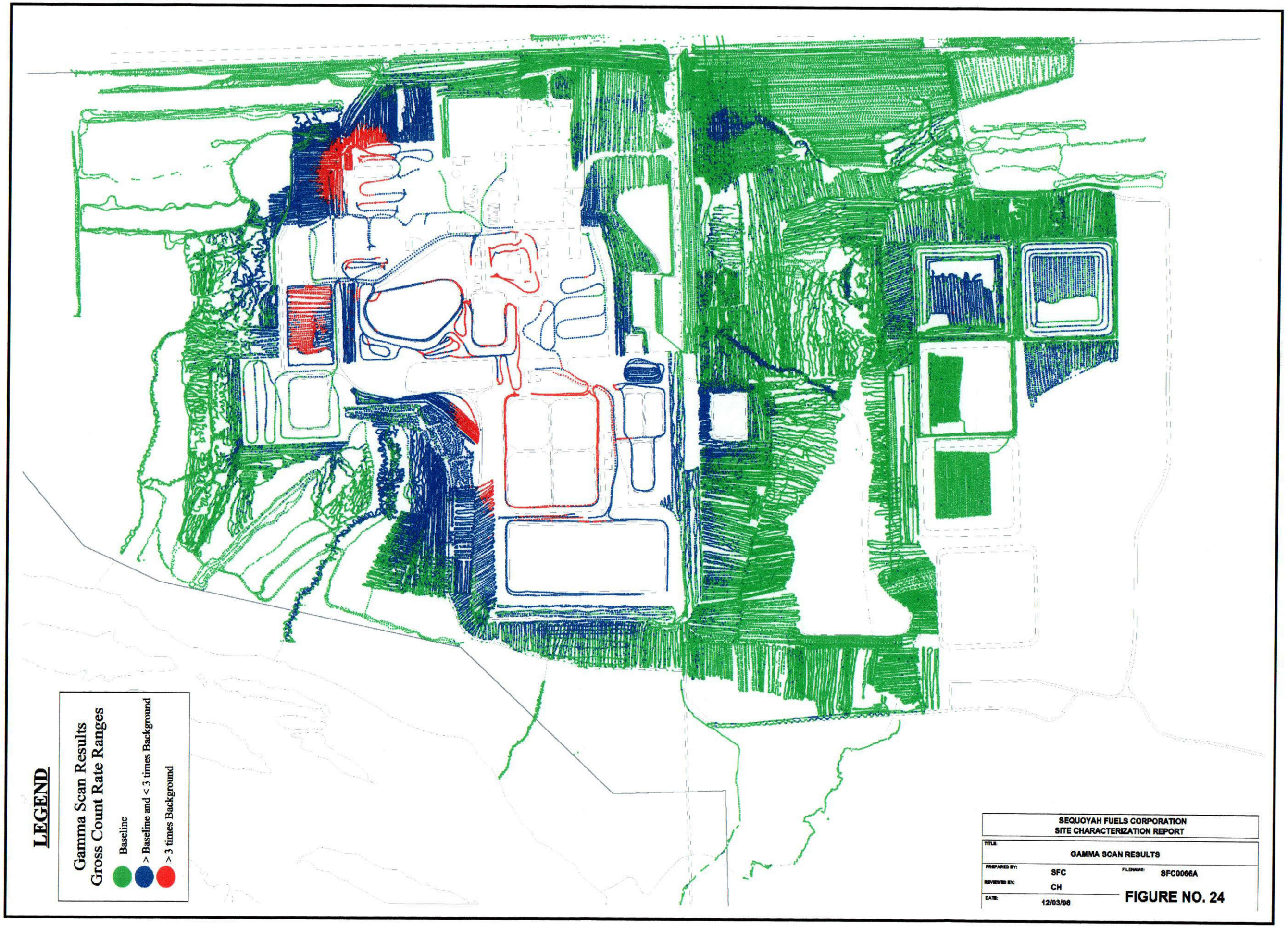
LEGEND

- DRAINAGE BASIN BORDERS
- MONITORING SITE
- STREAM FLOW
- DRAINAGE AREA = 8.43 ACRES
- CULVERT
- 007 OUTFALL
- AREAS WITHIN THE SFC FACILITY WHICH DO NOT DISCHARGE DIRECTLY TO THE SURFACE WATER SYSTEM DEFINED BY THE NUMBERED DRAINAGE AREAS. SURFACE WATER FROM THESE AREAS IS ROUTED TO EITHER THE COMBINATION STREAM DRAIN, FERTILIZER PONDS, OR IS CONTAINED ON-SITE.

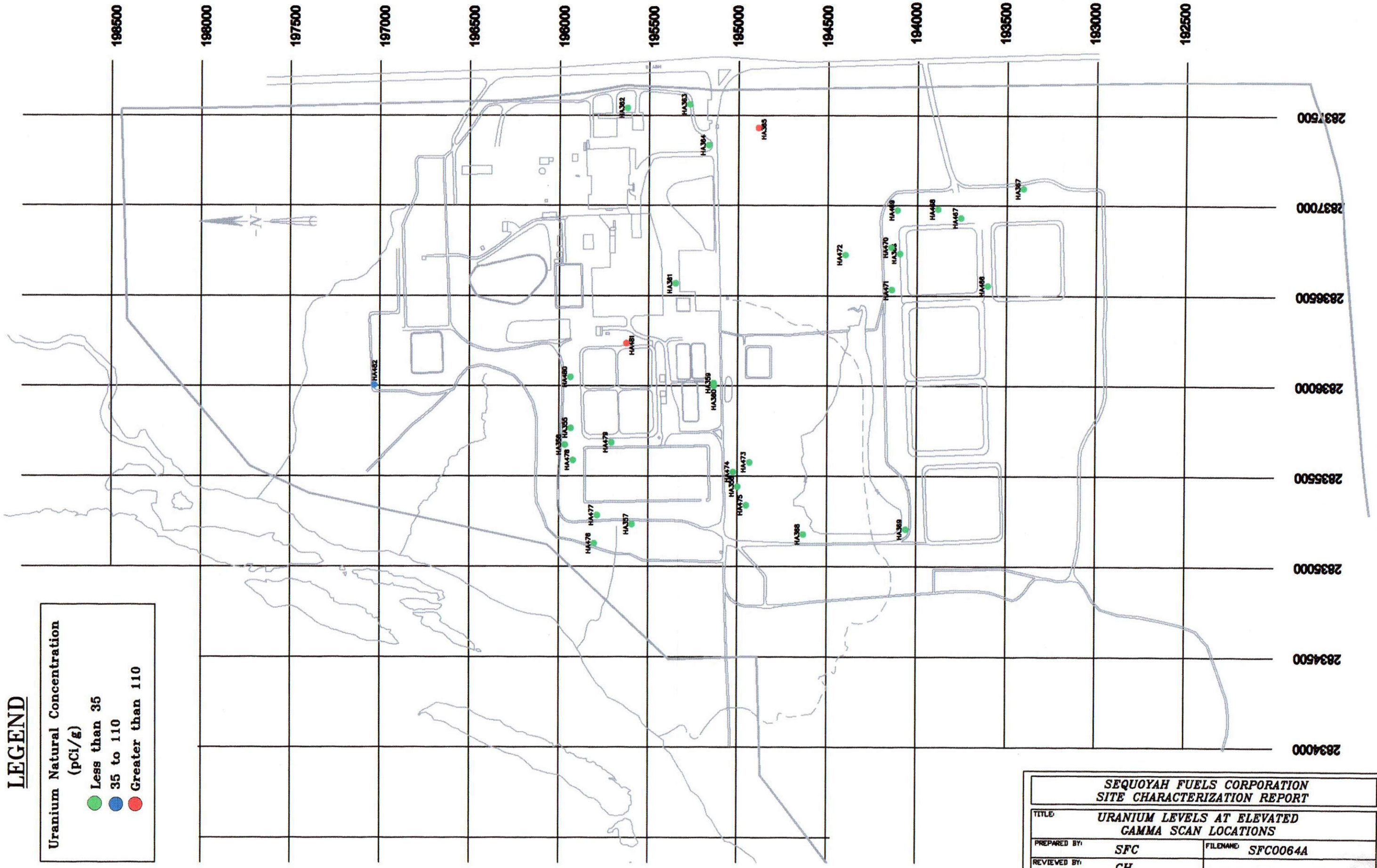
SEQUOYAH FUELS CORPORATION
SITE CHARACTERIZATION REPORT

TITLE: STORM WATER SAMPLE LOCATIONS	
PREPARED BY: SFC	FILENAME: SFC0043A
REVIEWED BY: KS	FIGURE NO. 23
DATE: 11/24/98	

C14


LEGEND
Gamma Scan Results
Gross Count Rate Ranges
Baseline
> Baseline and < 3 times Background
> 3 times Background
SEQUOYAH FUELS CORPORATION
SITE CHARACTERIZATION REPORT
TITLE:
GAMMA SCAN RESULTS
PREPARED BY:
SFC
FILENAME:
SFC0066A
REVIEWED BY:
CH
DATE:
12/03/98
FIGURE NO. 24

C15



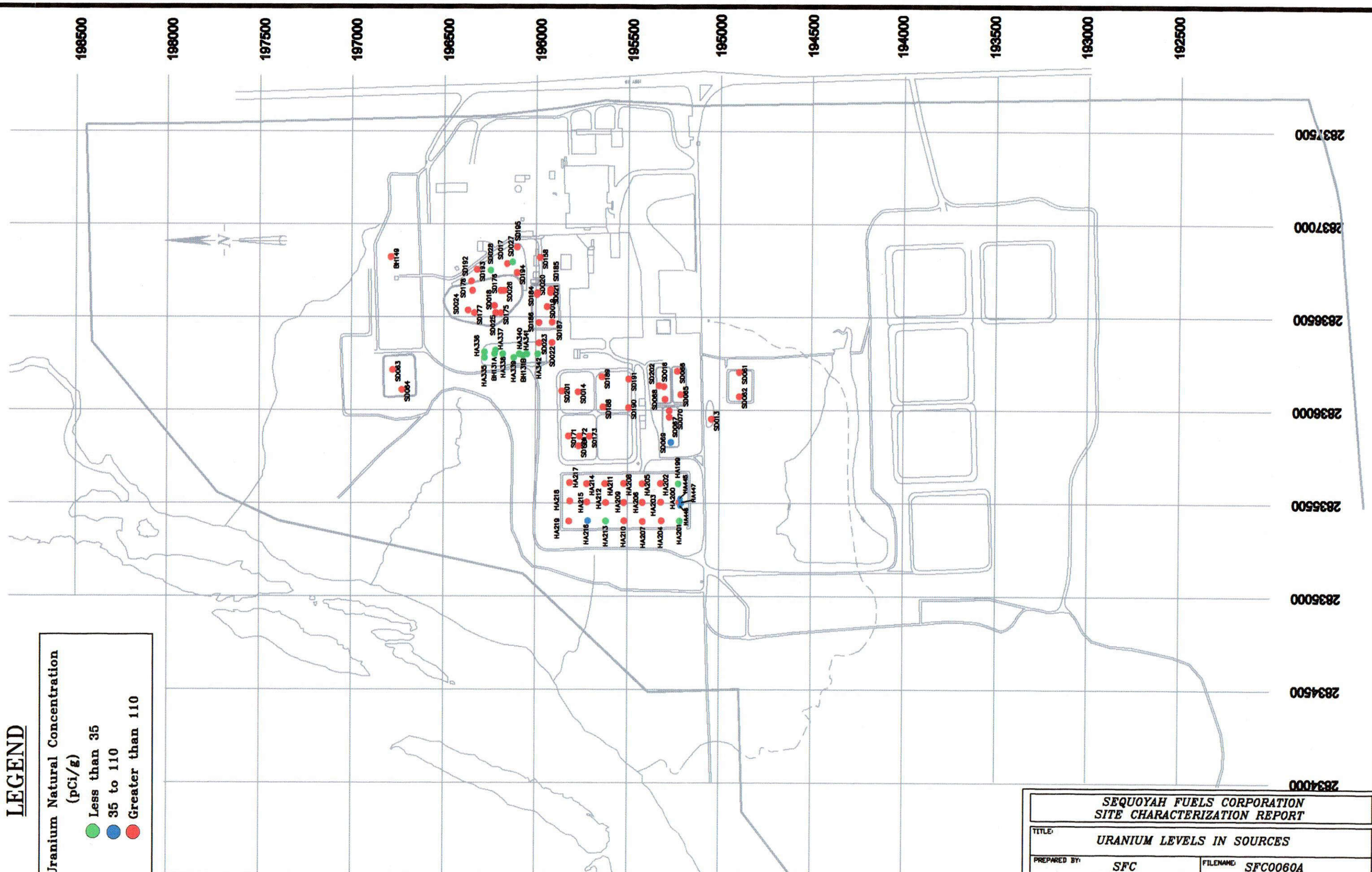
LEGEND

Uranium Natural Concentration (pCi/g)

- Less than 35
- 35 to 110
- Greater than 110

SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: URANIUM LEVELS AT ELEVATED CAMMA SCAN LOCATIONS	
PREPARED BY: SFC	FILENAME: SFC0064A
REVIEWED BY: CH	FIGURE NO. 25
DATE: 11/23/98	

C16



SEQUOYAH FUELS CORPORATION SITE CHARACTERIZATION REPORT	
TITLE: URANIUM LEVELS IN SOURCES	
PREPARED BY: SFC	FILENAME: SFC0060A
REVIEWED BY: CH	FIGURE NO. 26
DATE: 11/23/98	