320SERBSF10,617

320SERBSF10,617

Site Name (Subject):	SOUTHERN MANUFACTURING, INC.
Site ID (Document ID):	NCD990715658
Document Name (DocType):	Pre-CERCLIS Screening (PSA)
Report Segment:	
Description:	CERCLIS Site Addition Request (Pre-CERCLIS Site Screening)
Date of Document:	11/6/2002
Date Received:	
Box: *Enter SF and # with no spaces*	SF10,617
Access Level:	PUBLIC
Division:	WASTE MANAGEMENT
Section:	SUPERFUND
Program (Document Group):	SERB (SERB)
Document Category:	FACILITY

Print Report for Record | Go to New Blank Record | Go to New Record - (default to last record values) | Delete Record

NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT

MICHAEL F. EASLEY, GOVERNOR
WILLIAM G. ROSS, JR., SECRETARY
DEXTER R. MATTHEWS, DIRECTOR

NCDENR

November 6, 2002

Ms. Jennifer Wendel
NC Site Management Section
USEPA Region IV, Waste Division
61 Forsythe Street, 11th Floor
Atlanta, GA 30303

Subject: CERCLIS Site Addition Request
(Pre-CERCLIS Site Screening)
Southern Metals Recycling
Wilmington, New Hanover County, NC

Dear Ms. Wendel:

Please add the subject site to CERCLIS. Site screening and data gathering have established the following about the site:

The site is located on Wright Street, off Front Street south of downtown Wilmington (Attachment 1). The site is bordered by the Old ATC Refinery Site (NCD 986 186 518) to the north, by Meares Street to the south, and by the Cape Fear River to the west (Fig. 1). The site currently consists of the entire Southern Metals Recycling (SMR) Co. facility and portions of the adjacent former JLM Petroleum Terminal (recently purchased by Colonial Oil) to the south and southwest. Geographic coordinates are 34° 13' 21.2" north latitude by 77° 56' 55.5" west longitude (Attachment 1).

According to former employees of the Old ATC Refinery, the SMR property was historically used for several decades as an automotive junkyard. Reports indicate that junked vehicles were crushed on site. Reports also included allegations that vehicle fuel tanks were ruptured and drained onsite using a forklift. SMR subsequently stockpiled large quantities of used newsprint and various scrap metals outdoors at its facility (Attachment 2).

During 1998-1999, the EPA Region IV conducted a Time-Critical Removal Action at the Old ATC Refinery site. EPA On Scene Coordinators expressed concern to NCDENR about high lead concentrations in soils at ATC's property line with SMR (Attachment 3). On 7/30/98 NC Superfund Section personnel visually examined the SMR property through the fenceline and identified remnants of 55-gallon drums on the ground surface there (Attachment 4).

1646 MAIL SERVICE CENTER, RALEIGH, NORTH CAROLINA 27699-1646
401 OBERLIN ROAD, SUITE 150, RALEIGH, NC 27605
PHONE: 919-733-4996 \ FAX: 919-715-3605
AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER - 50% RECYCLED/10% POST-CONSUMER PAPER

In early 2002, the NC Superfund Section completed a Supplemental Expanded Site Inspection (SESI) at the Old ATC Refinery site. SESI sampling detected elevated metals concentrations in sediment and water along the ATC property's Cape Fear riverfront, extending downriver as far as the JLM property shoreline. A subsurface soil sample, collected concurrently at the SMR/ATC property line, contained arsenic, cadmium, and a very high lead level, each exceeding their respective NC soil Remediation Goals. Semi-volatile organic compounds were also detected in the sample. Two background features, the SMR property and a municipal stormwater outfall at ATC, were both identified as potential alternative metals sources, complicating attribution of surface water pathway contamination to ATC. Because a Removal action had already been completed at ATC, and because of the uncertain contaminant attribution, the Superfund Section recommended the Old ATC Refinery site for no further remedial action under CERCLA (Attachment 5).

On July 2, 1998, a propane gas leak caused an explosion and fire at SMR, destroying a large portion of its main structure. Local fire departments responded and extinguished the fire (Attachment 6). However, a large quantity of water from the firefighting effort flowed across Wright Street into the former JLM Terminal. This runoff flowed to unpaved areas of the property and also collected in JLM's oil/water separator adjacent to the Cape Fear River (Fig. 1). In addition, heavy smoke persisted for several days after the explosion, and reportedly deposited particulate fallout across the JLM terminal's land surface. During the following week JLM reportedly deployed hazardous materials teams to decontaminate its paved areas, drainage-control surfaces, and its oil/water separator (Attachments 7-8). JLM subsequently sued SMR, attempting to recover costs for the cleanup of the separator (Attachment 2).

Soil and Groundwater Investigations:

During August 1992, Maude Environmental, Inc., submitted a Final Remedial Action Plan for the JLM terminal to the NC Division of Environmental Management. The plan was completed for Unocal Oil Co., then-owners of the terminal, in response to the discovery of underground petroleum leakage in 1990. As part of the investigation, 24 subsurface soil samples and 20 groundwater samples were collected at the site. Samples were analyzed primarily for volatile organic compounds and fuels. One third of the soil samples (but none of the groundwater samples) were analyzed for lead and arsenic. Arsenic did not exceed its detection limit (1.0 mg/kg), however, lead was reported in every tested sample, at concentrations ranging from 2.5 mg/kg to 78 mg/kg (Attachment 9). No additional metals data from that time period were available at the time of this report.

During February 2000, Landis, Inc., personnel sampled JLM surface soils to test for contamination from the SMR fire. Landis personnel observed particulate deposits of apparent particulate fallout at the JLM entrance and at several surface soil locations on SMR and JLM. At the JLM property, residue reportedly had accumulated to depths of up to one quarter inch (Attachment 7).

In February and August 2001, Landis, Inc., released Preliminary Environmental Investigation reports on the SMR and JLM properties. The reports were based on soil sampling conducted from February to June 2000, and on groundwater sampling conducted from April to June 2000. Surficial soil sampling was conducted at approximately 27 locations. At eight locations, push-core samplers were used to collect subsurface soils at various depths. Beneath the SMR property, the push-cores reportedly encountered resistance due to metals encrustation in the subsurface soils. Approximately 29 monitoring and recovery wells on the two properties were used to sample groundwater. (Attachments 7-8).

The Landis reports contend that SMR caused extensive metals contamination of soil and groundwater at the JLM terminal. Contaminants listed included antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, thallium, vanadium and zinc. Due to the litigation between the two parties, the NC Superfund Section carefully scrutinized the reports to evaluate the validity of their conclusions. Particular attention was paid to several computer-generated contour plots, which Landis produced to model the areal and cross-sectional distribution of contaminants throughout the site's surficial aquifer and soil column (Attachment 8).

The Landis sample data indicated that soil and groundwater at the SMR property were heavily contaminated with various metals. Concentrations of arsenic, cadmium, copper, lead, mercury, nickel, thallium, vanadium and zinc exceeded NC Soil Remediation goals and/or federal soil exposure benchmarks. High concentrations of lead and other metals were detected near the SMR property line with the Old ATC Refinery. Metals were also elevated in surface soil directly north of Wright Street, upgradient from the former JLM terminal (Attachments 7-8).

JLM surface soils located directly downgradient from SMR contained elevated concentrations of copper, iron and lead. However, analyte concentrations in these and the majority of other soil samples at JLM did not exceed their respective NC Soil Remediation Goals. Individual exceedences included antimony in samples from the north-central and southeast portions of JLM, and thallium in samples from the far southwest (Attachments 7-8).

JLM groundwater samples collected directly downgradient from SMR contained elevated concentrations of arsenic, barium, chromium, iron, lead, manganese, nickel and zinc. These concentrations exceeded their respective NCAC 2L standards for groundwater. Cobalt, copper, magnesium and vanadium were also detected but did not exceed groundwater standards. All of these contaminants were also detected in groundwater samples collected at the upgradient JLM property line and SMR property (Attachments 7-8). Groundwater elevation data generated for JLM indicated that groundwater beneath SMR flows toward the JLM property .

Iron and manganese exceeded 2L standards in virtually all groundwater samples at both properties, iron reaching its maximum concentration directly downgradient from SMR. Zinc was detected in most samples but exceeded the 2L standard at only one JLM well location. Arsenic and lead were detected in a recovery well located directly downgradient from SMR. Barium, cobalt copper, nickel and zinc were detected in a second JLM recovery well located several hundred feet further downgradient from SMR. However, the downgradient analyte concentrations did not exceed 2L standards.

Areal sample coverage and density varied considerably across the site. As a result, the Landis report's computer contour plotting relied heavily upon interpolation between disparate sample locations and results. Contour lines were also extrapolated far into peripheral areas where actual data were unavailable. Due to a lack of sample data directly downgradient from the contaminated JLM well(s), interpolation generated potentially inaccurate representations of the extent of groundwater contamination on the property.

To summarize: Metals contamination in soil and groundwater at SMR appears to have migrated to portions of the JLM property. No applicable soil cleanup standards exist for iron, magnesium or manganese, however, the areal extent of other more toxic groundwater analytes at the site remains undetermined.

The site is located in an urban industrial setting and no water wells reportedly operate within 2 miles north, south or east of the site. Water supply wells operating to the west are hydrogeologically separated from the site by the Cape Fear River (Attachment 7). Therefore, minimal potential groundwater targets exist near the site

Surface Water Pathway

The JLM terminal's oil-water separator discharges to the Cape Fear River estuary; the latter constitutes the surface water pathway. The riverfront itself is the probable point of entry (PPE) for surface runoff and groundwater on or beneath the JLM property. The estuary is a fishery containing several threatened and endangered plant and animal species within one mile, and extensive wetland frontage further from the site.

No surface water pathway sampling has been performed downriver from the PPEs at JLM. However, preliminary HRS scoring scenarios indicate that an observed release of metals to the estuary could score the site above 28.5 points.

To date, no alternative metals sources have been identified upgradient from SMR and the former JLM terminal. Therefore, if future sampling detected a significant increase of metals concentrations along the JLM waterfront, the attribution issues that affected the disposition of the Old ATC Refinery site would not apply, and the SMR site would remain a potential NPL candidate.

Attachments to this letter include latitude and longitude worksheets, partial copies of past investigation reports, and a CERCLIS Site Discovery Form. If you have any questions, please call me at (919)733-2801.

Sincerely

Stuart F. Parker, Hydrogeologist
Site Evaluation and Removal Branch
NC Superfund Section

James Bateson, Head
Site Evaluation and Removal Branch
NC Superfund Section

Attachments
cc: Stuart Parker
Scott Ross
File
cc: (letter only)
Charlotte Jesneck
Doug Holyfield
Larry Perry
Mike Williford

STATE OF NORTH CAROLINA

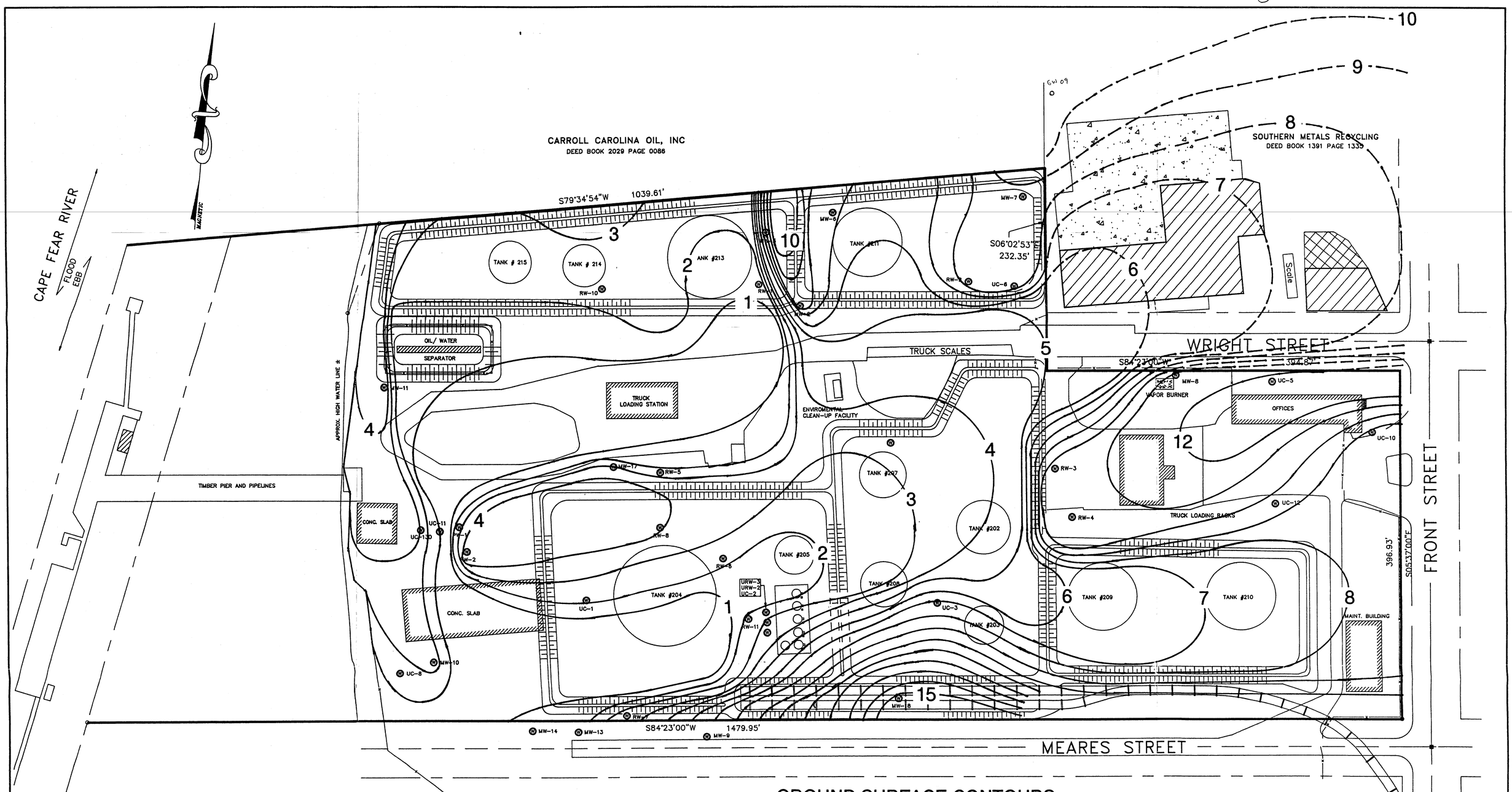
Department of Environment
and Natural Resources
Division of Waste Management
Superfund Section

CERCLIS Site Addition Request
(Pre-CERCLIS Site Screening)
Southern Metals Recycling
Wilmington, New Hanover County, NC

Figure 1 and Attachments

November 2002

Stuart F. Parker
Hydrogeologist
Division of Waste Management
Superfund Section



GROUND SURFACE CONTOURS

JLM TERMINALS, INC.

PORTION OF THE GULF OIL CORPORATION TRACT
CAPE FEAR TERMINAL
CITY OF WILMINGTON NEW HANOVER COUNTY
NORTH CAROLINA
JUNE, 2000

Contours by Landis, Inc.

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

STUART Y. BENSON & ASSOCIATES
ONE NORTH SIXTH STREET
WILMINGTON, NORTH CAROLINA 28401
PHONE: 910-762-9496

Figure 1

List of Attachments

1. Parker, Stuart F., NC Superfund Section, Latitude and Longitude Worksheet Calculations as per CERCLA, EPA Pub 9345.01A, September 30, 2002.

2. Parker, Stuart F., NC Superfund Section, Memorandum to File: Site Operations, October 3, 2002.

3. USEPA Region IV, Emergency Response and Removal Branch, Pollution Report (POLREP) # 86 and Final, October 25, 1999.

4. Parker, Stuart F., NC Superfund Section, Old ATC Refinery Removal Oversight Field Notes, April 8, 1998.

5. Parker, Stuart F., NC Superfund Section, Supplemental Expanded Site Inspection, Old ATC Refinery, NCD 986 186 518, June 2002.

6. Wilmington NC Fire Prevention Bureau, Fire Investigation Report, July 2, 1998.

7. Landis, Inc., Preliminary Environmental Investigation Report Regarding Metals Contamination at JLM Industries, Inc., Wilmington Terminal, February 23, 2001.

8. Landis, Inc., Preliminary Environmental Investigation Report Regarding Metals Contamination at JLM Industries, Inc., Wilmington Terminal, Part II, August 10, 2001.

9. Maude Environmental, Inc., Final Remedial Action Plan, Unocal Cape Fear Terminal. Wilmington, NC, August 6, 1992.

10. Parker, Stuart F., NC Superfund Section, Pre-CERCLIS Screening Assessment Checklist/Decision Form, October 17, 2002.

LATITUDE AND LONGITUDE CALCULATION WORKSHEET #2

LI USING ENGINEER'S SCALE (1/60)

SITE NAME: Southern Metals Recycling CERCLIS #: T.B.D.

AKA: n.a. SSID: n.a.

ADDRESS: Wright Street

CITY: Wilmington STATE: NC ZIP CODE: 28402

SITE REFERENCE POINT: Burned Main Building

USGS QUAD MAP NAME: Wilmington TOWNSHIP: - N/S RANGE: - E/W

SCALE: 1 : 24,000 MAP DATE: 1979 SECTION: - 1/4 - 1/4 - 1/4

MAP DATUM [1927] 1983 (CIRCLE ONE) MERIDIAN: -

COORDINATES FROM LOWER RIGHT (SOUTHEAST) CORNER OF 7.5' MAP (attach photocopy)

LONGITUDE: 77 ° 52 ' 30.00 " LATITUDE: 34 ° 7 ' 30.00 "

COORDINATES FROM LOWER RIGHT (SOUTHEAST) CORNER OF 2.5' GRID CELL:

LONGITUDE: 77 ° 55 ' 0.00 " LATITUDE: 34 ° 12 ' 30.00 "

CALCULATIONS: LATITUDE (7.5' QUADRANGLE MAP)

A) NUMBER OF RULER GRADUATIONS FROM LATITUDE GRID LINE TO SITE REF POINT: 155

B) MULTIPLY (A) BY 0.3304 TO CONVERT TO SECONDS:

A X 0.3304 = 51.21 "

C) EXPRESS IN MINUTES AND SECONDS (1' = 60") : 0 ' 51.21 "

D) ADD TO STARTING LATITUDE: 34 ° 12 ' 30.00 " + 0 ' 51.21 "

SITE LATITUDE: 34 ° 13 ' 21.21 "

CALCULATIONS: LONGITUDE (7.5' QUADRANGLE MAP)

A) NUMBER OF RULER GRADUATIONS FROM RIGHT LONGITUDE LINE TO SITE REF POINT: 350

B) MULTIPLY (A) BY 0.3304 TO CONVERT TO SECONDS:

A X 0.3304 = 115.64 "

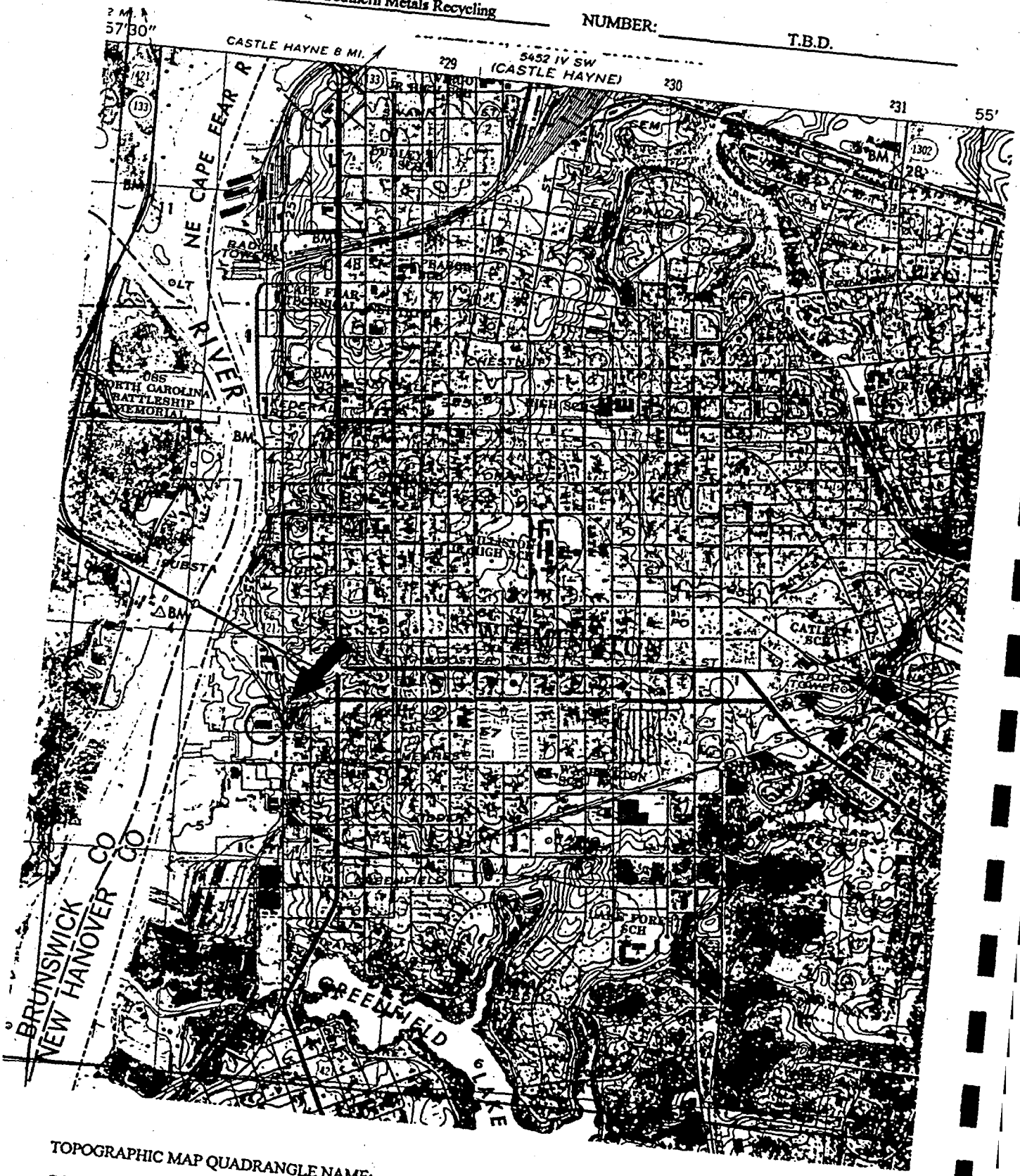
C) EXPRESS IN MINUTES AND SECONDS (1' = 60") : 1 ' 55.64 "

D) ADD TO STARTING LATITUDE: 77 ° 55 ' 0.00 " + 1 ' 55.64 "

SITE LONGITUDE: 77 ° 56 ' 55.64 "

INVESTIGATOR: Stuart F. Parker DATE: 9/30/02

SITE NAME: Southern Metals Recycling NUMBER: T.B.D.



TOPOGRAPHIC MAP QUADRANGLE NAME: Wilmington SCALE: 1 : 24,000

COORDINATES FROM LOWER RIGHT (SOUTHEAST) CORNER OF 2.5' GRID CELL:

LATITUDE: 34 ° 12 ' 30.00 " LONGITUDE: 77 ° 55 ' 0.00 "

MEMORANDUM

To: File
From: Stuart F. Parker, Hydrogeologist
Date: October 3, 2002
Subject: Southern Metals Recycling, Inc.
(NCD pending)
Wilmington, New Hanover Co., NC
Site operations

On 9/27/02, SFP telephoned Linda Carroll (910-392-2321), former owner of the Old ATC Refinery site (NCD 986 186 518) regarding the history of the neighboring Southern Metals Recycling Co. property. Ms. Carroll described second-hand accounts she had heard about site operations at SMR. According to her sources, the outdoor (north) portion of the property had been used as an automotive junkyard for several years. She recalled hearing that forklifts had been used to puncture fuel tanks, causing them to ignite and spill onto the ground surface. Vehicles were also crushed and compacted on site, and it was possible that car batteries were disposed or recycled there as well.

On 10/03/02 SFP telephoned Don Arthur (910-791-6261). Mr Arthur had worked for several years at ATC, and sued PRP Axel Johnson Co. after suffering lead poisoning and other long-term occupational health problems. He confirmed that the Southern Metals property had been a junkyard for auto parts from the 1930s and 1940s, and had formerly been known as Queensboro Steel. He recalled seeing piles of scrap steel plate and "mashed-up tin" on the property in the early 1970s, and reported that aluminum had been recycled in one of the buildings. He did not know about newspaper or battery disposal.

Former ATC employee David Henson (910-791-9418) recalled seeing stacked, crushed cars and busses, and later stockpiled cardboard and newsprint. He was not aware of any chemical disposal at the other property.

Ed Beck of NCDENR Wilmington Regional Office reported that runoff from the firefight flowed to JLM's oil-water separator. JLM cleaned out debris/runoff from the separator and sued SMR to cover the cost of the cleanup. Beck was called to testify during the suit.

Attachment 3

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION IV

POLLUTION REPORT (POLREP)

POLREP #86 and Final

OLD ATC REFINERY

801 Surry Street

Wilmington, North Carolina

RECEIVED

SUPERFUND SECTION

TO: Myron D. Lair, ERRB

Shane Hitchcock, ERRB

Ralph D. Rigger, ERRB

Dan Thorton, EPA HQ, ERD Regional Coordinator

EPA Region 4 Regional Response Center

CC: T. Best, ERRB

T. Cox/K. Beswick, EAD

R. Davidson, ERRB

BCC: J. Glaser, EPA-ORD

FROM: Christopher A. Muntschel, OSC

Michael Taylor, OSC

DATE: October 25, 1999

Period Covered: 10/12/99 to 10/23/99

I. BACKGROUND

Site No: 04YR

Delivery Order No: 4008-F4-002

Response Authority: CERCLA, Non-NPL

Incident Category: Time-Critical; Fund-lead Removal

II. PERSONNEL ON-SITE

OSC: 1/2

USCG-GST: 0

ERRS: 5/6

Weather: Hurricane Irene did not severely impact coastal N.C. However, heavy periodic rain during the reporting period delayed or caused disruptions to site activities.

III. SITUATION

See previous POLREPs

Nonetheless, the owner and EPA required immediate changes to safety procedures and the problem was resolved expeditiously with little impact to the overall removal action. Fires which occurred during the removal of the refractory tower were generally anticipated and handled safely and properly by EPA's ERRS contractor. These fires were caused primarily because of cutting torch sparks igniting the extremely volatile soil contaminants found around the refractory tower.

The biopile treatment system (adapted from the U.S. Navy) for contaminated soils represented a significant cost savings (hundreds of thousands $$$) during the removal action. While it was generally very successful for a significant reduction in the volume of petroleum contaminants, the cleanup goal of 100 ppm based upon the "ARAR" for State of North Carolina for petroleum contaminated soils could not be achieved in the desired time-frame. Furthermore, the off-site migration problem on the Southside required additional treatment measures (chem-ox) to approach the cleanup goal. Nevertheless, the OSCs were fortunate to have Dr. John Glaser's assistance on the design and evaluation of the biopile treatment system.

The site is not considered by the OSCs to be 'pristine'. It is generally known from former employees from Old ATC and long-time Wilmington residents that the property had been filled in decades earlier with municipal-type trash and rubble; including bricks, rock, concrete, wood, metal, glass and other debris. However, removal activities conducted at the site are believed to be consistent with prior removal actions and eliminated the mobility, toxicity and volume of the hazardous substances present from the former refinery operations. The cleanup of the former Old ATC Refinery property will potentially allow for some future industrial /commercial use. Persons interested in any future remedial actions proposed for this site should contact Mr. Stewart Parker with the North Carolina Department of Environment and Natural Resources (NCDENR) and also the owner of property, Mrs. Linda Carroll.

VI. ESTIMATED COSTS:

ERRS estimated costs as of 10/22/99 are $4,787,000, with approximately $77,000 remaining in the D.O. ceiling. EPA direct costs are estimated at $162,600, with approximately $15,400 remaining in the revised ceiling (See Memorandum to site files dated 8/25/99). No new significant costs are anticipated for the GST, START contractor, or ERT/REAC.

VII. FUTURE ACTIVITIES:

The OSCs will continue work on the site file organization and in turning the records over to the Superfund Records Center. OSCs will continue with D.O. close-out activities with the ERRS contractor, including coordination on the final disposition of the mercury, review of the final 1900-55's & invoices, and review of the PM's final report. OSCs will coordinate with EAD and others, as requested and necessary, regarding cost recovery and enforcement issues.

In a separate report, the OSCs will refer both JLM Terminal and Southern Metals facilities to NCDENR for site assessments. EPA's remedial program will also be notified of the potential contamination problems at these facilities.

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
POLLUTION REPORT (POLREP)

POLREP #60
OLD ATC REFINERY
801 Surry Street
Wilmington, North Carolina

TO: Myron D. Lair, ERRB
Shane Hitchcock, ERRB
Dan Thorton, EPA HQ, ERD Regional Coordinator
Michael Henderson, R4 Community Relations
EPA Region 4 Regional Response Center

FROM: Christopher A. Militscher, OSC
Tony Best, OSC

DATE: July 17, 1998

Period Covered: 6/26 to 7/17/98

I. BACKGROUND:

Site No.:	04YR
Delivery Order No.:	4005-F4-050
Response Authority:	CERCLA, Non-NPL
Incident Category:	Time-Critical, Fund-lead Removal

PERSONNEL ON-SITE

OSC - 1
USCG-GST - 1
ERRS - 7

Weather: Conditions were generally hot and humid, with temperatures in the low 90's and partly to mostly cloudy. Some precipitation the week of 7/13.

II. SITUATION:

See POLREP #1 and other POLREPs for additional details of response actions.

III. SITE ACTIVITIES:

ERRS re-mobilized personnel and equipment to the site on 7/13 following the holiday break. An explosion and fire next door at Southern Metals on 7/2 re-initiated media and local

Interest from EPA's work at ATC: The PM, George F. Mick responded to the incident and assisted burn victims until EMS arrived. He also secured equipment and materials away from the "fenceline" as the fire lasted several days. Run-off from the fire is not believed to have impacted the Site.

ERRS set up the tarp for the soil and waste excavation work and completed other preparations for the next phase of activities by 7/15. On 7/16, ERRS began excavation work based upon the sample grid map at "Pelican Point". As of 7/17, one grid area has been excavated and stockpiled. The grid average depth is 5 feet. Air monitoring at the excavation hole peaked at 20,000 units above background on the FID. Breathing zone concentrations did not exceed the 5 ppm action level for Level C PPE.

A visible sheen is present in the excavation hole. Excavations will be limited to infiltration of groundwater, where necessary. Stockpiled soils will be sampled for waste characterization parameters.

ERRS is nearing completion of the first phase of the treatability study for the contaminated soils on the northwestern portion of the site. Samples will be taken to confirm preliminary test conditions. Additional work will be needed to identify optimum soil treatment conditions.

ERRS removed a small area of visibly contaminated soils from the pump station area and OSC/GST took a confirmatory sample for analysis.

OSC coordinated with CCO owner and former employee Don Arthur this week. A summary report was provided to CCO owner on the status of removal activities. OSC also gave brief news update to Wilmington Star News reporter.

IV. ESTIMATED COSTS:

ERRS costs as of 7/15/98 were estimated at approximately $2,361,000 with $284,000 remaining in the current D.O. EPA/GST costs as of 7/16 are a combined $331,120.

V. FUTURE ACTIVITIES:

ERRS will continue with soil and waste excavation activities and stockpiling.

Lead OSC Best will continue with coordination on sampling and analytical test results with ESD. GST will continue with health and safety monitoring and contractor oversight tasks during this next phase of the removal action.

OLD ATC REFINERY 4/8/98 [illegible]

TANK 8 ALL TANKS LEFT
OTHER TANKS GONE
LANDFARMING CONT SOILS AT TANKS
TOWER (REFINERY) DOWN

FINISHED, PLATFORM, COMING DOWN

RECOVERY TRENCHES BACKFILLED

TRACING WATER FROM REFINERY TOWER.

OTHER TANKS HAD GASOLINE IN SOIL
MUST HAD LEAKED — DEFINITELY
WHEN REMOVED

PHOTOGRAPHED FROM EAST EDGE OF EXCAVATION
2nd LEFT SITE 1745.

OLD ATC REFINERY 6/2/98

910 25 1886 ROD ELKINS

SCRAP METAL REMOVAL

ALL TANKS DOWN

NEXT WK SOIL SAMPLING
PODS ARE TO PUT LANDFARMING.

7/8 TONY BEST SEE BRIEF / ~~[illegible]~~ VS NOW OSC

SOUTHERN SCRAP EXPLOSION COMP GAS

CREWS OFF SITE NOW
TANKS 2-5 SCRAP PUT
AREA — WORKER ON SITE

SOUTHERN SCRAP HAS WARRANT INVESTIGATE
- HIGH OFFS AT RISK
- EMPLOYEE'S AS OTHER PROPERTY
N OF WILL. OSHA

CALL TONY

[illegible] 7/30/95

TREATABILITY STUDY FOR SOILS FROM THE TANKS 0001 + 0002 AREA THAT WERE REMOVED BY GTA

↳ TO INTRODUCE OXG MOT AND FACILITATE VEGETATION OF GROUND AND SOIL

REMOVED TEL A STOCKPILE NE OF BOOD3 BASE. AND TEL. EXCAVATION — ABOVE - USING VIBRAN CRITERIA AND DIGGING DOWN TO WATER TABLE (ALSO PROFILE DATA: PARDING)

DECONTED AND TOXIC AMOUNT OF SOUTHERN MOTORS THAN PARCEL NOTED PIECES OF DRUM FRAGMENTS W/ BUNGE. 1 AREA EXCAVATED THERE VIEWED 2 50'x10' EXCAVATED AREA W/ "CHEMICAL" OLD FILL AREA SE CORNER OF SITE AT DAWSON + FRONT ST.

AT TRAILER. TONY BEST GIVE SFP COPY OF ACTUAL BUDGET $5,933,000.

MIKE TOOK MY PHONE NO TO CALL ALSO ACCUMULATED DATA.

SFP LEFT SITE @ 17:50 OFFC 20:15

Cristex
Oxford, Granville County, NC
USEPA ID: NCD 001 606 250
PA/SI Sampling.
Wednesday, August 16, 1995
(Continued)
Doug Moore } Team 3
Stuart Parker }

16:00 arrived at Cristex and setup to sample MW-19 onsite above lagoon for sample CD-19-GW

Stickup = 0.7 feet.
Depth of well 9.2 feet
Depth to water table 4.875 feet
Depth of water col. = 4.325 or 0.692 gals per well vol. x 3 for 2.1 gallons 3 well volumes.

16:15 - SFP collected MBAS sample Tabbit 8' below top of wellhead. Sample labelled "CD-19-GW". Sample split received by James Sasle of Mid-Atlantic Associates. Turbidity reading was 52.2 NTU.

DBM

Attachment 5

SUPPLEMENTAL
EXPANDED SITE INSPECTION

Old ATC Refinery
NCD 986 186 518
Wilmington, New Hanover County, North Carolina
Reference No. 05591

June 2002

Superfund Section
Division of Waste Management
North Carolina Department of Environment
and Natural Resources

Prepared by:

Stuart F. Parker
Hydrogeologist

Reviewed by:

James Bateson, Head
Site Evaluation & Removal Branch

NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT

MICHAEL F. EASLEY, GOVERNOR
WILLIAM G. ROSS, JR., SECRETARY
DEXTER R. MATTHEWS, DIRECTOR

NCDENR

June 27, 2002

Ms. Jennifer Wendel
NC Site Management Section
US EPA Region IV Waste Division
61 Forsythe Street, 11th Floor
Atlanta, Georgia 30303

Subject: Supplemental Expanded Site Inspection
Old ATC Refinery Site
Wilmington, New Hanover County, NC
NCD 986 186 518

Dear Ms. Wendel:

The enclosed document summarizes the results of a Supplemental Expanded Site Inspection (SESI) of the Old ATC Refinery site, completed by the NC Superfund Section. This SESI is based upon site-specific information obtained during a Time-Critical Removal Action completed in 1999, a Site Re-Assessment completed in June 2001, and SESI field observation and sampling conducted during December 2001 and January 2002. The purpose of the SESI was to characterize post-removal site conditions, contaminant migration pathways and potential threats to human health and the environment.

SESI sampling was conducted on site during January 28-30, 2002. Approximately half of the surface soil samples and two thirds of the subsurface soil samples contained residual concentrations of semi-volatile organic compounds (SVOCs) exceeding federal soil exposure benchmarks and NC Soil Remediation Goals. Lead concentrations were less than federal or state limits in all but one of the soil samples,. The exception was a subsurface soil sample beneath the upgradient property line with Southern Metals Recycling Co. (SMR). This sample contained elevated concentrations of arsenic, barium, cadmium, chromium, mercury, selenium, silver, vanadium, zinc, SVOCs and an extremely high lead level.

Groundwater sampling in the site's surficial aquifer detected semi-volatile organic compounds (SVOCs) beneath the southwest portion of the site. Some contaminant concentrations exceeded federal and state groundwater limits. Barium, chromium, lead, vanadium and zinc were detected in some groundwater samples, but concentrations generally were less than drinking water standards.

Surficial and bedrock aquifers beneath the site are not locally used to supply drinking water. No municipal groundwater wells exist within the study area, and the nearest community and domestic drinking-water wells are located at least two miles from the site. The site's surficial aquifer discharges to the tidal Cape Fear River.

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During the Removal Action, two surface impoundments were created on site to control site runoff. The south impoundment's overflow discharges to the Cape Fear River via the site's river inlet, which also contains a municipal stormwater outfall. The north impoundment has no apparent overflow point. Surface water in both impoundments is anticipated to infiltrate to groundwater.

SESI sampling included surface water and sediment from both impoundments. South impoundment surface water contained arsenic, barium, lead and zinc. South impoundment sediment contained elevated pyrene, arsenic, barium, lead, vanadium and zinc. North impoundment surface water contained elevated barium and zinc. North impoundment sediment contained elevated SVOCs, arsenic, lead, mercury and zinc. Chromium levels in sediment from both impoundments were comparable to background soil.

Fluoranthene and pyrene were detected in sediment along the site's Cape Fear waterfront, however similar concentrations were detected in one background sample upriver from the site. No other SVOCs were detected in the river samples. Elevated lead concentrations were detected in sediment samples at the river inlet and adjacent to the site's former NPDES discharge. No other elevated contaminant concentrations were detected at these locations. It is worth noting that historical sampling detected a high lead concentration in inlet sediment located downgradient from the municipal stormwater outfall.

Elevated arsenic and zinc concentrations were detected in river sediment parallel to the site's south impoundment. Arsenic was also detected in sediment further downriver, adjacent to the neighboring JLM petroleum terminal. Surface water parallel to the south impoundment contained elevated arsenic and vanadium. Elevated chromium was detected both parallel to the impoundment and downriver. However, the river sample chromium concentrations were considerably higher than those detected in the impoundment.

The Cape Fear River estuary contains no active municipal or community drinking water intakes within 15 miles of the site. However, the estuary is a commercial and recreational fishery and contains extensive wetland frontage. The threatened species *Alligator mississippiensis* and the endangered species *Acipenser brevirostrum* have been documented upriver from the site. The former also was reportedly observed on site several years prior to the Removal.

The site is presently vacant and no full-time workers are present. No residents are reported within a 0.25 mile radius, and no schools or day care facilities are evident in proximity to the site. Air monitoring conducted on site during the SESI detected no elevated organic vapor levels, and no evidence of blowing dust or particulates was observed.

During the Time-Critical Removal, EPA Region IV personnel expressed concern about potential on-site contaminant migration from the neighboring Southern Metals Recycling (SMR) facility. During soil bio-treatment, organic soil contaminant concentrations fluctuated within the southern portion of the site, possibly due to its proximity to SMR. SESI soil sample results from the property line suggest that a source of organic and inorganic contaminants exists there.

In August 2001, private consultants completed a site assessment report for JLM Industries regarding the SMR property. The report contended that surface runoff and groundwater flow from the SMR property had caused extensive migration of inorganic contaminants to soil and groundwater at the JLM terminal. The report indicated that contaminants had also migrated to the Old ATC property, and that soil contamination at JLM had reached the Cape Fear River.

In summary, SESI sampling detected inorganic contamination in surface water and sediment along the site's Cape Fear riverfront. However, attribution is complicated by the presence of alternative upgradient contaminant sources. Based on the above findings, the site is recommended for no further action under CERCLA. If you have any questions, please contact me at (919) 733-2801.

Sincerely,

Stuart F. Parker,
Hydrogeologist,
NC Superfund Section

Attachments
cc: File

5.0 GROUNDWATER PATHWAY

5.1 Hydrogeologic Setting

The ATC site is located in the Coastal Plain Physiographic Province. The province is characterized by low topographic relief, with maximum elevations of approximately 500 feet MSL along the western margins. Coastal plain geology consists of a southeastward-thickening wedge of Cretaceous and Tertiary sediments, which overlays more ancient crystalline bedrock (Ref. 22).

Surface soils in and around the ATC site are mapped as Urban Land Complex. These are soils where the original soil profile has been extensively altered by excavation and/or filling associated with urban development. Local natural soils are characterized as Baymeade soil, consisting of layered fine and loamy fine sand (Ref. 23). Periodic underfilling apparently was performed beneath the former facility's large ASTs. On-site excavations and test borings encountered discarded lumber, brick and other construction/demolition refuse beneath the ATC site (Ref. 12; Appendices A and B).

The ATC site's surficial aquifer is a non-fossiliferous sand, estimated to be locally 20 feet thick (Refs. 24-25). Local Pliocene-Pleistocene-age sand and carbonates and the region's Tertiary Castle Hayne limestone aquifer are reportedly absent beneath the ATC site (Refs. 24-25). The underlying Cretaceous Pee Dee Formation consists of thick silty clay with confined water-bearing sands at various depths. The uppermost confining clay is 20 feet thick. However, this clay thins north, south and west of the ATC site, and is absent beneath northern Wilmington, Greenfield Creek, and part of the Cape Fear River (Refs. 25-26).

The confined sand beneath the ATC site is the Scotts Hill member of the Pee Dee Formation (Ref. 26). This freshwater aquifer ranges up to 35 feet thick, and is apparently recharged to the north of Wilmington. Due to the region's proximity to the coast, deeper Pee Dee sands contain brackish to saline groundwater (Ref. 25).

At SESI wellpoints installed in western and central portions of the ATC site, measured depths to groundwater ranged from 1.85 to 7.6 feet beneath the ground surface. Groundwater depths exceeded 11 feet in background wellpoint locations east and upgradient from the former refinery (Appx. B). Historical water-level measurements indicate that groundwater beneath the ATC site flows generally westward toward the inlet and Cape Fear River. Semi-daily tides in the estuary induce continuous fluctuation in groundwater elevations beneath the ATC site (Ref. 12). EPA personnel reported that several intermittent surface springs existed on site (Appx. A).

5.2 Groundwater Targets

The ATC site's urban location, and the presence of saline groundwater at depth, limits groundwater use within a 4-mile radius of the site. Municipal water is obtained from the Cape Fear River at a location 23 miles upstream from the ATC site. The river is a hydrogeologic discharge boundary, and wells located across the river in Brunswick County are not considered to be potentially affected by the ATC site (Ref. 20).

According to previous site investigations, one community well located approximately 3.5 miles east of the ATC site serves 300 people. In New Hanover County, no drinking water wells reportedly operate within a 2-mile radius of the ATC site. The remaining groundwater population within the study area was estimated at 49 people between 2 and 3 miles from the ATC site, and 835 people between 3 and 4 miles from the site, respectively (Ref. 20).

5.3 Groundwater Sampling

5.3.1 Historical Groundwater Sampling and Results

During the 1991 SSI, the NC Superfund Section collected groundwater samples from the on-site product recovery well (GW-1) and from a shallow wellpoint (GW-2) located near the ATC site's tetraethyl lead tank. Both samples were analyzed for inorganic contaminants. The recovery well sample contained 0.03 mg/l arsenic and 1.87 mg/l lead. The wellpoint sample contained 0.06 mg/l arsenic and 2.90 mg/l lead (Ref. 19). These results all exceed present day federal health-based benchmarks and state groundwater standards (Refs. 29-30). However, no off-site background sampling was conducted to support attribution of the contaminants to the ATC site (Ref. 19). No groundwater sampling was conducted on site during the 1993 ESI or the 1995 EE/CA (Ref 2; Ref. 20).

5.3.2 Supplemental ESI Sampling

5.3.2.1 Temporary Monitoring Well Installation

During the SESI, EPA SESD personnel used a Geoprobe$_c$ truck-mounted push-coring device to install temporary monitoring wellpoints at the ATC site. The eight wellpoint locations included two background locations and six locations in areas of suspected contamination (Appendices B-C).

Background location AE-001-MW was originally located between Surry Street and the northeastern portion of the former refinery. However, repeated emplacements to wellpoint refusal (20 feet depth) yielded insufficient groundwater for sample collection. As a result, AE-001-MW was relocated inside the former refinery's northeast corner fenceline. This location served as an on-site background sample for the northern portion of the ATC site, but also screened for potential background metals contamination from the recycling facility to the northeast. Background location AE-002-MW was installed to 20 feet depth in the former ATC parking lot on Front Street. This well served as a background sample for the southern portion of the ATC site and also for Southern Metals Recycling (Fig. 3; Appx. B).

5.4 Groundwater Conclusions

Because of limited local groundwater use, groundwater contamination at the ATC site is considered unlikely to pose any threat to drinking water wells. The potential remains for discharge of contaminated groundwater to the Cape Fear River. However, this concern is addressed under the surface water pathway.

6.0 SURFACE WATER PATHWAY

6.1 Site Hydrologic Setting

The ATC site's land surface drains to the two drainage ditches and surface impoundments, and from the southern impoundment to the inlet and Cape Fear River (Ref. 1). The Cape Fear River is a brackish tidal estuary, assigned a water quality classification of Class C tidal waters. Such waters are considered suitable for most common uses such as "aquatic life propagation and maintenance of biological integrity...secondary recreation and any other usage except primary recreation or shell fishing for market purposes" (Ref. 37).

Prior to the Removal Action, a large portion of the ATC site lay within the river's 100-year floodplain. The ATC site was flooded via the river inlet as recently as May 1999. This event interrupted on-site soil treatment (Appendices A-B). Portions of the site were subsequently backfilled with bio-treated soil, which was bulked by the addition of chipped wood from hurricane debris. This backfilling, plus completion of a continuous waterfront berm, reduced the area potentially affected by future river flooding (Photos 7-8; Appx. B).

Prior to the Removal, surface runoff from the ATC site discharged to the river inlet and to marshy areas east of the riverfront berm segments. A portion of ATC site runoff was captured by three oil/water separators and directed to the site's NPDES river discharge (Ref. 28). The discharge point was located north of the inlet (Ref. 2; Figs. 2-3). The EPA and Coast Guard subsequently removed the separators, and terminated a system which channeled runoff directly beneath the riverfront berms (Appx. A).

EPA Removal personnel suspected that runoff was transporting contaminants from the upgradient Southern Metals Recycling facility onto the ATC site. The south drainage ditch was constructed to divert run-on around the ATC site periphery to the south retention pond (Photos 5-6) . The pond's berm was designed to retain floating materials, but allows pond overflow to discharge to the mouth of the river inlet. On October 19, 1999 the EPA OSC advised ATC site owner Linda Carroll of potential requirements for NPDES permitting of northside and southside discharge points (Appx. A; Appx. B).

6.2 Surface Water Targets

No public water-supply intakes currently operate on the river in the Wilmington area. However, the estuary is a commercial and recreational fishery and a nursery for edible fish and shellfish. Several miles of wetland frontage exist within 15 miles upriver and downriver from the ATC site (Ref. 2; Ref. 20).

Several rare plant and animal species exist along the Cape Fear River within the study area, including four animal and two plant species that are listed as either threatened or endangered in NC and/or the US (Ref. 2; Ref. 26). Currently, *Alligator mississippiensis* (American Alligator) is reported 0.7 mile upriver from the ATC site (Ref. 38). An individual was also observed on site during Fall 1992 (Ref. 20). This species is listed as Threatened in NC and the US. *Acipenser brevirostrum* (Shortnose Sturgeon) was identified in the central Cape Fear River channel directly upriver from the ATC site. This species is listed as Endangered in NC and the US (Refs. 38-40).

6.3 Surface Water Pathway Sampling

6.3.1 Historical Sampling and Results

During the 1993 ESI, river inlet sediment was sampled at four locations: below the sludge disposal area; adjacent to the municipal storm-water outfall; below a drain pipe from the ATC site's northern portion; at the mouth of the inlet. Along the Cape Fear waterfront, low- tide and high-tide background sediment samples were collected upriver and downriver from the ATC site, respectively. Along the site's waterfront, sediment samples were collected near the fire pump and former NPDES discharge and downriver from the inlet. Samples were analyzed for semi-volatile organic compounds (SVOCs) and metals. No surface water samples were collected (Ref. 20).

In river-inlet sediments, the highest lead concentration occurred near the municipal storm-water outfall (990 mg/kg) and the drainage from the ATC site's northern portion (160 mg/kg). Lower lead levels existed below the sludge pile runoff (70 mg/kg) and at the mouth of the inlet (51 mg/kg). Elevated lead (330 mg/kg) was reported in sediment downriver from the inlet. Other sample lead concentrations along the riverfront were comparable to background sample concentrations. Arsenic and vanadium were detected in inlet sediment below the sludge runoff, and also in sediment downriver from the inlet (Ref. 20).

Benzo(a)pyrene, benzo(b,k)flouranthene, chrysene, fluoranthene, 2-methylnaphthalene phenanthrene and pyrene were detected in both the inlet and the downriver sediments. However, comparable concentrations of each SVOC were reported in low-tide background sediment samples located upriver from the ATC site. Fluoranthrene and pyrene were reported in high-tide background sediment samples located downriver from the ATC site. The remaining SVOCs were also reported at the mouth of the inlet and downriver from the ATC site, but their quantities were estimated (Ref. 20).

Three sediment samples were reportedly collected along the Cape Fear River as part of the EE/CA. However, sample results were apparently omitted from the EE/CA report (Ref. 2)

6.3.2 Supplemental ESI Sampling and Results

6.3.2.1 Sample Locations

Overland Flow Pathway sampling was conducted on the ATC site's north and south drainage ditches and surface impoundments. Ditch soil results are discussed in Section 7.3.

Surface water and sediment runoff samples AE-018-SW, water duplicate AE-118-SW and AE-018-SD were collected from the southern impoundment. Surface water sample AE-020-SW was collected from the northern impoundment and sediment sample AE-020-SD was collected from the lower surface drainage to the impoundment. During falling tide, surface water and sediment samples AE-025-SW and AE-025-SD were collected at an outflow stream where the inlet was discharging to the Cape Fear River (Photo 11; Appx. B).

Along the Cape Fear River, surface water and sediment samples were collected at two separate background locations upriver from the ATC site. Samples AE-021-SW and AE-021-SD were collected approximately 150 feet upriver from the site's north fence line. Samples AE-022-SW and AE-022-SD were collected approximately 30 feet upriver from the north fence line. Waterfront surface water and sediment samples AE-023-SW and AE-023-SD were collected approximately 60 feet upriver from the waterfront's former fire pump. Samples AE-024-SW and AE-024-SD were collected approximately 45 feet upriver from the river inlet, downriver from the site's former NPDES discharge. Samples AE-026-SW and AE-026-SD were collected approximately 200 feet downriver from the inlet. Samples AE-027 SW and AE-027-SD were collected approximately 50 feet downriver from the site's south fenceline (Photo 12) (Fig. 3; Appx. B).

6.3.2.2 Sample Results

Surface water pathway sample results are summarized in Table 3. Southern impoundment water samples contained arsenic (110-140 ug/l), barium (540-690 ug/l), chromium (2.6-3.6 ug/l), lead (66-100 ug/l), vanadium (10-14 ug/l) and zinc (75-110 ug/l). Sediment from the southern impoundment contained pyrene (0.97 mg/kg), arsenic (48 mg/kg), barium 440 (J) mg/kg, chromium (8 mg/kg), lead (210 mg/kg), mercury (0.3 mg/kg), silver 0.6 (R) mg/kg), vanadium (22 mg/kg) and zinc (230 mg/kg) (Table 3; Appx. C).

Northern impoundment surface water contained arsenic (4.8(R)ug/l), barium (270 (J) ug/l), chromium (1 (R) ug/l), silver 2.2(R), ug/l) vanadium (2.4(R) ug/l and zinc (30 ug/l). Northern impoundment sediment contained several SVOCs, including fluoranthene (1.2 mg/kg), pyrene (0.75 mg/kg), benzo(a)anthracene (0.46 mg/kg), chrysene (0.55 mg/kg), benzo(b)fluoranthene (0.6 mg/kg) and benzo(ghi)perylene (0.17 (J) mg/kg). Metals in the sample included arsenic (4.8(R) mg/kg, barium (270 (J) mg/kg), chromium (1(R) mg/kg), silver (2.2 (R) mg/kg), vanadium (2.4 (R) mg/kg), and zinc (30 mg/kg) (Table 3; Appx. C).

No organic compounds were detected in the aqueous Cape Fear River samples. Waterfront sediment samples AE-024-SD through AE-027-SD each contained remarkably consistent concentrations of fluoranthene and pyrene. However, similar concentrations were detected in background sample AE-021-SD. Therefore, these contaminants were not attributed to the ATC site. No other SVOCs were detected in the river sediments (Table 3; Appx. C).

Lead concentrations exceeded three times background in NPDES sediment sample AE-024-SD (120 mg/kg) and in inlet PPE sediment sample AE-025-SD (90 mg/kg). None of the remaining sediment or aqueous lead concentrations on the riverfront exceeded three times maximum background levels (19 mg/kg; 34 ug/l) (Table 3; Appx. C).

Arsenic was detected in sediment samples AE-026-SD (1.6 mg/kg), downriver from the inlet, and AE-027-SD (1.1 mg/kg) downriver from the property line. Sample quantitation limits ranged from 0.64 to 0.68 mg/kg. Arsenic exceeded three times background in aqueous sample AE-026-SW (19 ug/l), but not in AE-027-SW (Table 3; Appx. C).

Chromium exceeded three times background concentration in surface water samples AE-026-SW (63 ug/l) and AE-027-SW (39 ug/l). Vanadium (10 mg/kg) and zinc (59 mg/kg) exceeded three times background in sediment sample AE-026-SD. Vanadium (100 ug/l) and zinc (190 ug/l) also exceeded three times background in surface water sample AE-026-SW (Table 3; Appx. C).

6.4 Surface water Pathway Conclusions

Elevated lead concentrations were detected in river sediment at the inlet PPE and downstream from the former NPDES discharge. Northern impoundment sediment contained elevated lead, but its surface water did not; nor did groundwater sample AE-007-MW. Therefore, lead in the river sediment may either be a remnant of historical NPDES discharge, or have migrated from the inlet. The southern impoundment periodically overflows to the inlet and contains lead. However, historical sampling detected a higher lead concentration in sediment below the inlet's municipal storm-water outfall. Therefore, the latter is a potential alternative lead source.

Surface water at the lower riverfront's groundwater PPE contained elevated arsenic, chromium, vanadium and zinc. Sediment at the same location contained arsenic, vanadium and zinc. Each of these contaminants was detected in the southern impoundment, from which they may have potentially infiltrated to groundwater and then emerged from the riverbed. However, attempts to sample emergent groundwater at this particular riverbed location were unsuccessful. Therefore, existing data are insufficient to evaluate contaminant attribution to the impoundment.

Surface water downriver from the ATC site contained elevated chromium. Sediment downriver from the ATC site contained slightly elevated arsenic. These samples were located at the waterfront of the JLM petroleum terminal, which reportedly received metals-contaminated runoff from the upgradient Southern Metals Recycling Co. (Ref. 41). Therefore, attribution of the downriver sample contaminants to the ATC site is uncertain.

The Cape Fear River is a fishery containing rare plant and animal species. The threatened American Alligator was observed on site during the early 1990s, prior to removal of the old ATC Refinery. The endangered Shortnose Sturgeon has been documented in the Cape Fear River upriver from the ATC site. However, in recent years, no commercial or recreational fishing, or rare species, have been observed on site or at the ATC site's waterfront.

7.0 SOIL EXPOSURE AND AIR PATHWAYS

7.1 Physical Conditions

The ATC site is an inactive industrial property. The property is fenced. No surface soil cap was constructed on site, but the ground surface is moderately to heavily vegetated (Photos 1-8; Appx. B).

Site-specific soil cleanup goals for the Removal Action were: lead: 800 mg/kg; chromium (total): 1300 mg/kg; vanadium: 500 mg/kg; total SVOC (carcinogenic): 50 mg/kg; total SVOC (non-carcinogenic): 100 mg/kg. The SVOC cleanup goals did not address federal soil exposure limits or State Remediation Goals for specific SVOCs (Refs. 29-30). The EPA reported successful cleanup down to 200 - 300 mg/kg total petroleum. The 100 mg/kg cleanup goal for total petroleum was reportedly not achieved (Appx. A). Final inorganic cleanup levels for soil reportedly exceeded the State Soil Remediation Goals for lead (400 mg/kg) and total vanadium (1.1 mg/kg) (Ref. 30).

7.2 Soil and Air Targets

No residents or full-time workers are present on site. Land use surrounding the ATC site is primarily industrial, with no residents reported within a 0.25 mile radius. In the year 1995, approximately 6700 residents reportedly lived within one mile of the ATC site (Ref. 2).

Marshy areas adjacent to the ATC site's waterfront berms were converted into runoff impoundments during the removal (Photos 3-6). These areas were not formally mapped as wetlands. The rare species *Alligator mississippiensis* (American Alligator) was observed on site several years prior to the removal (Ref. 21).

7.3 Soil Sampling and Results

During the SESI, fifteen surface soil samples and twelve subsurface soil samples were collected on site. The EPA's X-Ray Fluorescence (XRF) field screening further characterized lead levels in surface soils. SESI soil samples were analyzed for EPA Target Compound List (TCL) semi-volatile organic compounds (SVOC) and for Target Analyte List (TAL) inorganics. At EPA's recommendation, selected soil samples were also collected for dioxin/furan analyses. Selected samples were analyzed at the NC Public Health Laboratory via Toxicity Characteristic Leaching Procedure (TCLP). Sample results are summarized in Table 4A, Table 4B and Appx. C.

7.3.1 SVOC and Inorganic Results

Eight surface soil samples and six subsurface soil samples contained residual SVOCs. In five surface and six subsurface samples, benzo(a)pyrene exceeded its federal health-based benchmark for human exposure and the NC Soil Remediation Goal (Refs. 29-30). Benzo(b)fluoranthene and/or benzo(a)anthracene also exceeded their soil benchmarks in two surface and two subsurface samples, including AE-009-SB at the Southern Metals property line (Refs. 29-30).

Subsurface soil sample AE-009-SB contained arsenic (13 mg/kg), cadmium (14 mg/kg), lead (42,000 mg/kg) at concentrations exceeding soil exposure limits (Refs. 29-30). The sample also contained the inorganics barium, chromium, mercury, selenium, silver and vanadium and zinc (Table 4A; Appx. C).

Arsenic was detected in fourteen surface and eight subsurface soil samples. Each detection exceeded the federal health-based benchmark (0.43 mg/kg) for human soil exposure. However none of the surface soil results exceeded three times the highest background concentration (5.7 mg/kg). Barium exceeded three times background in four surface and two subsurface samples but did not exceed its soil benchmark. Elevated chromium, mercury, silver and vanadium concentrations were each detected in isolated surface soil samples. Seven subsurface soil samples contained cadmium, chromium, lead, vanadium and/or zinc, but the concentrations did not exceed their respective benchmarks (Refs. 29-30; Table 4A; Appx. C).

Vanadium exceeded three times background concentration in two on-site surface soil samples: AE-009-SS, at the southern Metals property line; and AE-017-SS in the ATC site's south drainage ditch. Neither sample concentration exceeded the soil exposure benchmark (Refs. 29-30; Table 4A; Appx. C).

7.3.2 Dioxin/Furan Results

In surface soil sample AE-009-SS, several dioxin congeners were detected at concentrations exceeding either three times background or exceeding non-detect background. Results for 2,3,7,8 tetrachloro-dibenzodioxin (TCDD), total hexachlorodibenzodioxin, 1234678 heptachloro-dibenzodioxin, total heptachlorodibenzodioxin and octachlorodibenzodioxin also exceeded federal health-based soil-exposure benchmarks and state soil remediation goals (Table 4B; Appx. C).

TCDD exceeded soil limits in on-site soil sample AE-004-SS and TCDD and total heptachlorobenzodioxin exceeded soil limits in south impoundment sediment sample AE-018-SD. However, these concentrations did not exceed three times background soil or background Cape Fear River sediment concentrations (Table 4B; Appx. C).

7.3.3. State Soil Results

State Lab analysis detected 500 ug/kg total phenanthrene in subsurface soil sample AE-015-SB. No other organic contaminants were reported in the six samples tested. Due to the low or non-detect contaminant concentrations, TCLP organic analyses were not performed on the samples (Table 4C; Appx. C).

Sample AE-010-SS contained leachable cadmium and zinc concentrations exceeding NC Groundwater Remediation Goals (RGs). Leachable lead results for samples AE-010-SS, AE-011-SB, AE-012-SS, AE-013-SB and A-015-SB also exceeded NC Groundwater RGs. None of the associated total inorganic results exceeded State Soil RGs. Total and leachable arsenic levels in soil sample AE-012-SS exceeded respective State Soil and Groundwater RGs (Ref. 30; Table 4C; Appx. C).

7.4 Air Pathway Results

During the January 2002 SESI, photo-ionization detectors (PIDs) were used to monitor work zone air quality at subsurface soil sampling locations. Although a faint petroleum odor was perceived at some explorations, none of the PID readings were elevated above background. No blowing dust or evidence of airborne particulates has been observed on site since completion of the Removal Action (Appx. B).

7.5 Soil and Air Conclusions

The 1996-1999 Removal Action resulted in substantial reduction of soil contaminant levels on site. SESI surface and subsurface soil samples contained residual contaminant concentrations. Lead concentrations do not exceed 400 mg/kg, except in subsurface soil at the Southern Metals property line. Dioxin/furan sampling results did not exceed background levels except at the Southern Metals property line. Semi-volatile organic compounds in some soils continue to exceed federal health-based exposure benchmarks and state remediation goals. Work zone air monitoring during the SESI detected no elevated organic vapor concentrations on site.

The ATC site is vacant and the majority of structures have been removed. No residents or workers are present, and rare species have not been observed on site in recent years. Based on post-Removal conditions and limited targets, the soil exposure and air pathways represent a minimal hazard to human health and the environment.

8.0 SUMMARY AND CONCLUSIONS

During the 1996-1999 Time-Critical Removal Action, the EPA and Coast Guard dismantled and removed the Old ATC Refinery's petroleum processing, storage and transfer equipment, along with improperly disposed tank-bottom sludges and chemical containers. Visible product sheen was removed from the water table at two on-site locations. Lead and petroleum contaminated soils were removed to RCRA disposal facilities or bio-treated. Surface drainage was re-directed to two on-site surface impoundments. Pre-existing discharges to the Cape Fear River were eliminated. Backfilling of treated soils and extension of riverfront berms reduced the ATC site's vulnerability to future flooding.

In 2001, the NC Superfund Section recommended completion of a Supplemental ESI (SESI) at the ATC site, in order to characterize Post-Removal site conditions and evaluate any continued threats to human health or the environment. SESI field operations, conducted in January 2002, included shallow groundwater sampling on site and beneath the Cape Fear riverbed, surface and subsurface soil sampling, and surface water and sediment sampling at the ATC site's two surface impoundments and along the Cape Fear waterfront. Samples were analyzed for TCL semi-volatile organic compounds (SVOCs) and TAL inorganics. Selected samples were also analyzed for dioxins/furans.

Groundwater beneath the southeast portion of the ATC site contained SVOCs which exceed health-based benchmarks. Concentrations did not indicate free product on the water table. Arsenic in groundwater exceeded its federal health-based benchmark, but is not elevated above background. Barium and zinc exceeded background levels but did not exceed health-based benchmarks. Chromium, lead, vanadium and zinc were present in scattered samples and did not exceed benchmarks. Groundwater targets for the ATC site are very limited; the nearest groundwater wells subject to potential contamination are two miles away.

Water and sediment in the ATC site's northern and southern impoundments contained SVOCs and inorganic contaminants. Overflow from the southern impoundment discharges to the mouth of the ATC site's river inlet, which is the overland probable point of entry (PPE) to surface water. The inlet also contains a municipal storm water outfall. No surface water discharge point was identified for the northern impoundment. Neither impoundment has an impermeable liner. Therefore, impoundment contaminants are expected to infiltrate to groundwater. The ATC site's entire Cape Fear waterfront is the PPE for groundwater discharge to the surface water pathway.

Several SESI sediment samples along the Cape Fear waterfront contained fluoranthene and pyrene. However similar concentrations were reported in background sediment upriver from the ATC site. No other SVOCs were detected in the river samples. River sediment samples at the inlet PPE and the former NPDES discharge contained elevated lead concentrations. However, historical sediment sampling detected a higher lead concentration in sediment below the stormwater outfall in the upper inlet. No other elevated contaminants were detected in the PPE and NPDES river samples.

Sediment collected 0.04 mile downriver from the inlet, adjacent to the southern impoundment, contained elevated arsenic and zinc concentrations. Arsenic was also detected in sediment 0.07 downriver from the inlet, at the waterfront of the JLM terminal. Background river sediments were non-detect for arsenic. The downriver sediment concentration was approximately 1.7 times the background sample quantitation limit. Surface water 0.04 mile downriver from the inlet elevated arsenic, chromium and vanadium. Surface water at the JLM terminal contained chromium at 3.5 times background concentration.

Sampling of riverbed groundwater 0.04 mile downriver from the inlet was unsuccessful due to high turbidity. Therefore, surface water and sediment contaminant attribution to the impoundment could not be directly tested. JLM waterfront groundwater 0.07 mile downriver from the inlet contained acenaphthene and lead, the latter exceeding its federal benchmark and state groundwater limit. However, in the corresponding surface water and sediment samples, neither contaminant exceeded background levels.

The Cape Fear River is a commercial and recreational fishery and contains extensive wetland frontage and several rare species. Fishing has not been observed in proximity to the ATC site. The threatened American Alligator was observed on site during the early 1990s, prior to the refinery removal, but has not been observed there in recent years. The endangered Shortnose Sturgeon was reported to inhabit the central Cape Fear River channel directly upriver from the ATC site.

A site investigation report completed for JLM Industries concludes that inorganic soil and groundwater contamination at Southern Metals Recycling Co. has migrated to the JLM terminal. The report indicates that soil and groundwater at JLM contain several inorganic contaminants, including arsenic, chromium and lead. The full extent of contaminant migration from JLM toward the Cape Fear River was not determined.

SESI sampling indicated that on-site soils contained residual SVOC concentrations that exceeded federal benchmarks and state remediation goals. Lead concentrations in on-site soils did not exceed federal or state limits, except beneath the property line with the neighboring Southern Metals Recycling facility. Surface soil at this location, and downgradient in the ATC site's southern drainage ditch, contained elevated vanadium concentrations which did not exceed soil limits.

Soil sampling for Dioxins/Furans detected elevated concentrations of dioxin congeners in one surface sample at the property line with Southern Metals Recycling. Elevated furan congener concentrations were reported in some samples, but did not exceed regulatory limits.

The ATC site is presently vacant and no full-time workers are present. The property is fenced and substantially vegetated. No residents are reported within a 0.25 mile radius, and no schools or day care facilities are evident in proximity to the ATC site. During the SESI, photoionization meters were used on site to monitor air quality during subsurface explorations. Although faint petroleum odors were reported, no elevated photoionization readings were obtained on site during the SESI. No blowing dust or particulates were observed.

Review of the SESI findings and results leads to the following conclusions:

1. Due to limited targets, and to substantial reduction of on-site contamination by the 1996-1999 Removal Action, the groundwater, soil exposure and air pathways are considered to be of minimal concern at the ATC site. The surface water pathway is of greater concern, due to the apparent release of inorganic contaminants to the overland and groundwater PPEs.

2 The presence of potential alternative contaminant sources complicates contaminant attribution both at the PPEs and downriver from the ATC site. The primary alternative source, Southern Metals Recycling, is scheduled for pre-CERCLIS screening by the NC Superfund Section. Municipal stormwater outfall to the site's riverfront inlet is also a suspected alternative contaminant source

3. The surface water pathway is described as a fishery containing threatened and endangered animal species. However, in recent years, no fishing activity or rare species has been observed in proximity to the PPEs or directly downriver from the ATC site, where contaminants have been detected.

Based on the above considerations the Old ATC Refinery site is recommended for no further remedial action under CERCLA.

Old ATC Refinery
NCD 986 186 518
Supplemental Expanded Site Inspection
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Table 2
Old ATC Refinery
NCD 986 186 619
Supplemental Expanded Site Inspection
Groundwater Sample Results

Sample Number:	AE-001-MW	AE-101-MW	AE-002-MW	AE-003-MW	AE-004-MW	AE-005-MW	AE-006-MW	AE-007-MW	AE-008-MW	AE-021-GW	AE-023-GW	AE-027-GW	NC Groundwater Remediation Goal	Federal Health-based Benchmark
Location:	Background	Background	Background	TEL Area	Refractory	Southeast Site		NW Riverfront		Upriver	Riverfront	Downriver		
Semi-volatile Organic Compounds (ug/l):														
Naphthalene	--	--	--	--	--	--	**1400**	--	--	--	--	--	21	1500
2-methyl Naphthalene	--	--	--	--	--	--	**70**	--	--	--	--	--	28	--
Acenaphthene	--	--	--	--	--	**220**	--	--	--	--	--	25	80	2200
Dibenzofuran	--	--	--	--	--	**170**	18	--	--	--	--	--	28	--
Fluorene	--	--	--	--	--	120	37	--	--	--	--	--	280	1500
Phenanthrene	--	--	--	--	--	95	28	--	--	--	--	--	210	--
Anthracene	--	--	--	--	--	26	--	--	--	--	--	--	2100	11000
Carbazole	--	--	--	--	--	--	**17**	--	--	--	--	--	--	4.3
Fluoranthene	--	--	--	--	--	14	--	--	--	--	--	--	280	1500
Pyrene	--	--	--	--	--	11 J	--	--	--	--	--	--	210	1100
Metals (ug/l):														
Arsenic	**12**	**13**	**29**	**9.3**	--	--	**5.0 R**	--	--	--	--	--	50	0.057
Barium	--	--	--	--	--	270 J	--	300 J	320 J	290 J	390 J	530 J	2000	2000
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	5	5
Chromium	--	--	--	3.8	--	1.8	--	--	--	--	--	--	50	100
Lead	--	--	--	--	3.5	3.0 J	--	--	--	--	--	**28**	15	15
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	1.1	2
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	50	50
Silver	--	--	--	--	--	--	--	--	--	--	--	--	50	180
Vanadium	--	--	4.2	--	--	3.1	--	--	--	R	--	R	--	260
Zinc	14	14	4.7	15	17	21	53	19	150	4.5	--	19	2100	1100

MW = Monitoring Well; GW = Riverbed Pore Water, TEL = Tetraethyl lead tank
J = Estimated value, R = Data unusable.
Bold values exceed three times background or non-detect background.
Shaded bold values exceed regulatory limits.
Samples collected by NC Superfund Section on January 29-31, 2002.
Project Manager: S. F. Parker

Table 3
Old ATC Refinery
NCD 986 186 518
Supplemental Expanded Site Inspection
Surface Water Pathway Sample Results

Sample Number: Location:	AE-018-SD South Pond	AE-020-SD North Pond	AE-021-SD Cape Fear R. (background)	AE-022-SD Cape Fear R. (background)	AE-023-SD Cape Fear R. (waterfront)	AE-024-SD Cape Fear R. (waterfront)	AE-025-SD Cape Fear R. waterfront PPE	AE-026-SD Cape Fear R. (waterfront)	AE-027-SD Cape Fear R. (downriver)
Extractable Semi-volatile Organic Compounds (mg/kg):									
Acetophenone	0.16 J	--	--	--	--	--	--	--	--
Fluoranthene	--	1.2	0.65	--	--	0.62	0.68	0.62	0.77
Pyrene	0.97	0.75	0.44	--	--	0.46	0.5	0.54	0.55
Benzo(a)anthracene	--	0.46	--	--	--	--	--	--	--
Chrysene	--	0.55	--	--	--	--	--	--	--
Benzo(b)fluoranthene	--	0.6	--	--	--	--	--	--	--
Benzo(ghi)perylene	--	0.17 J	--	--	--	--	--	--	--
Metals (mg/kg):									
Arsenic	48	2.5	--	--	--	--	--	**1.6**	**1.1**
Barium	440 J	57 J	24 J	22 J	17 J	38 J	30 J	37 J	36 J
Cadmium	--	R	--	--	--	--	--	--	--
Chromium	8	7.7	4	R	1.3	3.3	3.7	8.9	4.5
Lead	210	90	19	3.8	4.5	**120**	**93**	49	18
Mercury	0.3	0.11	--	--	--	--	--	--	--
Silver	R	--	--	R	--	--	--	--	--
Vanadium	22	12	2.3	R	2.2	--	3	**10**	6.3
Zinc	230	84	16	9.3	6.3	39	36	**59**	20

Sample Number: Location:	AE-018-SW South Pond	AT-118-SW South Pond Duplicate	AE-020-SW North Pond	AE-021-SW Cape Fear R. (background)	AE-022-SW Cape Fear R. (background)	AE-023-SW Cape Fear R. (waterfront)	AE-024-SW Cape Fear R. (waterfront)	AE-025-SW Cape Fear R. (overland PPE)	AE-026-SW Cape Fear R. (waterfront)	AE-027-SW Cape Fear R. (downriver)	NC Class SC Water Standard	Federal AWQC/ AALAC
Extractable Semi-volatile Organic Compounds (ug/l):												
Acetophenone	--	--	--	--	--	--	--	--	--	--	NA	NA
Fluoranthene	--	--	--	--	--	--	--	--	--	--	NA	NA
Pyrene	--	--	--	--	--	--	--	--	--	--	NA	NA
Benzo(a)anthracene	--	--	--	--	--	--	--	--	--	--	NA	NA
Chrysene	--	--	--	--	--	--	--	--	--	--	NA	NA
Benzo(b)fluoranthene	--	--	--	--	--	--	--	--	--	--	NA	NA
Benzo(ghi)perylene	--	--	--	--	--	--	--	--	--	--	NA	NA
Metals (ug/l):												
Arsenic	110	140	R	4.7	3.8	3.5	3.5	--	19	13	50	190
Barium	540 J	690 J	270 J	--	--	**130 J**	--	**220 J**	**220 J**	**180 J**	NA	NA
Chromium	R	3.6	R	11	8.9	12	11	3.5	**63**	**39**	20	11
Lead	66	100	--	34	6.5	15	8.3	10	45	26	25	3.2
Selenium	--	--	--	--	--	--	--	--	R	R	NA	5
Silver	--	1.2	R	--	--	--	--	--	--	--	0.1	4.1
Vanadium	R	14	R	22	18	23	20	7	**100**	66	NA	NA
Zinc	75	110	30	67	36	53	43	33	190	130	86	110

SW = Surface Water; SD = Sediment
J = Estimated value. R = Data unusable.
Bold values exceed three times background or non-detect background.
Shaded bold values exceed regulatory limits.
Samples collected by NC Superfund Section on January 29-31, 2002.
Project Manager: S. F. Parker

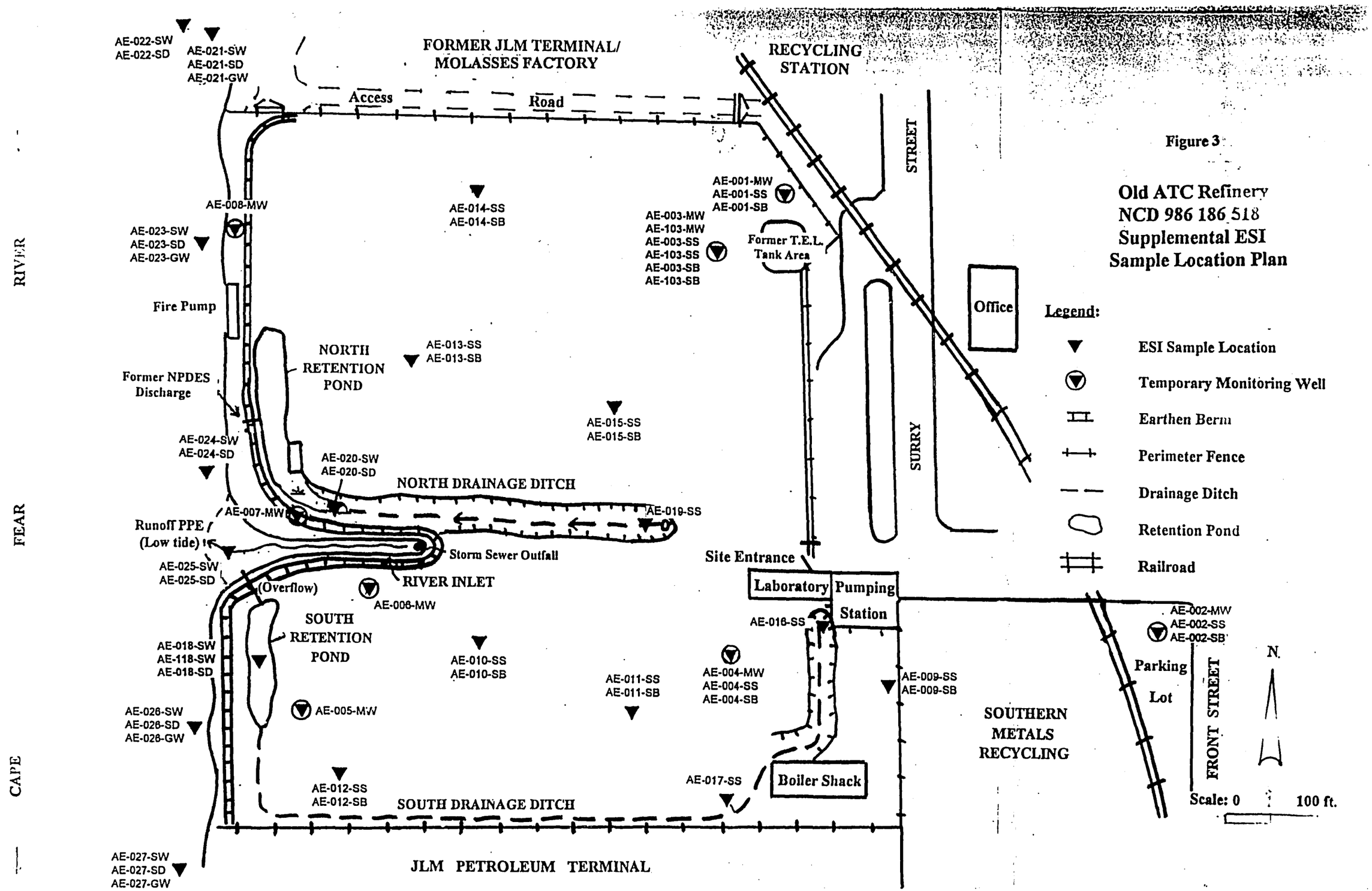


Figure 3
Old ATC Refinery
NCD 986 186 518
Supplemental ESI
Sample Location Plan
Legend:
ESI Sample Location
Temporary Monitoring Well
Earthen Berm
Perimeter Fence
Drainage Ditch
Retention Pond
Railroad
FORMER JLM TERMINAL/
MOLASSES FACTORY
RECYCLING
STATION
Access
Road
STREET
SURRY
Office
Former T.E.L.
Tank Area
Fire Pump
NORTH
RETENTION
POND
Former NPDES
Discharge
NORTH DRAINAGE DITCH
Runoff PPE
(Low tide)
Storm Sewer Outfall
RIVER INLET
(Overflow)
SOUTH
RETENTION
POND
Site Entrance
Laboratory
Pumping
Station
Boiler Shack
SOUTHERN
METALS
RECYCLING
Parking
Lot
FRONT STREET
N.
Scale: 0
100 ft.
SOUTH DRAINAGE DITCH
JLM PETROLEUM TERMINAL
RIVER
CAPE
FEAR
AE-022-SW
AE-022-SD
AE-021-SW
AE-021-SD
AE-021-GW
AE-008-MW
AE-023-SW
AE-023-SD
AE-023-GW
AE-014-SS
AE-014-SB
AE-001-MW
AE-001-SS
AE-001-SB
AE-003-MW
AE-103-MW
AE-003-SS
AE-103-SS
AE-003-SB
AE-103-SB
AE-013-SS
AE-013-SB
AE-015-SS
AE-015-SB
AE-024-SW
AE-024-SD
AE-020-SW
AE-020-SD
AE-007-MW
AE-019-SS
AE-025-SW
AE-025-SD
AE-006-MW
AE-018-SW
AE-118-SW
AE-018-SD
AE-010-SS
AE-010-SB
AE-011-SS
AE-011-SB
AE-004-MW
AE-004-SS
AE-004-SB
AE-016-SS
AE-009-SS
AE-009-SB
AE-002-MW
AE-002-SS
AE-002-SB
AE-026-SW
AE-026-SD
AE-026-GW
AE-005-MW
AE-012-SS
AE-012-SB
AE-017-SS
AE-027-SW
AE-027-SD
AE-027-GW

Table 4A
Old ATC Refinery
NCD 986 186 518
Supplemental Expanded Site Inspection
Soil Sample Results

Sample No:	AE-001-SS	AE-101-SS	AE-002-SS	AE-003-SS	AE-004-SS	AE-009-SS	AE-010-SS	AE-011-SS	AE-012-SS	AE-013-SS	AE-014-SS	AE-015-SS	AE-016-SS	AE-017-SS	AE-019-SS	NC Soil	Federal
Location:	Background	Background	Background	Northeast	Southeast Central	Southern Metals	Southwest Central	S-Southeast Central	Southwest	Northwest Central	North	Northeast Central	South Drainage	South Drainage	North Drainage	Remediation Goals	Health-based Benchmarks
Extractable Organics (mg/kg):																	
Phenanthrene	--	--	--	--	--	0.5	0.61	--	--	1.8	--	0.62	0.76	--	--	--	NA
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4400	2300
Fluoranthene	--	--	--	--	--	0.71	1.1	0.42	0.65	1.8	0.51	0.83	1.2	--	--	460	3100
Pyrene	--	--	--	--	--	0.61	1	--	0.79	1.3	0.49	1.1	1.4	--	--	460	--
Benzo(a)anthracene	--	--	--	--	--	--	0.83	--	0.42	0.68	--	--	0.61	--	--	0.62	0.88
Chrysene	--	--	--	--	--	0.37	1.1	--	0.57	0.84	--	0.38	0.6	--	--	62	88
Benzo(b)fluoranthene	--	--	--	--	--	--	1	--	0.54	0.66	--	0.39	--	--	--	0.62	0.88
Benzo(k)fluoranthene	--	--	--	--	--	--	1.2	--	0.6	0.45	--	--	0.62	--	--	6.2	8.8
Benzo(a)pyrene	--	--	--	--	--	--	1	--	0.61	0.55	--	0.42	0.52	--	--	0.062	0.088
Indeno(123-cd)pyrene	--	--	--	--	--	--	0.57	--	--	--	--	--	--	--	--	0.62	0.88
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.062	0.088
Benzo(ghi)perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (mg/kg):																	
Arsenic	--	0.95	5.7	3.7	4.1	3.8	5.8	6.7	6.5	4.2	R	3.6	1.2	3.7	3.2	4.4	0.43
Barium	--	26 J	--	64 J	71 J	61J	200 J	110 J	81 J	68 J	67 J	72 J	75 J	83 J	43 J	--	5500
Cadmium	--	--	0.53	--	0.19	1.4	0.51	0.45	R	R	--	R	0.29	R	--	7.4	39
Chromium	5.7	3.5	4.1	10	8.8	18	10	13	8.6	12	5.8	8.2	4.4	5	9	24000	390
Lead	56	64	140	32	100	290	340	220	150	90	50	150	170	190	29	400	--
Mercury	--	--	0.17	--	0.16	0.34	0.55	0.28	--	--	--	0.16	--	--	--	4.6	23
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	78	390
Silver	--	--	--	--	--	--	--	--	--	--	--	0.34	--	--	--	78	390
Vanadium	--	4.2	--	--	--	36	--	--	--	--	--	9.8	5.8	36	8.4	110	550
Zinc	29	24	220	48	100	330	350	220	100	140	48	120	120	140	28	4600	23000

Sample No:	AE-001-SB	AE-101-SB	AE-002-SB	AE-003-SB	AE-004-SB	AE-009-SB	AE-010-SB	AE-011-SB	AE-012-SB	AE-013-SB	AE-014-SB	AE-015-SB	NC Soil	Federal
Location:	Background	Background	Background	Northeast	Southeast Central	Southern Metals	Southwest Central	S-Southeast Central	Southwest	Northwest Central	North	Northeast Central	Remediation Goals	Health-based Benchmarks
Extractable Organics (mg/kg):														
Benzaldehyde	--	--	--	0.5	--	--	--	--	--	--	--	--	--	NA
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	0.69	740	4700
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	0.44	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	0.63	520	3100
Phenanthrene	--	--	--	--	0.49	1.4	--	--	1.1	1	--	1.2	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	0.41	4400	2300
Fluoranthene	--	--	--	--	0.71	2.5	0.81	--	1.4	1.4	--	0.99	460	3100
Pyrene	--	--	--	--	0.79	3	0.78	--	1.3	1.1	--	1.3	460	2300
Benzo(a)anthracene	--	--	--	--	0.42	0.99	0.48	--	0.56	0.6	--	0.49	0.62	0.88
Chrysene	--	--	--	--	0.46	1.4	0.74	--	0.74	0.7	--	0.43	62	88
Benzo(b)fluoranthene	--	--	--	--	0.45	1.1	0.45	--	0.73	0.56	--	0.4	0.62	0.88
Benzo(k)fluoranthene	--	--	--	--	0.460 J	0.710 J	--	--	0.56	0.63	--	--	6.2	8.8
Benzo(a)pyrene	--	--	--	--	0.54	0.64	0.5	--	0.69	0.62	--	0.41	0.062	0.088
Indeno(123-cd)pyrene	--	--	--	--	0.4	0.59	--	--	--	--	--	--	0.62	0.88
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--	--	--	0.062	0.088
Benzo(ghi)perylene	--	--	--	--	0.440 J	0.630 J	--	--	--	--	--	--	--	--
Metals (mg/kg):														
Arsenic	--	--	--	2.3	3.5	13	4.1 J	4	7.8	2.8 J	--	3	4.4	0.43
Barium	55 J	27 J	29 J	76 J	79 J	310 J	190 J	130 J	80 J	98 J	21 J	98 J	--	5500
Cadmium	--	--	--	--	0.35	14	R	R	0.24	R	1.3	0.22	7.4	39
Chromium	--	R	--	4	7.9	98	9.5	8.7	16	7.2	4.5	6.9	24000	390
Lead	23	19	9.6	72	150	42,000	370	260	140	150	--	130	400	--
Mercury	--	0.18	--	--	0.15	2.9	0.52	0.34	0.14	0.16	--	0.14	4.6	23
Selenium	--	--	--	--	--	1.7	--	0.63	--	--	--	--	78	390
Silver	--	R	--	--	--	8.8	--	--	--	--	--	--	78	390
Vanadium	--	R	--	--	--	69	--	--	16		1.1	10	110	550
Zinc	29	30	33	53	140	2900	400	220	110	130	4.6	96	4600	23000

SS = Surface Soil (<2.0 ft); SB = Subsurface Soil (>2.0 ft).
J = Estimated value. R = Data unusable.
Bold values exceed three times background or non-detect background.
Shaded bold values exceed regulatory limits.
Samples collected by NC Superfund Section on January 29-30, 2002.
Project Manager: S. F. Parker.

Attachment 6

To: Bennett-Kelly	From: W. Carter	Phone: 910-341-7846	Fax: 910-343-4772
Co./Dept.: Landis, Inc.	Co.: WFD	Phone: 919-787-1017	Fax: 919-787-9365

ID-GFC-2
NORTH CAROLINA INCIDENT REPORT
E1-C-11

Zone 3

FDID	Department Name	County	Exp.	Incident No.
0 6 5 0 3	Wilmington Fire	0 6 5	0 0	9 8 1 9 7 9

Mo.	Day	Yr.	Day of Week	Alarm Time	Time Out	Arr. Time	Time In	Tot. Time Out
0 7	0 2	9 8	Thur 05	1 5 3 1	1 5 3 2	1 5 3 4	2 3 5 2	8 4 2 1

FIRE SERVICE RESPONSE

Personnel	1 7 5
Engines 1,3,4,6,7/1	1 5
Aerials T-1	1 1 1
Tankers Hmat 1	1 1 1
Other Vehicles 51,61,82,	1 3

ALL CALLS

INCIDENT ADDRESS OR LOCATION	Street: 13 Wright St	Rm. or Apt.	
	City: Wilmington	State: N.C.	Zip: 2 8 4 0 3
OCCUPANT NAME	Last, First: Southern motels	Phone: (910) 762 9619	Mutual Aid (check one): 1 [X] Received 2 [ ] Given 3 [ ] Not Apply
OWNER NAME	Last, First: Lawton Marilyn	Phone: (910) 256 4745	
OWNER ADDRESS	Street: 1911 Blue eagle Dr.		
	City: Wilmington	State: N.C	ZIP: 2 8 4 0 5

Hazardous Materials Involved: 1 [X] Yes 2 [ ] No

PLEASE PUT APPROPRIATE CODE NUMBER IN BOX FOR EACH CATEGORY

METHOD OF ALARM FROM PUBLIC
1 Telephone
2 Municipal alarm system
3 Private alarm system
4 Radio
5 Verbal
6 Home dialer
7 Tie-line
8 Voice signal: Fire alarm system
9 Other
[4]

TYPE OF SITUATION FOUND
11 Structure fire
12 Any fire outside a structure where the material burning has a value
13 Vehicle fire
14 Trees, brush, grass fire
15 Refuse fire (material burning has no value)
16 Explosion, no after-fire
17 Outside spill, leak with fire
19 Fire/explosion not classified
20 Overpressure rupture (no combustion)
30 Rescue
32 EMS only
40 Hazardous condition
50 Service call
60 Good intent call
71 False malicious
73 False malfunction
74 False unintentional
99 Other situation found
[11]
Recycle Warehouse

TYPE OF ACTION TAKEN
1 Extinguishment
2 Rescue
3 Investigation
4 Remove hazard
5 Standby
6 Salvage
7 Medical Aid
8 Fill in, move up
9 Cancelled enroute
0 Water supply
[1] Primary
[3] Secondary

REQUIRES COMPLETION OF INJURY & FATALITY REPORT
No. Incident-related Injuries: Fire Srv. 1 1 Other 0 1 3
No. Incident-related fatalities: Fire Srv. 1 1 Other 1 1
Is juvenile suspected in ignition? 1 [ ] YES 2 [X] NO
Is property abandoned or vacant? 1 [ ] Yes 2 [X] No

FIRES

Fill in this section if "TYPE OF SITUATION FOUND" is 11, 12, 13, 16, 17, 19 ONLY (14, Optional) (Refer to coding sheet)

Fixed Property Use: Recycle Plant — 600

Ignition Factor: Tow motor Propane	99	Area of Fire Origin: Storage Area	45	Equipment Involved in Ignition: Tow motor	96
Form of Heat of Ignition: Tow motor	10	Type of Material Ignited: Propane Gas	10	Form of Material Ignited: Bulk storage	50

If Heating Equipment Involved, Type of Fuel Used: 1 Kerosene 2 LPG 3 Electric 4 Wood 5 Coal 6 Oil 7 Natural Gas 8 Gasoline 9 Other 0 Not Apply [0]

PROPERTY DAMAGE CLASSIFICATIONS
1 $1-99
2 $100-999
3 $1,000-9,999
4 $10,000-24,999
5 $25,000-49,999
6 $50,000-149,999
7 $150,000-499,999
8 $500,000-999,999
9 $1,000,000 or more
0 NO DOLLAR LOSS
[7] Value
[7] Damaged

	Estimated Value
Value	3 2 0 0 0 0
Estimated Structural Damage	3 2 0 0 0 0
Estimated Contents Damage	1 1 5 0 0 0 0

CONDITION UPON ARRIVAL
1 Overhaul
2 Smoldering
3 Open flame
8 Out on arrival
[3]

MOBILE PROPERTY TYPE
11 Automobile
12 Bus
13 All-terrain vehicle
14 Motor home
15 Travel trailer
17 Mobile home
20 Freight road transport
30 Rail transport
40 Water transport
50 Air transport
60 Heavy equipment
70 Special vehicles, containers
96 Other mobile property types
00 Not Apply
[00]

If Mobile Property	Yr.	Make	Model	St.	Lic. Number	Serial Number/VIN

If Equipment Involved in Ignition	Yr.	Item	Make	Model	Serial Number
		Tow motor			

STRUCTURE FIRES

NO. OF STORIES
1 Single Story
2 Two Stories
3 3 or 4
4 5 or 6
5 7 to 10
6 11 to 20
7 21 to 50
8 Over 50
9 Below Grade

Building Height: [1]
Level of Fire Origin: [1]

EXTENT OF DAMAGE
1 Confined to the object of origin
2 Confined to part of room or area of origin
3 Confined to room of origin
4 Confined to fire-rated comp. of origin
5 Confined to floor of origin
6 Confined to structure of origin
7 Extended beyond structure of origin
9 No damage of this type

Flame [6]
Smoke [6]
Water [6]

CONSTRUCTION TYPE
1 Fire resistive
2 Noncombustible
3 Heavy timber
4 Ordinary
5 Frame
0 Other
[4]

SPRINKLER PERFORMANCE
1 Equipment operated
2 Equipment inservice, did not operate
3 Equipment present: fire too small to operate
8 No equipment present
9 Equipment not in service
[8]

DETECTOR PERFORMANCE
1 [ ] Present 2 [X] Not Present
If Present, Type of Closest Unit: 1 [ ] Smoke 2 [ ] Heat
Power Supply: 1 [ ] Battery 2 [ ] A/C
1 In room of fire: operated
2 Not in room of fire: operated
3 In room of fire: did not operate
4 Not in room of fire: did not operate
5 In room: fire too small to operate
9 Not applied (Not Appl)

Fire Referred for Investigation to: Fire Prevention 1 [X] Yes 2 [ ] No

Officer in Charge (name, position): Chief T. E. Kidd
Member Making Report: Lt. W. A. Everett

Remarks:

WHITE: DEPARTMENT COPY PINK: COUNTY COPY YELLOW: DUPLICATE COPY

Wilmington Fire Department
Additional or Secondary Report

Company Number Engl Run Number 11 911 Incident Number 991979

Date 07-02-98 Zone 3

Address 13 Wright St

Time of Call 1531 Arrival Time 1534 10-8 Time 2352

Company making initial incident report Engl

Other units responding #7 T-1 #6 #2 S-1 #4 Haz mat 1 B-1 B2

Equipment Used

SCBA units used: Unit number 22 Unit number 35 Unit number

Unit number 37 Unit number Unit number

Ladders used by size:

Hose used by size / length: 100' 5" 800' 2½"

Approx. amount and type of extinguishing agent used: 500,000 gal water

Generator (total time used): 1 12 hr's

Positive pressure ventilation (total time used):

List below: Any special equipment used; (foam, fire extinguisher, haz-mat suits, etc.)

Responding Personnel		
Lt. W.B. Everett	Estimated Property Value	$ $323,309.00
J.C. Brown	Estimated Property Loss	$ $323,309.00
J.E. Gacay	Estimated Content Value	$ $150,000.00
T.P. Nava	Estimated Content Loss	$ $150,000.00
Lt. P.D. Sandoval	Amount of Insurance (Property)	$ $250,000.00
J.E. Devaux	Amount of Insurance (Content)	$ $100,000.00
C. Small		
R.E. Burton		
J.C. Miller		
Chief T.E. Kidl		
Lt. R.J. Little		
C.B. Robbins		
T.L. Smith		

Comments: upon Arrival warehouse was fully involved. Engl + 7 set up In defensive mode to halt spread of Fire + protect exposures. Bat. 1 set up Command and coordinated efforts of All In Coming personel and equipment. Turned over to Fire Prevention for Investigation.

Lt. W.B. Everett

Rumford Company Printing Form 1401 197-5151

FIRE INVESTIGATION REPORT
WILMINGTON FIRE PREVENTION BUREAU

Call received by: NHC 911 Time: 15:31 Date: 7/2/98
Telephone: 762-9619

Address: 13 WRIGHT STREET
Occupant: SOUTHERN METALS Telephone: 7629619

Owner: MARILYN LAUFER Telephone: 256-4745
Address: 1811 GLENEAGLE DRIVE

How is property used: INDUSTRIAL FABRICATION/RECYCLING
Classification of construction: 4

Is property insured? (Yes or No): YES Amount insured: self-insured
Property value: $323309.00 Amount of damage: $323309.00
Insurance company: CAPTIVE RESOURCES
Address: 201 E. COMMERCE DRIVE SCHAUNBURG, ILL. 60173 Phone: 781-1400

Is contents insured? (Yes or No): YES Amount insured: self-insured
Contents value: $150000.00 Amount of damaged: $150000.00
Insurance company: SAME
Address: Phone:

Type of fire: ACCIDENTAL
Ignition source: PROPANE TANK/FORKLIFT

Cause of fire (Mark with X) Accidental: XX Suspicious:
Undetermined: Incendiary:

Suspect: Arrested (Y or N): Date:
Trial (1 = Municipal Court 2 = Superior Court): Date:
Convicted (Y or N): Date: Sentence:

FIRE SCENE

Officer in charge: B/C KIDD

First Engine Co. on scene: 1

Engine Co #: 1
Officer: LT. W.A. EVERETT
Driver: S.C. BROWN
Firefighter: J.E. GARAY
Firefighter: J.P. NAVA
Firefighter:

Engine Co #: SQUAD 1
Officer: LT. R.J. LITTLE
Driver: J.C. MILLER
Firefighter: C.B. ROBBINS
Firefighter: T.L. SMITH
Firefighter:

Engine Co #: 7
Officer: LT. P.D. BRADSHAW
Driver: J.E. DEVANE
Firefighter: C. SMALL
Firefighter: R.F. BURTON
Firefighter:

Engine Co #: TOWER1
Officer:
Driver: K. DUDLEY
Firefighter: C.A. HATCHER
Firefighter: NIXON
Firefighter:

Other fire department agents: CARS 1,2,5,6,7, E-6, E-4, AND CAR 9

INVESTIGATOR'S NOTES
AND/OR
CASE PROGRESS RECORD

CASE: 13 WRIGHT STREET

DATE	INVESTIGATOR	SUMMARY
7-2-98	HARAWAY	ON 7-2-98 I WAS ENROUTE TO FIRE HEADQUARTERS WHEN WILMINGTON FIRE DEPARTMENT WAS DISPATCHED TO 13 WRIGHT STREET FOR AN EXPLOSION. I RESPONDED AND ARRIVED BEHIND ENGINE ONE. UPON ARRIVAL I FOUND ONE WAREHOUSE HEAVILY INVOLVED, ONE WAREHOUSE MODERATELY INVOLVED AND TWO OTHER BUILDINGS EXPOSED. I WAS ASSIGNED NORTHSIDE SAFETY OFFICER FOR THE INITIAL FIREFIGHTING EFFORT. ONCE THE SITUATION WAS UNDER CONTROL I SPOKE WITH L. GOODRUM AND CAPTAIN FORESTELL AND THEY STATED THEY HAD INTERVIEWED THE VICTIMS AND WITNESSES. ON 7-3-98 I RESPONDED BACK TO 13 WRIGHT STREET TO LOOK AT THE SCENE. I WAS ABLE TO FIND THE PROPANE TANK THAT THE FORKLIFT KNOCKED OVER. IT DID IN FACT HAVE A CRACK AROUND THE VALVE STEM WHERE IT HIT THE CONCRETE. IT APPEARED THE GAS CLOUD FOUND A SOURCE OF IGNITION AND IGNITED.

INTIALS OF PERSON MAKING NOTES _____

Weather: HOT, CLEAR

gine Co arrival time: 1534 10-8: 2352

Color of smoke: BLACK Color of flame: ORANGE
Location of fire: ENTIRE STRUCTURE
Location of entry: NO ENTRY Forcible entry (Y or N): NO
Location of Hydrants used: FRONT & WRIGHT/FRONT & SURRY/WRIGHT ST.
Was building sprinklered (Y or N): NO (Wet or Dry):
Was smoke detectors installed: NO

ime investigator called to scene: 15:34 Arrival time: 15:34
D officer: NONE
Police officer making report: J.L. SHOAF/L. GOODRUM
.D. case number: 98-55252
ther Agents:

(I) Injuries (F) Fatalities

I or F: I Sex (F or M): MALE
Name: CHRIS BRYANT Age:
ddress: 616 BURNTING DRIVE

I or F: I Sex (F or M): MALE
Name: RICK DOUGHTY Age:
ddress: 1607 KORNEGAY AVENUE

or F: I Sex (F or M): MALE
ne: GEORGE WATKINS Age:
ddress:

I or F: Sex (F or M):
ame: Age:
ddress:

I or F: Sex (F or M):
ame: Age:
ddress:

Witness

Name: SEE ATTACHED INTERVIEWS. Phone:
ddress:

ame: Phone:
ddress:

me: Phone:
ddress:

me: Phone:
ddress:

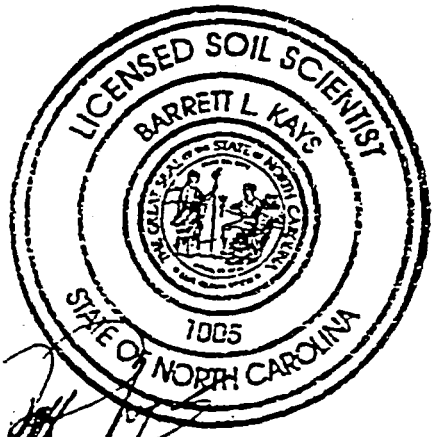
Wilmington Fire Department Investigator
me: CAPT. MARK HARAWAY Signature_____

me: Signature_____

Preliminary Environmental Investigation

Report Regarding Metals Contamination at

JLM Industries, Inc., Wilmington Terminal



February 23, 2001

By

Barrett L. Kays, Ph.D.
Landis, Inc., Raleigh, NC

Attorney Client Privileged Information: This document is subject to a court established protective order to protect the rights of both plaintiff and defendants involved in the JLM Industries, Inc. v. Southern Metals Recycling, Inc., et al., Superior Court, New Hanover County, North Carolina. Unauthorized distribution of this report may subject the distributor to the contempt powers of the Court.

EXECUTIVE SUMMARY

Landis, Inc. was retained by JLM Industries, Inc. to conduct an environmental investigation of alleged metals contamination of the JLM Terminal property in Wilmington, North Carolina. Soil samples and groundwater samples were collected in February through June of 2000. Samples were collected on the JLM property, Southern Metals Recycling, Inc. property, and various off-site locations. Samples were transported to the laboratory of GeoChem, Inc. in Morrisville, North Carolina for testing. GeoChem conducted metals analysis for eighteen metals and conducted toxic characteristic leaching procedure analysis for eight metals.

Extensive metals contamination of the soils consisting of antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, thallium, vanadium, and zinc were found on both the JLM property and the SMR site. The concentrations of these metals above the background level were compared between the JLM property and the SMR site. Geoprobe sampling provided a depth analysis of the metals in the soil at selected locations. Various findings of fact supported by the data prove that the SMR site is the primary source of metals contamination of the soils on the JLM property.

Extensive metals contamination of the groundwaters consisting of iron, manganese, and zinc were found on the JLM property. Less extensive metals contamination of antimony, arsenic, barium, chromium, copper, lead, nickel, and vanadium were found on the JLM property. Exceedance of groundwater standards on the JLM property was found for arsenic, barium, chromium, copper, iron, lead, manganese, nickel, and zinc. Various finding of fact supported by the data proves that the SMR site is the primary source of metals contamination of the groundwater on the JLM property.

Soils were found on the SMR site that had sufficient lead contamination to consist of toxic hazardous waste. This material may involve a significant portion of the soil material above the water table on SMR site. This and other metals contamination on the SMR site serves as a continuing source of groundwater contamination of the JLM property.

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INTRODUCTION

Landis, Inc. was retained to conduct an environmental investigation for JLM Terminals, Inc. for their Wilmington Terminal (referred to herein as "JLM" property) in Wilmington, North Carolina, regarding contamination that may have occurred from the Southern Metals Recycling site (referred to herein as "SMR" site) located adjacent to the JLM facility. Landis, Inc. was retained to analyze the issues, determine findings of fact, and determine causation if any of the alleged metal contamination on the JLM property.

On February 21, 2000, Barrett L. Kays conducted the initial site visit to the JLM property and met with Mr. Charlton L. Allen of the Seay Law Firm in Wilmington. On February 23, 2000, Barrett L. Kays conducted the initial collection of surface soil samples, and followed later with additional surface soil sampling on March 17, 2000 and April 26, 2000. Geoprobe sampling was conducted on May 31, 2000, and followed later with additional sampling on June 7, 2000. The initial groundwater sampling was conducted on April 26, 2000, followed with additional groundwater sampling on May 31, 2000, June 7, 2000, and June 8, 2000. On May 11, 2000, Barrett L. Kays met with Stewart Benson of Stewart Benson & Associates to arrange for the land surveying of the property.

On Friday, July 2, 1998 at 3:31 PM the Wilmington Fire Department was notified of an explosion at Southern Metals Recycling, Inc. facility at 13 Wright Street, Wilmington, NC. The Wilmington Fire Department responded with Engine Company 1, Engine Company 2, Engine Company 4, Engine Company 6, Engine Company 7, Engine Company Squad 1, Engine Company Tower 1, and Cars 1, 2, 5, 6, 7, and 9. In addition, approximately five other area fire departments responded to provide additional engine companies, as well as the Wilmington Fire Department's Hazardous Materials Unit and the United States Coast Guard. The initial engine companies left the site at 11:52 PM on July 2, 1998. Fire Department records are provided in **Appendix F.** Witnesses interviewed indicated that a heavy black smoke persisted from the time of the explosion and throughout the weekend and into Monday, July 5, 1998.

During the suppression of the fire at Southern Metals Recycling, Inc. facility at 13 Wright Street, a considerable amount of water was applied to the fire, so much so that runoff of the waters washed out onto Wright Street and entered the JLM property. JLM property storm drainage system intercepted the water until it became over capacity. At that time runoff waters wash down across the JLM property, down the storm drainage

system, and flowed into the JLM oil/water separator near the Cape Fear River. The runoff waters also wash across unpaved areas on the JLM property. During the week of July 5, 1998, JLM Terminals, Inc. hired a hazardous materials team to cleanup as much of the residue as possible from Wright Street, paved areas on JLM property, JLM storm drainage system, and JLM oil/water separator.

On my initial sampling site visit on February 23, 2000, I found residue apparently from the fire in numerous areas on the JLM property. Residue was found in a storm drainage inlet and adjacent manhole at the end of Wright Street and just inside of the JLM property (Sample Test JSA04). Surface metals residue was found covering the sandy soils to such an extent that the surface was black at Sample Test JSA05. Additional metals residue was found on March 17, 2000 on various soil surfaces of the JLM property including but not limited to Sample Test JSA16, JSA17, and JSA20. In the soil area surrounding Sample Test JSA20, a heavy coating of metals residue, as well as, a large area of caked coatings about a quarter inch thick covered the soil surface.

On February 23, 2000, I collected three surface soil samples off-site to the east of the properties, as well as, one sample in Wright Street right-of-way, one sample in JLM storm drainage system, and five samples on SMR site. Based upon some preliminary results by GeoChem, chemical testing laboratory, an additional nine samples were taken on March 17, 2000 and three samples were taken on April 26, 2000. The preliminary results suggested that a considerable amount of metals contamination might have been deposited across the JLM property as deposition from the explosion, fire, and smoke.

Climatic records (**Appendix G**) were collected for the nearest official meteorological weather station located at the Wilmington Airport. The climatic records show that on July 2, 1998 the wind direction at 14:53 and 15:53 were variable, at 16:53 was 310, at 17:53 was 300, at 18:53 was 280, at 19:53 was 230, and at 20:53 was 000. Thus during the early portion of the fire the wind direction was generally out of the northwest and shifting to out of the southwest. Over night and starting late on July 2, 1998, the wind shifted at 20:53 to 000 out of the north and slowly shifted to the northeast so that at 8:53 it was 030. During this overnight period heavy black smoke blew directly across the JLM property depositing materials starting at the eastern most side about 180 degrees or due south of the eastern most portions of the fire and spreading west to about 215 degrees or southwest of the western most portion of the fire. This deposition area on JLM property is represented by an area bounded by a north south line just east of JLM Tank 210, westward to a line starting at Sample Test #25 and running southwest to midway through JLM Tank 204. To the north the area is bounded by SMR site and Wright Street right-of-way and to the south by the Colonial Terminal property. This area

is approximately 6.94 acres and is about one-half of the JLM property that is above the normal high water mark of the Cape Fear River.

Based upon the preliminary results of the initial surface soil sampling an extensive area of the JLM property was thought to have been affected by the deposition from the fire. Groundwater from various monitoring wells was collected on April 26, 2000 and additional wells were sampled on June 8, 2000. In addition groundwater samples were collected on May 31, 2000 and June 7, 2000 below a number of the geoprobe samples. On June 7 and 8, 2000, water surface measurements were made for the various monitoring wells that had been sampled. These water surface measurements along with field surveying of the wells and geoprobe locations was used to prepare a water surface contour map of the subsurface of the JLM property and SMR site **(Appendix J)**.

Geoprobe sampling of the soil on May 31, 2000 and June 7, 2000 was conducted to analyze deeper into the soil. During the process of collecting the geoprobe samples, soil samples at certain depths were so encrusted with metals that it was difficult to advance the probe through these soil layers. The encrusted soils were found on SMR site at JSA09, 23, and 26. At Sample Test location JSA23, it was necessary to twice relocate the equipment before hydraulic truck mounted geoprobe could cut through the encrusted layer. The total metals analyzed accounted for between nine and fifteen percent of the soil for the surface samples at JSA09, 10, 23, and 26, all on the SMR site. This unusually high level of metals in the soils on the SMR site made it difficult for the laboratory to achieve their accuracy standards due to the interference between various metals found in the soil samples. The interference was made more difficult by the variety of metals found and the large quantity of metals in the soils.

JLM Terminals, Inc. purchased the JLM property in 1992 from Unocal. Prior to the purchase of the property, JLM had an environmental audit prepared for the property. The report was entitled "Environmental Assessment, Soil and Groundwater Sampling and Analysis, Unocal, Cape Fear Terminal" and dated October 1992. GeoChem, Inc prepared the laboratory work for the 1992 report. Therefore, it was decided to use GeoChem, Inc. to prepare the laboratory analysis for this report to assure a comparably high level of quality control and quality assurance of the data.

Well	Metal	1992 Data	2000 Data
MW-4	Barium	0.118 mg/l	**0.506** mg/l
	Lead	0.044	0
	Vanadium	0.036	0.01
MW-5	Barium	0.150	0
	Lead	0.108	0
	Vanadium	0.039	0
MW-6	Barium	0.144	0.037
	Chromium	0	**0.013**
	Lead	0.129	0
	Vanadium	0.024	0
MW-7	Arsenic	0	**0.018**
	Barium	0.134	0.051
	Chromium	0.025	**0.104**
	Lead	0.043	0
	Silver	0	**0.027**
	Vanadium	0.046	0
MW-10	Barium	0.097	0
	Chromium	0.037	0
	Lead	0.015	0
	Vanadium	0.041	0
UC-6	Barium	0.204	0.046
	Chromium	0.045	**0.058**
	Lead	0.146	0
	Vanadium	0.041	0
UC-12	Barium	0.894	0
	Chromium	0.277	0
	Lead	0.109	0
	Silver	0	**0.011**
	Vanadium	1.00	0.014
RW-3	Barium	0.372	0
	Chromium	0.012	0
RW-5	Barium	2.23	0.929
	Lead	0.030	0

Bold values represent increases over the 1992 concentration.

Since 1992, JLM has conducted pumping and treatment for various organic carbon compounds in the groundwater. This has involved a considerable volume of the pumping of the groundwater under the JLM property. Therefore, since 1992 there has been, at the same time, a reduction in the concentration of many of the metals in the groundwater. Even with this groundwater pumping, the concentration of some of the metals has increased in a number of the wells. **Arsenic** has increased in MW-7 by 1,800 percent immediately adjacent and down gradient to the SMR site. **Barium** has increased in MW-4 by 429 percent along the northern property line and the well closest to Cape Fear River. **Chromium** has increased in MW-7 by 24 percent and UC-6 by 78 percent, both immediately adjacent and down gradient from the SMR site; in addition it has increased in MW-6 by 1,300 percent along the northern property line and down gradient from the SMR site. **Silver** has increased in MW-7 by 2,700 percent immediately adjacent and down gradient to the SMR site, and UC-12 by 1,100 percent adjacent to the JLM office. The increases in metals contamination at MW-6, MW-7, and UC-6 have occurred during the period of significant decreases in barium by 389 percent, 263 percent, and 443 percent, respectfully; lead by 12,900 percent, 4,300 percent, and 14,600 percent, respectfully; and vanadium by 2,400 percent, 4,600 percent, and 4,100 percent, respectfully, at these wells. Immediately down gradient of MW-6, MW-7, and UC-6, JLM has operated a recovery well during this period. It is probable that increases in concentration of arsenic, chromium, and silver at those wells would be substantially greater if not for the groundwater pumping by JLM.

Summary – The groundwater data supports the following facts:

1. **Iron, magnesium, manganese, and zinc** were found in all or essentially all of the JLM wells and its proximate cause is due to contamination that came from the SMR site.
2. **Barium** was found in about half of the JLM wells and its proximate cause is due to contamination that came from the SMR site.
3. **Arsenic, chromium, cobalt, copper, lead, nickel, and vanadium** was found in a number of the JLM wells and its proximate cause is due to contamination that came from the SMR site.
4. **Antimony** was found in one of the JLM wells and its proximate cause is due to contamination that came from the SMR site.
5. **Silver and thallium** were found in some of the JLM wells and its proximate cause may be due to contamination that came from the SMR site.
6. **Cadmium, mercury, and selenium** were not found in any of the JLM wells and were not found in the SMR wells.

7. **Arsenic, barium and chromium** have since 1992 increased in concentration in JLM wells immediately adjacent and down gradient from the SMR property even during a period of groundwater pumping, therefore if not for the pumping, these metals would have been more concentrated in 2000 as a direct result of contamination that came from the SMR site.
8. **Barium, chromium, lead, and vanadium** have since 1992 decreased in concentration in some of the JLM wells down gradient from the SMR property during a period of groundwater pumping, therefore if not for the pumping, these metals would have been more concentrated in 2000 as a direct result of contamination that came from the SMR site.

SUMMARY OF PRELIMINARY FINDINGS OF EXTENT OF SOIL AND GROUNDWATER CONTAMINATION OF THE JLM INDUSTRIES, WILMINGTON TERMINAL CAUSED BY THE SOUTHERN METALS RECYCLING PROPERTY

This preliminary environmental investigation of the JLM property has determined that significant metals contamination of the JLM property has occurred and that the proximate cause is that the contamination came from the SMR site. The findings of fact are as follows:

Finding of Fact #1 - The surface soil samples demonstrate a wide spread significant concentration across the JLM property above the background levels for twelve metals consisting of **antimony, arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, thallium, and vanadium.** The spatial pattern of the concentrations of these metals supports a finding of fact that they came from the SMR site. The pattern of the concentration of metals appears to be consistent with the wind direction such that they were primarily spread from the explosion, fire, and smoke that occurred on the SMR property. The area of contamination of the JLM property covers approximately 6.94 acres with the contamination extending downward in soils areas to a shallow depth.

Finding of Fact #2 – The subsurface soil samples demonstrate significant contamination across a portion of the JLM property for fourteen metals consisting of **antimony, barium, cadmium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, thallium, vanadium, and zinc.** The spatial and vertical pattern of the concentrations of these metals and the relationship to groundwater flow supports a finding of fact that they primarily came from the SMR site. The area of contamination of the JLM property covers approximately 1.84 acres or more with contamination extending downward in the subsoils to as much as eleven-foot depth.

Finding of Fact #3 – The soil profile metals data in conjunction with the underlying groundwater metals data demonstrates that significant contamination of metals is leaching vertically down to the groundwater under the SMR site; these thirteen metals consist of **antimony, arsenic, barium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, vanadium, and zinc.** The data supports a finding of fact that the metals contamination on the SMR site is the primary source of contamination to the groundwater of both the JLM property and the SMR site.

Finding of Fact #4 – The soil profile metals data in conjunction with the underlying groundwater metals data demonstrates that significant contamination of metals is leaching laterally into the soils and to the groundwater under the JLM property; these twelve metals consist of **arsenic, barium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, vanadium, and zinc.** The data supports a finding of fact that the metals contamination on the SMR site is the primary source of contamination to the soils and the groundwater of the JLM property.

Finding of Fact #5 - The groundwater metals analysis data demonstrates that significant contamination of **iron and manganese** has primarily come from the SMR site, has spread across a significant portion of the JLM property, and has caused exceedance of the North Carolina groundwater standards.

Finding of Fact #6 – The groundwater metals analysis data demonstrates that significant contamination of **zinc** has primarily come from the SMR site and has spread across a significant portion of the JLM property, but has caused to date only limited exceedance of the North Carolina groundwater standards.

Finding of Fact #7 - The groundwater metals analysis data demonstrates that **antimony, arsenic, barium, chromium, copper, lead, nickel, and vanadium** has primarily come from the SMR site and has spread across a limited portion of the JLM property. This contamination has caused exceedance of the North Carolina groundwater standards for **arsenic, barium, chromium, copper, lead, and nickel.**

Finding of Fact #8 – The Toxic Characteristic Leaching Procedure demonstrates that a portion of soils on the SMR site consists of **toxic hazardous waste** and that the soils are hazardous waste due to the high concentration of TCLP **lead** in the soils down to as much as a 9-foot depth. This material may involve a significant portion of the soil material above the water table on the SMR site.

Finding of Fact #9 – The data collected from a sample found in the storm drainage system demonstrates that **antimony, arsenic, chromium, copper iron, lead, magnesium, manganese, mercury, nickel, thallium, vanadium, and zinc** were present primarily in the runoff of waters from the suppression of the fire and from runoff of the SMR site and Wright Street, and therefore it is probable that these thirteen metals were washed onto and contaminated the JLM property and the oil/water separator.

TABLE 1 - JLM Industries, Inc., Wilmington Terminal Site, Surface Soils Metals Data

Site ID#	Lab ID#	Antimony Sb mg/kg	Arsenic As mg/kg	Barium Ba mg/kg	Cadmium Cd mg/kg	Chromium Cr mg/kg	Cobalt Co mg/kg	Copper Cu mg/kg	Iron Fe mg/kg	Lead Pb mg/kg	Magnesium Mg mg/kg	Manganese Mn mg/kg	Mercury Hg mg/kg	Nickel Ni mg/kg	Selenium Se mg/kg	Silver Ag mg/kg	Thallium Tl mg/kg	Vanadium V mg/kg	Zinc Zn mg/kg
00JSA01	436**	12.74	0	66.87	0	6.82	0	3.41	957.08	25.47	909.77	14.78	1.36	0	0	0	0	3.34	1,546.61
00JSA02	437**	10.91	2.03	0	0	14.12	0	440.57	3,536.96	288.72	782.76	43.2	2.14	69.94	0	0	0.79	7.27	1,817.89
00JSA03	438**	5.29	0.46	0	0	0	0	1.6	1,380.03	14.76	738.09	5.79	0	0	0	0	0	4.09	1,615.82
00JSA04	439**	8.93	18.1	0	0	21.58	0	496.02	8,863.36	180.55	50.10	78.62	1.74	15.18	0	0	4.56	13.39	2,827.31
00JSA05	440	20.64	7.69	0	0	20.44	0	500.9	13,291.56	963.74	1,687.04	111.0	3.81	15.65	0	0	2.81	9.02	2,464.44
00JSA06	441	2.61	0.71	0	0	12.15	0	62.87	4,911.77	123.64	3,185.38	47.36	1.89	7.98	0	0	0.59	8.59	2,808.16
00JSA07	442	20.92	0.81	0	0	42.92	0	2,207.74	20,868.47	670.44	1,637.66	173.59	4.27	28.82	0	0	2.35	13.66	3,992.72
00JSA08	443	10.06	5.53	0	0	207.05	0	1,751.08	45,267.27	2,910.58	2,851.43	499.89	354.95	144.05	0	0	9.47	87.26	6,536.98
00JSA09	444	68.93	17.48	0	67.36	567.1	53.58	3,289.79	97,891.02	8,553.46	4,793.70	1,008.87	742.55	375.98	0	0	19.3	532.63	16,824.93
00JSA10	445	39.63	14.89	0	55.27	359.8	29.46	1,582.58	94,521.57	4,692.99	3,415.46	672.66	328.51	397.6	0	0	10.43	239.86	11,263.18
00JSA11	698	1.62	0.23	0	0	10.23	0	21.75	1,106.04	83.15	219.59	28.35	1.28	0	0	0	0	3.88	58.84
00JSA12	699	1.99	0.52	0	0	11.53	0	19.13	1,362.69	68.69	385.13	32.14	1.23	0	0	0	0.71	4.86	98.61
00JSA13	700	1.38	3.76	0	0	10.83	0	11.93	4,491.33	84.41	571.07	93.59	3.85	0	0	0	0.59	7.56	69.55
00JSA14	701**	17.18	1.7	0	0	14.0	0	4.45	3,133.64	33.93	2,517.51	72.11	0	8.8	0	0	6.79	12.94	39.02
00JSA15	702	1.8	1.04	0	0	12.42	0	13.46	3,493.81	74.53	265.01	40.75	1.24	0	0	0	0.87	7.87	50.93
00JSA16	703	1.04	1.37	0	0	10.16	0	47.42	2,629.96	233.36	44.79	6.96	4.14	5.12	0	0	0	3.48	116.68
00JSA17	704	8.91	0.52	0	0	35.65	0	89.74	11,020.47	302.58	482.89	63.0	2.49	8.14	0	0	3.48	10.57	452.01
00JSA18	705**	91.08	1.28	0	0	14.17	0	0	3,354.82	259.08	658.01	6.48	1.62	0	0	0	1.74	7.69	18.01
00JSA19	706	11.14	0	0	0	16.41	0	42.74	4,734.72	26.33	658.71	21.67	1.01	5.47	0	0	1.54	14.79	162.85
00JSA20	932	2.28	1.36	6.58	0	6.99	0	44.17	8,522.66	343.42	103.64	40.64	1.65	7.38	0	0	1.11	3.95	84.93
00JSA21	933	17.1	1.55	125.6	0	7.36	0	3,402.64	22,218.49	1,352.83	850.66	144.11	2.6	25.22	0	0	0	36.87	660.18
00JSA22	934	1.93	0.33	29.69	0	0	0	21.82	5,442.97	36.29	99.95	58.55	0	0	0	0	1.08	5.69	51.78
00JSA09	1332	85.24	54.05	412.24	46.65	653.83	29.25	3,023.36	58,285.97	28,758.8	6,946.36	3,288.83	201.56	468.5	0	0	23.33	71.28	17,968.1
00JSA20	1224	4.75	0	0	0	0	0	0	1,092.71	16.3	13.66	4.09	0	0	0.62	2.89	0	5.36	0
00JSA23	1229	49.91	15.38	291.09	9.38	1,050.37	40.58	3,804.33	62,550.36	4,622.49	779.1	11,098.32	20.18	0	0	0	9.77	29.51	11,024.54
00JSA24	1236	0	0	0	0	0	0	11.08	1,509.66	47.27	29.99	10.77	0.59	0	0	0	0	5.2	33.91
00JSA25	1243	0	0	21.61	0	10.74	0	2.15	6,348.99	18.65	38.43	4.3	0.81	0	0	0	0	10.54	0
00JSA26	1335	10.7	8.73	15.03	47.92	51.99	24.86	1,463.07	75,063.59	2,734.93	985.48	327.74	67.81	87.92	0	0	44.59	13.11	10,126.01
00JSA27	1341	0	1.34	23.0	0	0	0	6.5	1,099.28	40.61	20.82	28.61	2.67	0	0	0	0.74	2.24	0
00JSA28	1327**	0.63	0.78	0	0	6.73	0	10.85	2,570.92	79.91	847.44	31.69	0	6.04	0	0	50.62	1.68	46.05
00JSA29	1346**	0	0.77	30.44	0	6.29	0	6.06	2,390.89	53.69	1,115.75	23.93	0	0	0	0	0.67	4.95	27.05
00JSA30	1333**	0.64	0.27	0	0	8.65	0	17.5	3,232.35	115.41	714.41	58.06	2.47	6.36	0	0	0.99	6.59	143.71
00JSA31	1334**	0	0.32	0	0	5.39	0	2.2	1,232.79	40.4	582.21	43.18	0	0	0	0	1.55	3.65	0
SMR	Mean	34.29	13.92	79.82	25.18	329.52	19.75	1,965.08	52,516.84	6,003.45	2,920.18	2,139.66	191.73	169.61	0	0	13.27	111.66	9,223.23
JLM	Mean	4.04	0.64	15.29	0	9.35	0	286.35	5,429.42	203.39	247.17	35.08	1.52	3.95	0.05	0.22	0.73	8.87	136.21
SMR/JLM	Percent	8	2,175	1,517	2,518,000	3,524	1,975,000	686	967	2,952	1,181	6,099	12,614	4,294	2	0	1,818	1,259	6,771
JLM/SMR	Percent	12	0	19	0	3	0	15	10	3	8	2	1	2	5,000	22,000	0	8	1
Background	00JSA01	12.74	0	66.87	0	6.82	0	3.41	957.08	25.47	909.77	14.78	1.36	0	0	0	0	3.34	1,546.61
SMR/Back	Percent	269	1,392,000	119	2,518,000	4,832	1,975,000	57,627	5,487	23,571	321	14,477	14,098	16,961,000	100	100	1,327,000	3,343	596
JLM/Back	Percent	32	64,000	23	100	137	100	8,397	567	799	27	237	112	395,000	5,000	22,000	73,000	266	9

Bold values represent SMR site; ** Samples are not included in JLM.

TABLE 3 - JLM Industries, Inc., Wilmington Terminal Site, Groundwater Quality Metals Data

Site ID#	Lab ID#	Antimony Sb mg/l	Arsenic As mg/l	Barium Ba mg/l	Cadmium Cd mg/l	Chromium Cr mg/l	Cobalt Co mg/l	Copper Cu mg/l	Iron Fe mg/l	Lead Pb mg/l	Magnesium Mg mg/l	Manganese Mn mg/l	Mercury Hg mg/l	Nickel Ni mg/l	Selenium Se mg/l	Silver Ag mg/l	Thallium Tl mg/l	Vanadium V mg/l	Zinc Zn mg/l
00JMW2-A	948	0	0	0.029	0	0	0	0	42.1	0	6.38	0.065		0	0	0	0	0	0.18
00JMW3-A	949	0	0	0	0	0.589	0	0	1.05	0	5.58	0.065		0	0	0	0	0	0.10
00JMW4-A	1367	0	0	0.506	0	0	0	0	1.6	0	8.67	0.054	0	0	0	0	0	0.01	0.08
00JMW5-A	1368	0	0	0	0	0	0	0	11.1	0	9.11	0.427	0	0	0	0	0	0	0.17
00JMW6-A	950	0	0	0.037	0	0.013	0	0	15.08	0	3.6	0.064		0	0	0	0	0	0.32
00JMW7-A	951	0.062	0.018	0.051	0	0.104	0	0.068	75.6	0	5.83	0.078		0.055	0	0.027	0	0	0.16
00JMW8-A	952	0	0	0.104	0	0.04	0	0.012	18.0	0	2.8	0.1		0	0	0	0	0.013	0.5
00JMW9-A	1406*	0	0	0	0	0	0	0	3.67	0.022	2.194	0.065	0	0	0	0	0	0	0.067
00JMW10-A	1408	0	0	0	0	0	0	0	12.3	0	1.177	0.216	0	0	0	0	0	0	0.056
00JMW11-A	1369	0	0	0	0	0	0	0	2.59	0	9.9	0.327	0	0	0	0	0	0	0.206
JMW12-A	1404*	0	0	0	0	0	0	0	0.74	0	1.274	0.052	0	0	0	0	0	0	0
JMW13-A	1407*	0	0	0	0	0	0	0	0.28	0	1.684	0.073	0	0	0	0	0	0	0.05
00JMW17-A	1403	0	0	0	0	0	0	0	36.4	0	15.29	0.883	0	0	0	0	0	0	0
00JRW3-A	1370	0	0	0	0	0	0	0	8.4	0	1.954	0.2	0	0	0	0	0	0	0.125
00JRW4-A	1371	0	0.023	0	0	0	0	0	6.2	0.013	0.786	0.24	0	0	0	0	0	0	0.081
00JRW5-A	955	0	0	0.929	0	0	0.029	0.025	388.0	0	22.22	0.111		0.029	0	0	0.029	0	0.17
00JUC1-A	1410	0	0	0	0	0	0	0	0.8	0	1.442	0.061	0	0	0	0	0	0	0.07
00JUC3-A	1405	0	0	0	0	0	0	0	0.65	0	1.118	0.352	0	0	0	0	0	0	0.06
00JUC5-A	953	0	0	0.076	0	0	0	0	33.571	0	4.63	0.097		0	0	0	0	0	0.109
00JUC6-A	954	0	0	0.046	0	0.058	0	0	15.68	0	3.89	0.091		0.018	0	0	0	0	0.241
00JUC10-A	1372	0	0	0	0	0	0	0	2.08	0	2.259	0.269	0	0	0	0	0	0	0.101
00JUC12-A	1373	0	0	0	0	0	0	0	4.94	0	3.04	0.22	0	0	0	0.011	0	0.014	0.11
00JUC13D-A	1409	0	0	0	0	0	0	0	0.87	0	5.14	0.099	0	0	0	0	0	0	0.07
00JGW09-A	1348	0.24	0.132	4.99	0	2.08	0.077	3.032	469.0	14.6	24.47	4.326	0	1.67	0	0.	0	0.284	58.4
00JGW20-A	1251	0	1.613	2.424	0	0.856	0.232	0.334	865.0	0.63	231.8	1.916	0	1.98	0	0	0	0.55	4.251
00JGW23-A	1248	0	0.017	0	0	0.064	0.049	0.076	50.5	0.063	2.92	0.538	0	0.16	0	0	0	0.06	0.523
00JGW24-A	1249	0	0.105	0.518	0	0.486	0.068	0.146	136.0	0.31	1.759	0.708	0	0.48	0	0.011	0	0.058	0.86
00JGW25-A	1250	0	0.223	1.532	0	0.402	0.088	0.169	418.0	0.3	67.1	3.626	0	0.9	0	0	0	33.4	1.126
00JGW26-A	1347	0.56	0.1	2.024	0	2.345	0.079	1.255	480.0	4.89	28.35	3.917	0	1.63	0	0	0	0.67	56.4
SMR	Mean	0.267	0.083	2.338	0	1.496	0.068	1.454	361.667	6.518	18.58	2.927	0	1.153	0	0	0	0.338	38.441
JLM	Mean	0.003	0.086	0.271	0	0.111	0.018	0.033	91.131	0.054	18.062	0.446	0	0.151	0	0.002	0.001	1.480	0.401
MR/JLM	Percent	8,900.00	96.51	862.73		1,347.75	377.78	4,406.06	396.86	12,070.37	104.71	656.28		763.58				22.84	9,586.28
JLM/SMR	Percent	1.12	103.61	11.59		7.42	26.47	2.27	25.20	0.83	95.50	15.24		13.10				437.87	1.01
NC 2L GW	Standard		0.05	2.0	0.005	0.05		1.0	0.3	0.015		0.05	0.0011	0.1	0.05	0.018			2.1
SMR/NC Std	Percent		166.00	116.90		2,992.00		145.40	120,555.67	43,453.33		5,854.00		1,153.00					1,830.52
JLM/NC Std	Percent		172.00	13.55		212.00		3.10	29,121.67	360.00		860.00		144.00		11.11			19.1

Bold represents SMR site; * Samples represent Colonial site; Other samples represent JLM site.

TABLE 4 - JLM Terminals, Inc., Wilmington Terminal Site, Soil Boring Metals Data, 0 to 1 Foot Depth

Site ID#	Lab ID#	Antimony Sb mg/kg	Arsenic As mg/kg	Barium Ba mg/kg	Cadmium Cd mg/kg	Chromium Cr mg/kg	Cobalt Co mg/kg	Copper Cu mg/kg	Iron Fe mg/kg	Lead Pb mg/kg	Magnesium Mg mg/kg	Manganese Mn mg/kg	Mercury Hg mg/kg	Nickel Ni mg/kg	Selenium Se mg/kg	Silver Ag mg/kg	Thallium Tl mg/kg	Vanadium V mg/kg	Zinc Zn mg/kg
00JSA09	1332	0	0	0	46.65	653.83	29.25	3,023.36	58,285.97	28,758.8	6,946.36	3,288.83	201.56	468.5	0	0	0	71.28	17,968.1
00JSA23	1229	0	0	0	9.38	1,050.37	40.58	3,804.33	62,550.36	4,622.49	779.1	11,098.32	20.18	0	0	0	9.77	29.73	5,555.67
00JSA26	1335	0	0	0	47.92	51.99	24.86	1,463.07	79,719.74	2,734.93	985.48	327.74	67.81	87.92	0	0	0	13.11	10,126.01
SMR	Mean	0	0	0	34.65	585.4	31.56	2,763.59	66,852.02	12,038.74	2,903.65	4,904.96	96.52	185.47	0	0	3.26	38.04	11,216.59
00JSA20	1224	4.75	0	0	0	0	0	10.11	1,092.71	10.52	13.66	4.09	0	0	0	2.89	0	5.41	0
00JSA24	1236	0	0	0	0	0	0	11.08	1,509.66	47.27	29.99	10.77	0.59	0	0	0	0	5.3	33.94
00JSA25	1243	0	0	0	0	10.74	0	2.15	6,348.99	0	38.43	0	0.81	0	0	0	0	10.54	0
00JSA27	1341	0	0	0	0	0	0	6.5	1,099.28	40.61	20.82	28.61	2.67	0	0	0	0	2.24	0
JLM	Mean	1.19	0	0	0	2.69	0	7.46	2,512.66	24.6	25.73	10.87	1.02	0	0	0.72	0	5.87	8.49
00JSA28	1327	0	0	0	0	6.73	0	10.85	2,570.92	79.91	847.44	31.69	0	6.01	0	0	0	8.41	46.05
00JSA29	1346	0	0	0	0	6.29	0	6.06	2,390.89	5,369.02	1,115.75	23.93	0	0	0	0	0	4.99	27.05
COL	Mean	0	0	0	0	6.51	0	8.46	2480.91	2724.47	981.6	27.81	0	3.02	0	0	0	6.7	36.55
SMR	Mean	0	0	0	34.65	585.4	31.56	2,763.59	66,852.02	12,038.74	2,903.65	4,904.96	96.52	185.47	0	0	3.26	38.04	11,216.59
JLM	Mean	1.19	0	0	0	2.69	0	7.46	2,512.66	24.6	25.73	10.87	1.02	0	0	0.72	0	5.87	8.49
MR/JLM	Percent	0			3,465,000	21,762	3,156,000	37,045	2,661	48,938	11,285	45,124	9,463	18,547,000		0	326,000	648	132,115
JLM/SMR	Percent	119,000			0	0	0	0	4	0	1	0	1	0		72,000	0	15	0

TABLE 6 - JLM Terminals, Inc., Wilmington Terminal Site, Soil Boring Metals Data, 2 to 3 Foot Depth

Site ID#	Lab ID#	Antimony Sb mg/kg	Arsenic As mg/kg	Barium Ba mg/kg	Cadmium Cd mg/kg	Chromium Cr mg/kg	Cobalt Co mg/kg	Copper Cu mg/kg	Iron Fe mg/kg	Lead Pb mg/kg	Magnesium Mg mg/kg	Manganese Mn mg/kg	Mercury Hg mg/kg	Nickel Ni mg/kg	Selenium Se mg/kg	Silver Ag mg/kg	Thallium Tl mg/kg	Vanadium V mg/kg	Zinc Zn mg/kg
00JSA09	1332	0	0	0	46.65	653.83	29.25	3,023.36	58,285.97	28,758.8	6,946.36	3,288.83	201.56	468.5	0	0	0	71.28	17,968.1
00JSA23	1231	0.47	0	14.01	0	0	0	15.93	1,578.41	0	11.95	16.2	0	0	0	0	1.8	0.87	158.33
00JSA26	1337	0	0	0	0	0	0	2.57	548.91	45.55	5.26	2.32	0	0	0	0	0.93	0.6	192.7
SMR	Mean	0.16	0	4.67	15.55	217.94	9.75	1,013.95	20,137.76	9,601.45	2,321.19	1,102.45	67.19	156.17	0	0	0.91	24.25	6,106.38
00JSA20	1226	0	0	0	7.45	0	0	0	139.07	6.55	6.21	0	0	0	0	0	0.9	1.02	0
00JSA24	1238	0	0	0	0	0	0	0	267.15	0	9.21	0	0	0	0	0	0	1.12	0
00JSA25	1245	0	0.29	10.16	0	0	0	15.5	1,713.97	12.69	24.18	15.6	3.63	0	0	0	0	2.34	24.38
00JSA27	1343	0	0.23	0	0	0	0	1.33	957.18	33.93	7.84	0	0	0	0	0	0.97	1.33	0
JLM	Mean	0	0.13	2.54	1.86	0	0	4.21	769.34	13.29	11.86	3.90	0.91	0	0	0	0.47	1.45	6.10
00JSA28 COL	1329	0	0.26	0	0	0	0	2.23	765.3	33.95	43.77	0	0	0	0	0	0.92	1.67	0
SMR	Mean	0.16	0	4.67	15.55	217.94	9.75	1,013.95	20,137.76	9,601.45	2,321.19	1,102.45	67.19	156.17	0	0	0.91	24.25	6,106.38
JLM	Mean	0	0.13	2.54	1.86	0	0	4.21	769.34	13.29	11.86	3.9	0.91	0	0	0	0.47	1.45	6.1
SMR/JLM	Percent	16,000	1	184	836	21,794,000	975,000	24,084	2,618	72,246	19,572	28,268	7,384	15,617,000	100	100	194	1,672	100,105
JLM/SMR	Percent	1	13,000	54	12	0	0	0	4	0	1	0	1	0	100	100	52	6	0

TABLE 7 - JLM Industries, Inc., Wilmington Terminal Site, Soil Boring Metals Data, 4 to 5 Foot Depth

Site ID#	Lab ID#	Antimony Sb mg/kg	Arsenic As mg/kg	Barium Ba mg/kg	Cadmium Cd mg/kg	Chromium Cr mg/kg	Cobalt Co mg/kg	Copper Cu mg/kg	Iron Fe mg/kg	Lead Pb mg/kg	Magnesium Mg mg/kg	Manganese Mn mg/kg	Mercury Hg mg/kg	Nickel Ni mg/kg	Selenium Se mg/kg	Silver Ag mg/kg	Thallium Tl mg/kg	Vanadium V mg/kg	Zinc Zn mg/kg
00JSA23	1232	80.77	0	30.02	0	11.68	0	112.27	3,016.94	34.01	32.84	29.87	1.23	0	0	0	0	2.21	141.16
00JSA26	1338	0.47	0.22	10.76	0	0	0	10.8	1,119.62	43.8	8.88	5.76	0	0	0	0	0.9	0.86	184.64
SMR	Mean	40.62	0.11	20.39	0	5.84	0	61.54	2,068.28	38.91	20.86	17.82	0.62	0	0	0	0.45	1.54	162.90
00JSA20	1227	0	0	0	0	7.15	0	0	257.56	16.85	7.59	0	0	0	0	0	0.65	1.27	0
00JSA24	1239	0	0	0	0	7.25	0	1.45	547.46	0	8.04	0	0	0	0	0	0	1.15	0
00JSA25	1246	0	0	0	0	0	0	38.22	1,823.89	34.88	27.34	1.83	3.94	0	0	0	0	1.2	0
00JSA27	1344	0	0	0	0	0	0	0	1,028.83	41.01	6.9	0	0	0	0	0	0	1.26	0
JLM	Mean	0	0	0	0	3.60	0	9.92	914.44	23.19	12.47	0.46	0.99	0	0	0	0.16	1.22	0
00JSA28 COL	1330	0	0.54	111.84	0	0	0	1.65	1,823.62	9.05	45.8	11.77	0	0	0	0	1.02	1.81	0
SMR	Mean	40.62	0.11	20.39	0	5.84	0	61.54	2,068.28	38.91	20.86	17.82	0.62	0	0	0	0.45	1.54	162.90
JLM	Mean	0	0	0	0	3.60	0	9.92	914.44	23.19	12.47	0.46	0.99	0	0	0	0.16	1.22	0
SMR/JLM	Percent	4,062,000	11,000	2,039,000	100	162	100	620	226	168	167	3,874	63	100	100	100	281	126	16,290,000
JLM/SMR	Percent	0	1	0	100	62	100	16	44	60	60	3	160	100	100	100	36	79	0

TABLE 8 - JLM Terminals, Inc., Wilmington Terminal Site, Soil Boring Metals Data, 6 to 7 Foot Depth

Site ID#	Lab ID#	Antimony Sb mg/kg	Arsenic As mg/kg	Barium Ba mg/kg	Cadmium Cd mg/kg	Chromium Cr mg/kg	Cobalt Co mg/kg	Copper Cu mg/kg	Iron Fe mg/kg	Lead Pb mg/kg	Magnesium Mg mg/kg	Manganese Mn mg/kg	Mercury Hg mg/kg	Nickel Ni mg/kg	Selenium Se mg/kg	Silver Ag mg/kg	Thallium Tl mg/kg	Vanadium V mg/kg	Zinc Zn mg/kg
00JSA23	1233	0	0	0	0	0	0	0	331.99	0	6.06	0	0	0	0	0	0	0.73	0
00JSA26	1339	2.23	0.96	0	3.56	12.06	0	402.8	9,524.13	291.13	44.52	97.42	1.48	9.21	0	0	1.41	5.24	1,372.47
SMR	Mean	1.12	0.48	0	1.78	6.03	0	201.40	4,928.06	145.57	25.29	48.71	0.74	4.61	0	0	0.71	2.99	686.24
00JSA20	1228	0	0	0	0	0	0	0	651.12	9.38	5.97	0	0	0	0	0	1.33	0.66	0
00JSA24	1240	0	0	0	0	0	0	0	297.04	0	9.62	0	0	0	0	0	0	1.47	0
00JSA25	1247	0	1.24	0	0	0	0	10.52	4,200.72	13.9	45.09	1.66	0	0	0	0	0	12.66	0
00JSA27	1345	0	1.06	0	0	0	0	1.13	2,625.69	19.33	7.63	3.13	0	0	0	0	0	4.03	0
JLM	Mean	0	0.58	0	0	0	0	2.91	1,943.64	10.65	17.08	1.20	0	0	0	0	0.33	4.71	0
00JSA28 COL	1331***	0	0.28	0	0	0	0	0	945.37	31.71	35.07	3.07	0	0	0	0	1.0	2.02	0
SMR	Mean	1.12	0.48	0	1.78	6.03	0	201.40	4,928.06	145.57	25.29	48.71	0.74	4.61	0	0	0.71	2.99	686.24
JLM	Mean	0	0.58	0	0	0	0	2.91	1,943.64	10.65	17.08	1.20	0	0	0	0	0.33	4.71	0
SMR/JLM	Percent	112,000	83	100	178,000	603,000	100	6,921	254	1,367	148	4,059	74,000	461,000	100	100	215	63	68,624,000
JLM/SMR	Percent	0	121	100	0	0	100	1	39	7	68	2	0	0	100	100	46	158	0

TABLE 9 - JLM Industries, Inc., Wilmington Terminal Site, Soil Boring Metals Data, 8 to 9 Foot Depth

Site ID#	Lab ID#	Antimony Sb mg/kg	Arsenic As mg/kg	Barium Ba mg/kg	Cadmium Cd mg/kg	Chromium Cr mg/kg	Cobalt Co mg/kg	Copper Cu mg/kg	Iron Fe mg/kg	Lead Pb mg/kg	Magnesium Mg mg/kg	Manganese Mn mg/kg	Mercury Hg mg/kg	Nickel Ni mg/kg	Selenium Se mg/kg	Silver Ag mg/kg	Thallium Tl mg/kg	Vanadium V mg/kg	Zinc Zn mg/kg
00JSA23	1234	6.83	0	29.21	0	21.73	0	446.41	14,885.6	107.62	105.55	82.58	3.1	8.71	0	0	0.54	4.55	345.62
00JSA26	1340	2.05	1.15	22.94	5.09	8.4	0	33.19	16,656.61	230.82	182.63	75.28	3.95	12.83	0	0	1.85	2.2	2,273.60
SMR	Mean	4.44	0.58	26.08	2.55	15.07	0	239.80	15,771.11	169.22	144.09	78.93	3.53	10.77	0	0	1.20	3.38	1,309.61
00JSA24 JLM	1241	0	0	0	0	11.23	0	3.35	1,431.55	0	8.31	6.02	0	0	0	0	0	1.31	0
SMR	Mean	4.44	0.58	26.08	2.55	15.07	0	239.80	15,771.11	169.22	144.09	78.93	3.53	10.77	0	0	1.20	3.38	1,309.61
JLM	Mean	0	0	0	0	11.23	0	3.35	1,431.55	0	8.31	6.02	0	0	0	0	0	1.31	0
SMR/JLM	Percent	444,000	58,000	2,608,000	255,000	134	100	7,158	1,102	16,922,000	1,734	1,311	353,000	1,077,000	100	100	120,000	258	130,961,000
JLM/SMR	Percent	0	0	0	0	8	100	0	130	0	0	0	0	0	100	100	0	1	0

TABLE 10 - JLM Industries, Inc., Wilmington Terminal Site, Soil Boring Metals Data, 10 to 11 Feet

Site ID#	Lab ID#	Antimony Sb mg/kg	Arsenic As mg/kg	Barium Ba mg/kg	Cadmium Cd mg/kg	Chromium Cr mg/kg	Cobalt Co mg/kg	Copper Cu mg/kg	Iron Fe mg/kg	Lead Pb mg/kg	Magnesium Mg mg/kg	Manganese Mn mg/kg	Mercury Hg mg/kg	Nickel Ni mg/kg	Selenium Se mg/kg	Silver Ag mg/kg	Thallium Tl mg/kg	Vanadium V mg/kg	Zinc Zn mg/kg
00JSA23 SMR	1235	0	0	0	0	0	0	2.46	86.49	0	4.0	0	0	0	0	0	0	0.34	0
00JSA24 JLM	1242	0	0	0	0	8.75	0	0	390.89	14.38	12.38	0	0	0	0	0	0	1.79	0
SMR/JLM	Percent	100	100	100	100	0	100	246,000	22	0	32	100	100	100	100	100	100	19	100
JLM/SMR	Percent	100	100	100	100	875,000	100	0	452	1,438,000	310	100	100	100	100	100	100	526	100

TABLE 11 - JLM Industries, Inc., Wilmington Terminal Site, Soil Boring Metals Data, Concentration Above Water Table

Site ID#	Depth ft	Lab ID#	Antimony Sb mg/kg	Arsenic As mg/kg	Barium Ba mg/kg	Cadmium Cd mg/kg	Chromium Cr mg/kg	Cobalt Co mg/kg	Copper Cu mg/kg	Iron Fe mg/kg	Lead Pb mg/kg	Magnesium Mg mg/kg	Manganese Mn mg/kg	Mercury Hg mg/kg	Nickel Ni mg/kg	Selenium Se mg/kg	Silver Ag mg/kg	Thallium Tl mg/kg	Vanadium V mg/kg	Zinc Zn mg/kg
00JSA23	8 to 9	1234	682.96	0	29.21	0	21.73	0	446.41	14,885.6	107.62	105.55	82.58	3.1	8.71	0	0	0.54	4.55	345.62
00JSA26	8 to 9	1340	2.05	1.15	22.94	5.09	8.4	0	33.19	16,656.61	230.82	182.63	75.28	3.95	12.83	0	0	1.85	2.2	2,273.60
SMR		Mean	342.51	0.58	26.08	2.55	15.07	0	239.80	15,771.11	169.22	144.09	78.93	3.53	10.77	0	0	1.20	3.38	1,309.61
00JSA20	6 to 7	1228	0	0	0	0	0	0	0	651.12	9.38	5.97	0	0	0	0	0	1.33	0.66	0
00JSA24	8 to 9	1241	0	0	0	0	11.23	0	3.35	1,431.55	0	8.31	6.02	0	0	0	0	0	1.31	0
00JSA25	6 to 7	1247	0	1.24	0	0	0	0	10.52	4,200.72	13.9	45.09	1.66	0	0	0	0	0	12.66	0
00JSA27	6 to 7	1345	0	1.06	0	0	0	0	1.13	2,625.69	19.33	7.63	3.13	0	0	0	0	0	4.03	0
JLM		Mean	0	0.58	0	0	2.81	0	3.75	2,227.27	10.65	16.75	2.70	0	0	0	0	0.33	4.67	0
00JS[illegible]8 COL	6 to 7	1331	0	0.28	0	0	0	0	0	945.37	31.71	35.07	3.07	0	0	0	0	1.0	2.02	0
SMR		Mean	342.51	0.58	26.08	2.55	15.07	0	239.80	15,771.11	169.22	144.09	78.93	3.53	10.77	0	0	1.20	3.38	1,309.61
JLM		Mean	0	0.58	0	0	2.81	0	3.75	2227.27	10.65	16.75	2.70	0	0	0	0	0.33	4.67	0
SMR/JLM		Percent	34,251,000	100	2,608,000	255,000	536	100	6,395	708	1,589	860	2,923	353,000	1,077,000	100	100	364	72	130,961,000
JLM/SMR		Percent	0	100	0	0	19	100	2	14	6	12	3	0	0	100	100	28	138	0

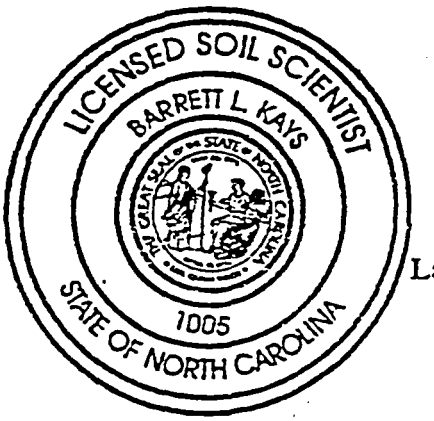
TABLE 5 - JLM Industries, Inc., Wilmington Terminal Site, Soil Boring Metals Data, 1 to 2 Foot Depth

Site ID#	Lab ID#	Antimony Sb mg/kg	Arsenic As mg/kg	Barium Ba mg/kg	Cadmium Cd mg/kg	Chromium Cr mg/kg	Cobalt Co mg/kg	Copper Cu mg/kg	Iron Fe mg/kg	Lead Pb mg/kg	Magnesium Mg mg/kg	Manganese Mn mg/kg	Mercury Hg mg/kg	Nickel Ni mg/kg	Selenium Se mg/kg	Silver Ag mg/kg	Thallium Tl mg/kg	Vanadium V mg/kg	Zinc Zn mg/kg
00JSA09	1332	0	0	0	46.65	653.83	29.25	3,023.36	58,285.97	28,758.8	6,946.36	3,288.83	201.56	468.5	0	0	0	71.28	17,968.1
00JSA23	1230	20.67	15.98	37.48	0	13.47	0	74.07	14,875.51	309.17	90.48	10.81	3.03	7.8	8.06	2.85	5.77	8.35	2,750.30
00JSA26	1336	0	0.28	11.03	0	6.47	0	6.87	1,416.62	96.8	13.1	7.28	1.15	5.64	0	0	1.25	1.52	1,232.73
SMR	Mean	6.89	5.42	16.17	15.55	224.59	9.75	1,034.77	24,859.37	9,721.59	2,349.98	1,102.31	68.58	160.65	2.69	0.95	2.34	27.05	7,317.04
00JSA20	1225	0	0	0	0	5.28	0	0	115.21	0	4.81	0	0	0	0	0	0.55	1.08	0
00JSA24	1237	0	0	0	0	0	0	2.93	606.58	13.4	15.02	2.28	0	0	0	0	0	1.45	0
00JSA25	1244	0.54	0	38.45	0	7.34	0	60.3	6,492.61	132.26	44.43	47.71	1.54	10.74	0	0	0	6.95	144.81
00JSA27	1342	0	0.54	15.41	0	0	0	3.71	1,429.22	16.59	9.77	11.51	0.84	0	0	0	1.0	2.97	0
JLM	Mean	0.14	0.14	13.47	0	3.16	0	16.74	2,160.91	40.56	18.51	15.38	0.60	2.69	0	0	0.39	3.11	36.20
00JSA28 COL	1328	0.91	2.94	0	0	7.12	0	23.02	4,586.71	121.19	345.35	74.96	1.71	5.58	0	0	60.36	3.51	76.94
SMR	Mean	6.89	5.42	16.17	15.55	224.59	9.75	1,034.77	24,859.37	9,721.59	2,349.98	1,102.31	68.58	160.65	2.69	0.95	2.34	27.05	7,317.04
JLM	Mean	0.14	0.14	13.47	0	3.16	0	16.74	2,160.91	40.56	18.51	15.38	0.60	2.69	0	0	0.39	3.11	36.20
SMR/JLM	Percent	4,921	5,707	139	1,555,000	10,559	975,000	9,252	1,693	35,833	19,008	10,727	17,050	8,853	269,000	95,000	600	1,280	28,617
JLM/SMR	Percent	2	3	83	0	1	0	2	9	0	1	1	1	2	0	0	17	12	0

Attachment 8

PRELIMINARY ENVIRONMENTAL INVESTIGATION REPORT REGARDING METALS CONTAMINATION AT JLM INDUSTRIES, INC., WILMINGTON TERMINAL,

PART II



August 10, 2001

By

Landis, Inc., Raleigh, NC

Preliminary Environmental Investigation

Report Regarding Metals Contamination at

JLM Industries, Inc., Wilmington Terminal, Part II

August 10, 2001

By

Barrett L. Kays, Ph.D.
Landis, Inc., Raleigh, NC

Attorney Client Privileged Information: This document is subject to a court established protective order to protect the rights of both plaintiff and defendants involved in the JLM Industries, Inc. v. Southern Metals Recycling, Inc., et al., Superior Court, New Hanover County, North Carolina. Unauthorized distribution of this report may subject the distributor to the contempt powers of the Court.

EXECUTIVE SUMMARY

Landis, Inc. was retained by JLM Industries, Inc. to conduct an analysis of alleged metals contamination data contained in it's first report concerning the JLM Terminal property in Wilmington, North Carolina. Soil metals contamination data was modeled to provide contour plot maps, 3-dimensional maps, and cross sectional contour maps. Groundwater metals contamination data was modeled to provide contour plot maps. Based upon the modeled data, estimates were prepared of the volume of contaminated hazardous and non-hazardous soil materials on the JLM property, Southern Metals Recycling, Inc. property, and Wright Street and Front Street right-of-ways.

The vast majority of soils across the JLM property have been contaminated with metals to a significant depth and the proximate cause of this contamination is that it has migrated from the SMR property. The proximate cause of the soils contamination on the JLM property of seventeen of the eighteen metals studied: **antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc** is due to migration from the SMR property. The plot and 3-dimensional maps demonstrate the fact that the proximate cause of the soil metals contamination is the SMR property and is not due to current and prior operations and uses on the JLM property. One of the eighteen metals, silver, may have as its source the SMR property.

The soils contamination due to the metals contamination from the SMR property has spread across the JLM site and down to the Cape Fear River. Soil samples have not been taken in the portions of the JLM property that is submerged by the Cape Fear River. Although it is likely that soil contamination exists in the submerged portions of the property, no determinations regarding the submerged lands is included in this report.

Cross sectional analysis of the soil metals data under the JLM property indicates that **antimony, barium, chromium, copper, iron, lead, magnesium, manganese, thallium, and zinc** contamination has moved well below the water table. The cross sectional data plots indicates that **barium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel thallium, vanadium, and zinc** contamination in the soil indicates that these metals have concentrated and have moved laterally well below the water table. Therefore, it is probable that the above metals extend below the mean sea level.

The volumes of contaminated hazardous and non-hazardous soil materials have been calculated for the SMR property and JLM property. In addition, the volumes have been calculated for adjacent Front Street and Wright Street right-of-ways. The total toxic hazardous waste soil metals contamination on the properties is approximately 13,700 cubic yards. The total non-hazardous soil metals contamination on the properties is approximately 1,077,756 cubic yards.

The groundwater under the JLM property has been contaminated with metals and the proximate cause is that it has migrated from the SMR property. **Iron, magnesium, manganese, and zinc** contamination in the groundwater has spread across the vast majority of the JLM property and the proximate cause is due to migration from SMR property. **Arsenic, barium, cobalt, copper, lead, nickel, and vanadium** contamination in the groundwater has spread across significant portions of the JLM property and the proximate cause is due to migration from SMR property. The plot and 3-dimensional maps demonstrate the fact that the proximate cause of the groundwater metals contamination is the SMR property and is not due to current and prior operations and uses on the JLM property. **Antimony and chromium** contamination in the groundwater has spread across limited portions of JLM property and the proximate cause is due to migration from SMR property. **Silver and thallium** contamination in the groundwater has spread across significant portions of the JLM property and the proximate cause may be due to migration from SMR property. **Cadmium, mercury, and selenium** were not found in the groundwater under the SMR and JLM properties. **Arsenic, chromium, copper, iron, lead, manganese, nickel, silver, and zinc** contamination in the groundwater under SMR property is sufficiently concentrated such that it exceeds NC groundwater standards. **Arsenic, chromium, iron, lead, manganese, nickel, silver, and zinc** contamination in the groundwater under JLM property is sufficiently concentrated such that it exceeds NC groundwater standards.

The groundwater contamination due to the metals contamination from the SMR property has spread under the JLM site and down to the Cape Fear River. Groundwater and surface water samples have not been taken in the portions of the JLM property that is submerged by the Cape Fear River. Although it is likely that groundwater and, or surface water metals contamination exists in the submerged portions of the property, no determinations regarding the submerged lands is included in this report.

The toxic hazardous metals waste and non-hazardous metals waste on the SMR property is a continuing source of contamination of the JLM property and it's groundwaters. The contamination poses a significant and real continuing toxic hazard and threat to the public health, property, and environs along the Cape Fear River.

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INTRODUCTION

Landis, Inc. was retained to conduct an environmental investigation for JLM Terminals, Inc. for their Wilmington Terminal (referred to herein as "JLM" property) in Wilmington, North Carolina, regarding contamination that may have occurred from the Southern Metals Recycling site (referred to herein as "SMR" site) located adjacent to the JLM facility. Landis, Inc. was retained to analyze the issues, determine findings of fact, and determine causation, if any, of the alleged metals contamination on the JLM property.

On February 23, 2001, Landis, Inc. issued it's initial report entitled: "Preliminary Environmental Investigation Report Regarding Metals Contamination at JLM Industries, Inc., Wilmington Terminal." At time of the report, Landis, Inc. did not submit the groundwater surface contour map. Since that date, Landis, Inc. completed and issued the groundwater surface contour map as a supplement to the initial report. In preparation of the map, it became important to investigate structural controls affecting the groundwater surface. Two old buried valleys were found to cross the properties. The larger and more significant valley graded from the northeast of SMR property to the southwest corner of JLM property. Evidence of this valley can be found on topographic map of the area and on the 1893 Sanborn Fire Insurance Map. Other presumed structure controls consist of (1) a tramway shown on 1893 map and located where the current groundwater drops approximately eight feet adjacent to RW-1, (2) an old log pond at the end of Wright Street shown on 1893 map, and (3) a pond located in the southwest portion of JLM property and shown on 1893, 1898, 1904, 1910, and 1915 maps. Current physical evidence was found that supports these relic natural and man-made features. Several of the interpretations in the initial report have been revised in this report as based upon the groundwater surface contour map.

On March 22, 2001, JLM Industries, Inc. authorized Landis, Inc. to proceed in preparation of the second part of their proposed analysis and report. Soil metals contamination data was modeled to provide contour plot maps, 3-dimensional maps, and cross sectional contour maps. Groundwater metals contamination data was modeled to provide contour plot maps. Based upon the modeled data, estimates were prepared of the volume of contaminated toxic hazardous and non-hazardous metals contaminated soil materials on the JLM property, Southern Metals Recycling, Inc. property, and Wright Street and Front Street right-of-ways.

MODELING PROCEDURES

The analytical metals data was presented in the initial preliminary report dated February 23, 2001. This report contains a spatial analysis of the data and interpretation of the results of this modeling analysis. The spatial modeling analysis was prepared using Surfer 7.0 Software of Golden Software, Inc. The Surfer Software is a contouring and three-dimensional surface mapping program used by scientists and engineers.

The groundwater concentration data for the metals: antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc were modeled. Contour plots were prepared for each of the metals. Property boundary overlay transparencies are provided prior to the appendix sections. Three-dimensional plots were prepared with views from the southwest corner of the JLM property and from the northeast corner of SMR property. A large-scale map of total combined metals in the groundwater is provided **(Appendix 30).**

The RCRA TCLP concentration data for lead was modeled. Contour plots were prepared for the leachable lead at various depths. Property boundary overlay transparencies are provided prior to the appendix sections. Three-dimensional plots were prepared with views from the southwest and northeast. The 5-mg/l maximum concentration of lead for the toxicity characteristic is shown in bold in the plots.

The surface soil concentration data for the metals: antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc were modeled. Contour plots were prepared for each of the metals. Property boundary overlay transparencies are provided prior to the appendix sections. Three-dimensional plots were prepared with views from the southwest and northeast.

The soil depth of total metals was analyzed for the combination concentration of the metals: antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc. Contour plots for total metals were prepared for depths of 0 to 3-inches, 1 to 2-feet, 2 to 3-feet, 4 to 5-feet, 6 to 7-feet, and below depth of water table **(Appendix 4).** Property boundary overlay transparencies are provided prior to the appendix sections. Three-dimensional plots were prepared with views from the southwest and northeast. The

vertical axis of the three-dimensional concentration plots was adjusted to approximately represent the differential concentration at various depths. Large-scale maps of total combined metals are provided (**Appendix 31 through 37**).

The soil concentration of each of the metals was analyzed at the various depths. The concentration plots for antimony (**Appendix 5**), arsenic (**Appendix 6**), barium (**Appendix 7**), cadmium (**Appendix 8**), chromium (**Appendix 9**), cobalt (**Appendix 10**), copper (**Appendix 11**), iron (**Appendix 12**), lead (**Appendix 13**), magnesium (**Appendix 14**), manganese (**Appendix 15**), mercury (**Appendix 16**), nickel (**Appendix 17**), selenium (**Appendix 18**), silver (**Appendix 19**), thallium (**Appendix 20**), vanadium (**Appendix 21**), and zinc (**Appendix 22**). Property boundary overlay transparencies are provided prior to the appendix sections. Three-dimensional plots from the southwest and northeast are provided for each of metals. The vertical axis of the three-dimensional concentration plots was adjusted to approximately represent the differential concentration at various depths.

The soil concentration of each of the metals was analyzed in sectional plots between selected boring locations. Section A – A' presents analysis diagonally across from the southwest of the JLM property to the northeast portion of the SMR property (**Appendix 23**). Section B – B' presents a similar analysis diagonally across JLM and SMR properties, but somewhat to the northwest of A-A' (**Appendix 24**). Section C – C' presents analysis from the southeast corner of JLM property to northeast corner of SMR property (**Appendix 25**). Section D – D' presents a modified analysis diagonally across the JLM and SMR properties (**Appendix 26**). Section E – E' presents another modified analysis diagonally across the JLM and SMR properties (**Appendix 27**). Section F – F' presents another modified analysis diagonally across the JLM and SMR properties (**Appendix 28**). Section G – G' presents a final analysis diagonally across the JLM and SMR properties (**Appendix 29**).

RESULTS OF GROUNDWATER METALS CONTAMINATION ANALYSIS

The groundwater concentration data for the metals: antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc were modeled. Contour plots were prepared for each of the metals. Property boundary overlay transparencies are provided prior to the appendix sections. Three-dimensional plots were prepared with views from the southwest corner of the JLM property and from the northeast corner of SMR property **(Appendix 1)**. A large-scale map of total combined metals in the groundwater is provided **(Appendix 30)**.

The **groundwater total metals concentration plots** illustrate the combined concentrations of the eighteen analyzed metals. The general trend is from higher concentrations on SMR property and with a broad plume across the vast majority of the JLM property. The southeast corner of JLM property is at or near zero metals concentration. The only exception to this trend is a spike at GW-20. GW-20 is located in an old buried valley that crosses the SMR and JLM properties. The old valley shows on the groundwater surface contour map **(Appendix 38)**. This is a logical area for accumulation of metals along the old valley.

The **groundwater antimony concentration plots** show that the higher concentration are on the SMR property and trend downward to the southwest. Antimony has moved onto the JLM property south of Wright Street and long the northern property of JLM.

The **groundwater arsenic concentration plots** show that arsenic has moved from SMR property to the northeast to JLM property in the southwest direction. A spike in the arsenic concentration occurs at GW-20, which is located in the old buried valley. The northeast to southwest trend of the plume is consistent with the old valley. A significant portion of SMR and JLM properties exceed the NC groundwater standard for arsenic of 0.05-mg/l concentration.

The **groundwater barium concentration plots** illustrate a northeast to southwest trend of the plume. The higher concentration is located at RW-5, a recovery well that probably concentrated barium at this location. The NC groundwater standard for barium of 2.0-mg/l has not been exceeded.

Plots were not prepared for **groundwater cadmium** since none of the samples detect any cadmium in the groundwater under SMR or JLM properties.

The **groundwater chromium concentration plots** show a plume coming from SMR onto JLM in the southwest direction and a second plume entering the JLM property from the north. The concentration of chromium in MW-3, MW-6, and MW-7 has increased considerably since JLM purchased the property in 1992. It appears that this plume originates from the SMR property. It appears that the spike at MW-3 occurs below the old tramway found in the 1893 Sanborn Fire Insurance Maps (earlier discussed). A portion of the JLM property exceeds the NC groundwater standard of 0.05-mg/l for chromium.

The **groundwater cobalt concentration plots** show a plume from SMR property in the northeast and moving down to southwest and across the JLM property. The orientation of this plume appears to follow the old buried valley. A spike in cobalt concentration occurs at GW-20 and spreads out over a significant portion of JLM property. A significant portion of JLM property groundwater has been contaminated by cobalt.

The **groundwater copper concentration plots** illustrate a plume originating on SMR property and extending in the southwest direction across the JLM property and apparently along the old buried valley. However, no portion of JLM property exceeds the NC groundwater standard of 1.0-mg/l for copper.

The **groundwater iron concentration plots** show a significant plume originating on SMR property and extending in the southwest direction across the JLM property. The plume spreads across the vast majority of the JLM property and a majority of the JLM property exceeds the NC groundwater standard of 0.3-mg/l for iron. Spikes occur at GW-20 and RW-5; the higher concentrations occurs along the old buried valley, but widens considerably across the western portion of JLM property and extending to the Cape Fear River.

The **groundwater lead concentration plots** illustrate a spread of lead from the SMR property across the entire JLM property and with a plume above the NC groundwater standard of 0.015-mg/l trending in the southwest direction across the JLM property and orientated along the old buried valley. A significant portion of JLM property has been contaminated above the NC groundwater standard.

The **groundwater magnesium concentration plots** show a spread of magnesium across the vast majority of the JLM property and trending in the southwest direction. The magnesium concentration spikes at GW-20, which is located in the old buried valley.

The **groundwater manganese concentration plots** show a spread of manganese from the SMR property across all of the JLM property and trending in the southwest direction. Virtually all of the JLM property has been contaminated with manganese concentrations above the NC groundwater standard of 0.05-mg/l.

Plots were not prepared for **groundwater mercury** since all samples did not detect any mercury in the groundwater under SMR or JLM properties.

The **groundwater nickel concentration plots** illustrate a plume from the SMR property across the JLM property and along the old buried valley in the southwest direction. A significant portion of the JLM property has been contaminated with nickel concentrations above the NC groundwater standard of 0.1-mg/l.

Plots were not prepared for **groundwater selenium** since all samples did not detect any selenium in the groundwater under SMR or JLM properties.

The **groundwater silver concentration plots** show a somewhat different pattern with spikes at MW-7, GW-24 and UC-12. The groundwater silver plots do not follow the pattern of the other metals. A small portion of JLM and SMR properties exceed the NC groundwater standard of 0.018-mg/l for silver.

The **groundwater thallium concentration plots** show two areas of thallium contamination one centered on the SMR property and the second area centered on JLM property and with a spike at RW-5.

The **groundwater vanadium concentration plots** illustrate a plume coming from the SMR property across a third property to the north and extending across a portion of JLM property. The vanadium concentration spikes at GW-25 in the northwest corner of the JLM property.

The **groundwater zinc concentration plots** illustrate zinc coming from the SMR property and spreading across a significant portion of the JLM property. Portion of the JLM property exceeds the NC groundwater standard of 2.1-mg/l of zinc.

In summary the groundwater metals concentration plots clearly show that the JLM property groundwater has been seriously impaired from contaminates flowing from the SMR property. The groundwater total metals concentration plots shows that the vast majority of the JLM property has been contaminated by the SMR property. The majority of this contamination has spread down gradient along the old buried valley, which crosses the SMR and JLM properties and extends to the Cape Fear River. The area of contamination has spread out to the west along the entire portion of the Cape Fear River that has been studied by the groundwater sampling.

The number of metals found to be contaminating the groundwater and the fact that they were found in the highest concentration in the soils on the SMR property supports the certainty of causation by SMR. The proximate cause is due to serious toxic metals contamination coming from the SMR property. The proximate cause is not due to the current or past operations and uses of the JLM property. The 1992 environmental audit was used to review the historical uses and operations on the JLM property. The following findings of fact are apparent from the groundwater metals concentration plots:

1. **Total metals, iron, magnesium, manganese, and zinc** plumes have spread across the vast majority of the JLM property and the proximate cause is due to contamination from the SMR property. The contamination coming from the SMR property is so significant that **iron and manganese** concentrations above the NC groundwater standards exist across the vast majority of the JLM property.
2. **Arsenic, barium, cobalt, copper, lead, nickel, and vanadium** plumes have spread across significant portions of the JLM property and the proximate cause is due to contamination from the SMR property. The contamination coming from the SMR property is so significant that **arsenic, lead, and nickel** concentrations above the NC groundwater standards exist across significant portions of the JLM property.
3. **Antimony and chromium** plumes have spread across limited portions of the JLM property and the proximate cause is due to contamination from the SMR property. The contamination coming from the SMR property is so significant that **chromium** concentrations above the NC groundwater standard exist across portion of the JLM property.
4. **Silver and thallium** plumes have spread across significant portions of the JLM property and the proximate cause may be due to contamination from the SMR property, based upon findings of the soil contamination. No **silver or thallium** was found in the groundwater under the SMR property.

5. **Total metals, arsenic, barium, cobalt, copper, iron, lead, magnesium, manganese, nickel, and zinc** plumes have spread across the JLM property and their patterns indicate that the probable spread along the old buried valley under the SMR and JLM properties.
6. **Cadmium, mercury, and selenium** were not found in the groundwater under the SMR or JLM properties.
7. **The certainty of causation by SMR** is based upon the spatial pattern of the concentration of the metals, the number of metals having similar patterns, related physical characteristics, and identification of the source being the toxic metals soil contamination being the SMR property. The results of the analysis supports the certainty that the source of the contamination is not the JLM property.

RESULTS OF SURFACE SOIL METALS CONTAMINATION ANALYSIS

The surface soil concentration data for the metals: antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc were modeled. Contour plots were prepared for each of the metals (**Appendix 3**). Property boundary overlay transparencies are provided prior to the appendix sections. Three-dimensional plots were prepared with views from the southwest and northeast.

The surface soil **antimony** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across the Wright Street right-of-way and onto the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and westward and southward across the JLM property. Significant areas of JLM property show contamination of antimony that is due to migration from the SMR property.

The surface soil **arsenic** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has southward and southwestward across Wright Street and JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and southward onto the JLM property. Significant areas of JLM property show contamination of arsenic that is due to migration from the SMR property.

The surface soil **barium** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward and southwestward across Wright Street and JLM property. The plots also show a plume that has moved westward onto the Carroll Carolina property and the JLM property. Significant areas of JLM property show contamination of barium that is due to migration from the SMR property.

The surface soil **cadmium** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and onto the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and onto the JLM property. Significant areas of JLM property show contamination of cadmium that is due to migration from the SMR property.

The surface soil **chromium** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and onto the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and onto the JLM property. Significant areas of JLM property show contamination of chromium that is due to migration from the SMR property.

The surface soil **cobalt** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and onto the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and onto the JLM property. Significant areas of JLM property show contamination of cobalt that is due to migration from the SMR property.

The surface soil **copper** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and onto the JLM property. The plots show a second plume that has moved southwestward across Wright Street and onto the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and southward across the JLM property. Significant areas of JLM property show contamination of copper that is due to migration from the SMR property.

The surface soil **iron** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward and southwestward across Wright Street and across the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and across the JLM property. The vast majority of JLM property shows contamination of iron that is due to migration from the SMR property.

The surface soil **lead** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward and southwestward across Wright Street and across the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and across the JLM property. The vast majority of JLM property shows contamination of lead that is due to migration from the SMR property.

The surface soil **magnesium** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward and southwestward across Wright Street and across the JLM property. The plots also

show a plume that has moved westward across the Carroll Carolina property and onto the JLM property. A peak located on the Colonial property may be associated with migration from the SMR property. Significant areas of JLM property show contamination of magnesium that is due to migration from the SMR property.

The surface soil **manganese** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and across the JLM property. The plots also show a plume that has moved westward onto the Carroll Carolina property and onto the JLM property. Significant areas of JLM property show contamination of manganese that is due to migration from the SMR property.

The surface soil **mercury** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and onto the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and across the JLM property. Significant areas of JLM property show contamination of mercury that is due to migration from the SMR property.

The surface soil **nickel** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and onto the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and onto the JLM property. Significant areas of JLM property show contamination of nickel that is due to migration from the SMR property.

The surface soil **thallium** concentration data plots illustrate higher concentrations on the SMR property and the Colonial property. The plots show a plume that has moved from the SMR property and southward across Wright Street and onto the JLM property. The plots also show a plume that has moved from the SMR property and westward across the Carroll Carolina property and onto the JLM property. A third plume is shown that has moved from the Colonial property and northward across the JLM property in the southwest portion of the JLM property. Significant areas of JLM property show contamination of thallium that is due to migration from the SMR property.

The surface soil **vanadium** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and onto the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and across the JLM property.

Significant areas of JLM property show contamination of vanadium that is due to migration from the SMR property.

The surface soil **zinc** concentration data plots illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and onto the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and across the JLM property. Significant areas of JLM property show contamination of zinc that is due to migration from the SMR property.

The surface soil total metals concentration data plots **(Appendix 4)** illustrate higher concentrations on the SMR property. The plots show a plume that has moved southward across Wright Street and across the JLM property. The plots also show a plume that has moved westward across the Carroll Carolina property and across the JLM property. The vast majority of JLM property shows contamination of surface total metals that is due to migration from the SMR property. Only the southwest portion of the JLM property and around the SA-14, 28, and 29 sample locations may not be due to contamination from the SMR property.

The following findings of fact are provided to summarize the analysis of the surface soil metals data:

1. **Sixteen of the eighteen metals** found in the surface soils on the JLM property, the proximate cause is due to migration of these metals from SMR property. These metals are **antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, thallium, vanadium, and zinc.** The certainty of causation by SMR is based upon the spatial pattern of the concentration of these metals, the number of metals having similar patterns, and that the highest concentration being located on the SMR property. The results of the analysis support the certainty that the proximate source of the contamination is not the JLM property.
2. **Two of the eighteen metals, selenium and silver,** found in the surface soils on the JLM property were located at only one location and this was insufficient data to produce a concentration plot map. Therefore, it could not be determined from the concentration plot maps whether these metals were due to contamination from SMR property.
3. **The surface total metals** plots show that the contamination has affected the **vast majority of the JLM property** and that its proximate cause is the SMR property.

property. The **barium, iron, lead, magnesium, thallium,** and **vanadium** plots show significant contamination well below the water table of the JLM property. The **antimony, selenium,** and **silver** plots show limited or no contamination under the JLM property.

The **barium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, thallium, vanadium,** and **zinc** plots indicate concentrations and lateral movement well below the water table.

Summary of Findings –

The cross section analysis of soil metal contamination provides the following summary findings of fact:

1. The **antimony, barium, chromium, copper, iron, lead, magnesium, manganese, and zinc** plots show significant deep contamination under the SMR and Wright Street properties.
2. The **arsenic, cadmium, mercury, nickel, selenium, silver, thallium, and vanadium** plots show less concentrated deep contamination under the SMR and Wright Street properties.
3. The **antimony, barium, chromium, copper, iron, lead, magnesium, manganese, thallium, vanadium, and zinc** plots show significant contamination well below the water table of the JLM property.
4. The **arsenic, cadmium, cobalt, mercury, nickel, and selenium** plots show limited concentration below the water table of the JLM property.
5. The **barium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, thallium, vanadium, and zinc** plots indicate concentrations and lateral movement well below the water table. Therefore, it is probable that many of these soil metal contaminants extend below sea level.

SUMMARY OF FINDINGS

The modeling of the metals data has been used to determine the extent of the soils and groundwater contamination on the SMR and JLM properties and the Front Street and Wright Street right-of-ways. The modeling has also been used to determine the source of the metals contamination in the soils and groundwater. In addition, the modeling has been used to calculate the volume of hazardous and non-hazardous soil material on the SMR and JLM properties and the Front Street and Wright Street right-of-ways.

The modeling of the groundwater metals concentration data was used to determine the following findings of fact:

1. **Total metals, iron, magnesium, manganese, and zinc** plumes have spread across the vast majority of the JLM property and the proximate cause is due to contamination from the SMR property. The contamination coming from the SMR property is so significant that **iron and manganese** concentrations above the NC groundwater standards exist across the vast majority of the JLM property.
2. **Arsenic, barium, cobalt, copper, lead, nickel, and vanadium** plumes have spread across significant portions of the JLM property and the proximate cause is due to contamination from the SMR property. The contamination coming from the SMR property is so significant that **arsenic, lead, and nickel** concentrations above the NC groundwater standards exist across significant portions of the JLM property.
3. **Antimony and chromium** plumes have spread across limited portions of the JLM property and the proximate cause is due to contamination from the SMR property. The contamination coming from the SMR property is so significant that **chromium** concentrations above the NC groundwater standard exist across portion of the JLM property.
4. **Silver and thallium** plumes have spread across significant portions of the JLM property and the proximate cause may be due to contamination from the SMR property, based upon findings of the soil contamination. No **silver or thallium** was found in the groundwater under the SMR property.
5. **Total metals, arsenic, barium, cobalt, copper, iron, lead, magnesium, manganese, nickel, and zinc** plumes have spread across the JLM property and their patterns indicate that the probable spread along the old buried valley under the SMR and JLM properties.

6. **Cadmium, mercury, and selenium** were not found in the groundwater under the SMR or JLM properties.
7. **The certainty of causation by SMR** is based upon the spatial pattern of the concentration of the metals, the number of metals having similar patterns, related physical characteristics, and identification of the source being the toxic metals soil contamination being the SMR property. The results of the analysis support the certainty that the source of the contamination is not the JLM property.

The modeling of the RCRA TCLP soil lead concentration data was used to determine the following findings of fact:

8. Two layers of **toxic hazardous lead waste** exist across the SMR property. The upper layer occurs in the 0 to 2-foot depth and exists across the majority of the SMR property. The estimated volume of toxic hazardous lead waste on the SMR property is 7,587-CY.
9. Two layers of **toxic hazardous lead waste** probably exist across the adjacent Front Street right-of-way. The estimated volume of toxic hazardous lead waste on the Front Street right-of-way is 2,271-CY.
10. One layer of **toxic hazardous lead waste** exists across the adjacent Wright Street right-of-way at the 0 to 2-foot depth and exists across the entirety of this property. The estimated volume of toxic hazardous lead waste in the Wright Street right-of-way is 1,927-CY.
11. One layer of **toxic hazardous lead waste** may exist on limited portions of the JLM property in the 0 to 2-foot depth. The estimated volume of toxic hazardous lead waste on the JLM property is 1,915-CY.
12. The proximate source of **toxic hazardous lead waste** on the Front Street, Wright Street, and JLM properties is the SMR property. The proximate source is not the JLM property.

The modeling of the surface soil metals concentration data was used to determine the following findings of fact:

13. **Sixteen of the eighteen metals** found in the surface soils on the JLM property, the proximate cause is due to migration of these metals from SMR property. These metals are **antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury,**

nickel, thallium, vanadium, and zinc. The certainty of causation by SMR is based upon the spatial pattern of the concentration of these metals, the number of metals having similar patterns, and that the highest concentration being located on the SMR property. The results of the analysis support the certainty that the proximate source of the contamination is not the JLM property.

14. **Two of the eighteen metals, selenium and silver,** found in the surface soils on the JLM property were located at only one location and this was insufficient data to produce a concentration plot map. Therefore, it could not be determined from the concentration plot maps whether these metals were due to contamination from SMR property.
15. **The surface total metals** plots show that the contamination has affected the **vast majority of the JLM property** and that its proximate cause is the SMR property.

The modeling of the soil total metals concentration data was used to determine the following finding of fact:

16. The **analysis of the totals metals** concentration modeling indicates that the vast majority of the JLM property has contamination of metals at the following depths: surface, 1 to 2-foot depth, 2 to 3-foot depth, 4 to 5-foot depth, 6 to 7-foot depth, and water table depth, and that the contamination is due to migration of metals contamination from the SMR property.
17. The **analysis of the totals metals** concentration modeling indicates that the certainty of causation by SMR is based upon the spatial pattern of the concentration of these metals and that the highest concentration is located on the SMR property. The results of the analysis support the certainty that the proximate source of the contamination is not the JLM property.

The modeling of the soil depth metals concentration data was used to determine the following findings of fact:

18. Significant areas of the JLM property has been contaminated with **barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, thallium, vanadium, and zinc** at various depths below the surface and the proximate cause of this contamination is due to migration from the SMR property.

19. Limited area of the JLM property has been contaminated with **antimony, arsenic, and selenium** at various depths below the surface and the proximate cause of this contamination is due to migration from the SMR property.
20. The **certainty of the proximate cause** of the above metals coming from the SMR property is based upon the spatial horizontal and vertical pattern of the metals concentrations, the number of metals having similar spatial patterns, and that the highest concentration of these metals are located on the SMR, rather than the JLM property. The results of the analysis supports that the proximate cause of the above metals contamination is not due to the current and prior operations and uses on the JLM property.

The calculation of the volume of non-hazardous toxic metals contaminated soil material provides the following findings of fact:

21. The volume of non-hazardous toxic metals contaminated soil material on the SMR property is **229,808-CY.**
22. The volume of non-hazardous toxic metals contaminated soil material on the JLM property is **723,239-CY.**
23. The volume of non-hazardous toxic metals contaminated soil material on the Front Street right-of-way property is **85,686-CY.**
24. The volume of non-hazardous toxic metals contaminated soil material on the Wright Street right-of-way property is **39,023-CY.**

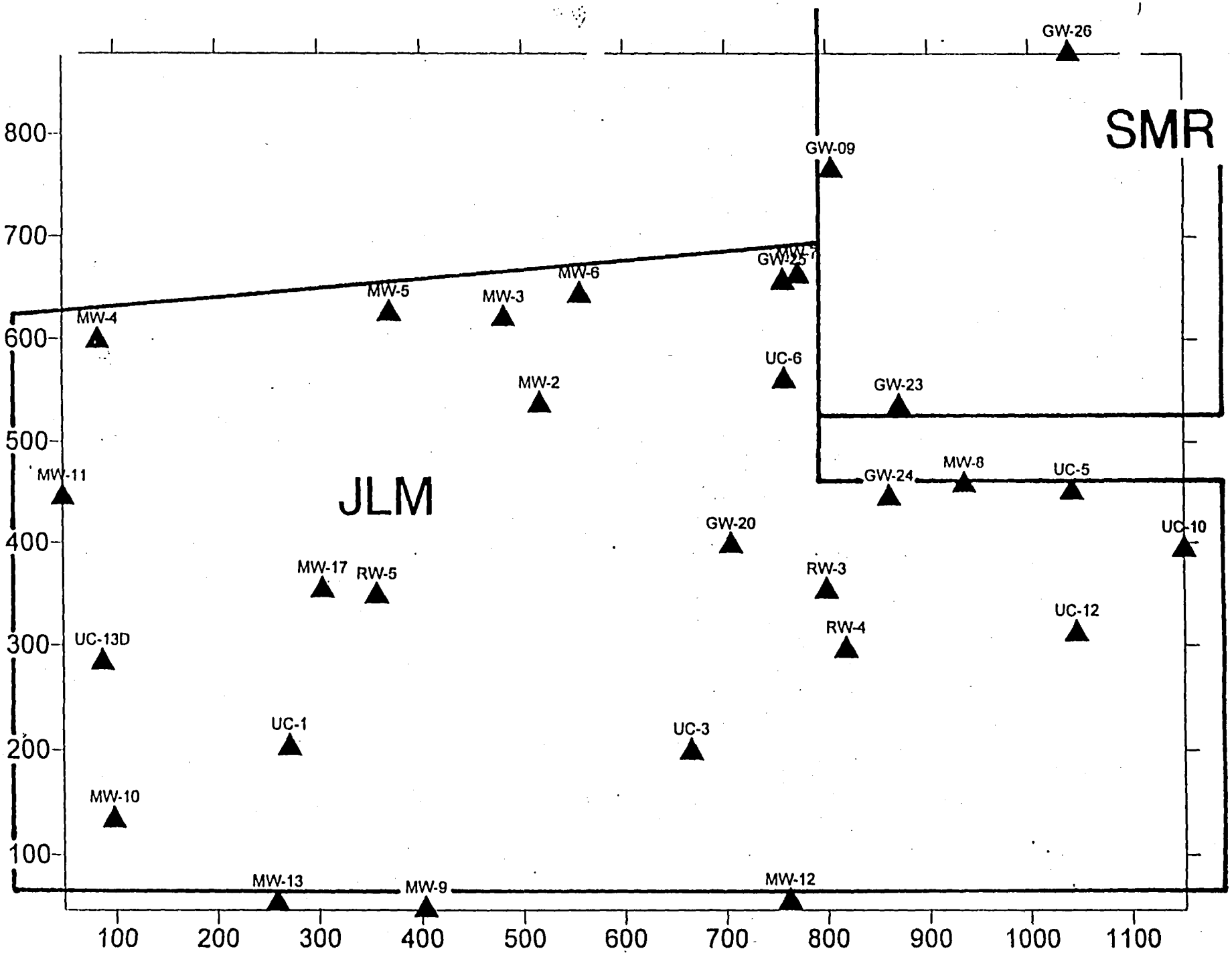
The modeling of the cross sectional metals concentration data was used to determine the following findings of fact:

25. The **antimony, barium, chromium, copper, iron, lead, magnesium, manganese, and zinc** plots show significant deep contamination under the SMR and Front Street properties.
26. The **arsenic, cadmium, mercury, nickel, selenium, silver, thallium, and vanadium** plots show less concentrated deep contamination under the SMR and Wright Street properties.
27. The **antimony, barium, chromium, copper, iron, lead, magnesium, manganese, thallium, vanadium, and zinc** plots show significant contamination well below the water table of the JLM property.
28. The **arsenic, cadmium, cobalt, mercury, nickel, and selenium** plots show limited concentration below the water table of the JLM property.

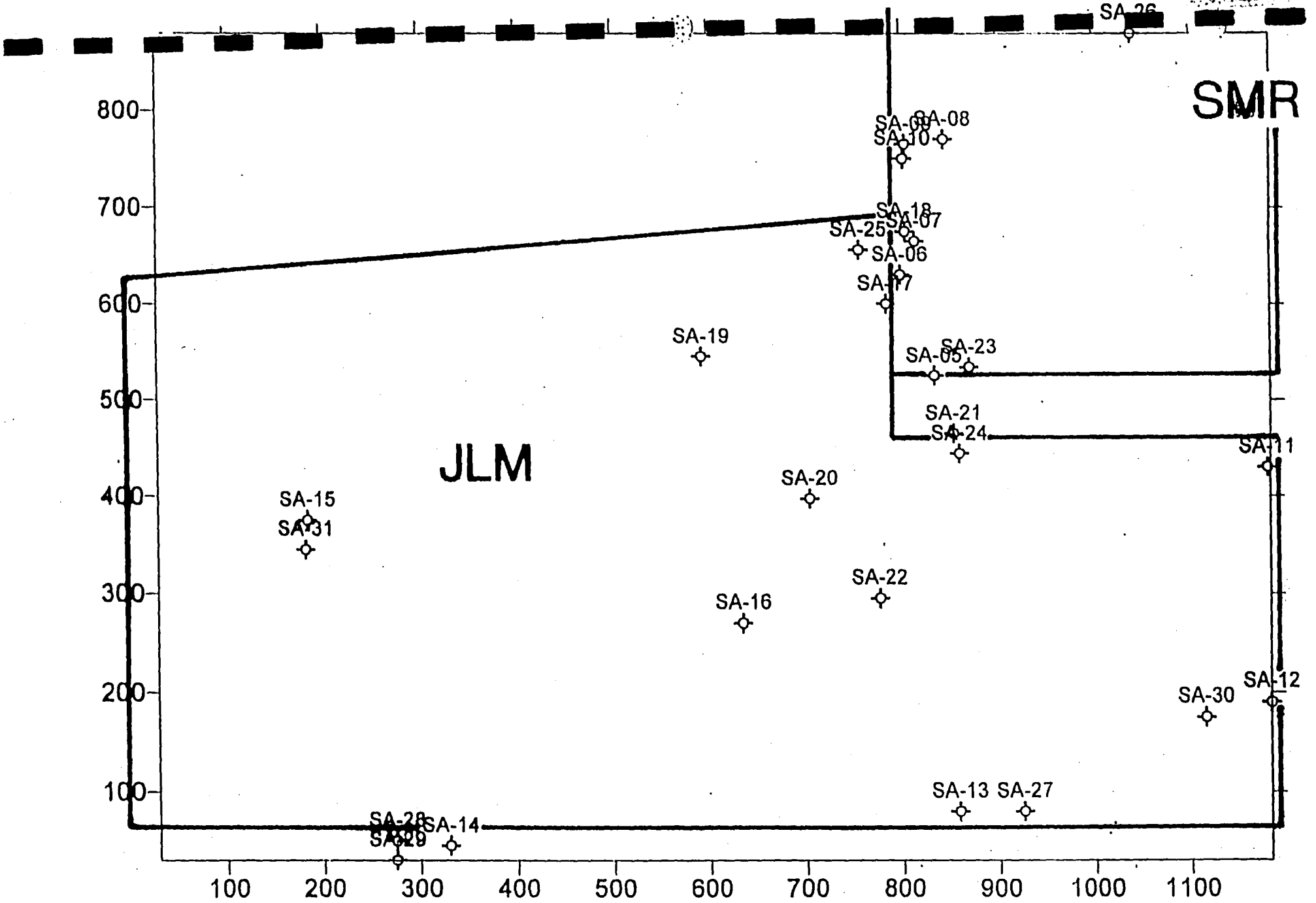
29. The **barium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, thallium, vanadium, and zinc** plots indicate concentrations and lateral movement well below the water table. Therefore, it is probable that many of these soil metal contaminants extend below sea level.

The following overall findings of facts are based upon the analysis of facts:

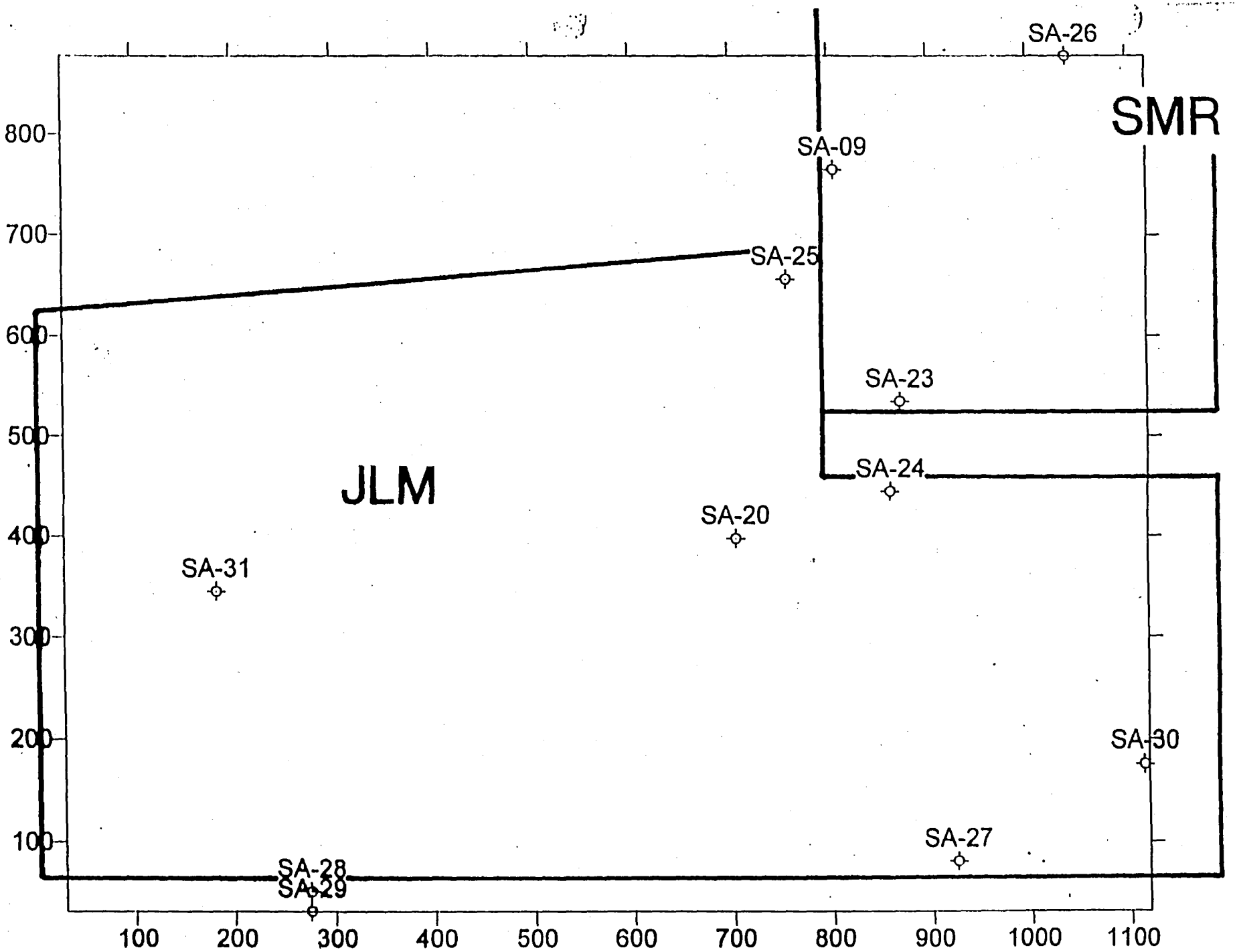
30. The toxic hazardous metals waste and non-hazardous metals waste on the SMR property is a continuing source of contamination of the JLM property and it's groundwaters. **The metals contamination poses a significant and real continuing toxic hazard and threat to the public health, property, and environs along the Cape Fear River.**
31. **The groundwater and soils contamination has spread from the SMR property across and under the JLM property and down to the Cape Fear River.** Groundwater, surface water, and soil samples have not been taken in the portions of the JLM property that is submerged by the Cape Fear River. Although it is likely that the groundwater, surface water, and soils have metals contamination in the submerged portions of the JLM property, no determinations regarding the submerged lands is included in this report.



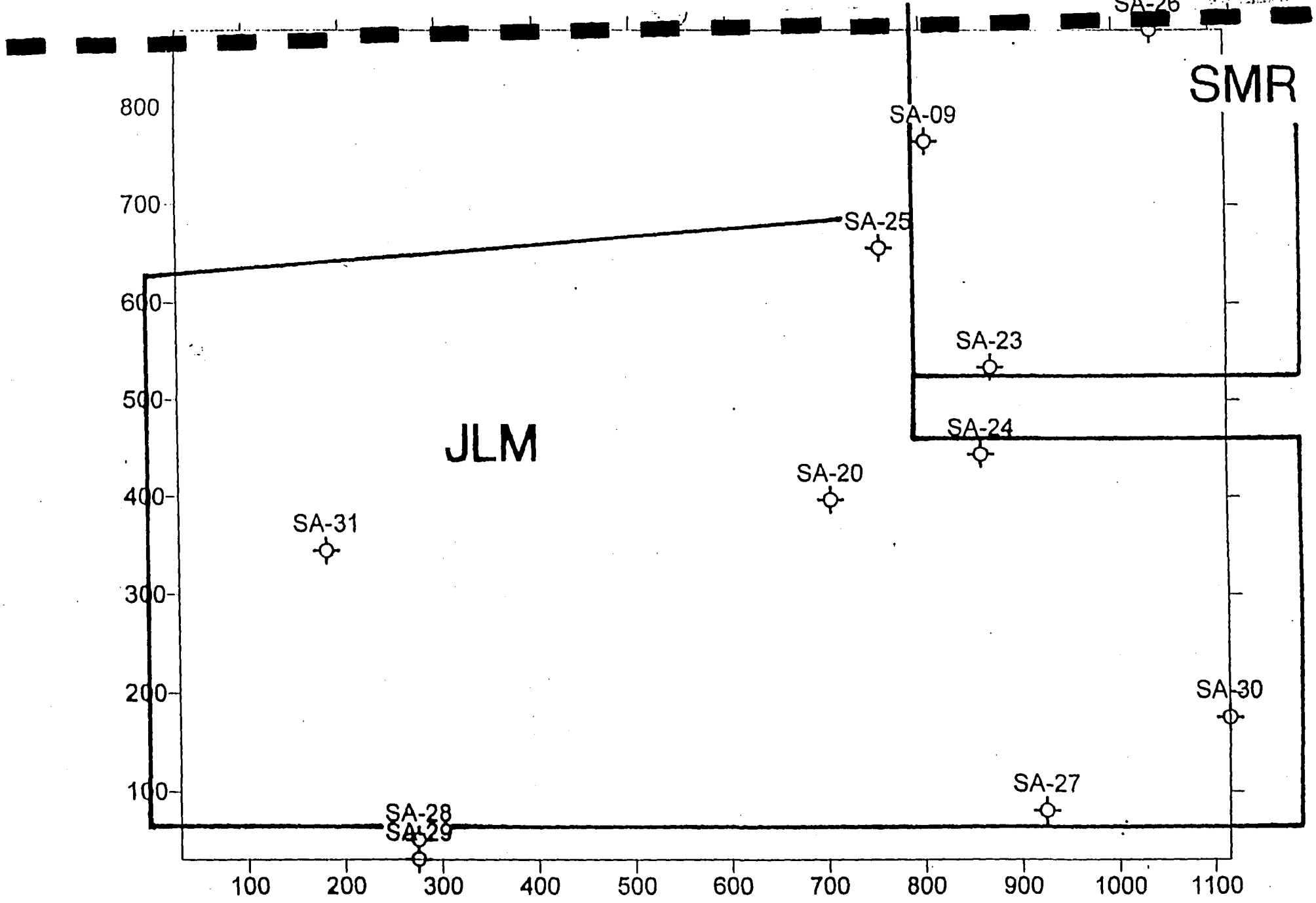
Groundwater Well Locations



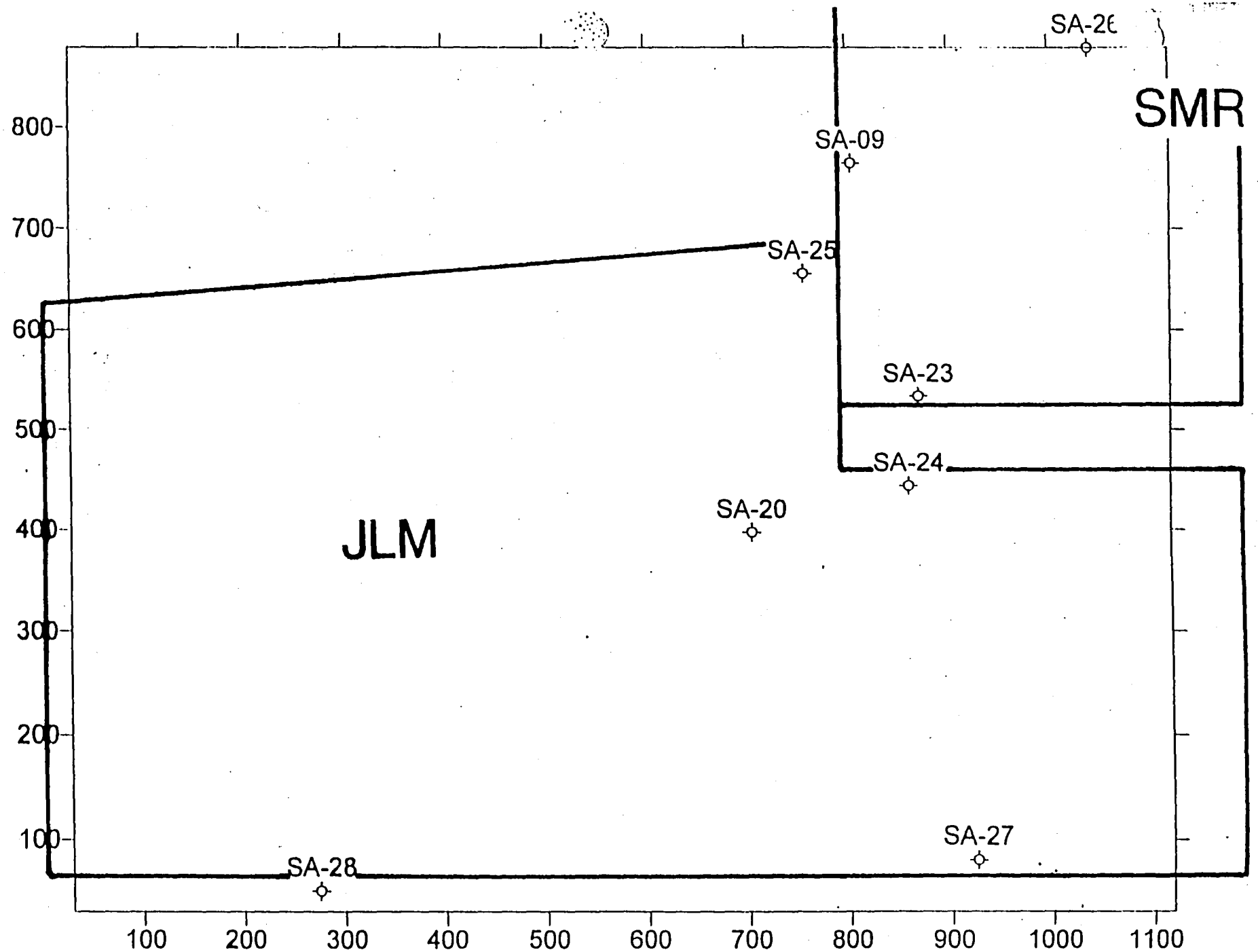
Surface Soil Metals Sampling Locations



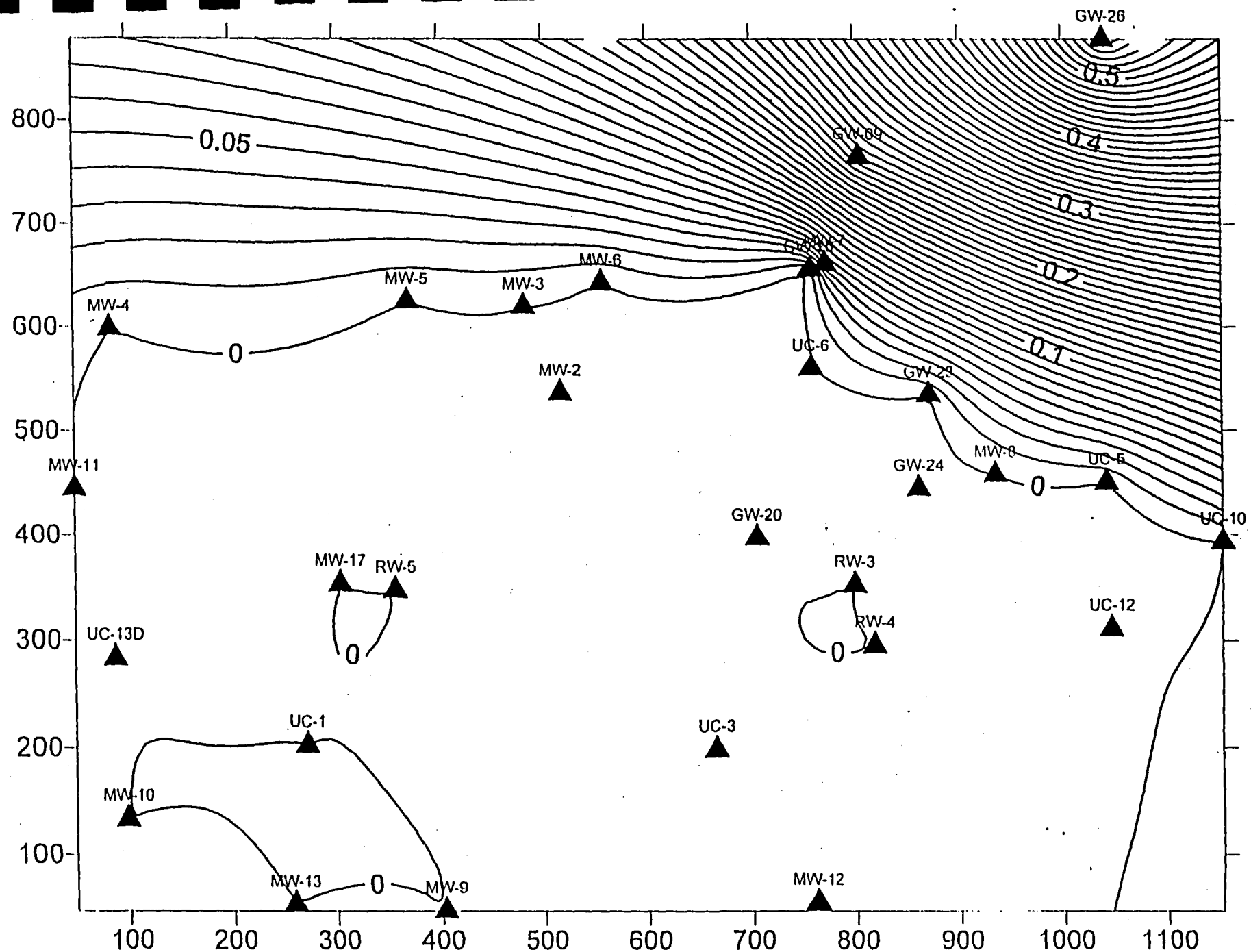
RCRA TCLP Soil Boring Locations



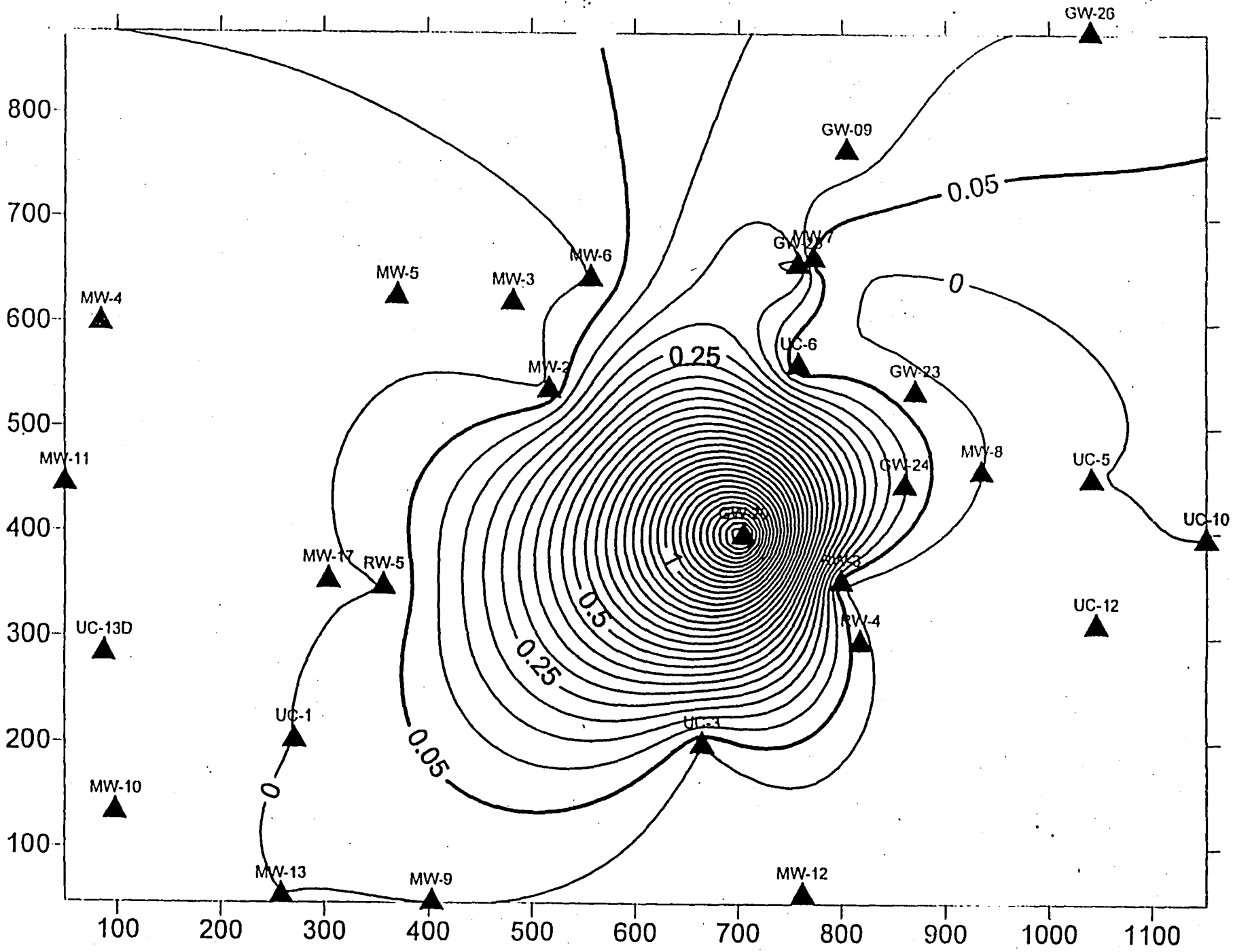
0-1 Foot, Soil Boring Locations



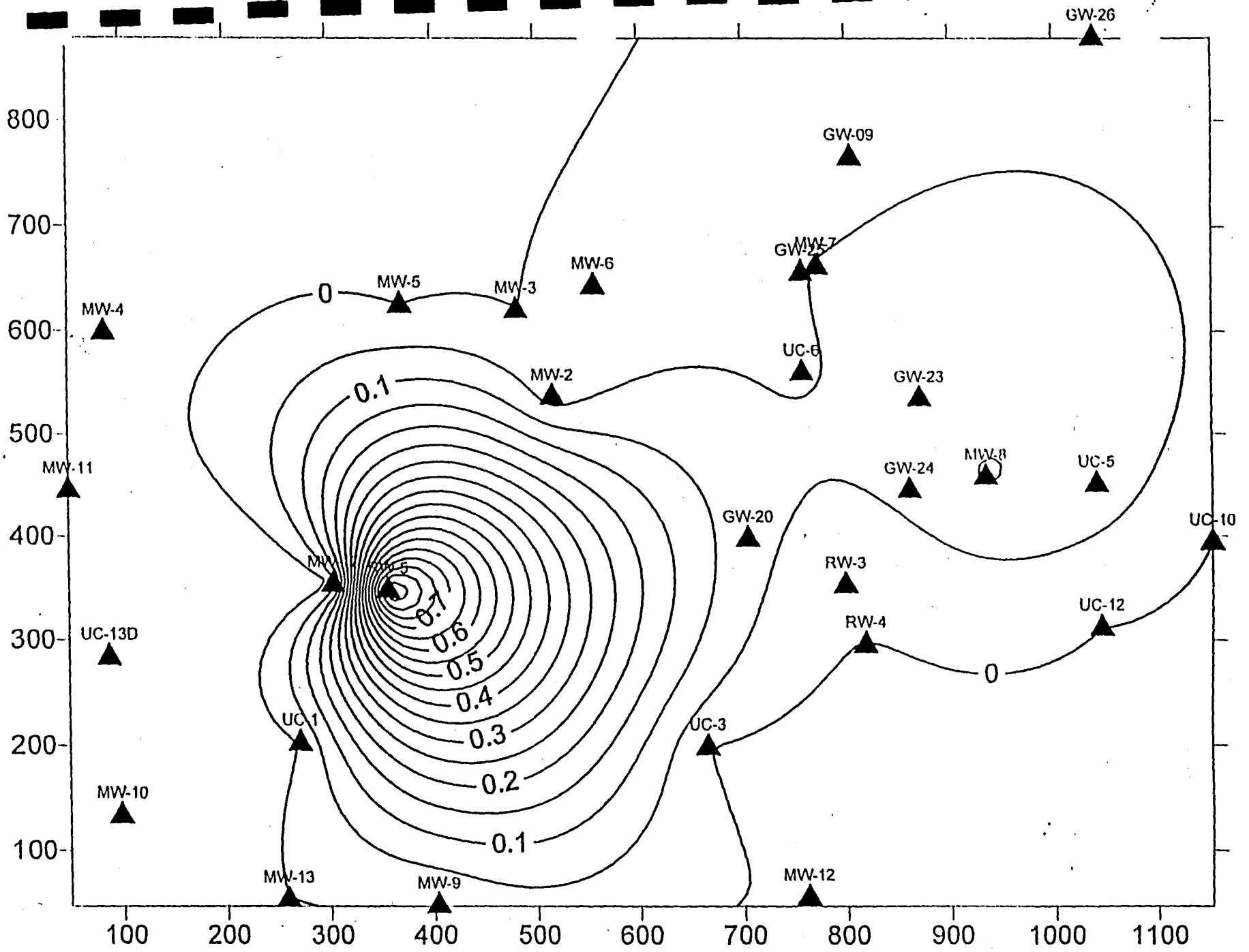
1-3 Feet, Soil Boring Locations



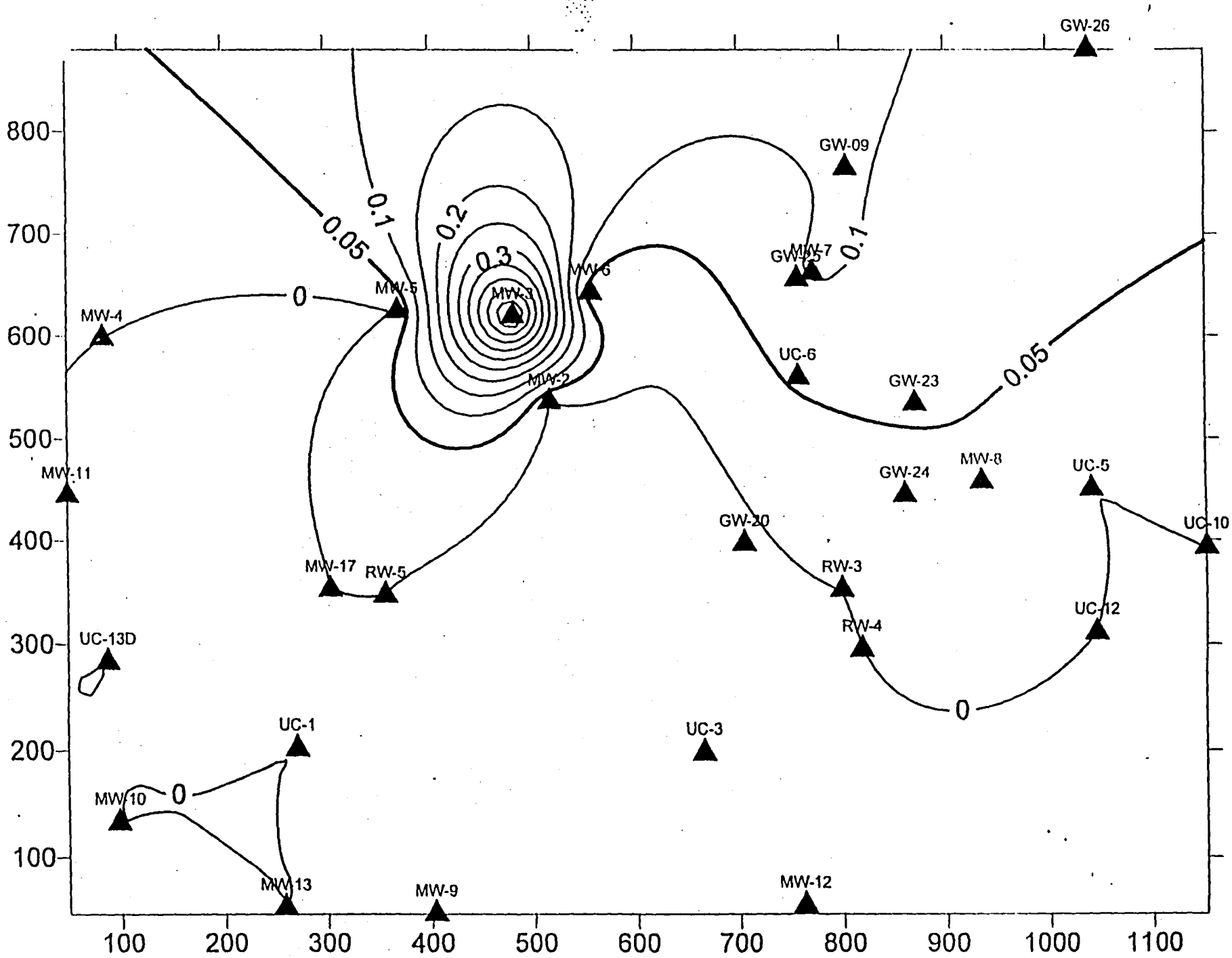
Groundwater Antimony Concentration, mg/l



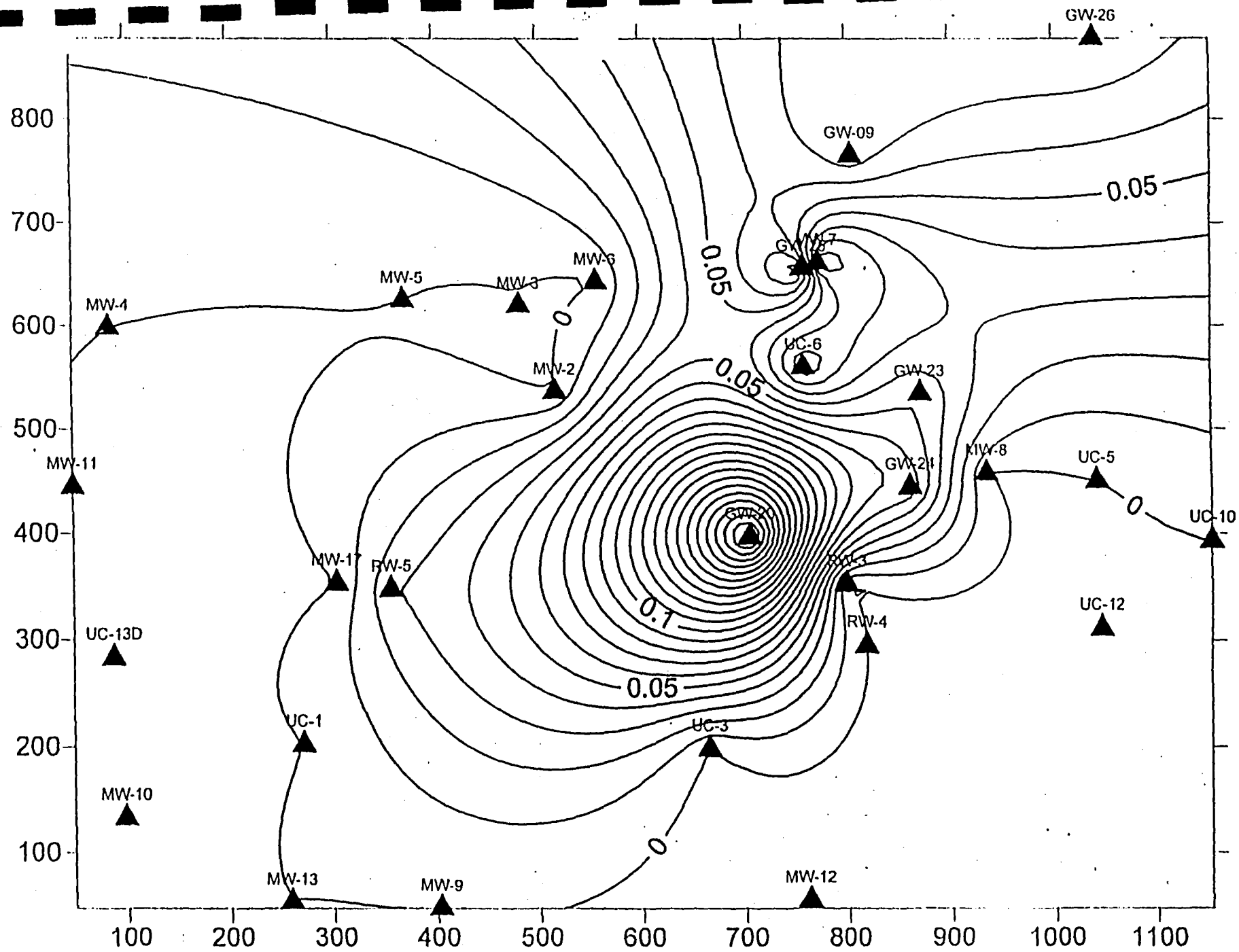
Groundwater Arsenic Concentration, mg/L



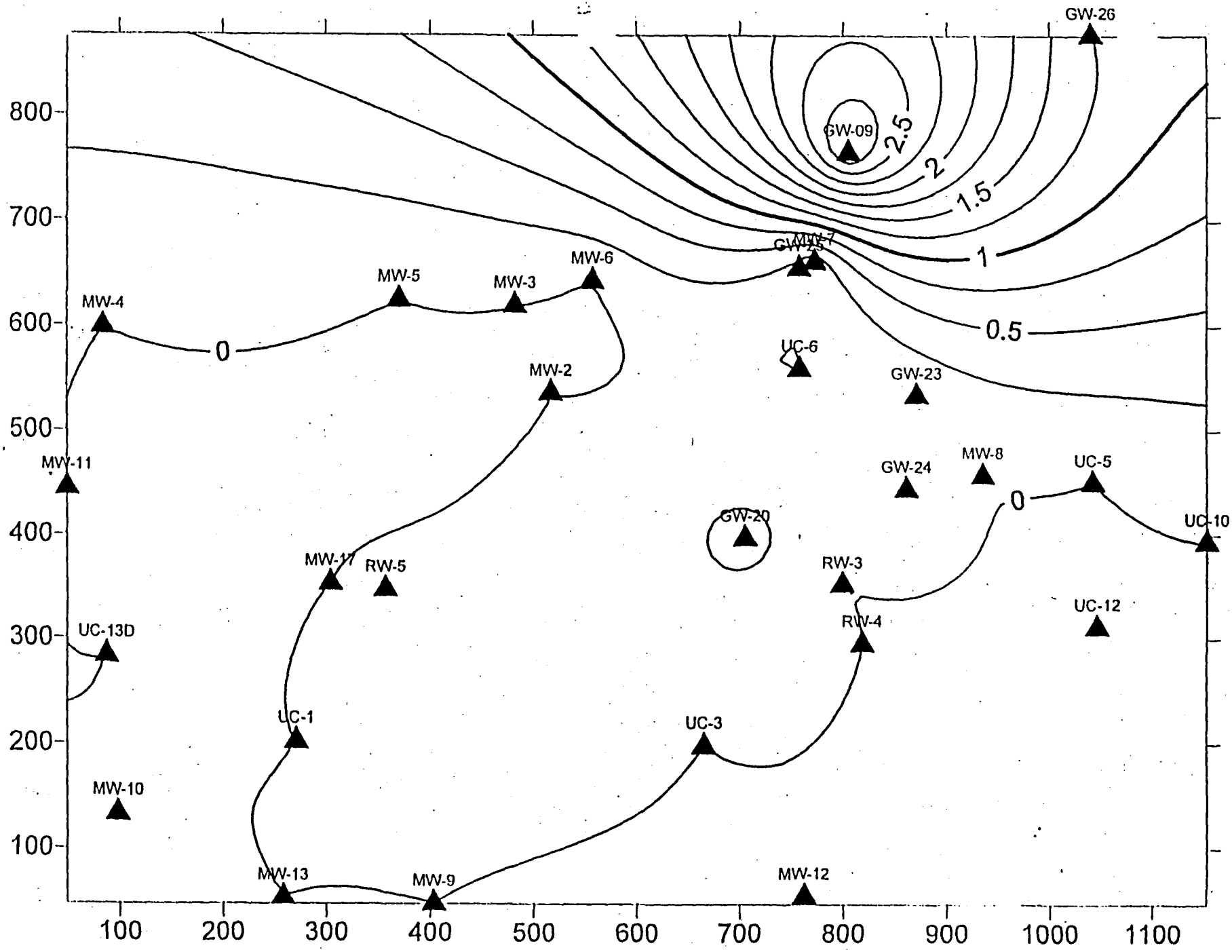
Groundwater Barium Concentration, mg/l



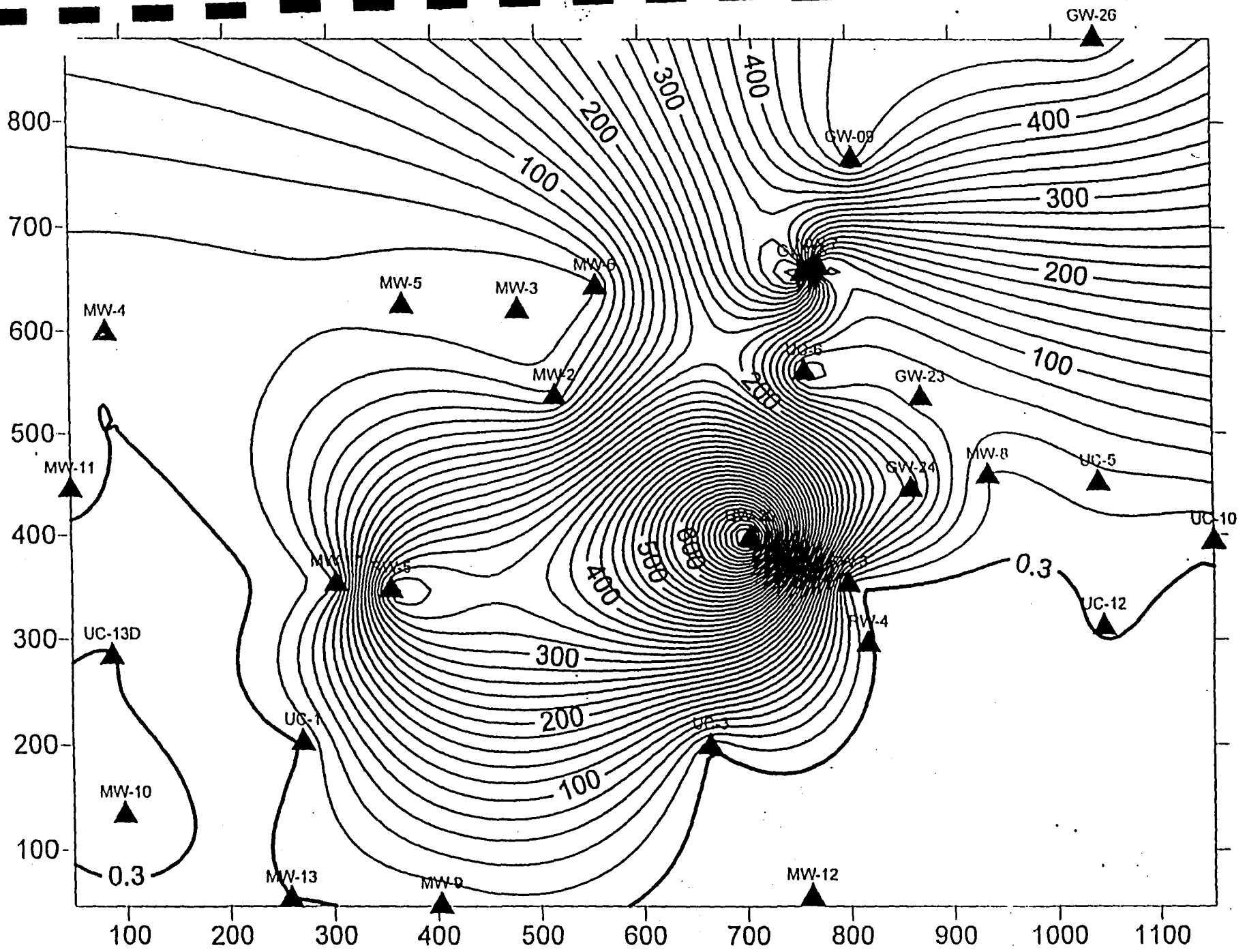
Groundwater Chromium Concentration mg/l



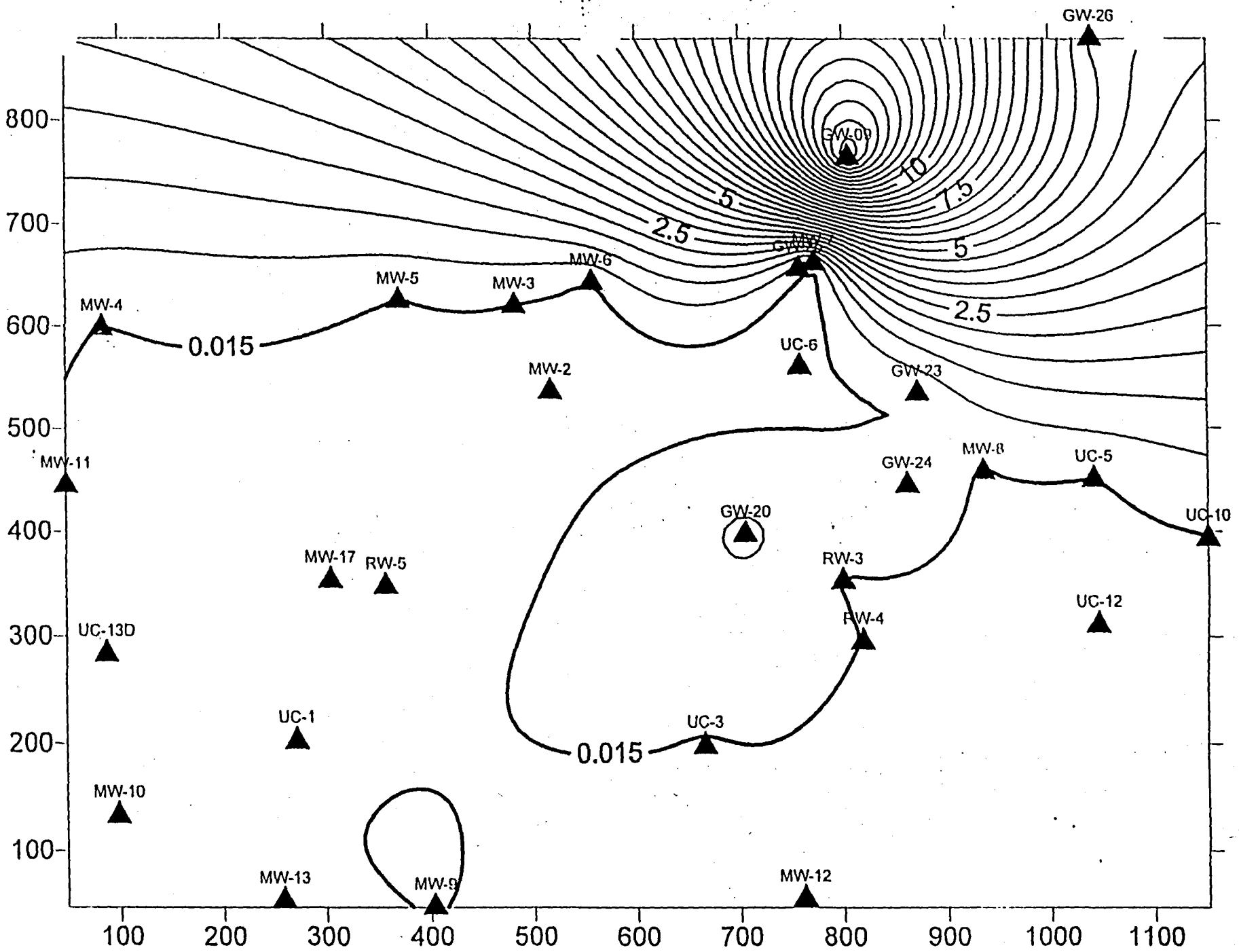
Groundwater Cobalt Concentrations, mg/l



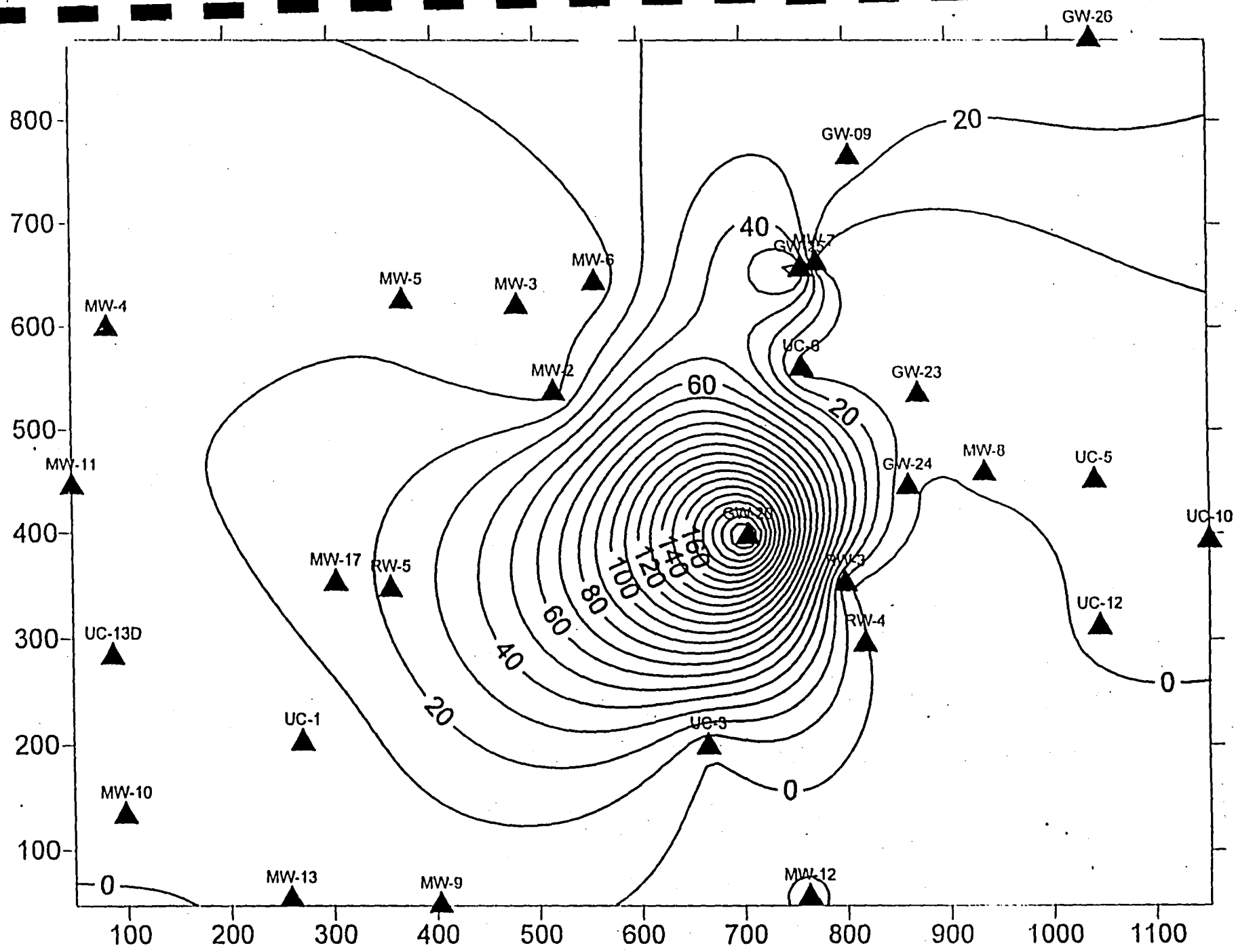
Groundwater Copper Concentrations, mg/l



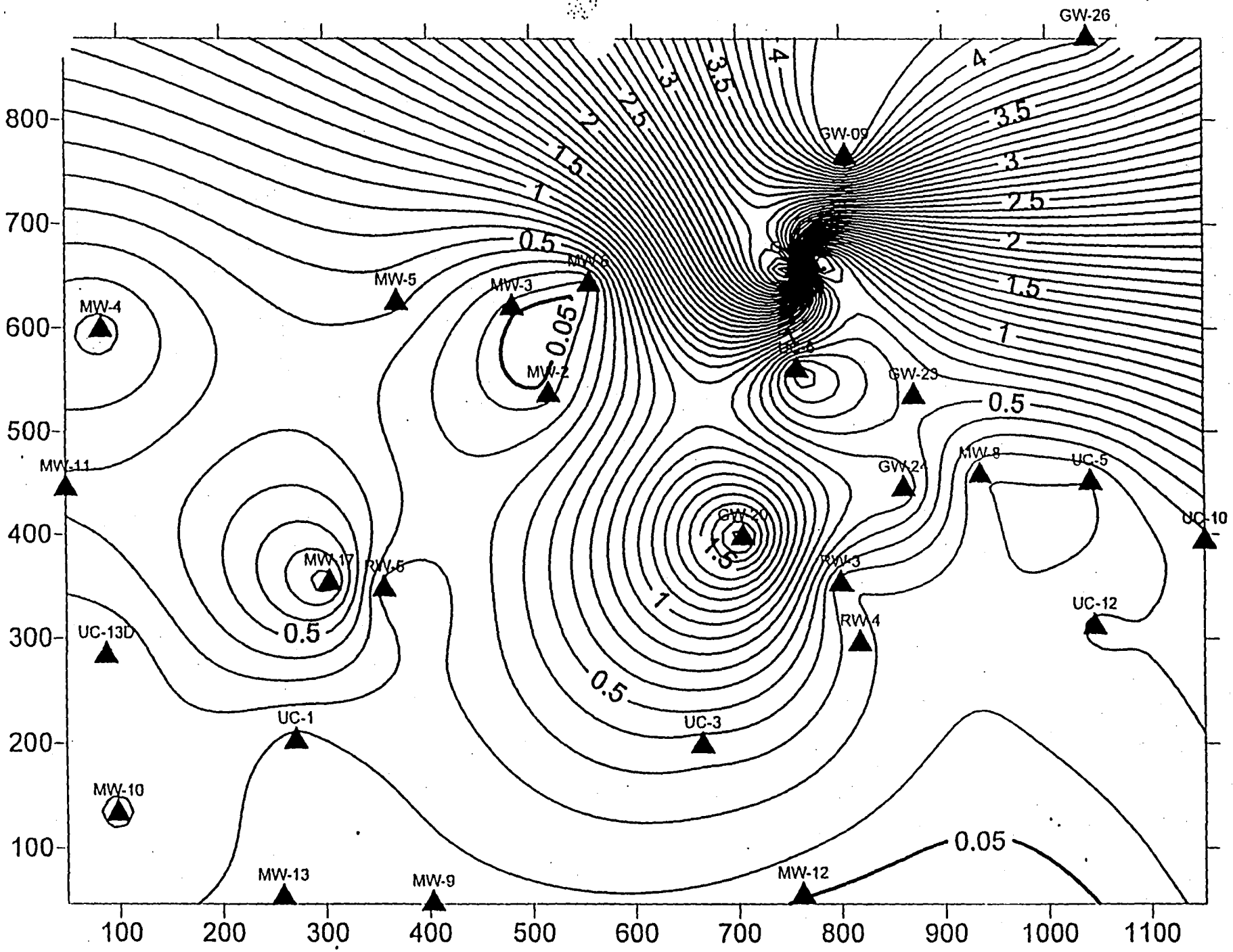
Groundwater Iron Concentration, mg/l



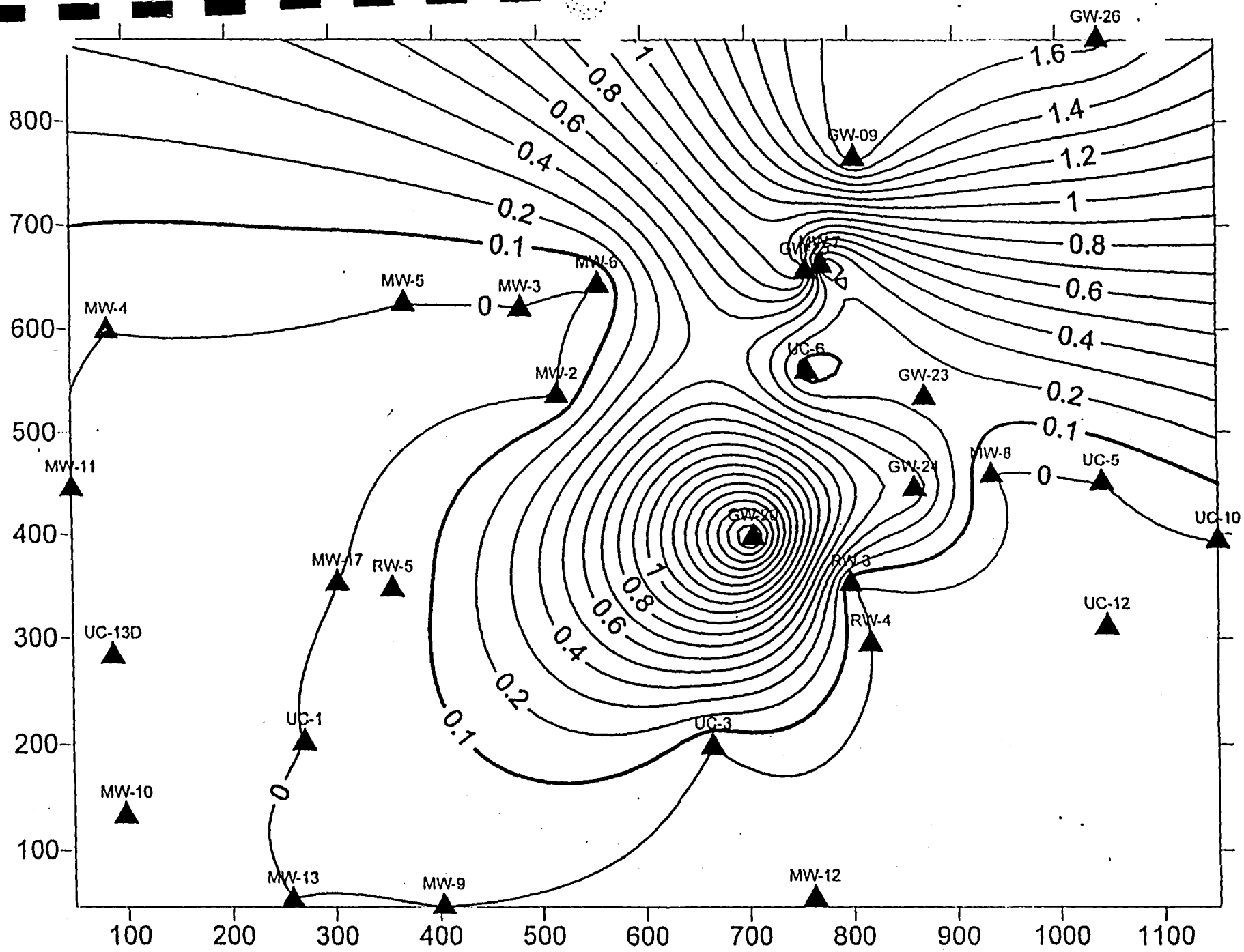
Groundwater Lead Concentration mg/l



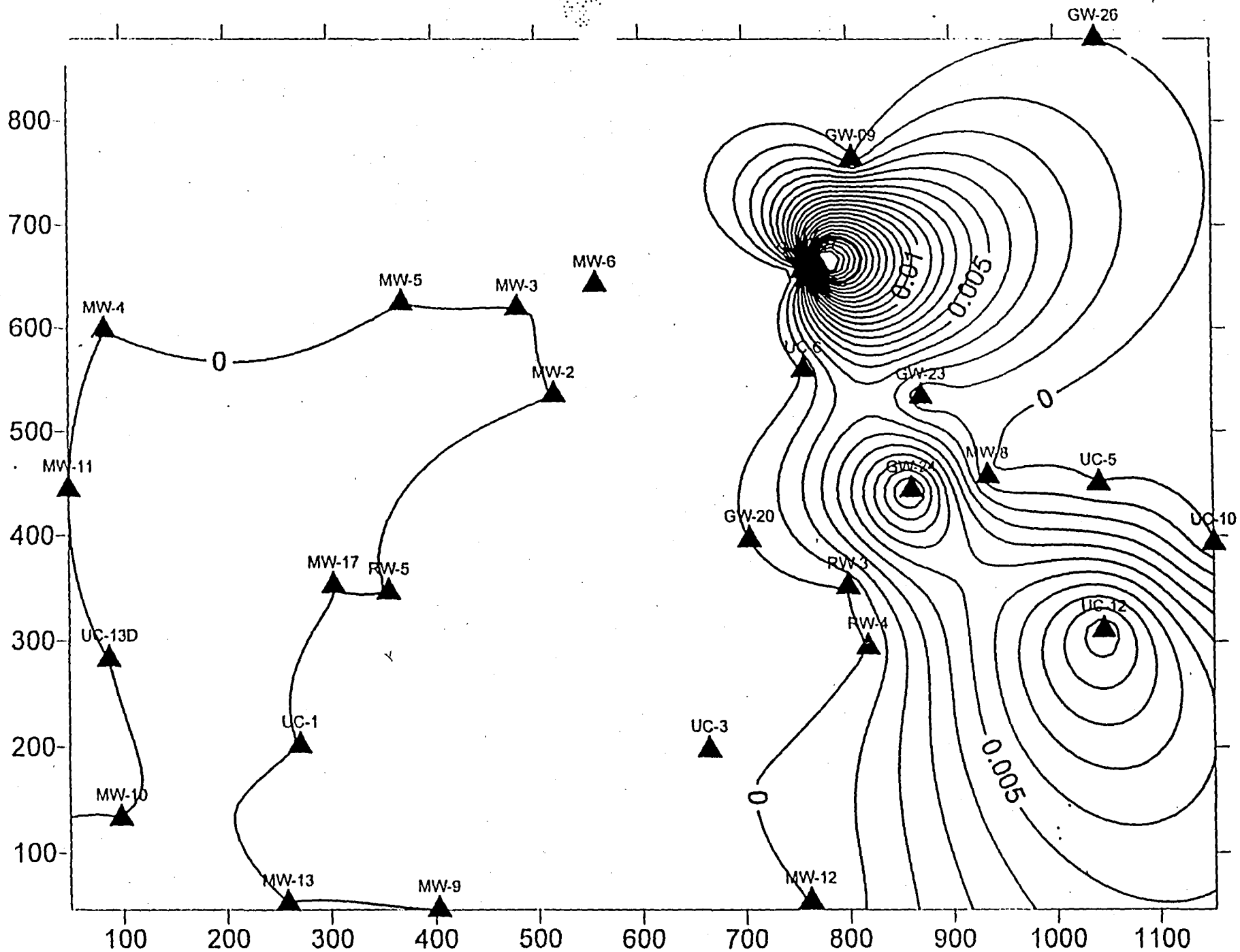
Groundwater Magnesium Concentration, mg/l



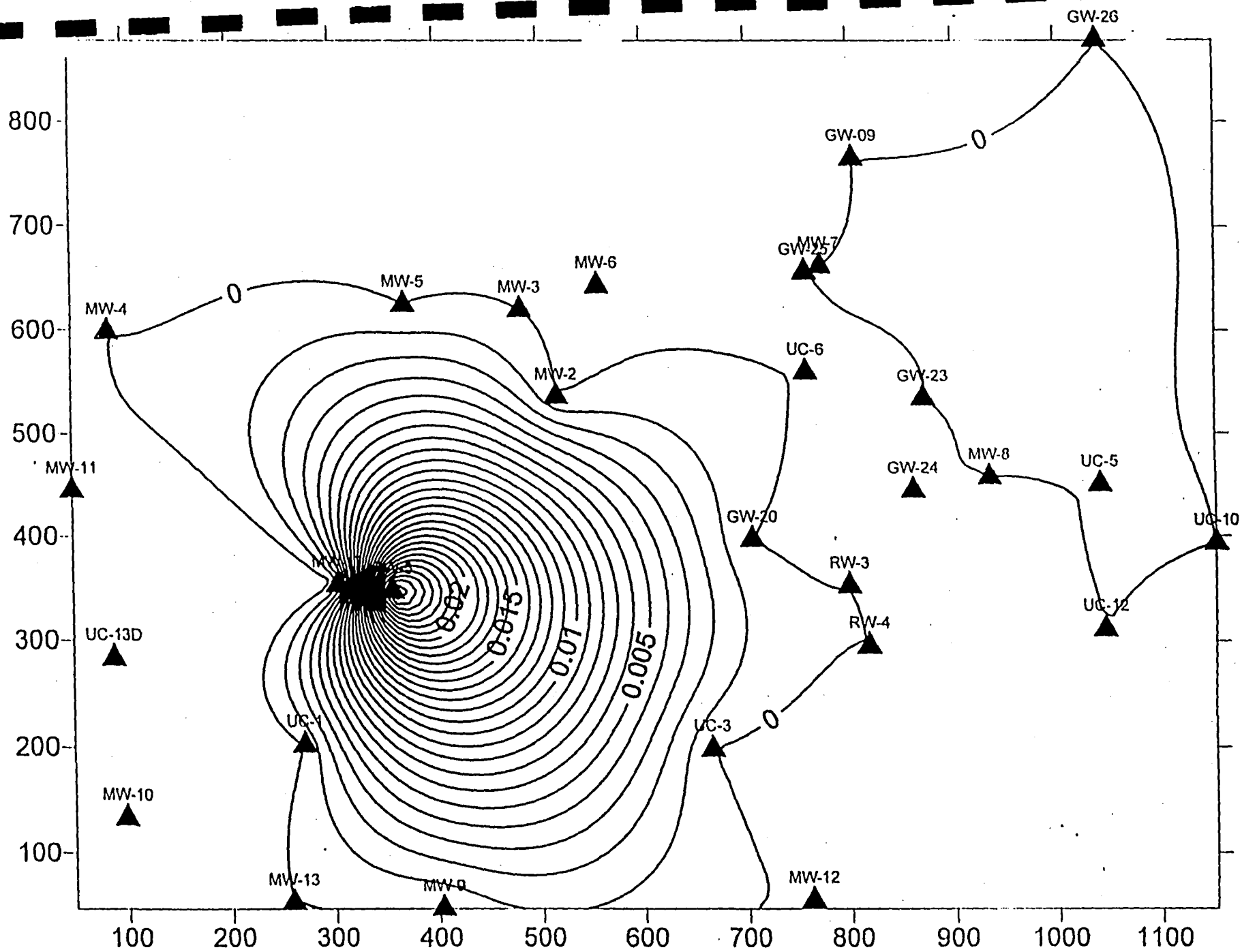
Groundwater Manganese Concentration mg/l



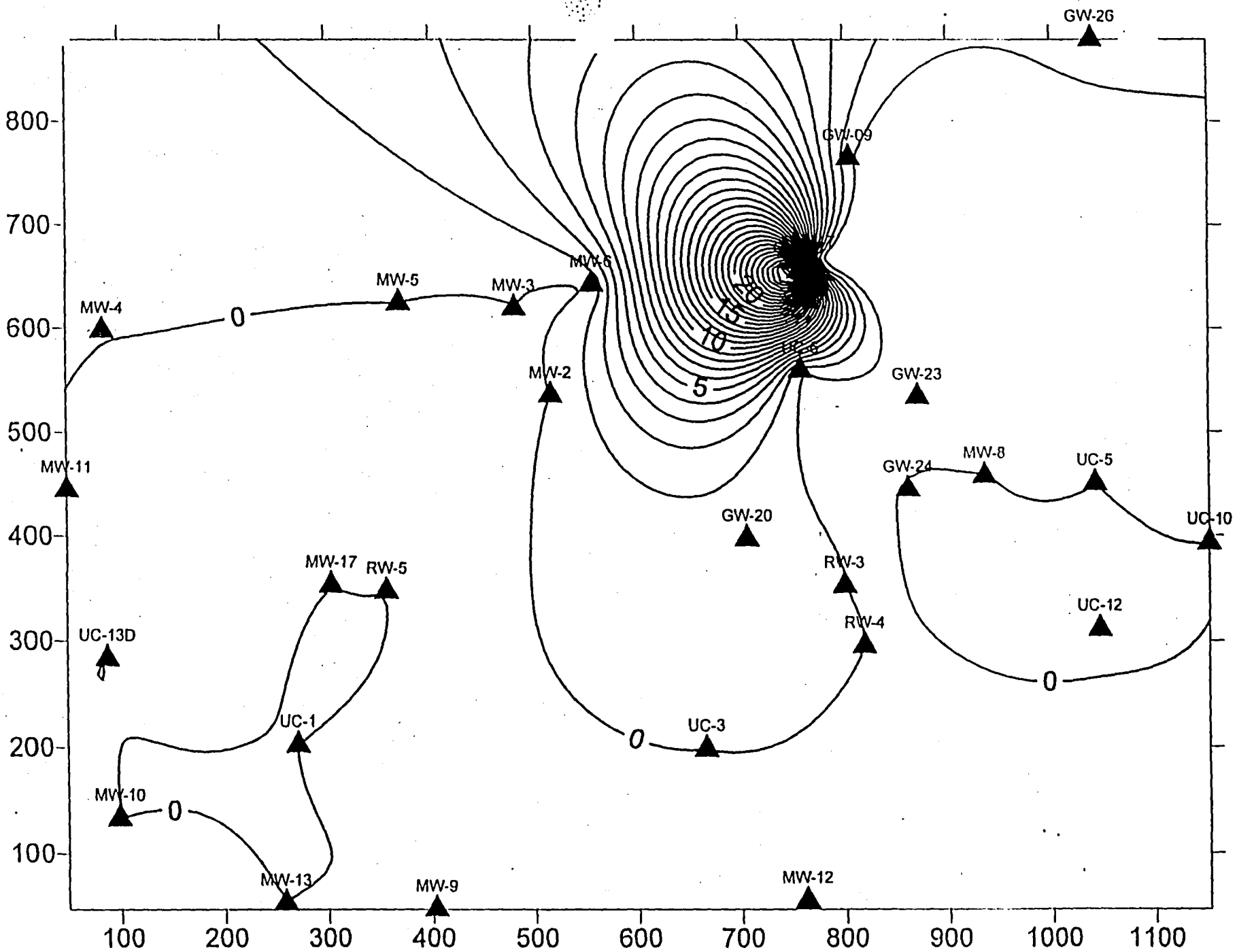
Groundwater Nickel Concentration, mg/l



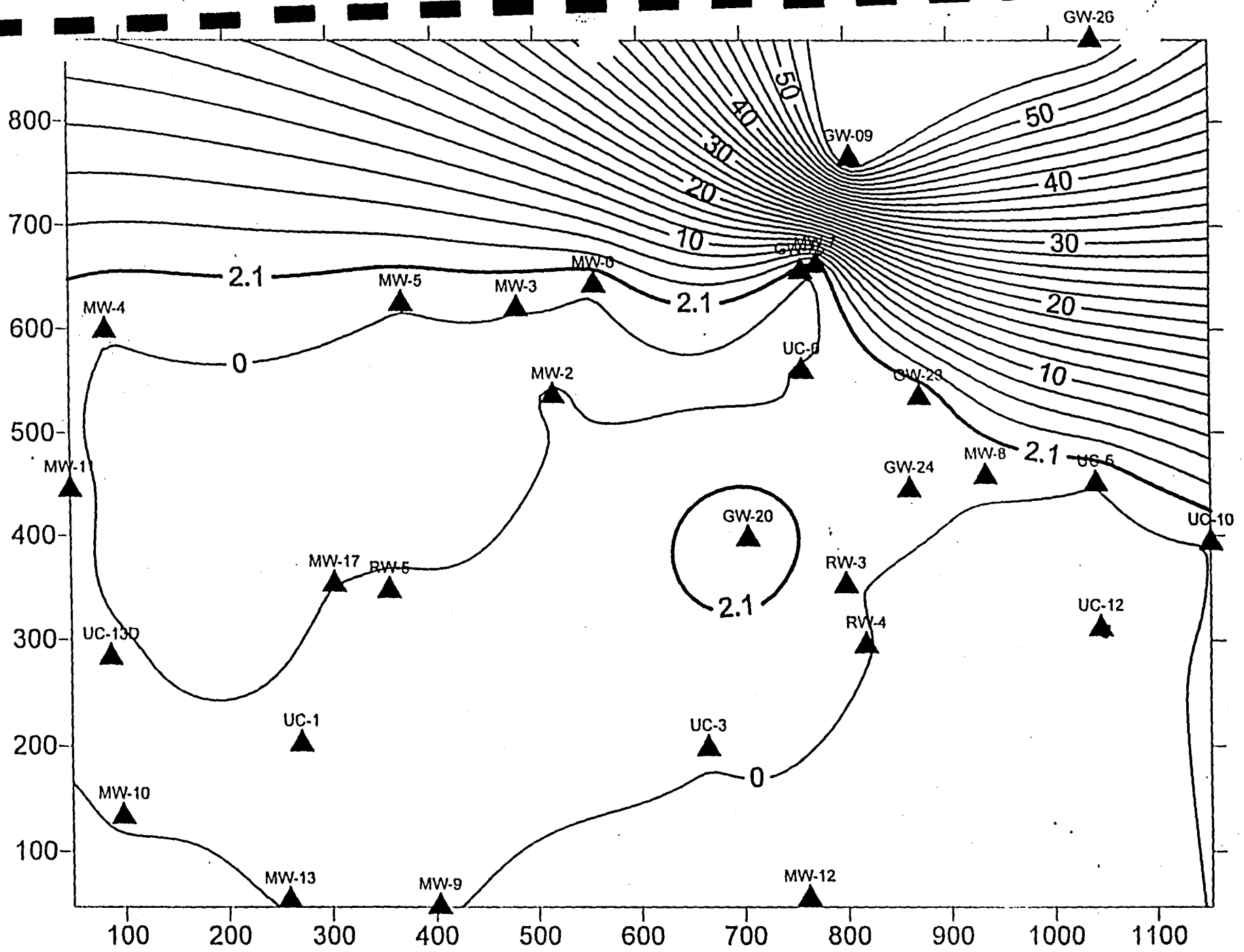
Groundwater Silver Concentration, mg/l



Groundwater Thallium Concentration, mg/l

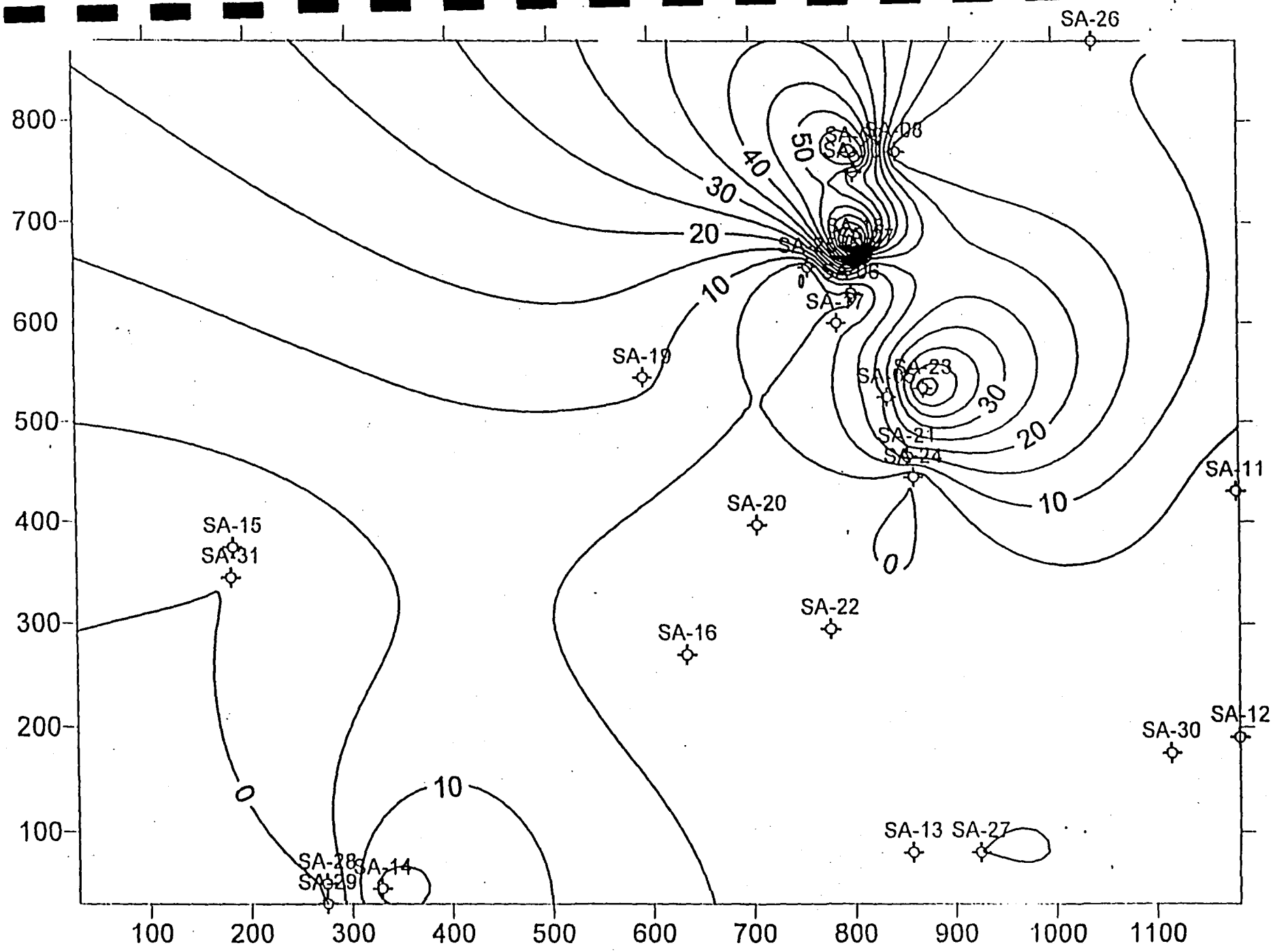


Groundwater Vanadium Concentration mg/l

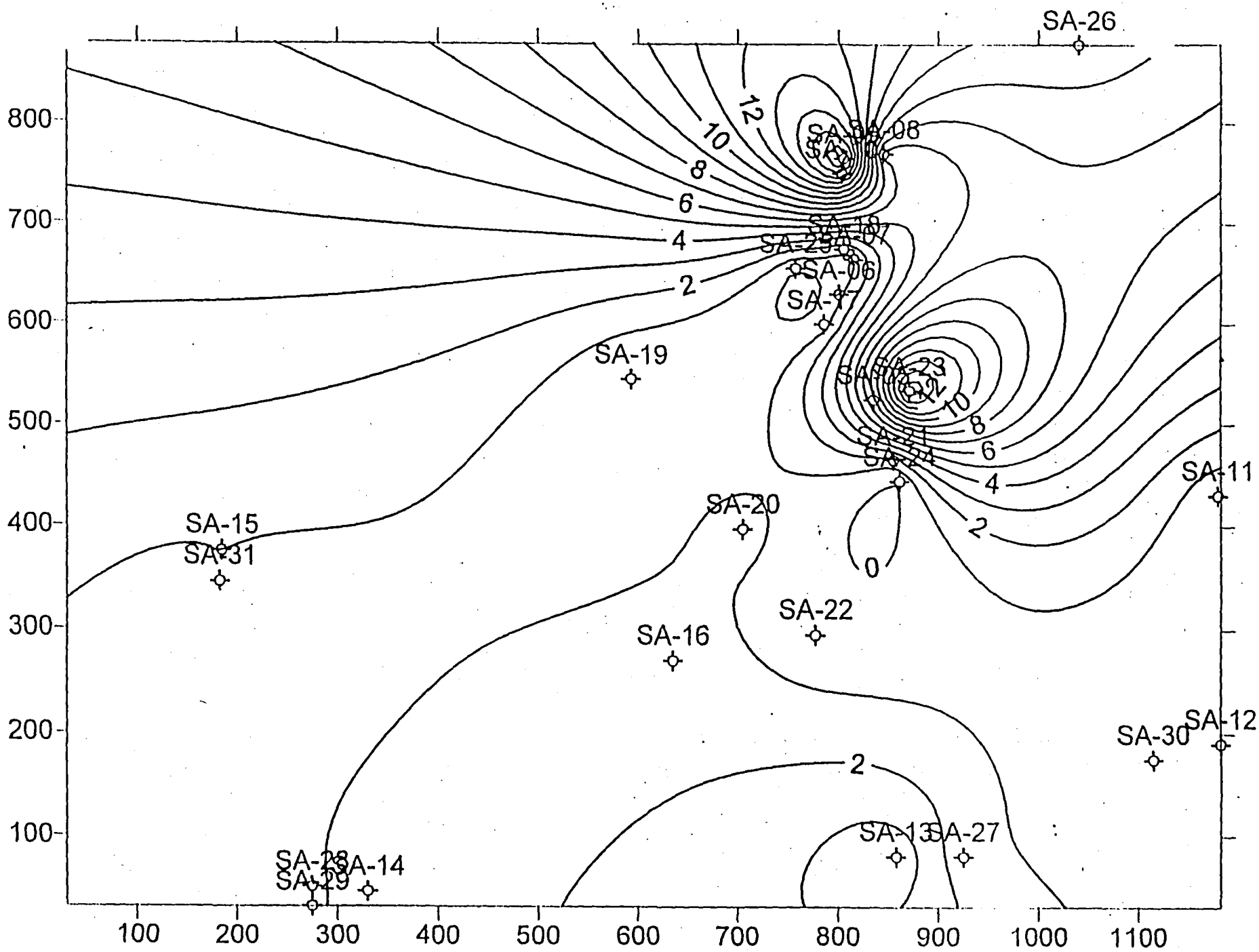


Groundwater Zinc Concentration, mg/l

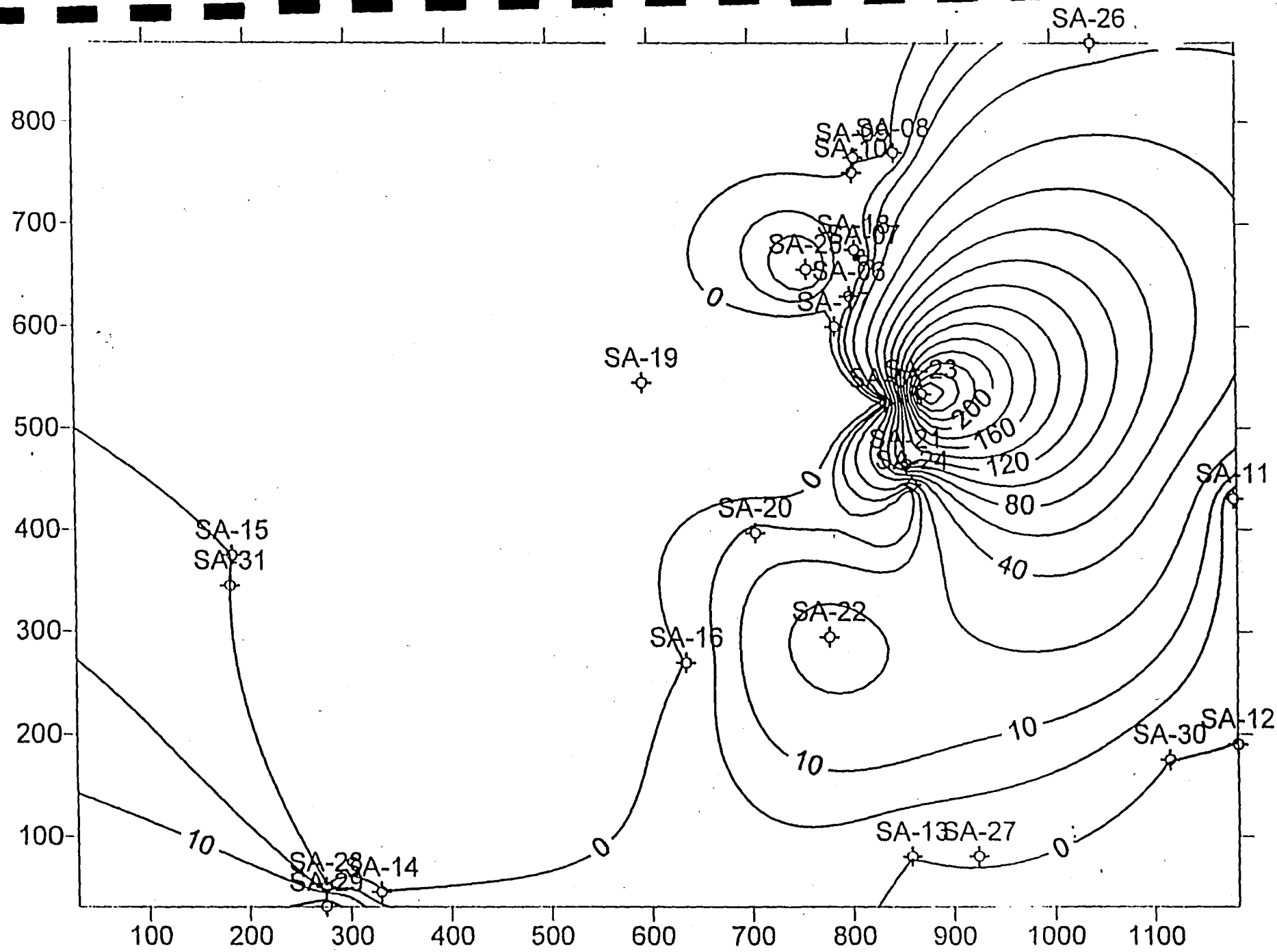
APPENDIX 3 – SURFACE SOIL METALS DATA PLOTS



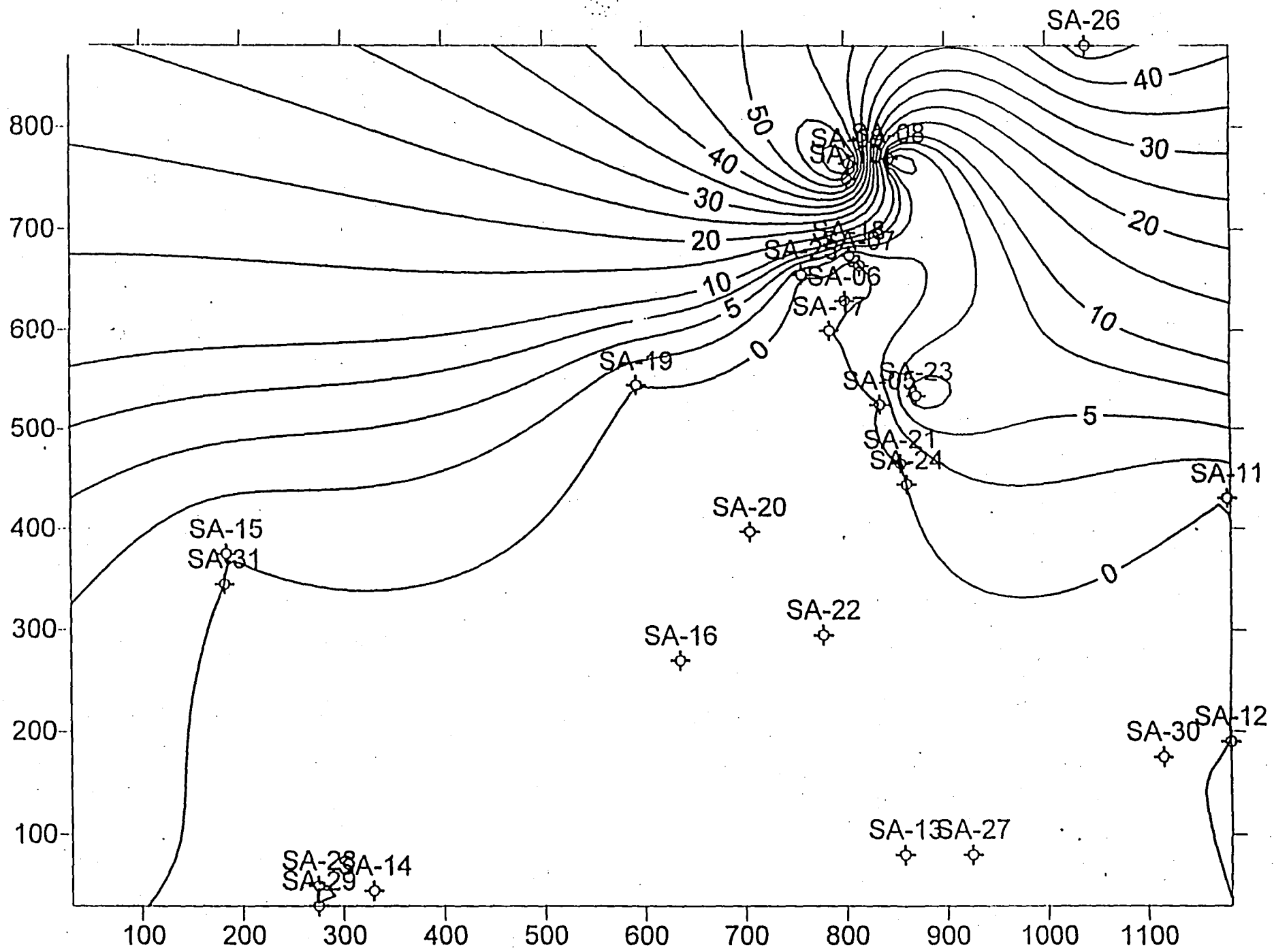
Surface Antimony Concentration, mg/kg



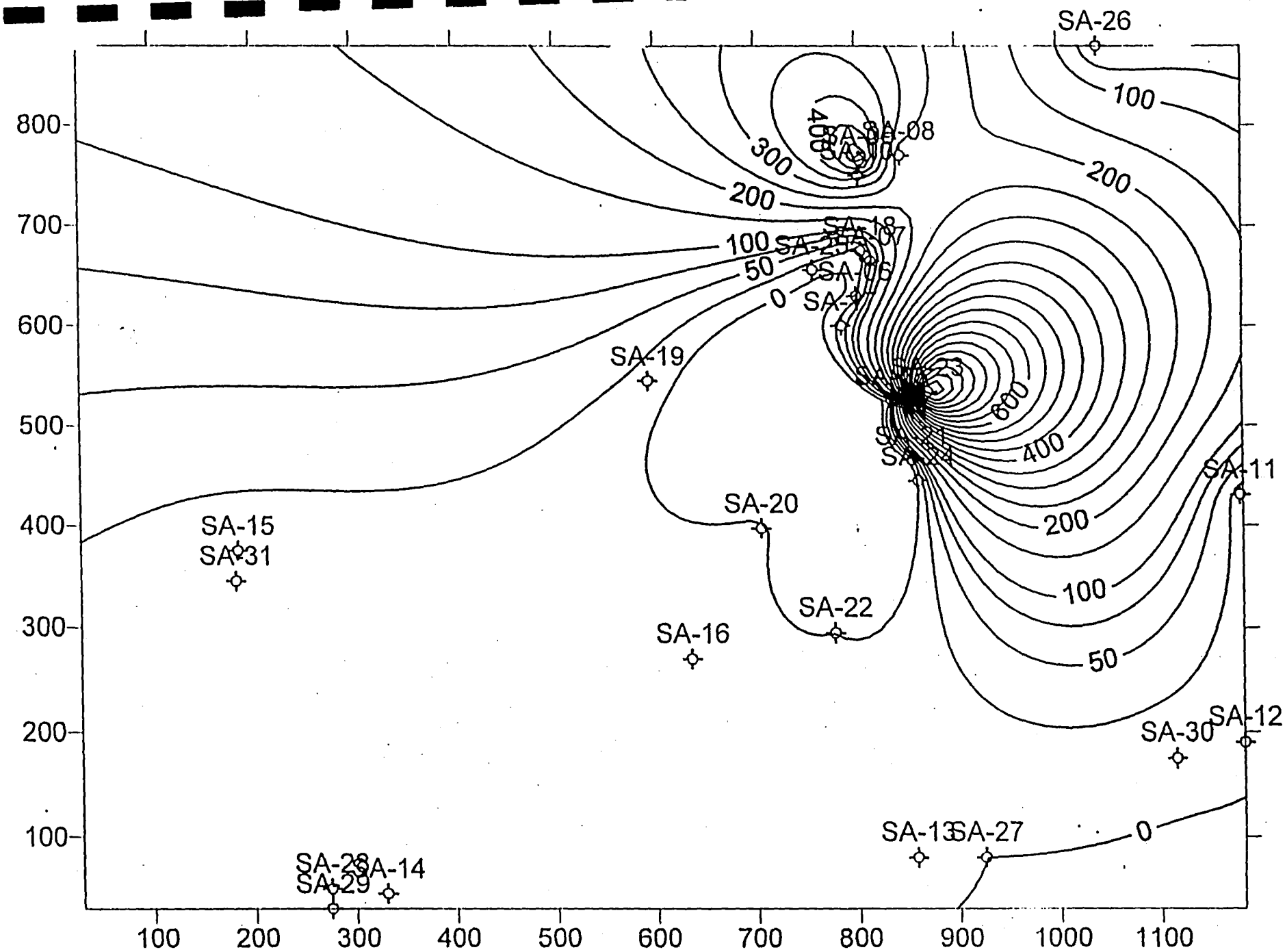
Surface Arsenic Concentration, mg/kg



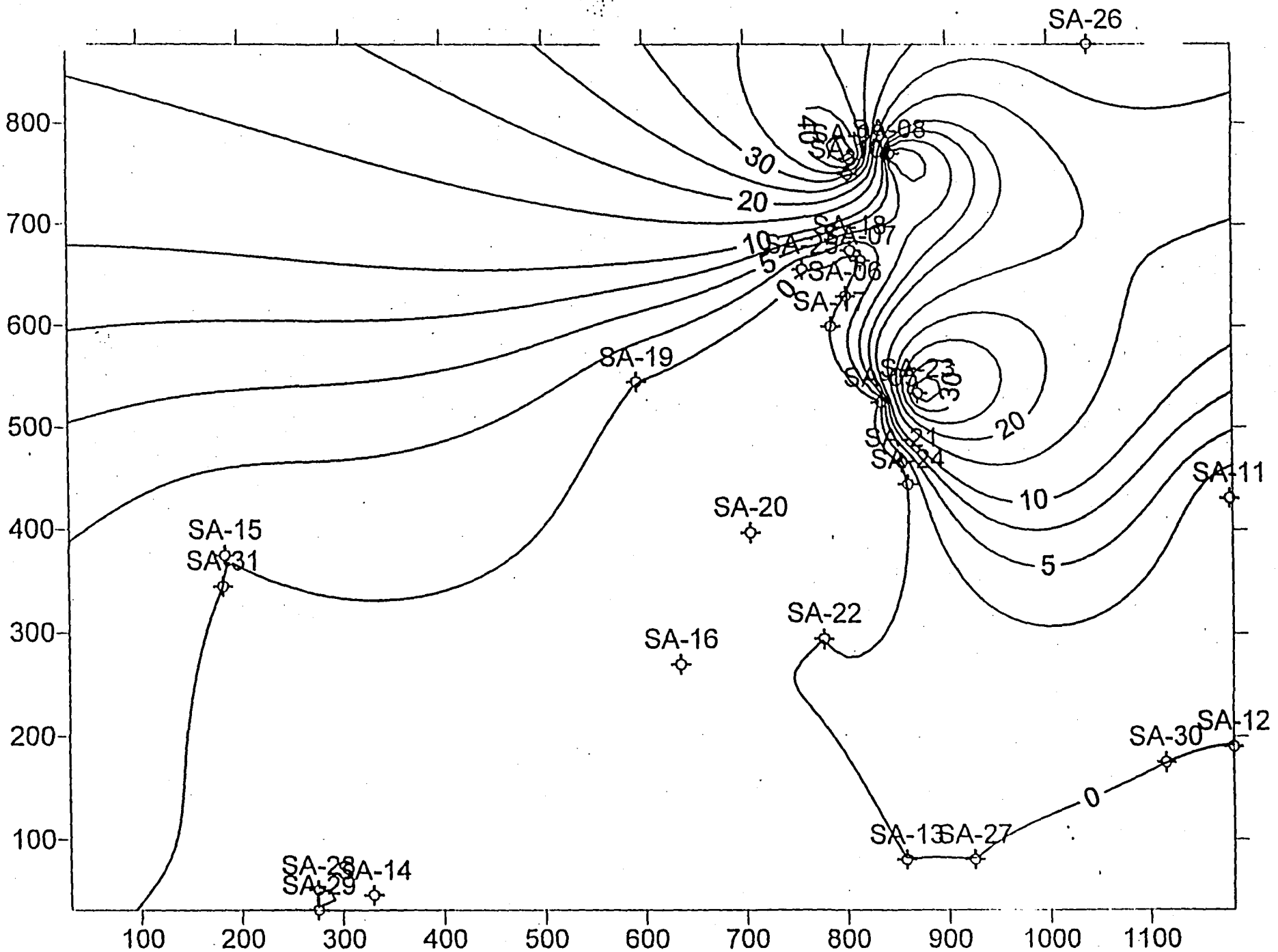
Surface Barium Concentration, mg/kg



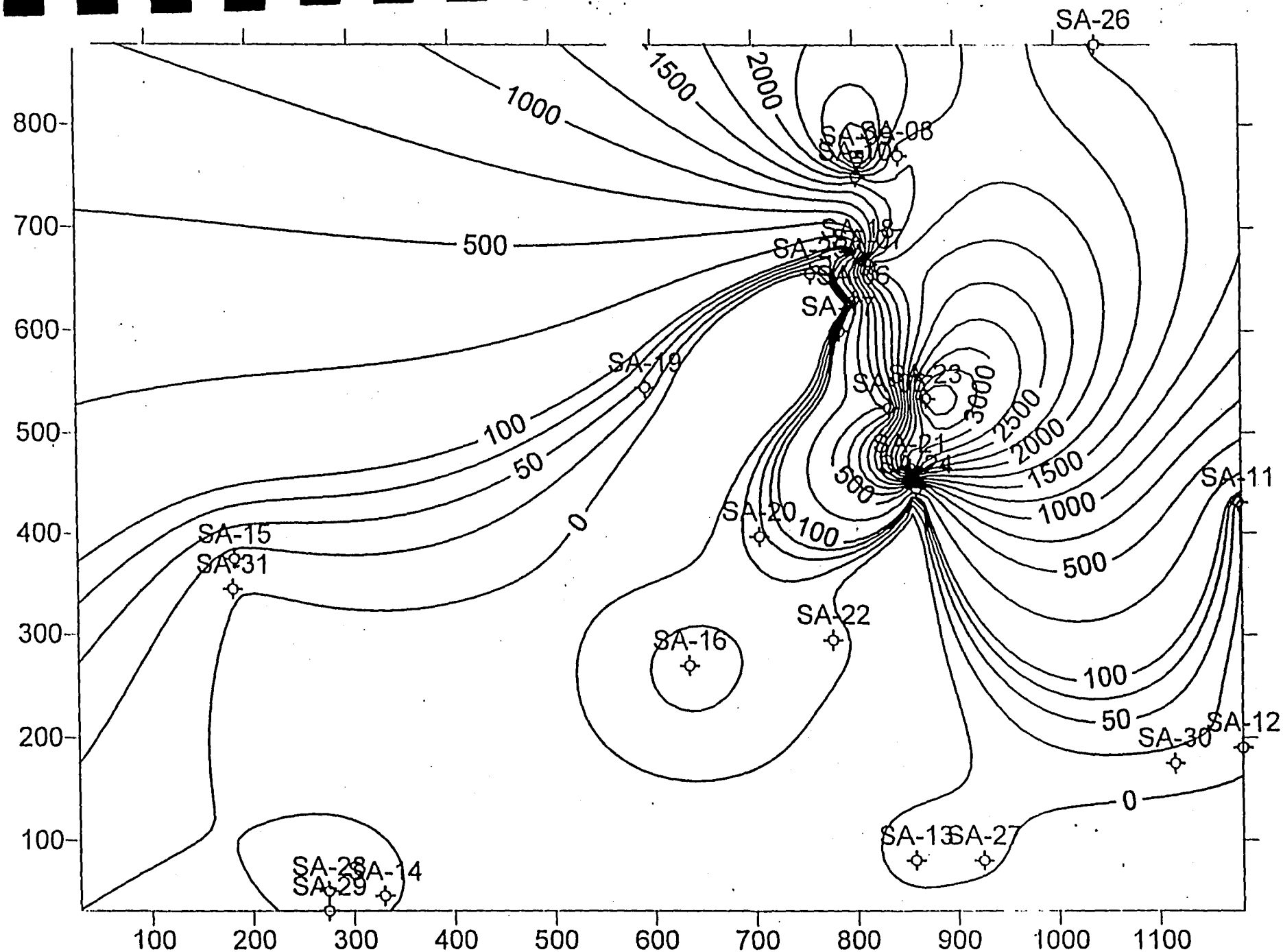
Surface Cadmium Concentration, mg/kg



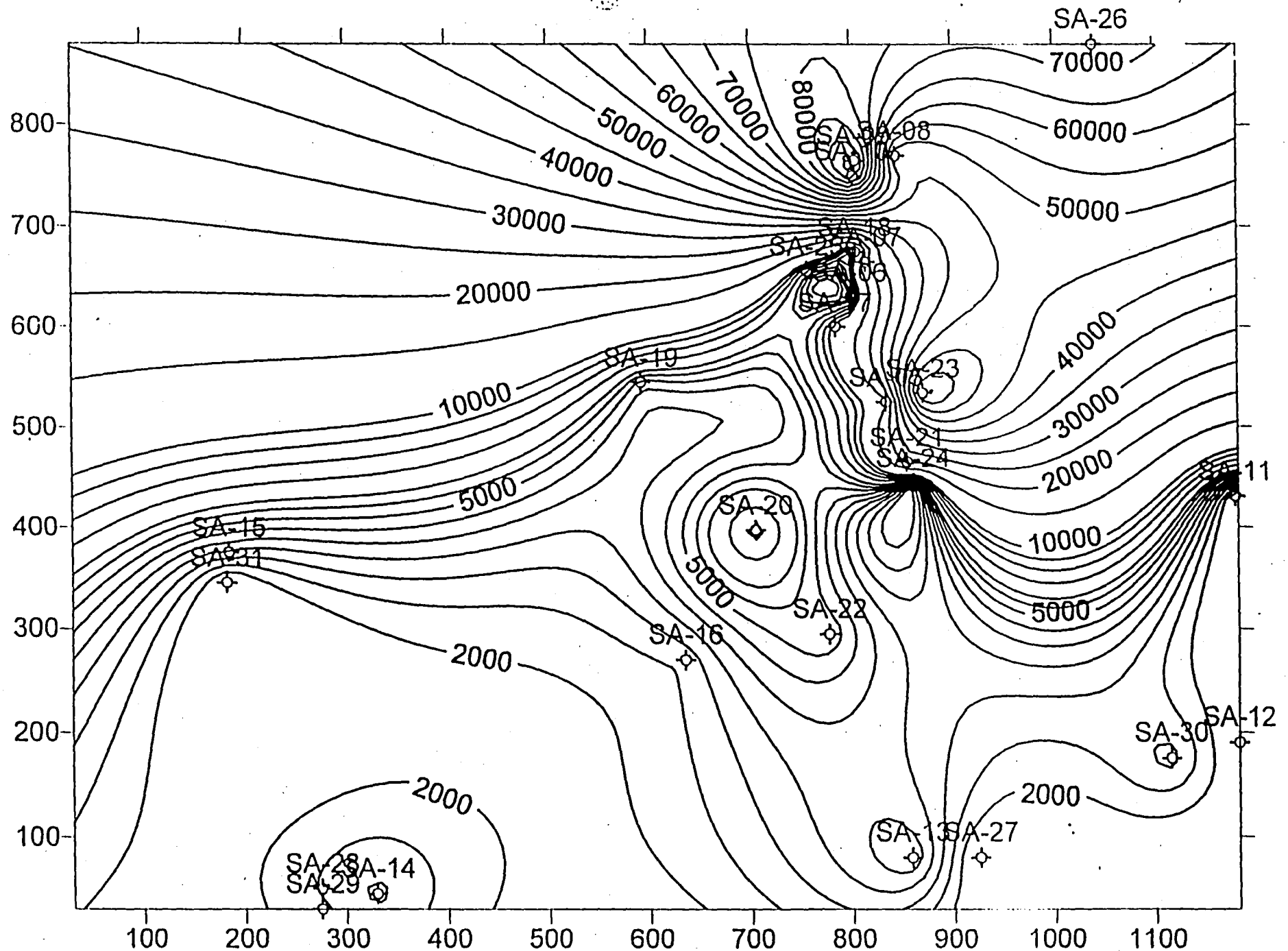
Surface Chromium Concentration, mg/kg



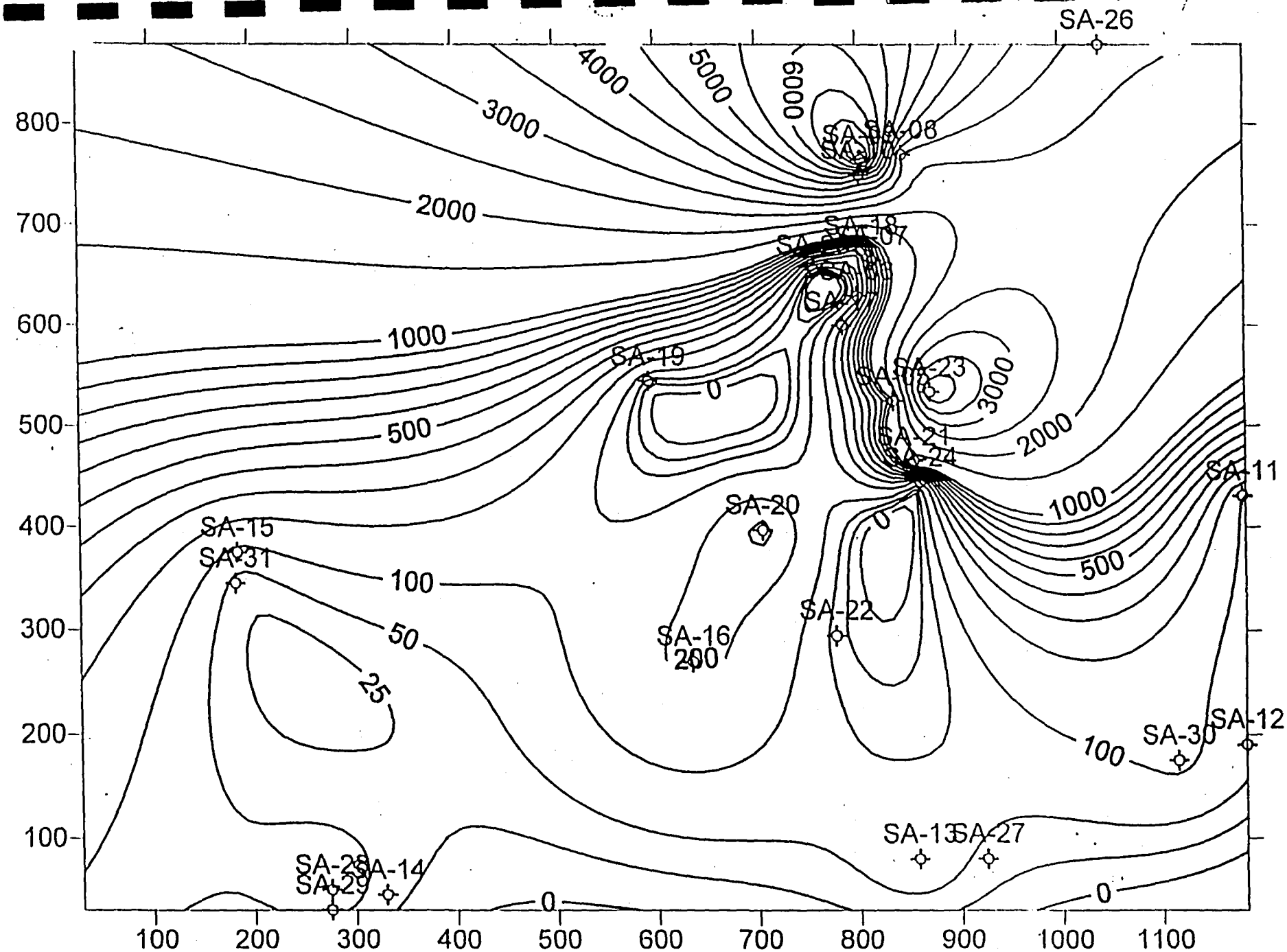
Surface Cobalt Concentration, mg/kg



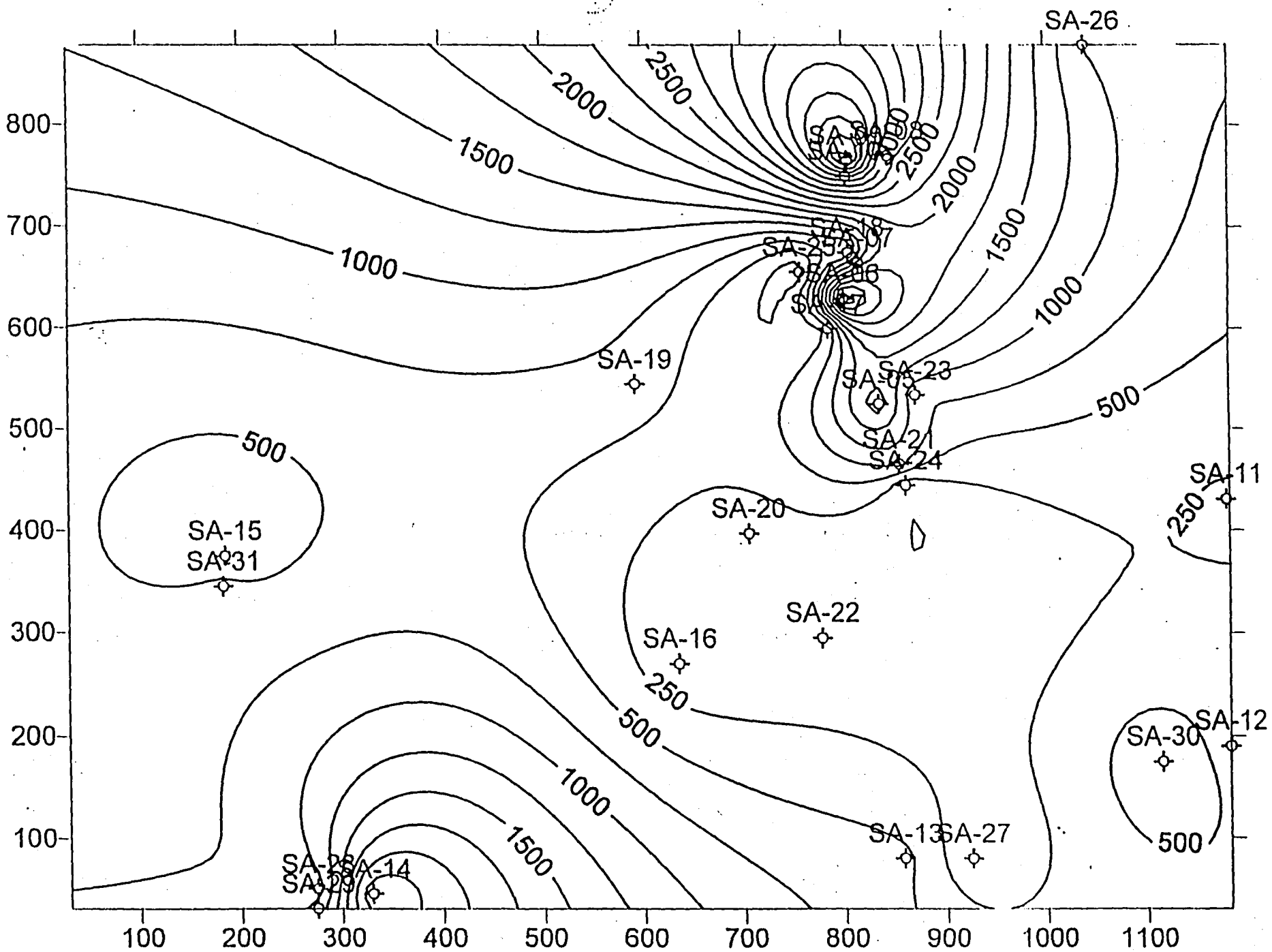
Surface Copper Concentration, mg/kg



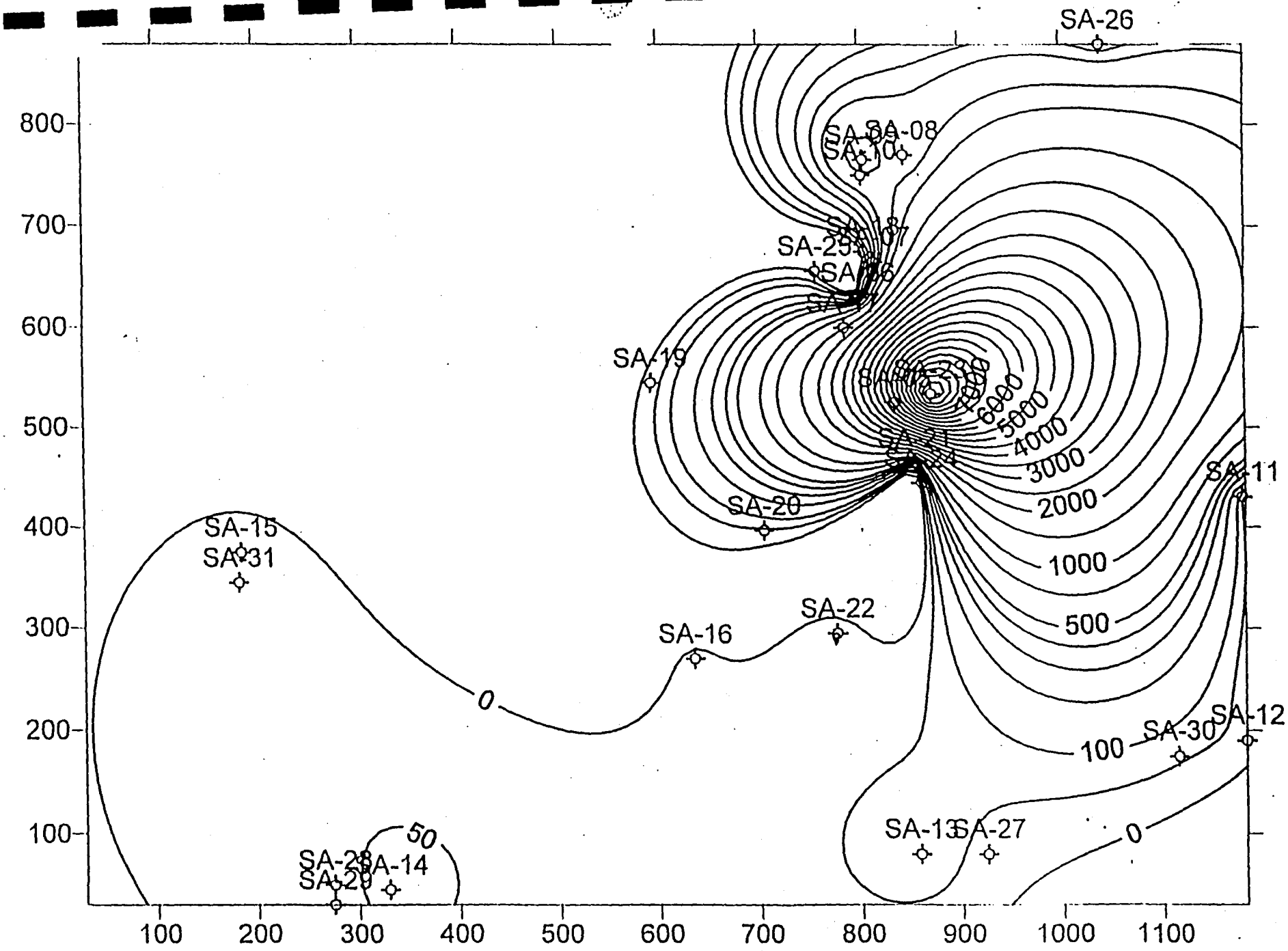
Surface Iron Concentration, mg/kg



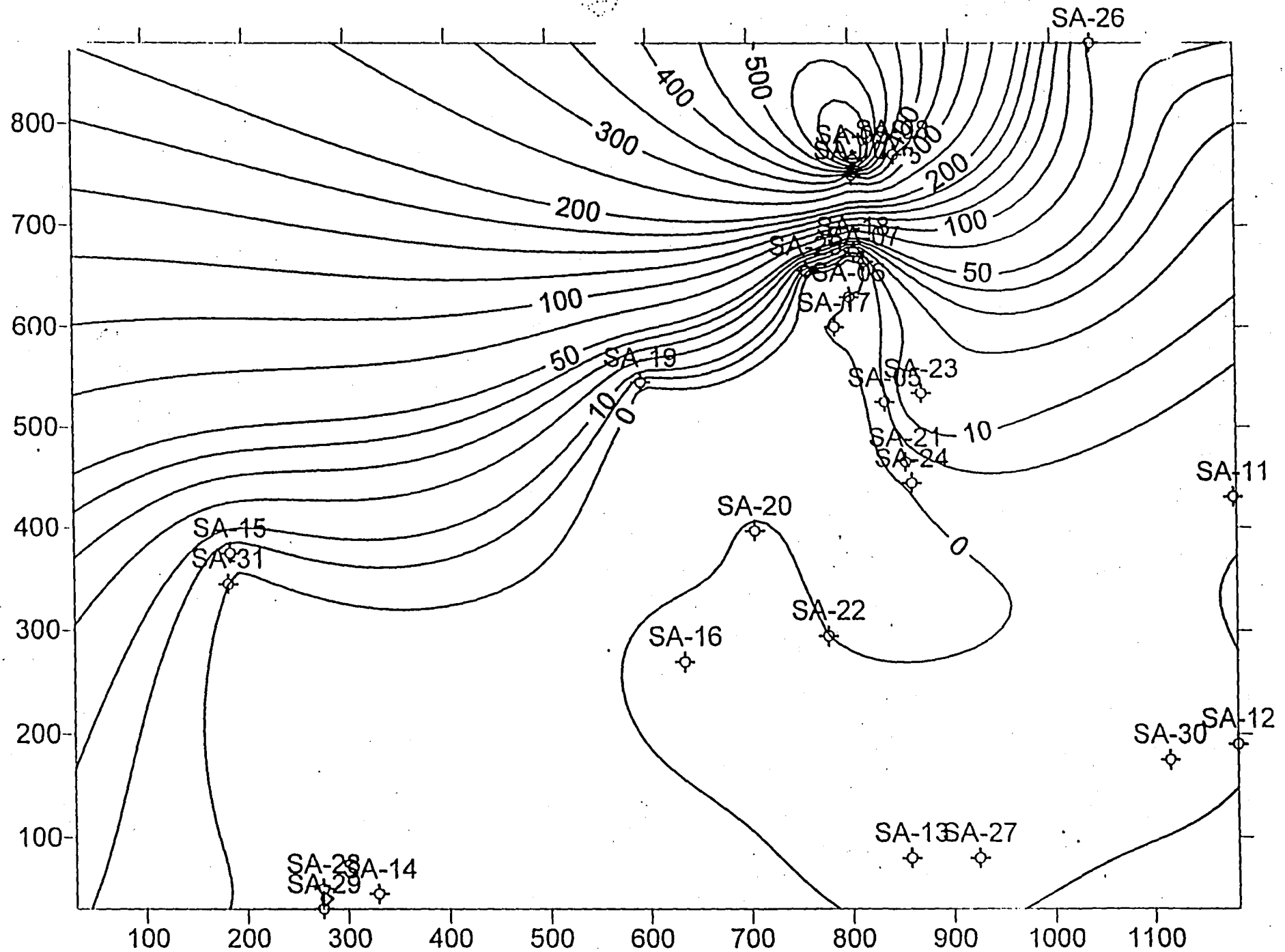
Surface Lead Concentration, mg/kg



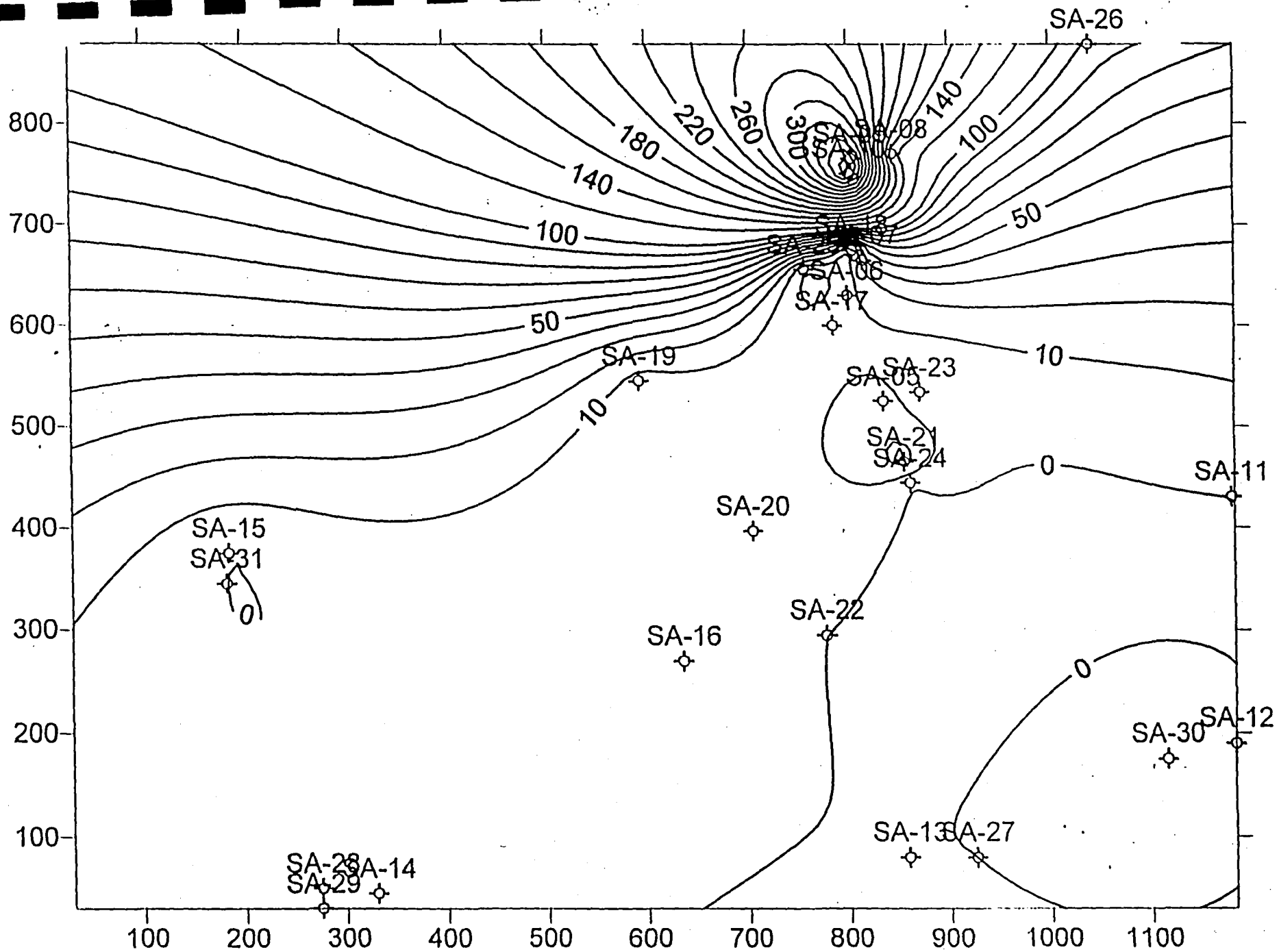
Surface Magnesium Concentration, mg/kg



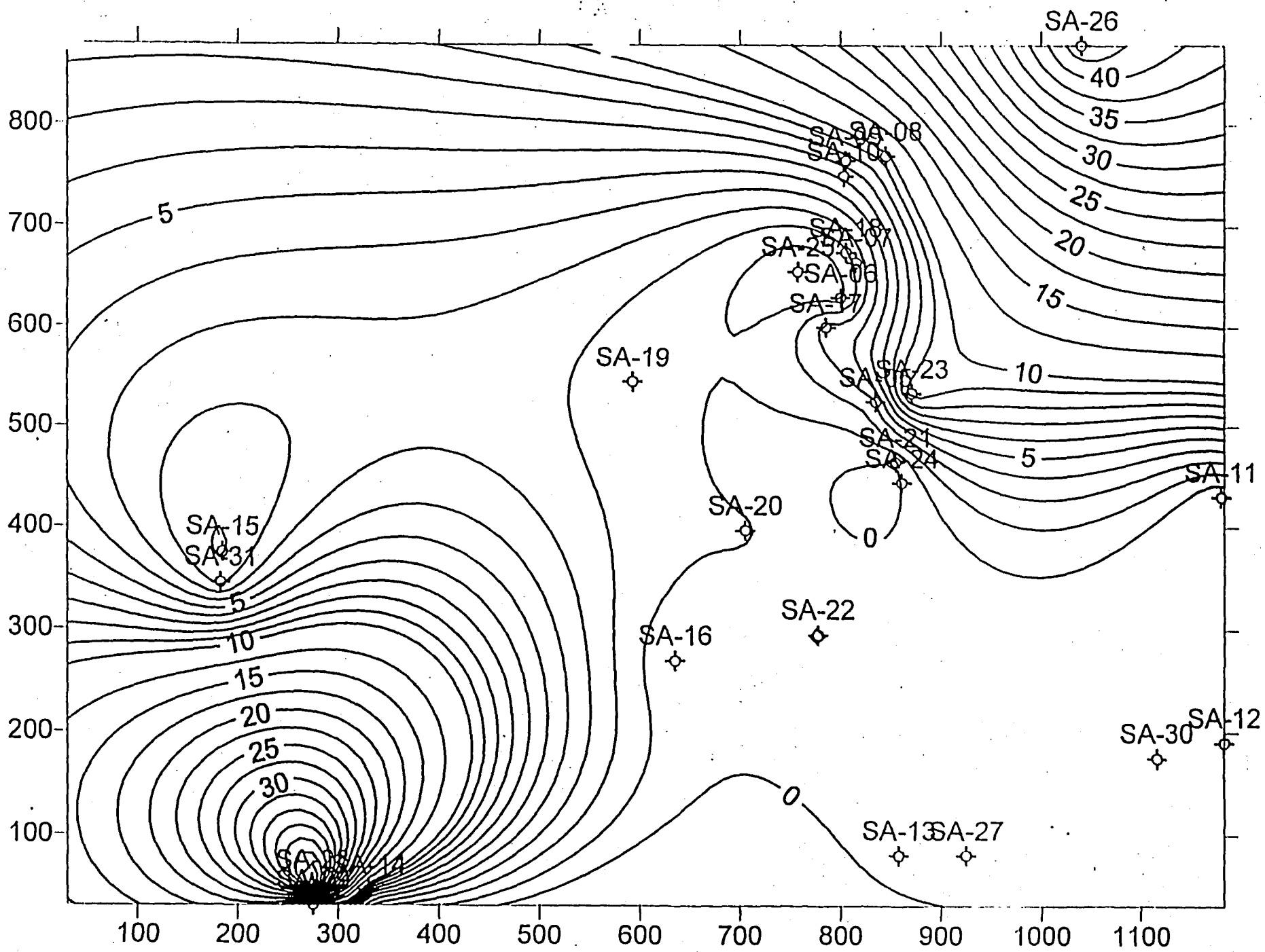
Surface Manganese Concentration, mg/kg



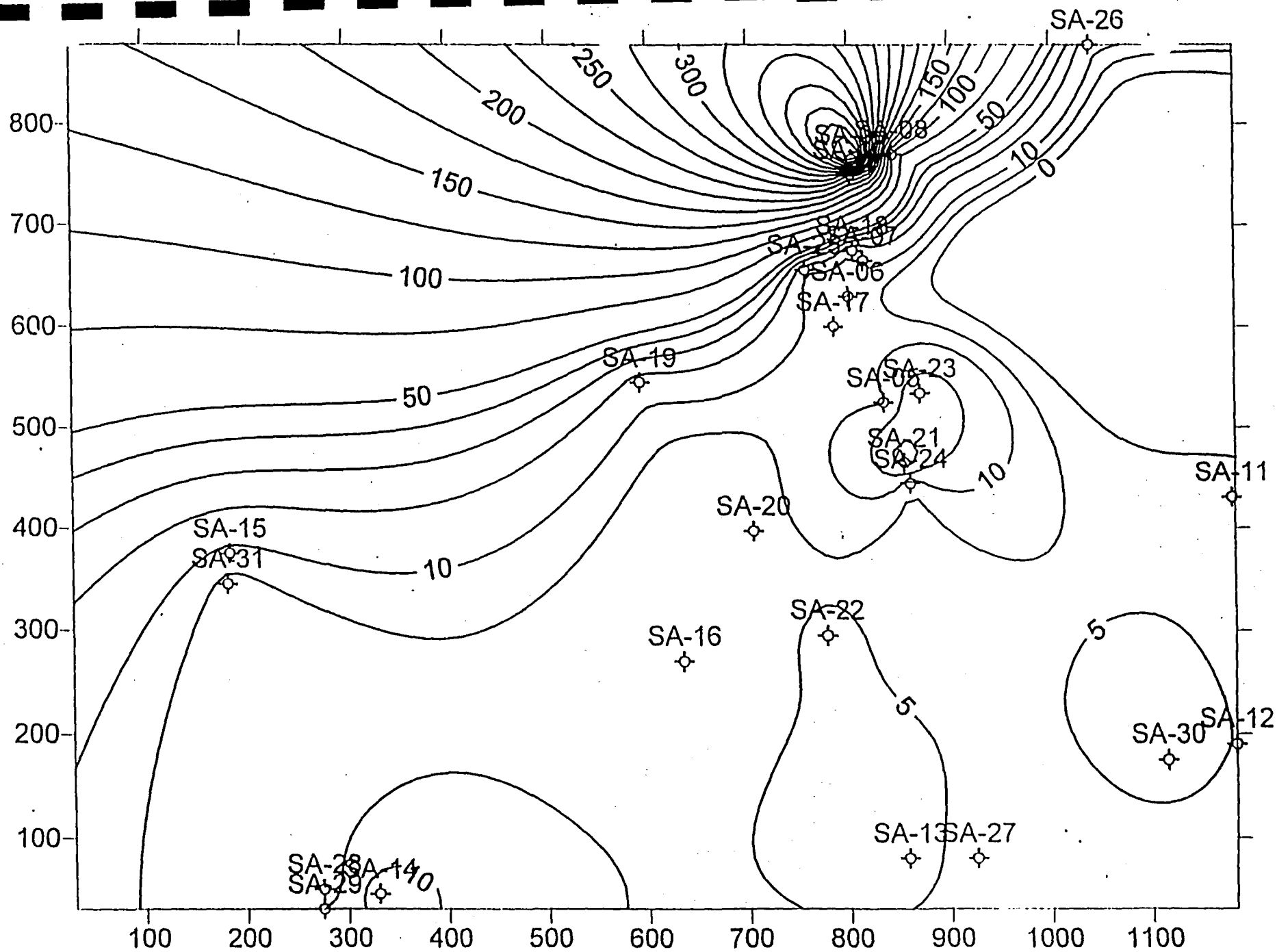
Surface Mercury Concentration, mg/kg



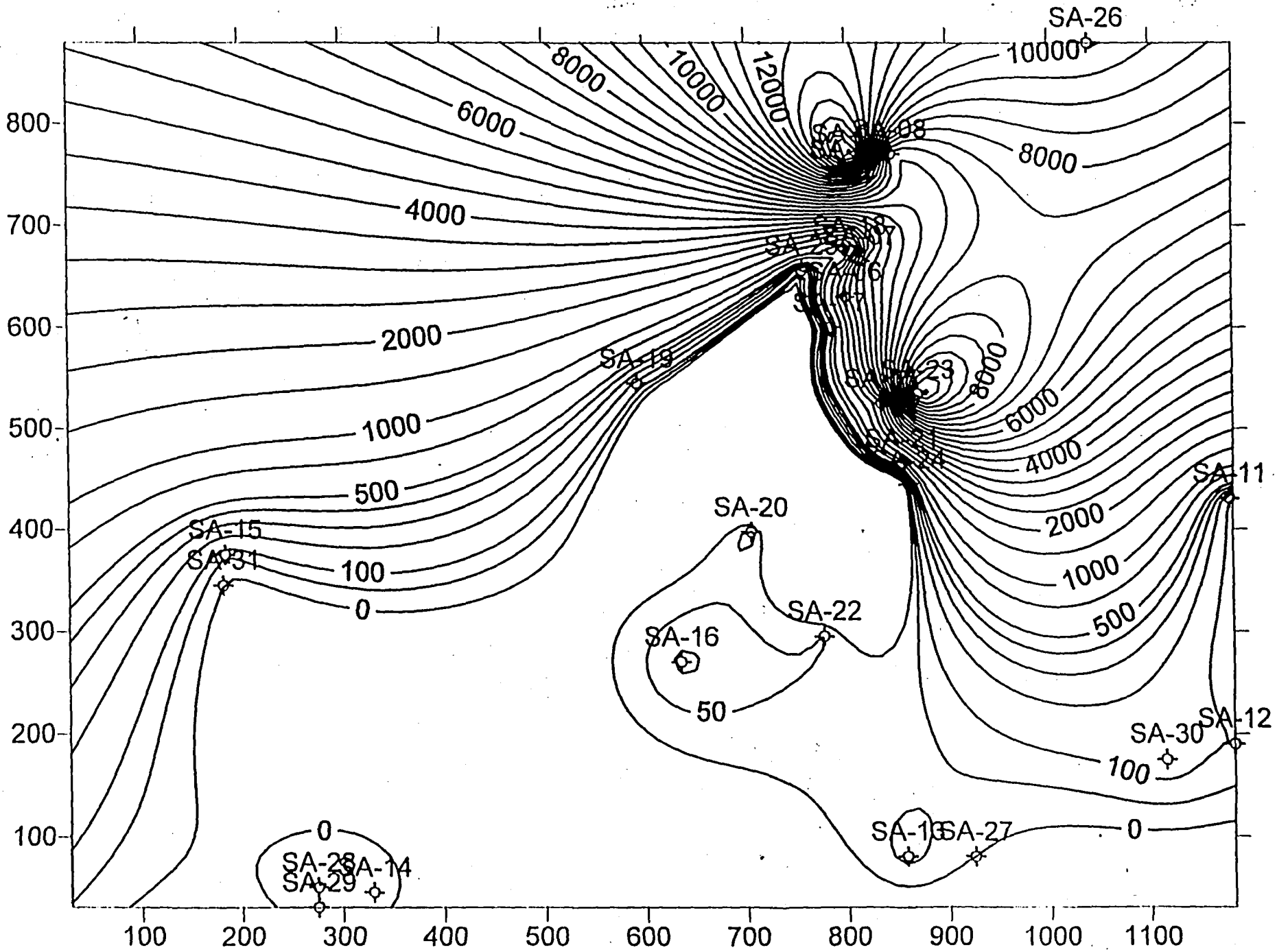
Surface Nickel Concentration, mg/kg



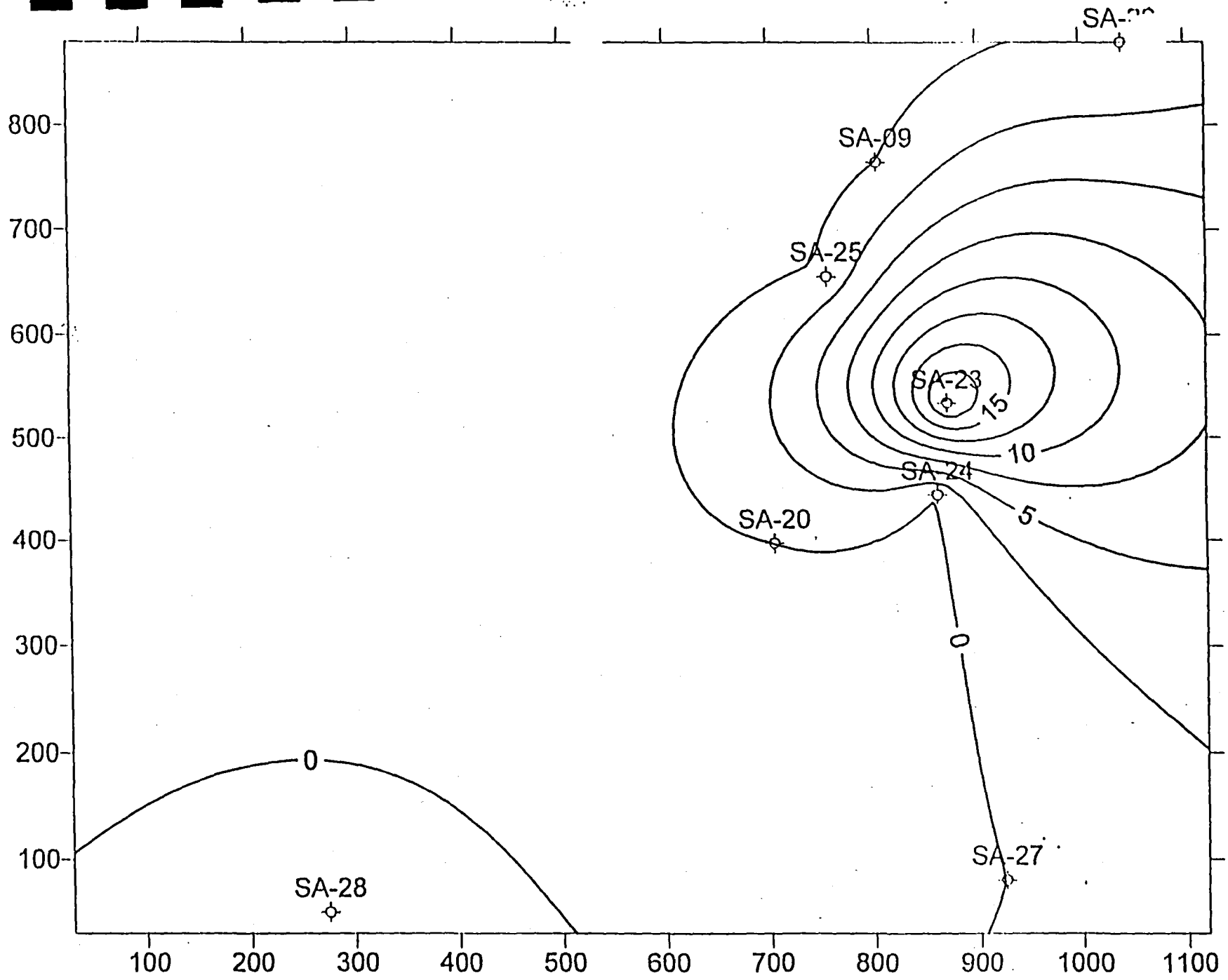
Surface Thallium Concentration, mg/kg



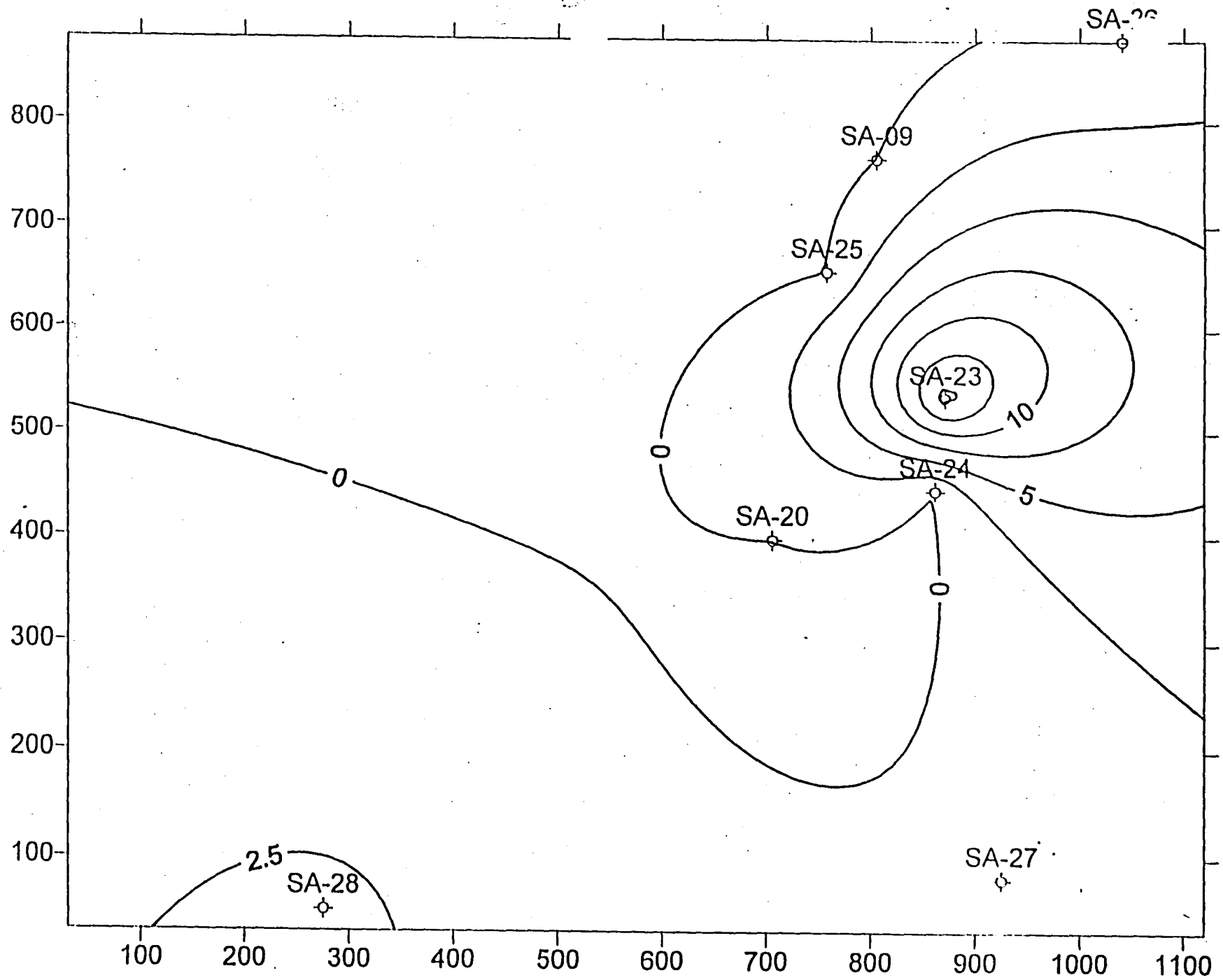
Surface Vanadium Concentration, mg/kg



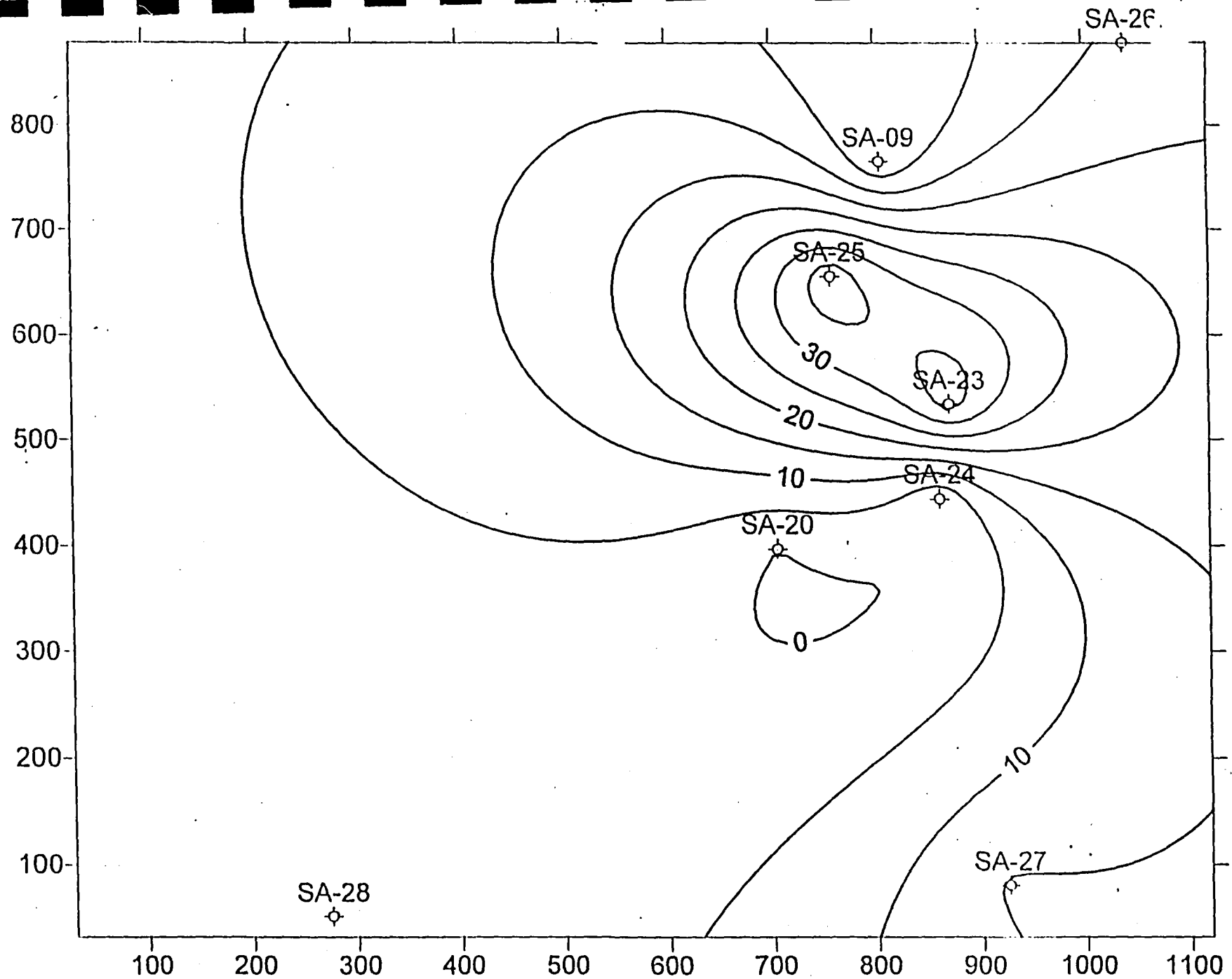
Surface Zinc Concentration, mg/kg



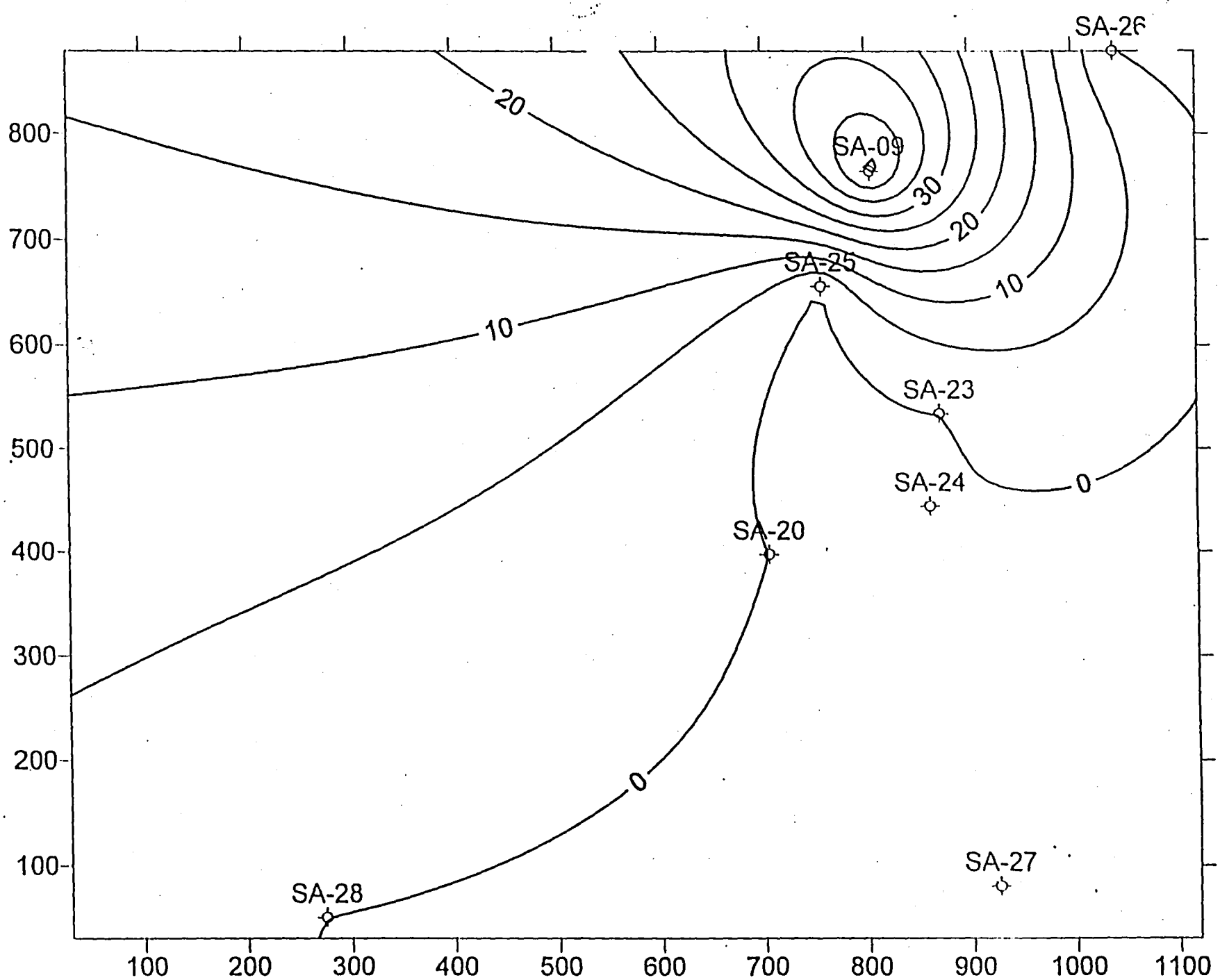
Soil 1-2 Feet, Antimony Concentration, mg/kg



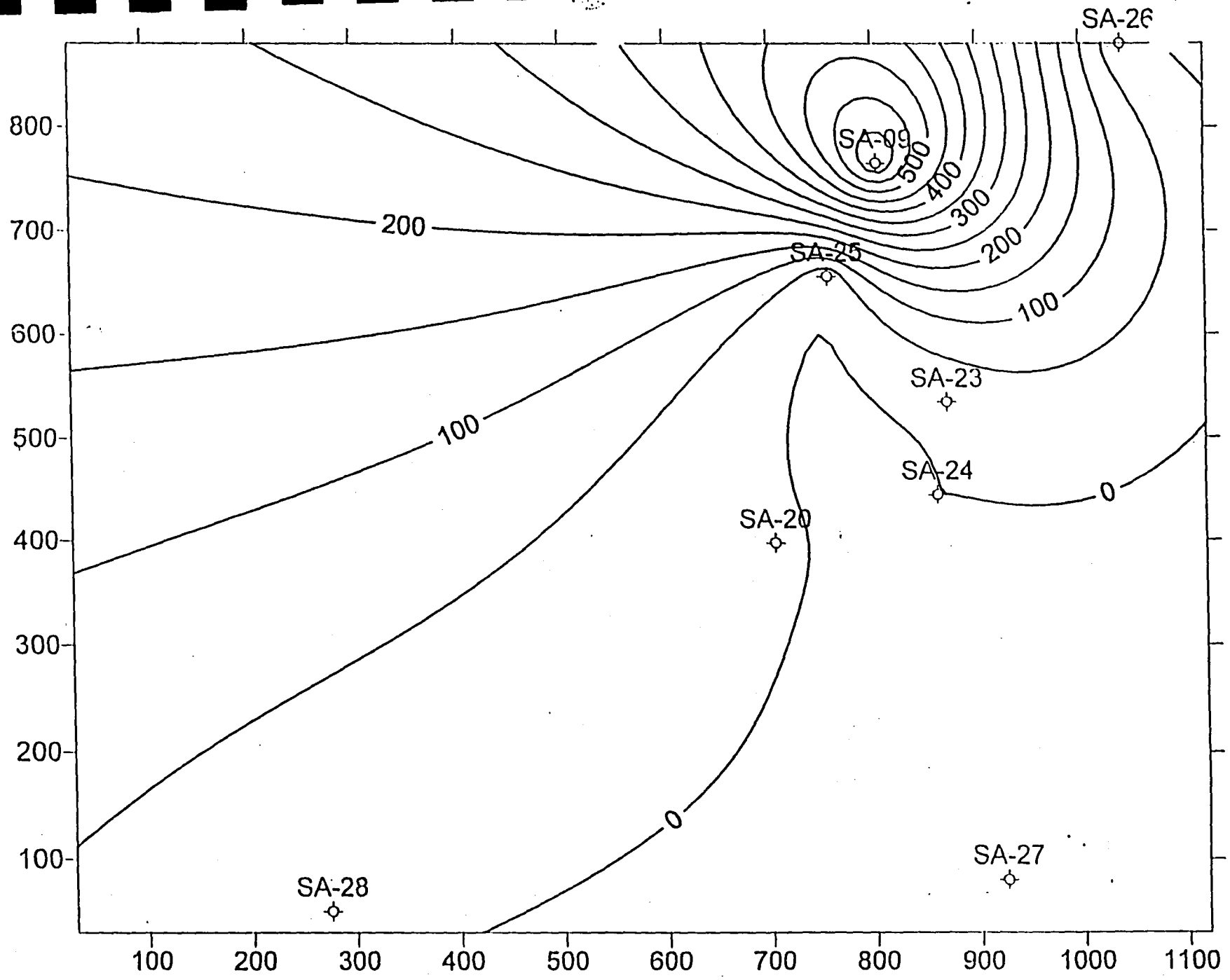
Soil 1-2 Feet, Arsenic Concentration, mg/kg



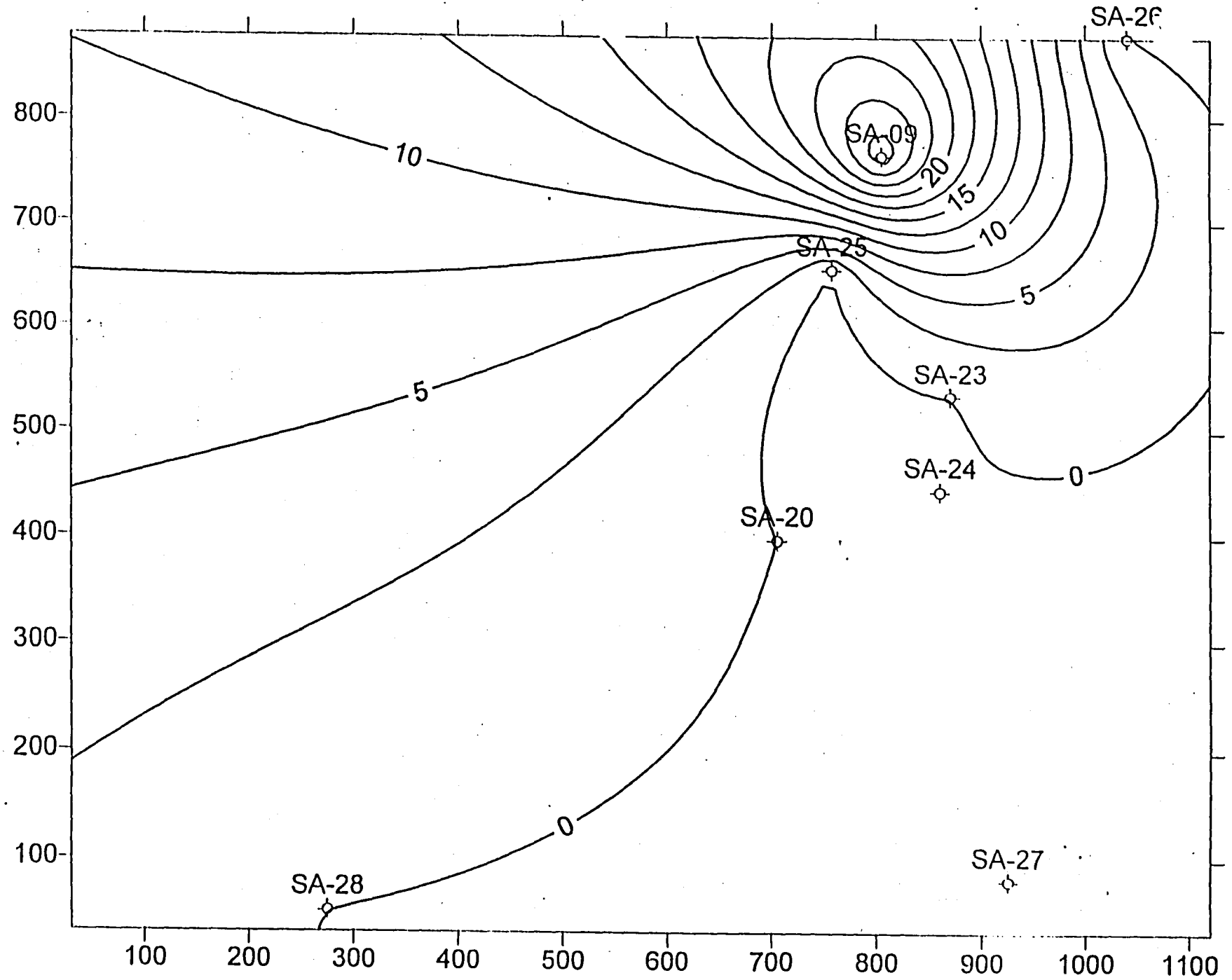
Soil 1-2 Feet, Barium Concentration, mg/kg



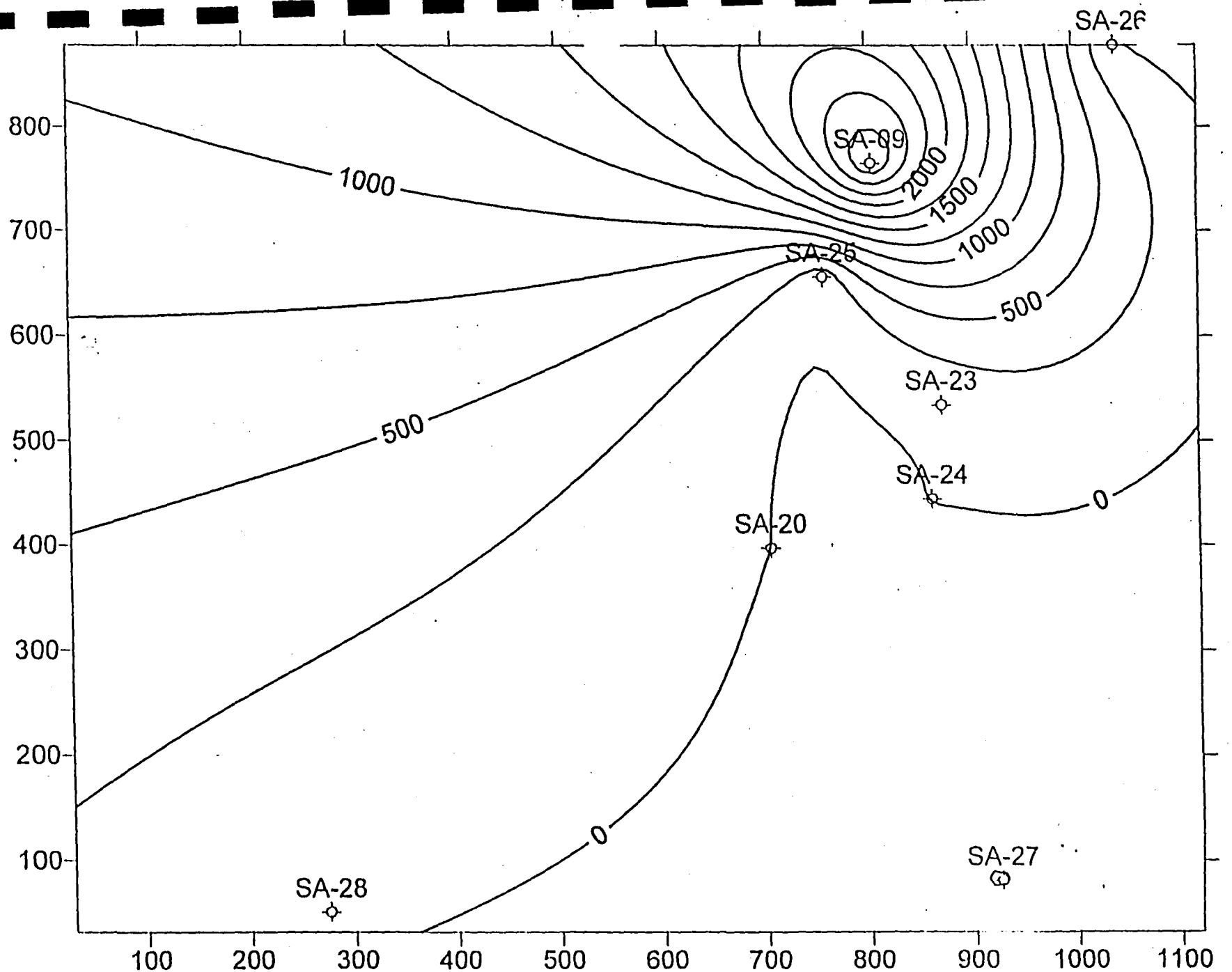
Soil 1-2 Feet, Cadmium Concentration, mg/kg



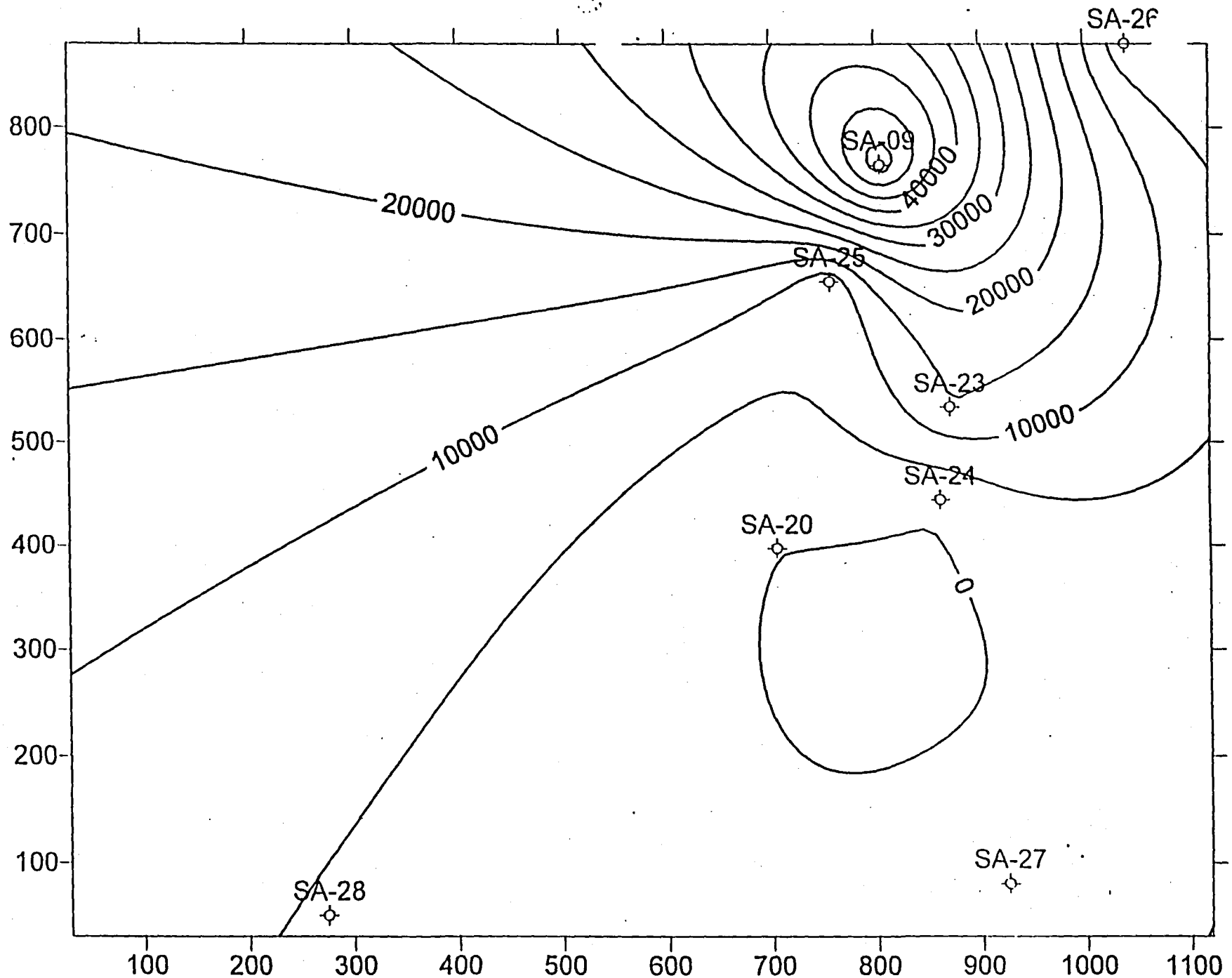
Soil 1-2 Feet, Chromium Concentration, mg/kg



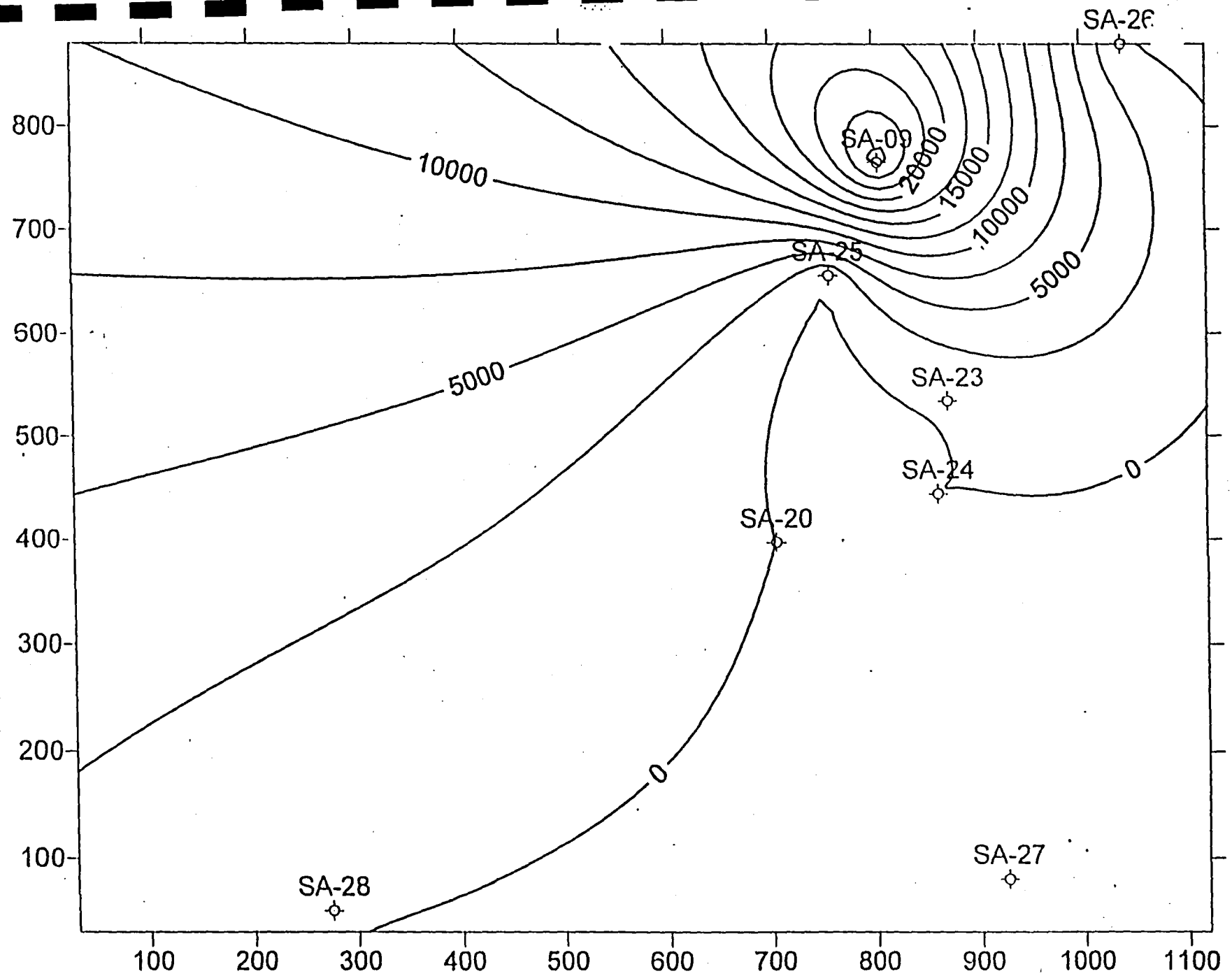
Soil 1-2 Feet, Cobalt Concentration mg/kg



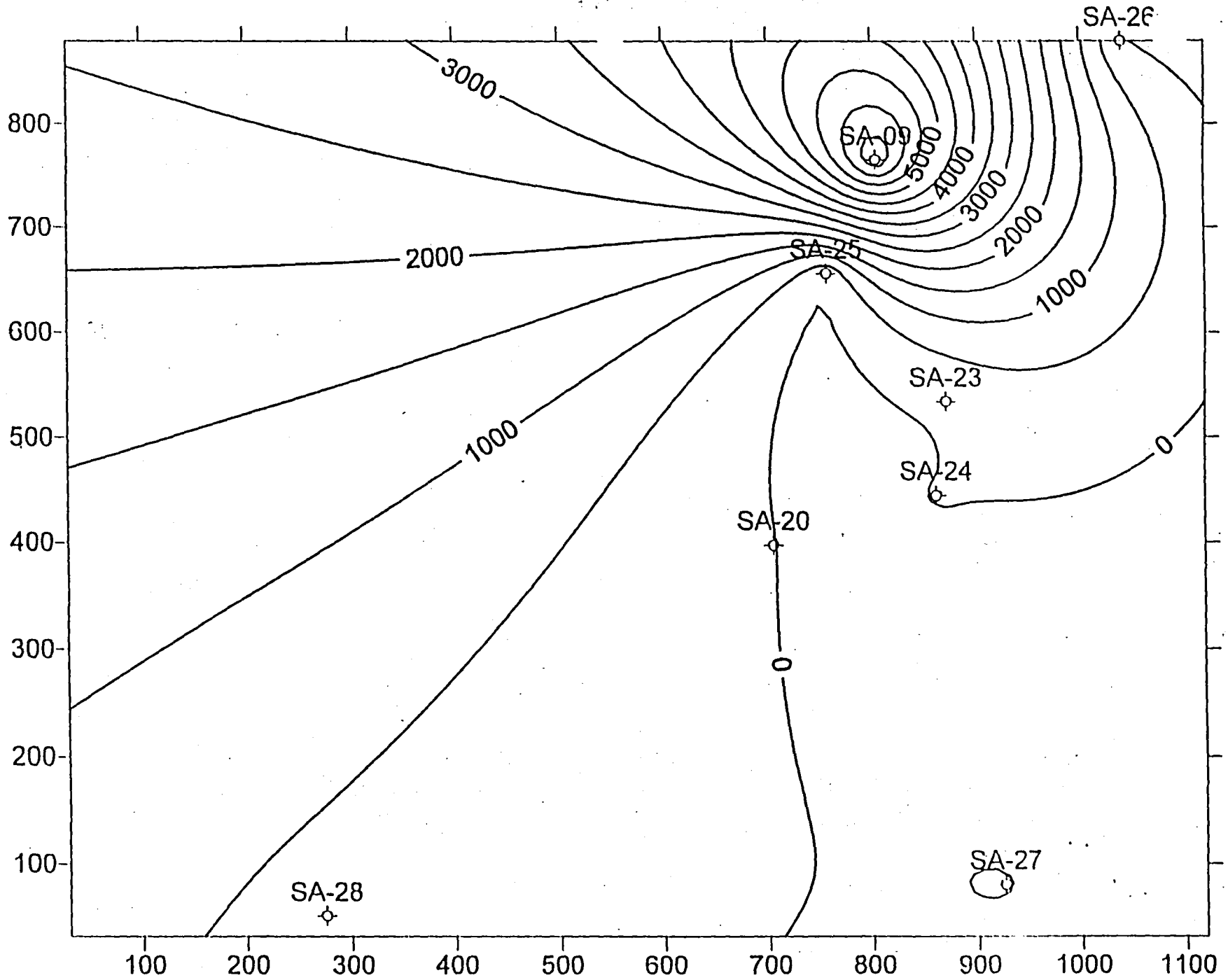
Soil 1-2 Feet, Copper Concentration, mg/kg



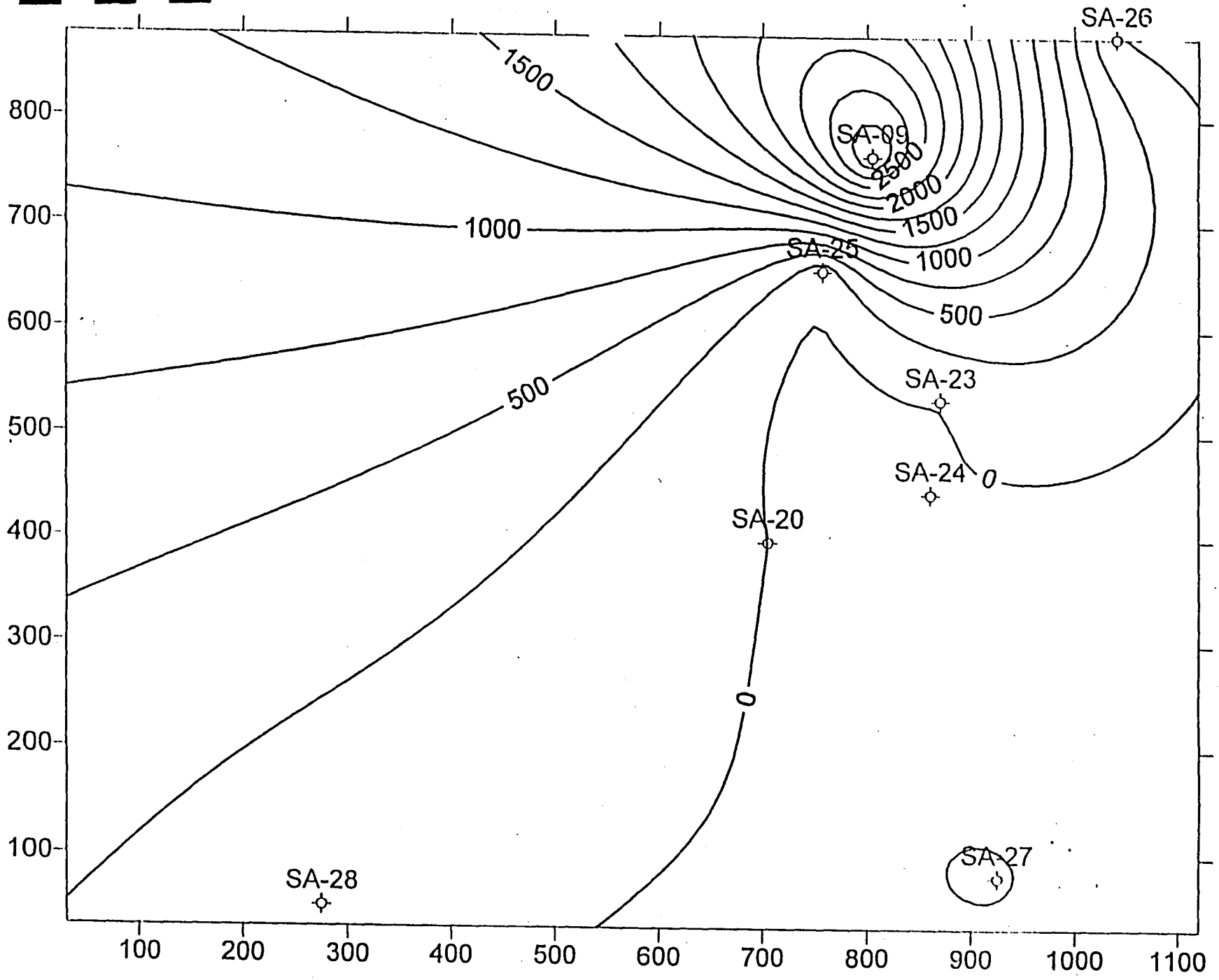
Soil 1-2 Feet, Iron Concentration, mg/kg



Soil 1-2 Feet, Lead Concentration, mg/kg



Soil 1-2 Feet, Magnesium Concentration, mg/kg



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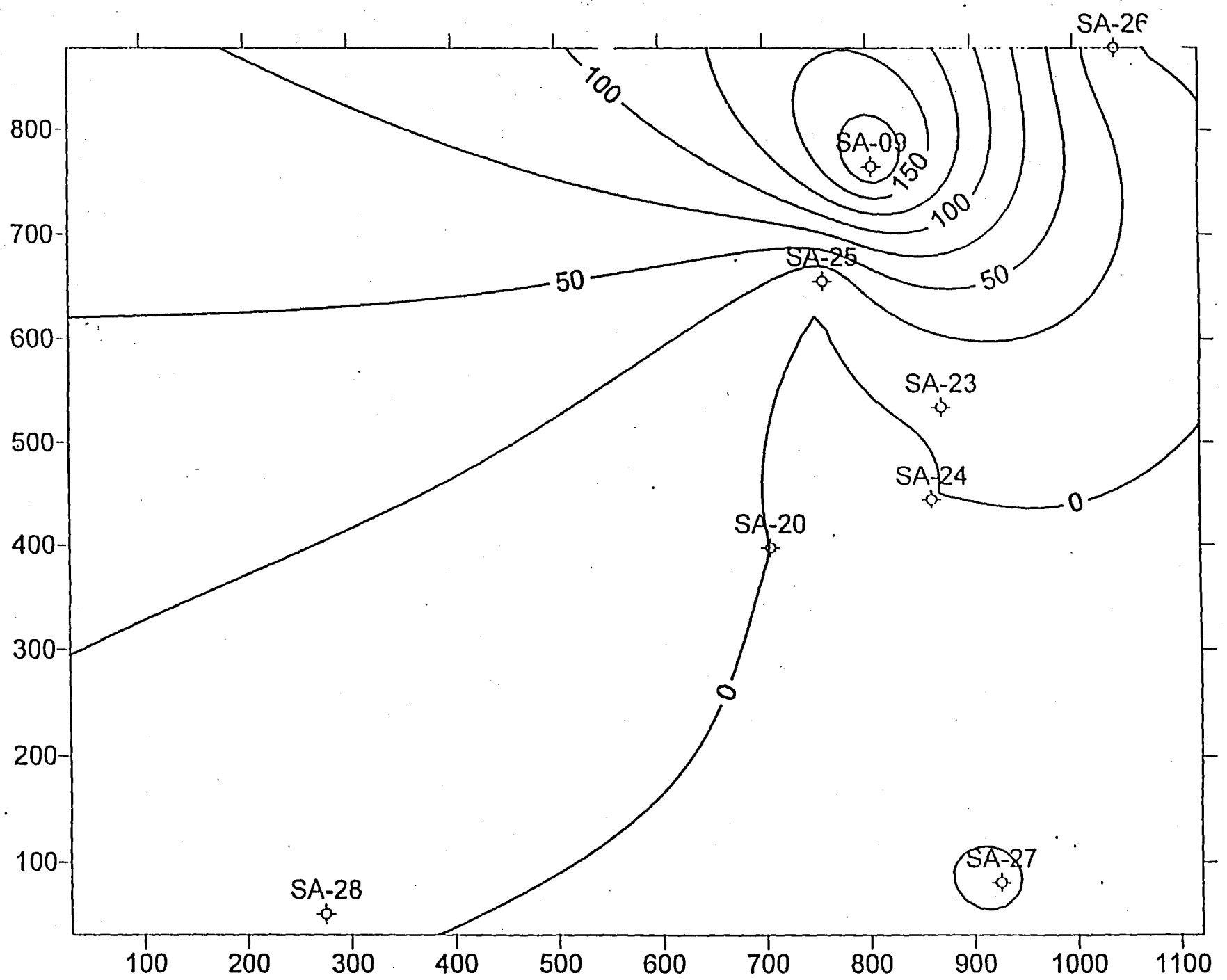

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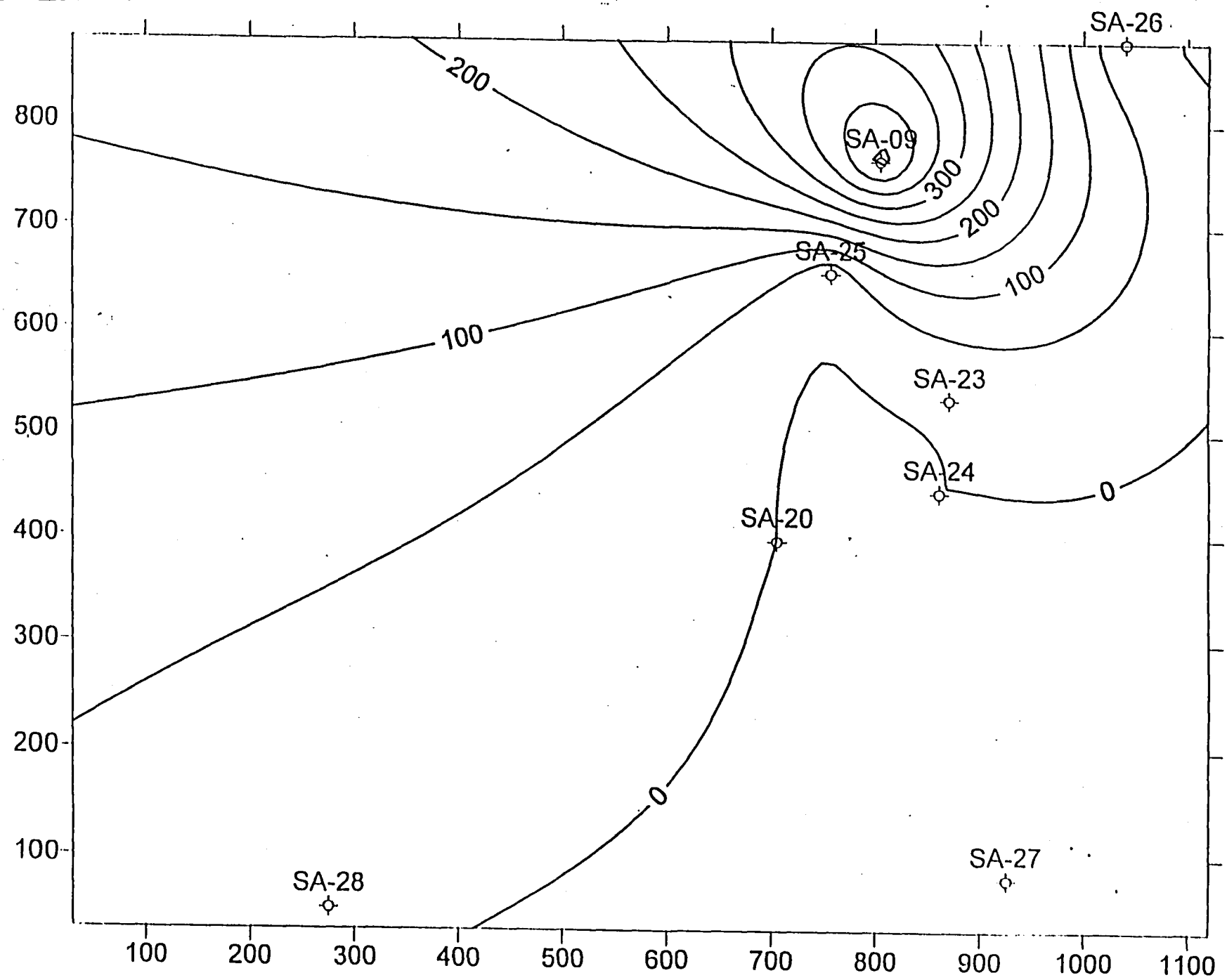
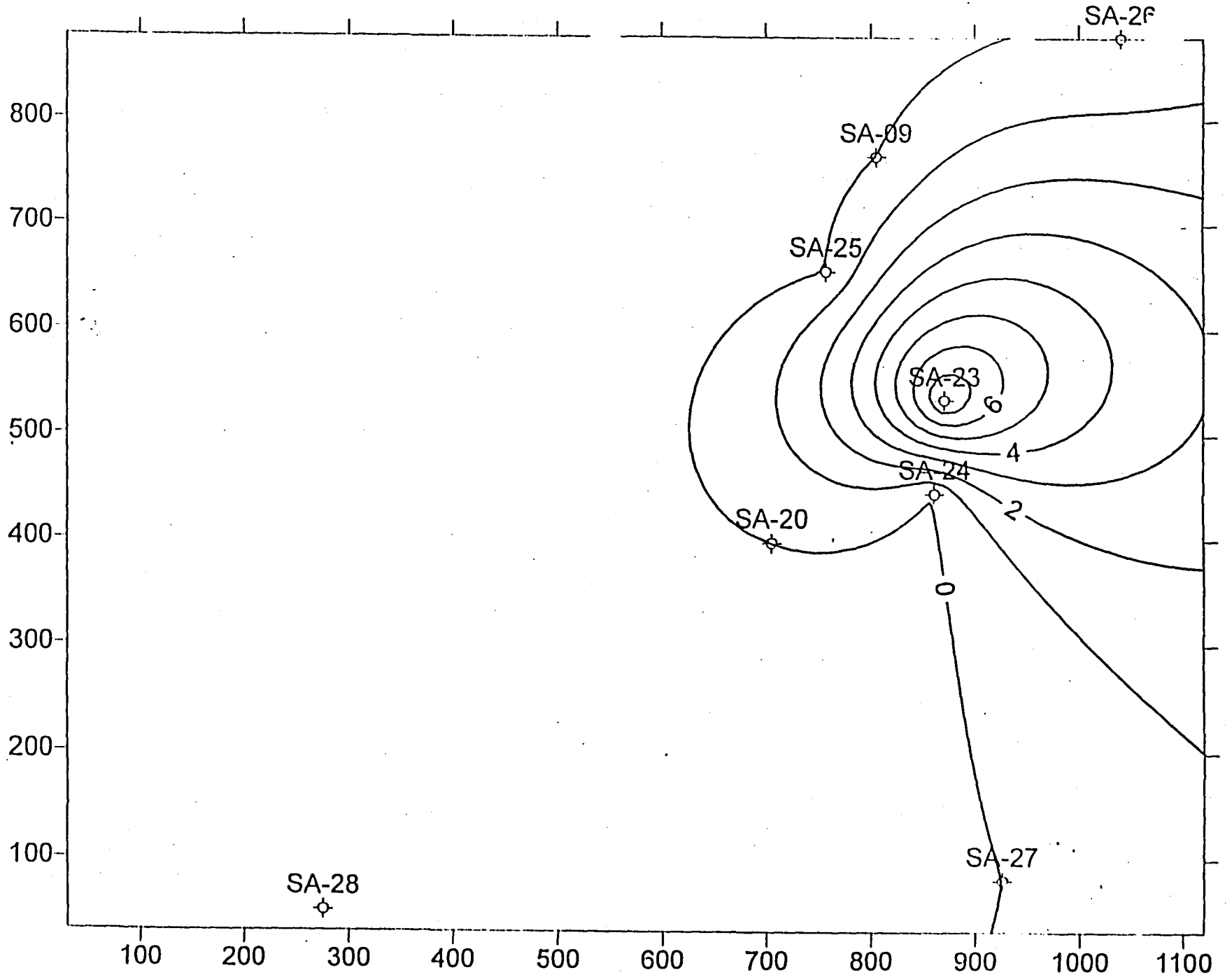


Soil 1-2 Feet, Nickel Concentration, mg/kg



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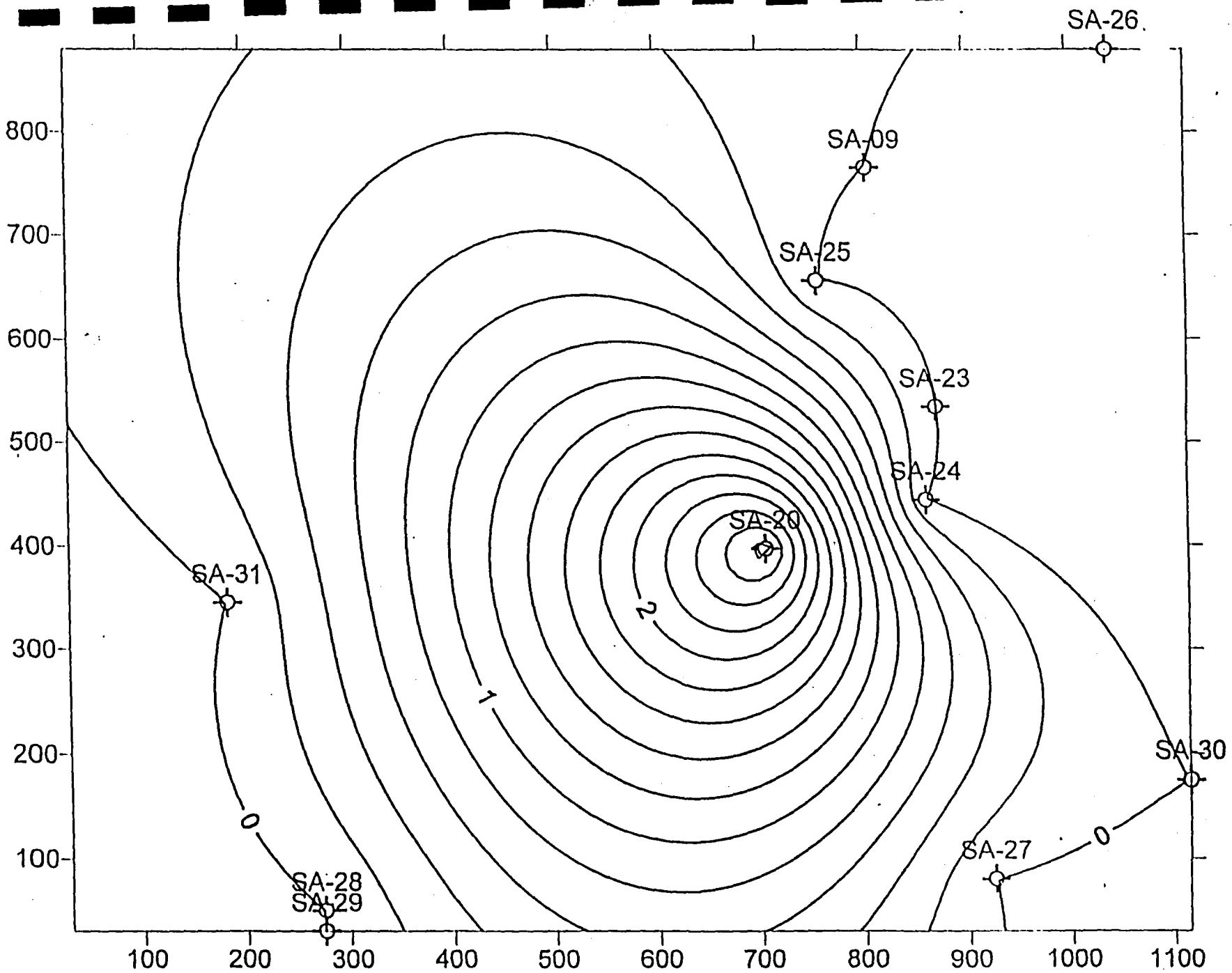
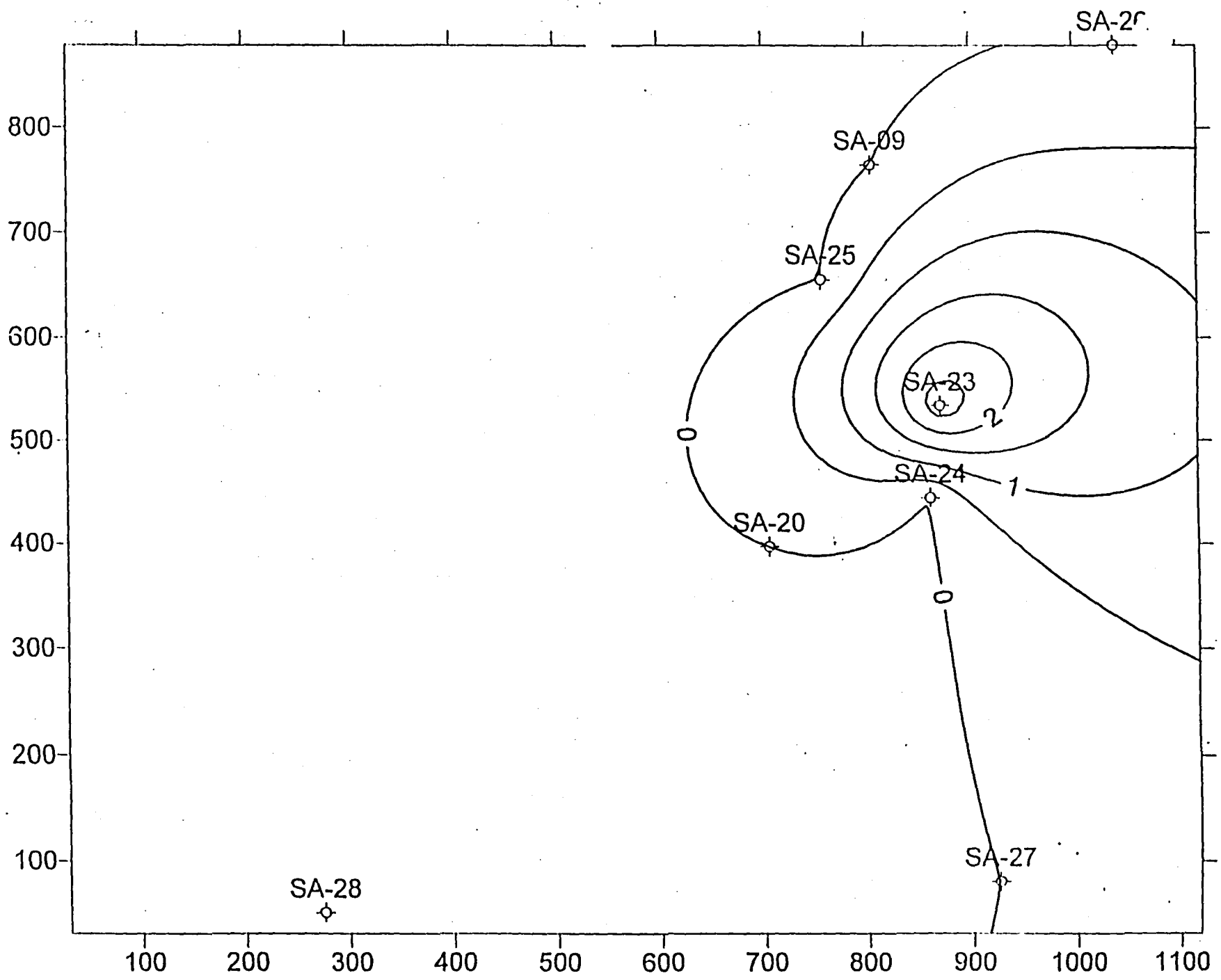
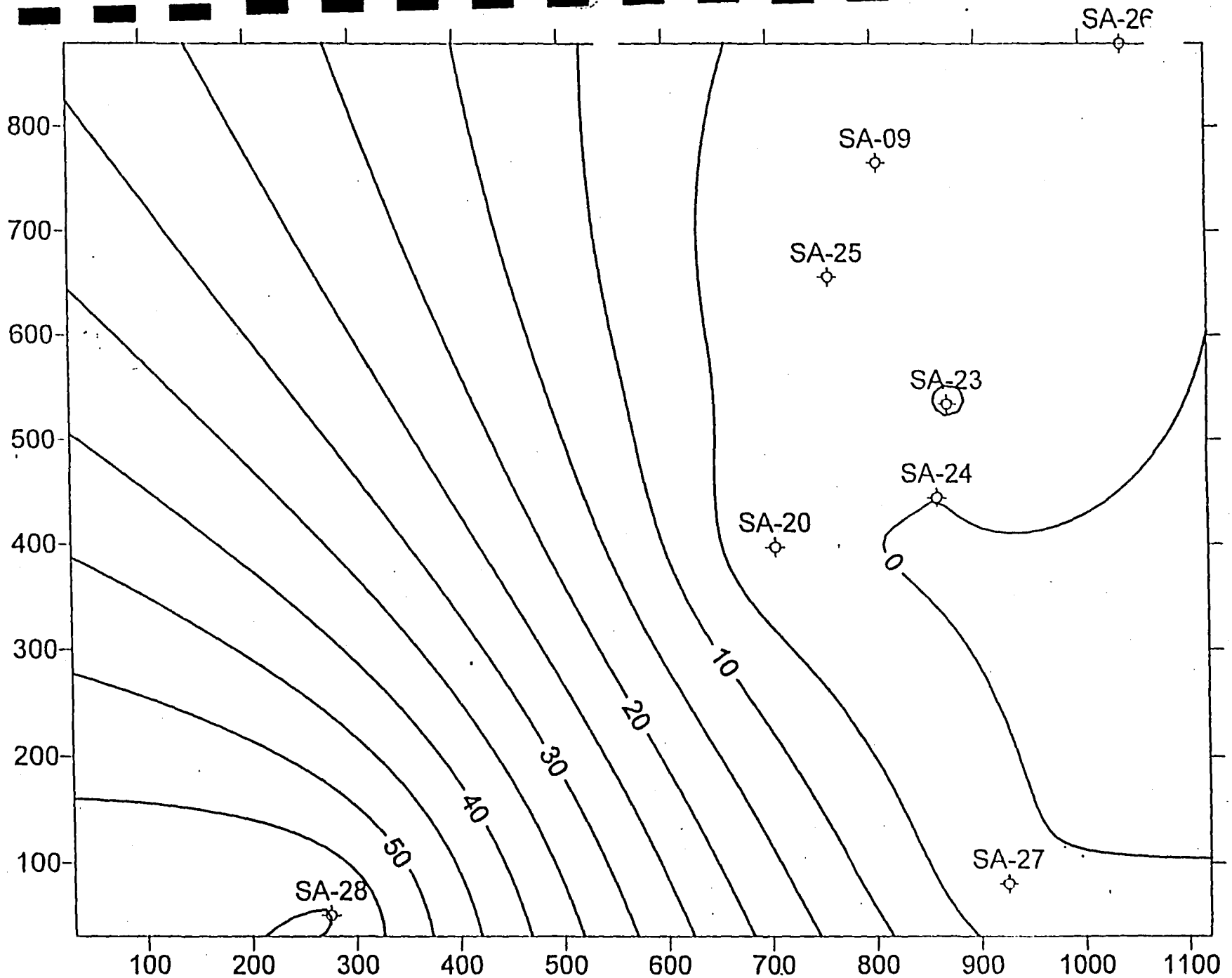


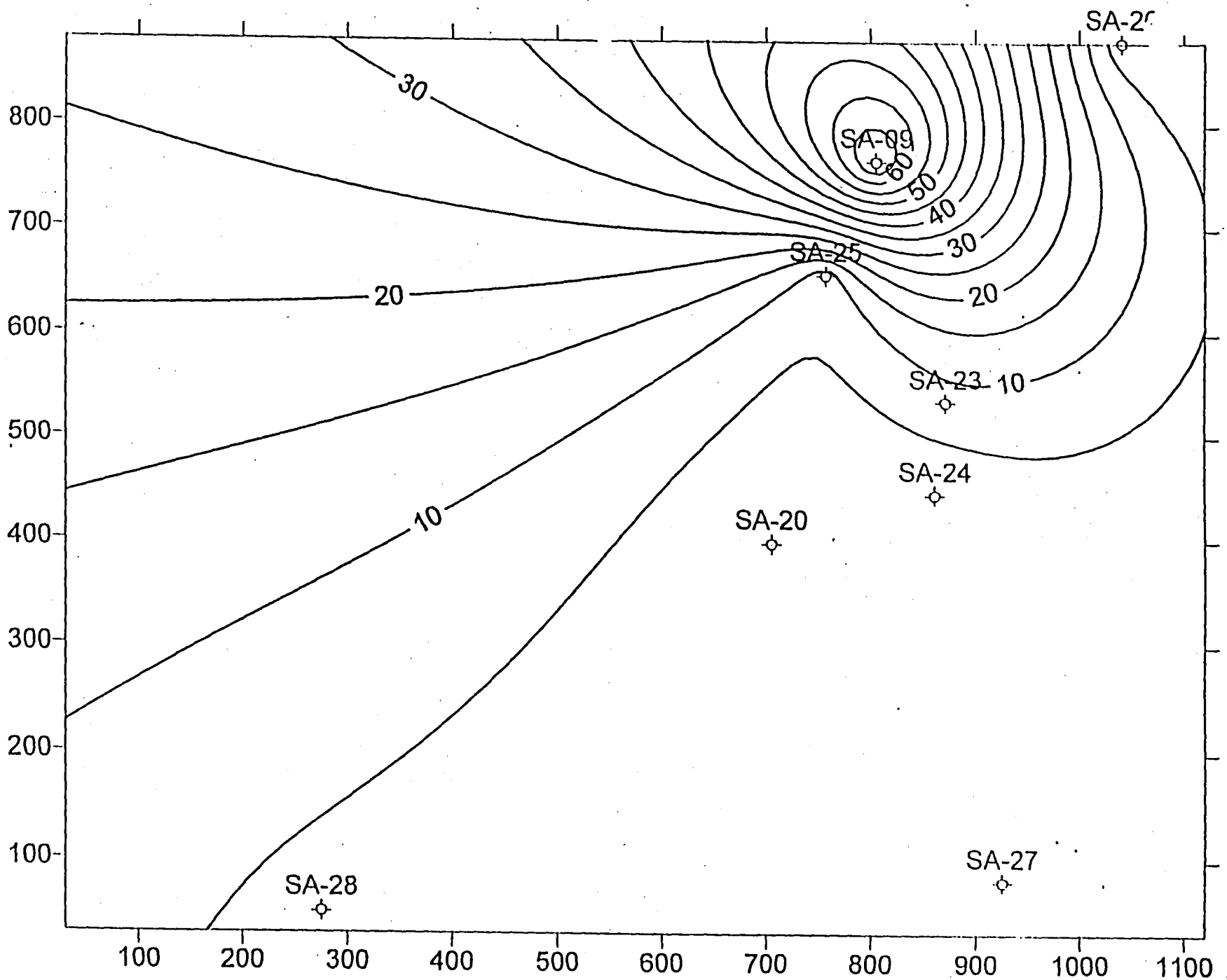
Soil 0-1 Foot, Silver Concentration, mg/kg



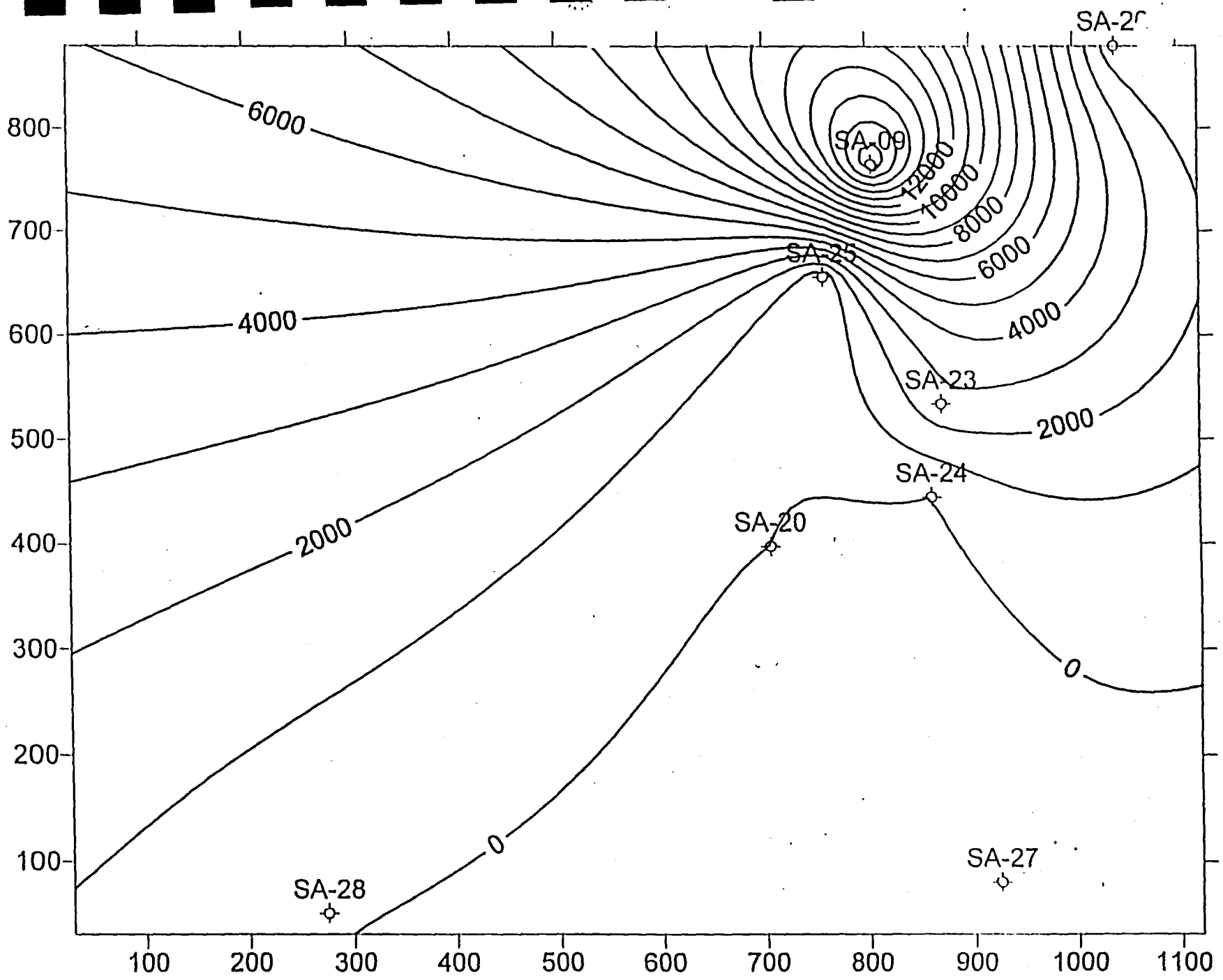
Soil 1-2 Feet, Silver Concentration mg/kg



Soil 1-2 Feet, Thallium Concentration, mg/kg



Soil 1-2 Feet, Vanadium Concentration, mg/kg



Soil 1-2 Feet, Zinc Concentration, mg/kg

Soo on Metals Recycling

Attachment 9

STATE FILE

FINAL REMEDIAL ACTION PLAN
UNOCAL CAPE FEAR TERMINAL
Wilmington, North Carolina

PREPARED FOR

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Unocal Chemicals and Minerals Division
1700 East Golf Road
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August 6, 1992

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1.0 INTRODUCTION AND BACKGROUND INFORMATION

This Remedial Action Plan (RAP) was prepared in response to a Notice Of Violation (NOV) for exceedance of groundwater quality standards at the Unocal Chemicals Cape Fear Distribution Terminal in Wilmington, North Carolina. The NOV was issued by the North Carolina Department of Environment, Health, and Natural Resources Division of Environmental Management (DEM) on December 14, 1990. This RAP presents the remedial action program for the Cape Fear Terminal, including proposed corrective actions to immediately address areas of identified groundwater contamination and to intercept/contain groundwater contaminants to prevent their discharge into the Cape Fear River. Appendix A presents backup groundwater modeling information that was used to evaluate various remedial alternatives. The supplemental RAP site assessment activities, which were conducted between preparation of the draft RAP (submitted in March, 1992) and this final RAP, are also outlined. Section 1.1 provides background information concerning the Cape Fear Terminal, describes the events leading to the issuance of the NOV, and summarizes findings of the site assessment activities conducted at the facility pursuant to the NOV requirements.

1.1 Background Information

The Cape Fear Terminal is currently owned and operated by the Unocal Chemicals Division of Union Oil Company of California (Unocal). The Cape Fear Terminal is located at 1002 South Front Street, Wilmington, North Carolina. Figure 1, Site Location Map, shows the site in relation to the Cape Fear River and downtown Wilmington. Figure 2 shows the facility in plan view. The facility was reportedly constructed in the 1920's as a petroleum distribution terminal. Unocal acquired the facility from the Pure Oil Company in the late 1960's and began operations on the site in 1975. Historically, gasoline and other petroleum products were stored at this facility as well as at other facilities immediately adjacent to the Unocal site. According to employees at the facility, no chlorinated solvents were used or stored at this facility by Unocal. Current operations at the facility generally include receiving bulk shipments of liquid chemicals, temporarily storing these chemicals in above ground tanks, and filling orders of bulk shipments of raw chemicals and custom blends. The facility is bounded on the north by the old City Gas refinery and on the south by Sprauge Energy.

The existence of possible contamination at the site was first identified during construction activities performed by Unocal at the facility in March of 1990. During construction activities a buried pipe of unknown origin and usage was encountered. As the pipe was unearthed, liquid (water and petroleum hydrocarbons) began to discharge from the open end of the pipe. Unocal immediately initiated recovery of the liquids, and samples were collected and submitted for analytical testing. The analytical results indicated the presence of benzene, toluene, ethylbenzene, and xylene (BTEX) compounds at concentrations ranging from 52 to 5,822 parts per billion (ppb), and Total Petroleum Hydrocarbon (TPH) concentrations ranging from 395 to 7,100 ppb. The DEM was notified of the incident whereupon Unocal was issued a request to conduct subsurface geologic and hydrologic investigations at the site.

A Preliminary Geologic and Hydrologic Investigation was conducted in July 1990. The results of the initial assessment activities were submitted to the DEM in a September 13, 1990 report titled "Preliminary Geologic and Hydrologic Investigation Report - Unocal Chemicals, Cape Fear Terminal - Wilmington, New Hanover County, North Carolina," (WCC, September 1990).

After reviewing this report the DEM stated that the data indicated Unocal Chemicals Division was in violation of certain provisions of the *Classifications and Water Quality Standards Applicable to Groundwaters of North Carolina* (15A NCAC 2L). The DEM required that Unocal take the following actions in accordance with applicable provisions of the 2L Standards:

1. Assess the cause, significance, and the extent of these violations; and

2. Submit the results of this assessment along with a remedial action plan (RAP) that provides for restoration of groundwater quality to the level of the standards.

In a letter dated January 8, 1991, Unocal responded by agreeing to develop a work plan for additional site assessment activities, and based upon findings of those activities present plans for remedial actions necessary to address groundwater concerns at the facility.

A work plan for the additional site assessment activities was prepared and submitted to the DEM on February 10, 1991. The approved work plan was implemented during May, 1991. The results of the additional site assessment activities were submitted to the DEM in a December 13, 1991 report titled "Additional Site Assessment Activities - Unocal Chemicals Cape Fear Terminal - Wilmington, North Carolina" (WCC - December, 1991). Groundwater analytical results from the first two assessments (WCC - Sept. 1990) and (WCC - Dec. 1991) are summarized in Figure 3.

A draft RAP was submitted to the DEM in March, 1992. The draft RAP identified the need for additional site characterization activities that would be needed to finalize the RAP. In April and May, 1992 Unocal conducted these additional site characterization activities (referred to as Supplemental RAP Site Assessment Activities), and began implementation of the RAP components that were not dependent upon results of these additional activities.

This final RAP document incorporates the results of the supplemental RAP activities and provides additional detail on the RAP components that were recently installed.

1.2 Regional Geologic Setting

The Unocal facility is located adjacent to the Cape Fear River in the Coastal Plain Physiographic Province in the Wilmington-New Bern area of New Hanover County, North Carolina (see Figure 1). This region is typical of a coastal plain that slopes gently eastward to the Atlantic Ocean at less than 3 feet per mile. This region represents the part of a former sea floor that has been uplifted above the present day sea level. As the sea level withdrew eastward, the streams extended their courses toward the southeast. Commonly, a terrace borders the streams and rivers at a level below the upland. These terraces vary greatly in area, and range in width from a few tens of feet to as much as a mile.

New Hanover County extends southward from Pender County forming a peninsula between the Cape Fear River and the Atlantic Ocean. Land surface elevations within the County ranges from sea level to approximately 40 feet above sea level. Crystalline rocks are expected to be encountered at a depth of 1,100 feet below sea level as noted in a well log from Hilton Park that is located near Wilmington.

The Wilmington area is located near the contact of the Cretaceous Age Peedee Formation and Tertiary Age Castle Hayne Formation. The Cape Fear Terminal is located in the area mapped as the Peedee Formation. According to the Geology and Groundwater Resources of Wilmington-New Bern Area, published by the North Carolina Department of Water Resources, the Peedee Formation dips gently to the southeast at the rate of approximately 25 feet per mile. The Peedee Formation consists chiefly of layers of dark gray sandy clay alternating with layers of dark green to gray glauconitic sand. Shells are disseminated throughout the formation and may be concentrated in layers as much as 3 feet or more in thickness.

1.3 Summary of Supplemental RAP Site Assessment Activities

As discussed previously, three site characterization assessments have been conducted at the Cape Fear Terminal. The purpose of the first investigation, the Preliminary Geologic and Hydrologic Investigation (WCC - Report dated September, 1990), was to provide a preliminary evaluation of the geologic, hydrogeologic, and water quality conditions at the facility. The purpose of the second investigation, the Additional Site Assessment Activities, was to evaluate the significance and extent of the water quality violations cited in the NOV. The purpose of the third investigation, the Supplemental RAP Site Assessment Activities, was to collect additional information concerning hydraulic characteristics, soil lithology, soil contamination, and groundwater quality for use in designing the remedial action components. The Supplemental RAP Site Assessment Activities were conducted at the Cape Fear Facility from April 20 to May 15, 1992.

The following sections contain a summary of the findings of the Supplemental RAP Site Assessment activities. The locations of the borings and wells are shown on Figure 4. Boring logs for each boring and well are provided in Appendix B.

1.3.1 Seismic Survey

A seismic survey was conducted during the week of April 20, 1992 to evaluate the depth to bedrock at the facility without the need for drilling numerous deep boreholes. The seismic survey crew used a hammer and steel plate, as well as blank shotgun cartridges to induce seismic waves into the ground. However, due to the very loose, sandy soil that attenuated the shock wave, and background seismic noise associated with plant activities that masked the signal, the seismic survey results were not sufficient to be able to map the bedrock surface in the western portion of the site. As a result, the depth to bedrock in the western portion of the facility was estimated based on the soil boring and monitoring well lithologic information discussed in the following sections. The results of the seismic survey are included in Appendix C.

1.3.2 Soil Sampling Activities

Eight soil borings (SB's) were drilled in April and May, 1992 at selected locations to evaluate soil contamination related to potential source areas. Two surface soil samples were also collected near the main product piping manifold area in February 1992. The potential on-site source areas include:

- past and present rail and truck loading/unloading areas
- areas around storage tanks
- areas near product piping

In addition to the soil borings, three trench alignment borings (TB's) were drilled near the conceptual alignment of the groundwater recovery trench, about 120 feet east of the river. TB-2 was converted into a pump test well (PW-2) and is located near the middle of the potential groundwater recovery trench alignment.

The soil and trench borings were drilled to characterize the nature of the subsurface materials, evaluate the potential existence of a low permeability layer within the water bearing unconsolidated materials, and to evaluate the magnitude of any vadose zone contamination. Since the seismic survey was unable to determine depth to bedrock, all of the trench borings were advanced to bedrock. Soil samples were collected from the soil borings, surface soil sample locations, and the trench borings. Soil samples were also collected from the recovery and monitoring well borings. Jar headspace screening using a photoionization detector (PID) was performed on a split of each sample (when sufficient sample was available) to aid in selecting a sample from each boring for laboratory analysis. Table 1 is a summary of the field jar headspace readings. Additional soil samples were collected from the trench borings and tested to evaluate soil gradation and permeability. Table 2 is a summary of the soil laboratory gradation and permeability testing results.

The soil lithology encountered in the eastern portion of the site was generally consistent with previous investigations, and consisted of loose to very loose, fine to medium grained, poorly graded sands and silty sands overlying a weathered, interbedded, glauconitic sandstone and shale bedrock. Bedrock was encountered at depths ranging from approximately 12.5 to 19 feet below ground surface (bgs).

Borings located in the western portion of the site (on the lower bench) encountered approximately 6 to 12 feet of mixed silty, sandy, dredged fill material and rubble, overlying several feet of a highly organic, plastic clay layer, overlying silty to clean poorly graded sand. The elevation of the top of the clay layer ranged from approximately -5 to -7 feet (below) mean seal level (MSL) near the river, to approximately -1 foot MSL near the base of the terrace. Throughout most of the lower terrace the top of the clay was characterized by an accumulation of saw dust, wood chips, stumps, and other debris. Near the base of the terrace the top of the clay layer was characterized by a 2 to 3 foot thick layer containing many plant fibers, roots, and peaty material that graded into a plastic clay. This layer apparently represents the former tidal marsh ground surface in the western portion of the site. Bedrock in the western portion of the site was encountered at depth of approximately 38 to 40.5 feet bgs. This clay layer appears to significantly retard the downward migration of contaminants in most areas. Additional discussions on the significance of this clay layer in the remedial design are presented in Section 2.3.1.

Free phase hydrocarbon was noted either in the soil and/or on the groundwater table in borings RW-2, RW-6, MW-9, MW-10, SB-5, SB-6 and SB-7. The thickness of the free phase hydrocarbon ranged from a sheen on the water in borings RW-2, MW-9, and MW-10 to several inches of hydrocarbon saturated soil in SB-5, SB-6, SB-7, and RW-6.

In general, one soil sample from each boring was sent to the laboratory for analysis. When there was sufficient vadose zone soil sample recovery, the vadose zone soil sample with the highest PID reading was selected for laboratory analysis. In many instances however, it was necessary to use the soil sample closest to the water table to submit for laboratory analysis.

1.3.3 Groundwater Monitoring and Secondary Recovery Well Construction and Sampling

Monitoring and recovery wells were constructed at the locations shown in Figure 4. Table 3 is a summary of the well construction information for each of these wells. Well development was performed on all wells installed during the field program. Well development consisted of surging and purging water from each well with a diaphragm pump until the water cleared or a minimum of 5 well volumes was removed from the well. Groundwater samples were collected from all of the new wells (MW and RW), as well as the existing "UC" wells that will be used as monitoring wells. Groundwater quality field parameters are summarized in Table 4.

Water levels measured in new and existing wells at the site ranged from approximately 7 feet to 12 feet bgs on the upper terrace, to approximately 0.5 feet to 3 feet bgs on the lower terrace. Table 5 is a summary of water level measurements taken during April and May, 1992 at the site. Based on these measurements groundwater flow is from east to west across the site toward the river. Figure 5 shows the groundwater contour map for the shallow water bearing zone above the clay layer at the site. Figure 6 is a generalized geologic cross section through the site.

1.3.4 Sample Analysis

All of the soil and groundwater samples collected during the field program were analyzed at IEA laboratories by EPA methods 8240 (volatiles) and Total Petroleum Hydrocarbons (TPH-GC). In addition, several soil and groundwater samples were analyzed for semivolatiles (8270), and selected metals. Several soil samples were analyzed for physical parameters (Table 2). Table 6 summarizes the soil analytical results for compounds that were detected. Analytical detection limits are elevated when there is a significant concentration of one or more compounds. Table 7 summarizes the same information for the groundwater analytical results. Figures 7 through 11 show the concentrations of selected contaminants in soil and groundwater. In general, the lateral extent of groundwater contamination is consistent with the previous site assessment study results. The vertical extent of groundwater contamination is primarily limited to the shallow water bearing strata above the clay layer. The exception to this is near MW-10, where contamination in the lower zone may be related to an off-site source. The results of the metals analyses for soil showed some elevated concentrations of lead in two borings. However, these concentrations are within the range of background soils near refineries (Loehrn and Malina, 1986). Since many of the soils in this area of the site are comprised of fill material, it is not unusual to see a wide range in metal concentrations. Field observations did not indicate the presence of any leaded tank bottoms in any of the areas that were sampled. Analytical summary tables are provided in Appendix D.

1.3.5 Hydraulic Testing

Variable rate drawdown pump tests were conducted on PW-1, PW-2, and RW-2 to confirm or refine the hydraulic properties that had been estimated in earlier studies. PW-1 and PW-2 are located about 45 feet apart, on the lower terrace approximately 120 feet east of the river. PW-1 and PW-2 are both constructed of 4" diameter PVC casing with 10 feet of 0.020-inch slot wrapped screen. PW-1 was screened above the clay layer from 3 to 13 feet bgs. PW-2 was screened below the clay layer from 27 to 37 feet bgs. The annulus of PW-2 was grouted through the clay layer to seal the upper water zone from the lower water zone.

Observation wells OW-1, 2, and 3 were located between PW-1 and PW-2 so that they could be used to measure drawdown in the shallow water bearing zone during the pump tests. OW-1 is located approximately 10 feet south east of PW-1. OW-2 is located approximately 10 feet north west of PW-2. OW-3 is located approximately 25 feet away from each of the pumping wells. All of the OW wells were constructed of 2" diameter PVC and screened above the clay layer. An existing well, deep well UC-13D, located approximately 75 feet west (toward the river) of well PW-2, was used during the PW-2 pump test to monitor drawdown and tidal changes in the lower water bearing zone (below the clay).

A pump test was conducted in well PW-2 on May 12, 1992 from 1:37 pm to 3:25 pm. During the test the tide in the Cape Fear river rose approximately 3 feet. PW-2 was pumped at a rate of 6 gallons per minute (gpm) for 68 minutes, then because the tide was rising faster than the well drawdown rate, the pumping rate was increased to 9 gpm for the duration of the test. The pump test was terminated at 3:25 pm when the groundwater table rise due to tidal influences exceeded the capacity of the pump (9 gpm). Drawdown in the pumping well was measured at a maximum of 0.68 feet. The maximum drawdown measured in UC-13D was 0.3 feet. No drawdown was observed in the shallow zone observation wells during the test. While the length of this pumping test was relatively short, it is evident that the lower water bearing strata in this portion of the site are under confined conditions, and are capable of yielding significant amounts of water.

A pump test was conducted in well PW-1 on May 13, 1992 to evaluate groundwater flow conditions in the shallow water bearing zone near the river. The test began at 10:45 am and was terminated by a thunderstorm at 11:45 am. During this brief test two pumping rates were used, 2.74 gpm and 4 gpm. The measured drawdown in the pumping well was a maximum of 6.21 feet. The maximum drawdown in the observation wells ranged from 0.82 feet in OW-1 (the closest to the pumping well) to 0.08 feet in OW-2 (the farthest from the pumping well). The data from this test indicate that the hydraulic conductivity is approximately 98 gallons per day per square foot (gpd/ft^2).

The pump test performed on RW-2 was to evaluate groundwater flow conditions on the upper terrace of the site. The observation wells for the test, OW-4 and -5, were located approximately 25 feet and 10 feet away from RW-2. During the test, RW-2 was pumped at a rate of approximately 0.7 gpm from 1:35 pm to 4:35 pm. The maximum drawdown measured in the pumping well during the test was 5.2 feet. The maximum drawdown measured in the observation wells was 0.23 feet in OW-5 and 0.19 feet in OW-4. The data from this test indicate that the hydraulic conductivity is approximately 107 gpd/ft^2.

Additional information concerning the pump test results is provided in Appendix D.

2.0 REMEDIAL ACTION PLAN COMPONENTS

This section describes the existing and proposed groundwater and soil remedial actions for the Unocal Cape Fear facility.

2.1 Objective

The ultimate objective of the proposed remedial actions is directed toward the restoration of groundwater quality at the Unocal Cape Fear facility to levels established by North Carolina Title 15 NCAC 2L. Additional goals of the remedial actions are as follows:

1) Intercept contaminated groundwater in the uppermost water bearing zone before it may discharge into the Cape Fear River (see Section 2.3.1);

2) Facilitate groundwater cleanup by targeting source area soils and identified areas of elevated groundwater contamination exceeding Subchapter 2L Standards (see Sections 2.3.1 and 2.3.2);

3) Recovery of Non-Aqueous Phase Liquids (NAPL) as encountered at the site (see Section 2.3.1);

4) Monitor the effectiveness and progress of the groundwater recovery system by collecting and analyzing groundwater samples from selected wells at the facility (see Section 3.8); and

5) Monitor the groundwater at the facility boundaries for the possible on-site migration of contamination from non-Unocal properties (see Section 3.8).

The ability of Unocal to achieve some of these goals will be impacted by known groundwater contamination at the facilities adjacent to Unocal on the northern (City Gas) and southern (Sprague) property boundaries. The remedial action components presented in this RAP comprise an integrated remedial action program which Unocal believes will satisfy the above objectives. However, as is discussed later in this RAP, certain remedial actions cannot be fully implemented until additional characterization and remediation of off-site sources is conducted.

2.2 Historic Abatement Measures

Immediately upon discovery of suspected groundwater contamination at the Cape Fear facility (Section 1.1), Unocal implemented groundwater cleanup efforts. A dewatering sump was constructed in the area of the March, 1990 spill described in Section 1.1. The sump was pumped and the NAPL was skimmed off the water surface.

During the subsequent initial site assessment investigation (WCC - Sept. 1990), NAPL was encountered near Tank 211 and an emergency recovery well RW-1 was installed to initiate recovery. During the additional subsurface site investigation (WCC - Dec. 1991), NAPL was noted in well UC-2 near Tank 204. Five borings were installed to evaluate the extent of the NAPL in that area. The

borings indicated that the areal extent of the NAPL was very localized. One additional recovery well (RW-2) was installed, and one of the investigative borings was converted into a recovery well (RW-3). These three wells were skimmed to recover the NAPL. These recovery well designations on Figure 4 are shown in parentheses to differentiate them from the secondary recovery wells discussed in Section 2.3.1.2.

2.3 Methodology and Selection Criteria for Additional Corrective Actions

The site characterization activities discussed in Section 1.0 have identified areas within the site where the concentration of certain compounds in the groundwater exceed the North Carolina groundwater quality standards of Subchapter 2L. Groundwater contamination does not appear to be migrating off-site, and is primarily limited to the shallow water bearing strata above the clay layer. The shallow groundwater quality exceedances may be related to past activities on the Cape Fear site and/or to activities on adjacent properties. Groundwater contamination observed in the water bearing strata below the clay layer appears to be largely related to off-site sources and activities that may have breached the clay layer. There appears to still be some NAPL on the groundwater table upgradient of Tank 204.

The following sections briefly describe the rationale for the various additional corrective actions proposed for the Cape Fear Terminal. The additional remedial action activities proposed for the Cape Fear site include components to immediately address identified source areas (soil and NAPL) and areas on the Unocal property where shallow groundwater (above the clay) has elevated concentrations of contaminants, and to intercept the shallow groundwater contaminants and prevent their discharge into the Cape Fear River.

2.3.1 Groundwater Recovery Systems

Unocal proposes to use pump and treat technology to address groundwater issues at the Cape Fear Terminal. Groundwater remedial efforts will be focused on the upper water bearing strata above the clay layer. This is where the majority of groundwater contamination occurs. As remediation of this upper zone progresses, the source of potential contamination to the lower zone is removed. Active remediation of the limited area of the lower zone that is currently contaminated (area near MW-10), is not recommended for the following reasons:

1. Large amounts of water would need to be extracted to intercept contamination near MW-10 and MW-9.

2. The most likely source for this lower zone contamination appears to be the property immediately south of the Unocal Cape Fear Terminal. Active remediation of the lower zone will accelerate movement of contaminants onto the Unocal property.

3. Active pumping of the lower zone will accelerate the downward migration of contaminants through the clay layer or at any potential breaches in the clay layer.

The primary groundwater containment/recovery system will consist of a linear array of shallow recovery wells oriented parallel to the Cape Fear River (Figure 12), and is intended to retard contaminant movement into the river. Unocal evaluated several configurations using two primary groundwater recovery alternatives; a groundwater recovery trench and a recovery well array. The results of the primary groundwater containment/recovery system alternatives evaluation are included in Appendix A. In addition to the primary groundwater containment/recovery system, a secondary groundwater recovery system consisting of six recovery wells will specifically target areas of identified elevated groundwater contamination. The purpose of the secondary recovery wells is to accelerate groundwater remediation of the upper zone, thereby reducing the potential for downward migration of contaminants into the lower zone. The locations of the secondary recovery wells are shown on Figure 12.

2.3.1.1 Primary Groundwater Containment/Recovery System

As illustrated on Figure 12, the primary groundwater containment/recovery system will consist of four new recovery wells oriented north to south (parallel to the Cape Fear River). Recovery well performance was evaluated for locations relatively close to the river and further from the river (Appendix A). The groundwater recovery wells were located a significant distance away from the river because of the relatively low levels of contaminant concentrations observed in the monitoring wells located adjacent to the river, and to take advantage of river recharge in "flushing" contaminants back toward the recovery system. It is anticipated that by having the containment/recovery system upgradient (inland) those contaminants will still be captured, but the amount of water induced into the system from the Cape Fear River will be minimized thereby reducing the total volume of water pumped to achieve control.

The groundwater modeling results presented in Appendix A indicate that operation of all four of the primary groundwater recovery wells will significantly increase the migration of contaminants onto the Unocal property from the Sprague and City Gas facilities. As a result, Unocal plans to install these primary groundwater recovery wells but will initially only operate primary recovery well RW-8.

2.3.1.2 Secondary Groundwater Recovery System

Unocal has installed six secondary groundwater recovery wells (RW-1 through RW-6) located in or downgradient from monitoring wells or temporary borings that have exhibited elevated concentrations of VOCs in exceedance of North Carolina Subchapter 2L Standards. These recovery wells will depress the groundwater table near the center of the facility, thus reducing the potential that impacted groundwater will migrate off-site and accelerating the overall cleanup. Unocal proposes to operate all six of these secondary groundwater recovery wells. As with the primary groundwater recovery system, it will be necessary to closely monitor groundwater quality at the site to ensure that no contamination from neighboring facilities is drawn onto the Unocal property. The locations for the six supplementary recovery wells are shown on Figure 12.

2.3.1.3 NAPL Recovery System

Although the analytical results from RW-6 indicate that the groundwater in this location does not exceed North Carolina Subchapter 2L Standards, there appears to still be a significant amount of NAPL upgradient of this location. The primary soil contaminants in this area are kerosene and No. 2 fuel oil (Table 6). In order to accelerate cleanup of source areas, Unocal proposes to install a shallow NAPL recovery trench in the location shown on Figure 12. This trench will be used to recover contaminated groundwater and NAPL in the shallow saturated soils.

2.3.2 Soil Remediation

The vadose zone soils in the areas of current and former truck and rail loading/unloading areas appear to have significant amounts of contamination (Table 6). In order to accelerate remediation of source area groundwaters, Unocal proposes to utilize soil vapor extraction system (VES) technology in the areas identified in Figure 12 to remove volatile contaminants from source area soils. VES technology is based on the principle that volatile organic compounds vaporize to a state of equilibrium in the air spaces surrounding the soil particles. The VES process creates a vacuum which induces subsurface air flow through the soil toward a vapor extraction well. As the air moves through the soil, contaminants in the air in the pore spaces are removed, which subsequently results in enhanced volatilization of contaminants from the soil matrix into the air in the pore spaces. In addition to removing the contaminants by volatilization, the VES technology also enhances the in-situ biodegradation of volatile and semi-volatile organic compounds.. The increased amount of oxygen that results from VES operations increases the biological activity in the subsurface. As a result, even the less volatile organic compounds are remediated to some degree by utilizing the VES technology.

Due to shallow groundwater conditions in the western portion of the site, the use of this technology is limited to areas with approximately 5 ft. or more of vadose zone thickness. Contaminants in soils in the western portion of the site, primarily along the piping runs, will be allowed to naturally biodegrade.

2.3.3 Groundwater Treatment System

Unocal proposes to install a groundwater treatment system that will be similar to the system currently in use for interim remedial actions at the Unocal Carolina Terminal. The current plan is to locate the treatment system for the Cape Fear Terminal on-site. An evaluation of economic and logistic considerations resulted in selecting on-site treatment rather than utilizing a common treatment system for both the Carolina and Cape Fear terminals. The Cape Fear Terminal groundwater treatment system design is discussed in detail in Section 3.3.

3.0 REMEDIAL SYSTEM DESIGN

Components of the remedial system design include a primary groundwater containment/recovery system, a secondary groundwater recovery system in areas identified as exhibiting elevated concentrations of VOCs across the site, a NAPL recovery system, a soil vapor extraction system, a groundwater treatment system, and a groundwater monitoring network. The following sections present additional information concerning the construction details for the multi-component remedial system proposed for the Unocal Cape Fear Terminal.

3.1 Primary Groundwater Containment/Recovery System Design

A linear array of four primary groundwater recovery wells will be used for the primary groundwater containment/recovery system (Figure 12). This array of recovery wells will be located to create a hydraulic barrier to reduce the potential for groundwater discharge into the Cape Fear River. The locations for these primary groundwater recovery wells were chosen based on the modeling results presented in Appendix A.

Each recovery well will be constructed with approximately 10 to 15 feet of 4-inch diameter, wire wrapped stainless steel screen (0.010-inch opening) and the appropriate length of 4-inch, flush threaded, type 304 stainless steel riser. The screened interval will be selected so that the top of the well screen is set at an elevation approximately 1 foot above the highest anticipated static water level, and that the bottom of the well screen is at or near the bottom of the clay layer. A 2 foot sump will be provided on the bottom of each well to allow the pump to be set at a depth that maximizes drawdown in the recovery well. This type of construction allows for the efficient recovery of NAPL if it is present. The screened interval will be sandpacked with a clean silica sand compatible with the selected screen slot size and the geologic formation. The sand pack will extend a minimum of 2 feet above the screened interval. The sand pack will be topped with 1 foot of a bentonite seal. A cement/bentonite grout will be used to seal the remaining annulus as necessary. Typical well construction details are shown in Figure 13. Surface completion will be comprised of an offset manhole vault that is also shown in Figure 13.

Each primary groundwater recovery well will be equipped with a pneumatic groundwater recovery pump manufactured by ESI. These pumps will be bottom fill/total fluids type pumps capable of pumping from less than 0.1 gpm to over 5 gpm. Pump controllers will be located as shown in Figure 13. The approximate location of the recovery well effluent piping is shown in Figure 12. Generally the piping will be above grade, except through traffic areas where there are no overhead pipe racks. The recovery well piping will be double contained, consisting of an outer 4-inch I.D. PVC secondary containment pipe, with a 1-inch flexible poly pipe for effluent and an air line for pump operation inside of the outer PVC pipe.

3.2 Secondary Groundwater Recovery Well System Design

The locations of the six secondary groundwater recovery wells were selected to accelerate the remedial efforts at the site. A total of six secondary groundwater recovery wells were installed in April and May 1992 as part of this remedial action plan. Specific recovery well construction details

for these recovery wells are provided in Appendix B, and are summarized in Table 3. The well vaults shown in Figure 13 have not yet been installed for these wells. The groundwater recovery pumps and recovery system piping will be the same as that discussed for the primary groundwater recovery wells.

3.3 NAPL Recovery System Design

The NAPL recovery system will consist of a shallow (approximately 5 to 8 feet deep) trench, backfilled with pea gravel. The trench location is shown in Figure 12 and is located immediately downgradient of the suspected area where NAPL is present. If possible, the downgradient side of the trench will be lined with a HDPE liner to inhibit migration of NAPL past the trench. This is desirable since the amount of groundwater that will be pumped initially will be minimized because of the off-site contaminant sources. The NAPL recovery trench will have one 10-inch diameter corrugated metal sump located near the center of the trench. A skimmer will be used to recover NAPL, while a pneumatic pump will be used to recover contaminated groundwater. The skimmer will pump any recovered NAPL to a 500 gallon NAPL holding tank for future recycling or disposal. This tank will be equipped with a high level shutoff. The holding tank will be located on a concrete containment pad with berms. Recovered groundwater will be pumped to the groundwater treatment system.

3.4 Soil Remediation System Design

Unocal proposes to install six vapor extraction wells at the locations shown in Figure 12. After the extraction wells are installed, a 1-week field pilot test will be conducted using a temporary vacuum extraction pump. Extraction wells will be operated individually and combined to evaluate system performance and contaminant concentrations. The estimated total extraction rate for the six wells is approximately 150 SCFM. Applied vacuums at the extraction wells will range between 5 and 30 inches of water. Pressure (vacuum) monitoring points will be installed near the vapor extraction wells to monitor the radius of influence of each extraction well. Samples of extracted air from each well and the combined stream will be taken early in the testing period and near the end of the testing period. These samples will be analyzed for EPA Method 8240 parameters. Periodic field measurements of total volatile organic concentrations using a Flame Ionization Detector (FID), LEL, oxygen and carbon dioxide will be made throughout the test. The results of this pilot test will be used to determine final extraction pump sizing, and to estimate the effluent concentrations from the VES. The final VES pump will be housed in the treatment trailer.

Currently, no vapor phase treatment is proposed for either the pilot test system or the final VES since total emissions of volatile organic compounds are expected to be much less than the 40 pound per day limitation.

3.5 Groundwater Treatment System Design

The groundwater treatment system is a pre-designed (packaged) system that is designed and manufactured by Ejector Systems, Inc. (ESI). The treatment system components will be housed in a

trailer that is approximately 20 ft. long, 7.5 ft. wide and 8.5 ft. high (Figure 14). The proposed location for the treatment system is shown on Figure 12. Sufficient space is provided in this trailer for the groundwater treatment system, pneumatic recovery pump compressors and the VES blower system.

The proposed groundwater treatment system has a treatment capacity of 25 gpm and includes a 1200 gallon coalescing baffle oil/water separator, and a seven (7) tray cascade air stripper. Any recovered oil is temporarily stored in a 275 gallon product tank. The cascade air stripper blower is powered by a 3 HP motor. The blower is capable of delivering 700 Standard Cubic Feet per Minute (SCFM) to the stripper. The air stripper is capable of removing greater than 99.9 percent of the volatile organic compounds contained in the waste stream. Influent concentrations were estimated utilizing the flow rates from the recovery wells estimated by the groundwater modeling, and estimated groundwater contaminant concentrations based on the site characterization studies. The estimated influent concentration of selected contaminants is shown in Table 8. Based on these concentrations, it is estimated that the proposed treatment system will provide sufficient contaminant removal to meet applicable effluent standards. Treated effluent will go to a effluent holding tank, where effluent can initially be held pending analytical results and approval to discharge. Once consistent system operations are achieved, this holding tank will serve as a surge tank. Air emissions from the stripper are vented out of the top of the trailer.

In addition to the above described treatment system components, two air compressors will be housed in the treatment trailer to provide supply air for the pneumatic groundwater recovery pumps. A VES blower will also be housed inside the treatment trailer once the final sizing has been determined as discussed above.

All of the motors, operational and safety appurtenances associated with the treatment system are intrinsically safe. The oil/water separator, product holding tank, and air stripper sump will all be equipped with high level shutoff switches. Check valves in the recovery well effluent lines will preclude the possibility of any backwash into the recovery wells.

3.6 System Security and Safety

The Cape Fear Terminal is bounded on all sides by a 6 foot high chain-link fence. During non-operational hours, all gates are locked. Mercury vapor flood lights are located throughout the facility. These lights provide adequate illumination of boundaries, storage areas and product transfer areas. The facility alarm is located on the east end of the main office building.

The treatment system will be enclosed and kept as a limited access unit for authorized personnel only. The recovery wells will be completed below grade in offset, pre-cast manhole vaults or other suitable protective enclosures that will limit unauthorized access to the pumps.

As a part of the treatment system package, automatic upset shutoff devices will be included. If for any reason the treatment system stops operating as designed, "fail-safe" shut-off systems will stop the recovery pumps. Alarms will sound to alert personnel of the upset condition of the treatment system. Ball and check valves will be installed in recovery piping so as to prohibit untreated waters from back-flowing into the formation.

3.7 System Operations

Unocal recognizes that the key to optimizing the efficiency of any groundwater recovery is to focus all efforts on maintaining continual operation of all system components. Operation and maintenance manuals will be developed following the installation of the proposed systems. Personnel responsible for operation and maintenance will receive the necessary training to insure that they have a working knowledge of both the mechanics of the systems components as well as the overall objectives of the remedial measures.

Once the final system has been installed, the system will be evaluated to assess whether any modifications are warranted to optimize the performance.

3.8 Monitoring Systems

The proposed groundwater monitoring network is designed to provide a basis to evaluate the performance of the individual system components and the effect of the groundwater recovery system on the local groundwater table. The following sections describe the various components of the monitoring system and how each element will be used to evaluate the effectiveness of the corrective action system. The monitoring system components are shown on Figure 12.

The proposed groundwater monitoring system will consist of:

- Nine existing monitoring wells downgradient of the groundwater containment/recovery system;
- eight existing and three proposed monitoring wells upgradient of the recovery system and near the site boundaries to detect the on-site migration of contaminants from non-Unocal sources;
- four primary and six secondary recovery wells will be sampled to evaluate the contaminant concentrations and remedial progress; and
- samples of the treatment system influent and effluent.

3.8.1 Downgradient Monitoring Wells

The locations of the downgradient monitoring wells are shown on Figure 12. Existing downgradient wells UC-4, UC-8, UC-11, UC-13D, MW-4, MW-10, MW-11, PW-1 and PW-2 will be used as downgradient monitoring wells.

3.8.2 Upgradient and Perimeter Monitoring Wells

The locations of the existing and proposed upgradient and perimeter monitoring wells are shown on Figure 12. Existing wells UC-6, UC-7, UC-10, MW-5, MW-6, MW-7, MW-8 and MW-9 will be

used to monitor groundwater quality upgradient of identified contamination from on-site sources, and near the southern perimeter of the Unocal site. Monitoring wells MW-5 through MW-7 are primarily for use in monitoring for potential migration of contaminants onto the Unocal site from the City Gas site on the northern Unocal property boundary. In addition, three new monitoring wells, two shallow (MW-12 and MW-13) and one deep (MW-14) are proposed for the area south of the rail loading area and Tank 204. These new monitoring wells will be used to evaluate groundwater contamination that may be migrating onto Unocal property from the Sprague Energy property.

3.8.3 Primary Containment/Recovery System and Secondary Recovery Wells

All of the supplemental recovery wells and containment extraction locations will be new components in the recovery system. Water level measurements would be obtained quarterly. Samples obtained from these components would provide a basis to evaluate the progress of the remedial efforts. Additionally, this data will be necessary to evaluate the removal efficiency of the treatment system.

3.8.4 Groundwater Treatment System

Samples of the influent and effluent water will be collected from sampling ports installed upstream and downstream of the water treatment unit. These samples will provide a basis to evaluate the removal efficiency of the water treatment system and will verify that the treated water meets the discharge permit standards. Unocal proposes to collect and analyze treated water samples quarterly.

3.9 Parameters

Table 9 provides a summary of the proposed sampling locations, frequency and analytical methods for the above described components of the remedial action system.

3.10 Quality Assurance/Quality Control

Quality assurance and quality control (QA/QC) for the remedial action system monitoring samples will include the use of blind duplicate samples at a frequency of five percent of the total samples submitted for analyses and one trip blank per cooler of samples shipped to the laboratory. The samples will be collected in pre-labeled, laboratory cleaned sample containers. Samples will be stored in coolers with ice prior to delivery to the analytical laboratory. Sample chain-of-custody records will be maintained for the samples. Laboratory QA/QC will follow standard EPA method protocols.

4.0 PERMITS

The following sections briefly discuss the types of permits that will be required (if any) for the groundwater recovery, NAPL recovery and VES components. Local building permit requirements are not discussed.

4.1 Groundwater

At the current time, a groundwater permit is not required for water withdrawal in conjunction with the proposed remedial action at the site unless it is decided that reinjection of treated groundwater will enhance the remediation efforts. If such reinjection should be proposed at a later date it will be necessary to obtain a "non-discharge permit" from the State of North Carolina Department of Environmental Management, Water Quality Section. Well construction permits have been obtained for all existing wells, and will be obtained for all future wells.

4.2 Water Quality Discharge

The Cape Fear facility has a current NPDES permit which permits the discharge of collected stormwater from the facility. Unocal is preparing an application of modification for that NPDES permit to allow discharge of treated effluent from the treatment system to the Cape Fear River.

4.3 Air Quality

It is anticipated that an air quality permit will not be required. Current regulations in North Carolina permit the discharge of as much as 40 pounds of pollutant compounds to the atmosphere per day without requiring the issuance of an air permit. It has been calculated that a treatment system worst case scenario would still fall under this standard exemption at the Cape Fear facility [WCC, Dec. 1991]. The air stripping system will be registered with the state.

4.4 Hazardous Waste

Unocal already has the necessary Hazardous Waste Generator number to ship wastes to a permitted hazardous waste disposal facility. All shipments of hazardous waste will comply with applicable local, state and federal regulations.

5.0 SCHEDULE

A proposed schedule for the tasks outlined in this Remedial Action Plan is presented in Figure 15.

6.0 REFERENCES

Loehr, Raymond C. and Joseph Malina, Jr. 1986. Land Treatment: A Hazardous Waste Management Alternative. Center for Research in Water Resources. Austin, Texas, 369 pp.

WCC. September 1990. Woodward-Clyde Consultants. "Preliminary Geologic and Hydrologic Investigation Report, Cape Fear Terminal."

WCC. December 1991. Woodward-Clyde Consultants. "Additional Site Assessment Activities, Unocal Chemicals, Cape Fear Terminal."

TABLE 6
SUMMARY OF DETECTED COMPOUNDS
SOIL SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

Parameters	Units	Sample No.: Sample Date:	MW-4 23-Apr-92 (depth 4-6)	MW-5 24-Apr-92 (depth 4.5-5)	MW-6 24-Apr-92 (depth 8.5-10.5)	MW-7 24-Apr-92 (depth 9-11)	MW-8 25-Apr-92 (depth 13-15)
acetone	ug/kg		< 100	< 500	< 500	< 100	< 100
2-butanone	ug/kg		< 100	< 50.0	< 500	< 100	< 100
benzene	ug/kg		< 5.0	< 25.0	< 25.0	< 5.0	< 5.0
ethylbenzene	ug/kg		< 5.0	< 25.0	< 25.0	< 5.0	< 5.0
gasoline	mg/kg		< 2.0	85.0	300	< 2.0	< 2.0
kerosene	mg/kg		< 2.0	< 50.0	< 20.0	< 2.0	< 2.0
toluene	ug/kg		< 5.0	< 25.0	< 25.0	< 5.0	< 5.0
varsol (1)	mg/kg		< 2.0	< 50.0	< 20.0	< 2.0	< 2.0
xylenes, total	ug/kg		< 5.0	< 25.0	< 25.0	< 5.0	< 5.0
#2 fuel oil	mg/kg		< 2.0	< 50.0	< 20.0	< 2.0	< 2.0
phenanthrene	ug/kg		--	--	--	--	--
2-methylnaphthalene	ug/kg		--	--	--	--	--
1,1,1-trichloroethane	ug/kg		< 5.0	< 25.0	< 25.0	< 5.0	< 5.0
arsenic	mg/kg		--	--	--	--	--
lead	mg/kg		--	--	--	--	--

< = Not-detected
-- = Not analyzed
(1) - Varsol is equivalent to mineral spirits

TABLE 6 (con't)
SUMMARY OF DETECTED COMPOUNDS
SOIL SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

		Sample No.:	MW-9	MW-10	MW-11	PW-1	RW-1
		Sample Date:	25-Apr-92	28-Apr-92	29-Apr-92	27-Apr-92	29-Apr-92
Parameters	Units		(depth 4-6)	(depth 8-10)	(depth 2-6)	(depth 2-4)	(depth 5-7)
acetone	ug/kg		< 500	< 100	< 100	< 50000	< 100
2-butanone	ug/kg		< 500	< 100	< 100	< 50000	< 100
benzene	ug/kg		160	< 5.0	< 5.0	< 2500	< 5.0
ethylbenzene	ug/kg		< 25.0	< 5.0	< 5.0	< 2500	< 5.0
gasoline	mg/kg		270	< 2.0	< 2.0	< 25.0	< 2.0
kerosene	mg/kg		< 200	< 20.0	< 2.0	< 50.0	< 2.0
toluene	ug/kg		< 25.0	< 5.0	< 5.0	< 2500	< 5.0
varsol (1)	mg/kg		< 200	790	< 2.0	2000	< 2.0
xylenes, total	ug/kg		< 25.0	< 5.0	< 5.0	< 2500	< 5.0
#2 fuel oil	mg/kg		3000	< 20.0	13.0	< 50.0	< 2.0
phenanthrene	ug/kg		--	< 330	--	--	--
2-methylnaphthalene	ug/kg		--	< 330	--	--	--
1,1,1-trichloroethane	ug/kg		< 25.0	< 5.0	< 5.0	< 2500	< 5.0
arsenic	mg/kg		--	> 1	--	--	--
lead	mg/kg		--	2.5	--	--	--

< = Not-detected
-- = Not analyzed
(1) - Varsol is equivalent to mineral spirits

TABLE 6 (con't)
SUMMARY OF DETECTED COMPOUNDS
SOIL SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

Parameters	Units	Sample No.: / Sample Date:	RW-1 29-Apr-92 (depth 7-9)	RW-2 27-Apr-92 (depth 9-11)	RW-3 26-Apr-92 (depth 4-6)	RW-4 26-Apr-92 (depth 13-15)	RW-5 30-Apr-92 (depth 3-5)
acetone	ug/kg		--	< 50000	< 12500	< 500	< 50000
2-butanone	ug/kg		--	< 50000	< 12500	< 500	< 50000
benzene	ug/kg		--	< 2500	< 625	< 25.0	< 2500
ethylbenzene	ug/kg		--	18000	3100	< 25.0	4300
gasoline	mg/kg		--	820	68.0	14.0	< 10
kerosene	mg/kg		--	< 2.0	700	< 2.0	< 600
toluene	ug/kg		--	5400	< 625	< 25.0	< 2500
varsol (1)	mg/kg		--	< 2.0	< 50.0	< 2.0	< 600
xylenes, total	ug/kg		--	110000	16000	< 25.0	3400
#2 fuel oil	mg/kg		--	< 2.0	< 50.0	< 2.0	14000
phenanthrene	ug/kg		< 330	--	--	--	--
2-methylnaphthalene	ug/kg		< 330	--	--	--	--
1,1,1-trichloroethane	ug/kg		--	< 2500	< 625	< 25.0	< 2500
arsenic	mg/kg		< 1.0	--	--	--	--
lead	mg/kg		10	--	--	--	--

< = Not-detected
-- = Not analyzed
(1) - Varsol is equivalent to mineral spirits

TABLE 6 (con't)
SUMMARY OF DETECTED COMPOUNDS
SOIL SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

Parameters	Units	Sample No.: / Sample Date:	RW-5 30-Apr-92 (depth 7-9)	RW-6 29-Apr-92 (depth 4-6)	SB-1 25-Apr-92 (depth 6-8)	SB-2 26-Apr-92 (depth 5-7)	SB-2 26-Apr-92 (depth 9-11)
acetone	ug/kg		--	< 12500	< 500	< 12500	< 500
2-butanone	ug/kg		--	< 12500	< 500	< 12500	< 500
benzene	ug/kg		--	< 625	< 25.0	< 625	< 25.0
ethylbenzene	ug/kg		--	< 625	< 25.0	< 625	< 25.0
gasoline	mg/kg		--	< 2.0	< 2.0	< 5.0	< 2.0
kerosene	mg/kg		--	< 40.0	30.0	440	18.0
toluene	ug/kg		--	< 625	< 25.0	< 625	< 25.0
varsol (1)	mg/kg		--	< 40.0	< 2.0	< 2.0	< 2.0
xylenes, total	ug/kg		--	< 625	1000	790	500
#2 fuel oil	mg/kg		--	1500	< 2.0	< 2.0	< 2.0
phenanthrene	ug/kg		< 1320	< 1320	--	--	--
2-methylnaphthalene	ug/kg		3100	< 1320	--	--	--
1,1,1-trichloroethane	ug/kg		--	< 625	< 25.0	1400	< 25.0
arsenic	mg/kg		< 1.0	1.0	--	--	--
lead	mg/kg		78	51	--	--	--

< = Not-detected
-- = Not analyzed
(1) - Varsol is equivalent to mineral spirits

TABLE 6 (con't)
SUMMARY OF DETECTED COMPOUNDS
SOIL SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

Parameters	Units	Sample No.: / Sample Date:	SB-3 27-Apr-92 (depth 9-11)	SB-4 28-Apr-92 (depth 9-11)	SB-5 28-Apr-92 (depth 6-10)	SB-6 27-Apr-92 (depth 4-6)	SB-7 28-Apr-92 (depth 4-6)
acetone	ug/kg		< 100	< 12500	< 12500	< 50000	21000
2-butanone	ug/kg		< 100	< 12500	< 12500	< 50000	< 12500
benzene	ug/kg		< 5.0	< 625	< 625	< 2500	6100
ethylbenzene	ug/kg		< 5.0	< 625	< 625	19000	< 625
gasoline	mg/kg		< 2.0	< 2.0	< 10.0	< 10.0	200
kerosene	mg/kg		< 2.0	17.0	13000	30000	< 2.0
toluene	ug/kg		< 5.0	< 625	< 625	< 2500	3600
varsol (1)	mg/kg		< 2.0	< 2.0	< 1000	< 1000	< 2.0
xylenes, total	ug/kg		< 5.0	< 625	1200	26000	53000
#2 fuel oil	mg/kg		< 2.0	< 2.0	< 1000	< 1000	< 2.0
phenanthrene	ug/kg		--	< 330	8000	--	< 2640
2-methylnaphthalene	ug/kg		--	< 330	41000	--	11000
1,1,1-trichloroethane	ug/kg		< 5.0	< 625	< 625	< 2500	< 625
arsenic	mg/kg		--	< 1.0	< 1.0	--	< 1.0
lead	mg/kg		--	3.0	6.3	--	32

< = Not-detected
-- = Not analyzed
(1) - Varsol is equivalent to mineral spirits

TABLE 6 - (con't)
SUMMARY OF DETECTED COMPOUNDS
SOIL SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

		Sample No.:	SB-8	TB-1	TB-2	TB-3
		Sample Date:	05-May-92	24-Apr-92	28-Apr-93	30-Apr-92
Parameters	Units		(depth 5.5-7.5)	(depth 4-6)	(depth 1-3)	(depth 1-3)
acetone	ug/kg		< 100	170000	< 12500	< 12500
2-butanone	ug/kg		< 100	230000	< 12500	< 12500
benzene	ug/kg		< 5.0	< 6250	< 625	< 625
ethylbenzene	ug/kg		< 5.0	< 6250	< 625	< 625
gasoline	mg/kg		< 2.0	800	< 2.0	< 25.0
kerosene	mg/kg		< 2.0	< 200	< 100	< 400
toluene	ug/kg		< 5.0	< 6250	< 625	< 625
varsol (1)	mg/kg		< 2.0	< 200	4700	7500
xylenes, total	ug/kg		< 5.0	< 6250	< 625	< 625
#2 fuel oil	mg/kg		< 2.0	< 200	< 100	< 400
phenanthrene	ug/kg		--	--	--	< 3300
2-methylnaphthalene	ug/kg		--	--	--	< 3300
1,1,1-trichloroethane	ug/kg		< 5.0	< 6250	< 625	< 625
arsenic	mg/kg		--	--	--	< 1.0
lead	mg/kg		--	--	--	28

< = Not-detected
-- = Not analyzed
(1) - Varsol is equivalent to mineral spirits

TABLE 7
SUMMARY OF DETECTED COMPOUNDS
GROUNDWATER SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

Parameters	Units	Sample No.: / Sample Date:	MW-4 14-May-92	MW-5 15-May-92	MW-6 14-May-92	MW-7 14-May-92	MW-8 13-May-92	MW-9 13-May-92
benzene	ug/L		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	1300
2-butanone	ug/L		< 100	< 100	< 100	< 100	< 100	< 1000
carbon disulfide	ug/L		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 50.0
ethylbenzene	ug/L		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	500
toluene	ug/L		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	86.0
xylenes, total	ug/L		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	1000
#2 fuel oil	mg/L		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	5.4
gasoline	mg/L		< 0.05	0.64	0.051	< 0.05	< 0.05	8.5
oil and grease	mg/L		--	--	--	--	--	7.1

< = Not-detected
-- = Not analyzed

TABLE 7 (con't)
SUMMARY OF DETECTED COMPOUNDS
GROUNDWATER SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

Parameters	Units	Sample No.: / Sample Date:	MW-10 13-May-92	MW-11 9-June-92	PW-1 15-May-92	RW-1 15-May-92	RW-2 13-May-92	RW-3 9-Jun-92
benzene	ug/L		1400	< 5.0	< 5.0	< 50.0	< 100	2900
2-butanone	ug/L		< 1000	< 100	< 100	< 1000	< 2000	< 10000
carbon disulfide	ug/L		< 50.0	5.0	< 5.0	< 50.0	< 100	< 500
ethylbenzene	ug/L		120	< 5.0	< 5.0	< 50.0	1100	2600
toluene	ug/L		100	< 5.0	< 5.0	< 50.0	960	1600
xylenes, total	ug/L		1000	< 1.0	< 5.0	2000	7300	< 500
#2 fuel oil	mg/L		2.4	< 1.0	< 1.0	< 1.0	< 0.05	< 1.0
gasoline	mg/L		5.4	< 0.05	< 0.05	1.2	20.0	26.0
oil and grease	mg/L		2.4	--	--	--	--	7.1

< = Not-detected
-- = Not analyzed

TABLE 7 (con't)
SUMMARY OF DETECTED COMPOUNDS
GROUNDWATER SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

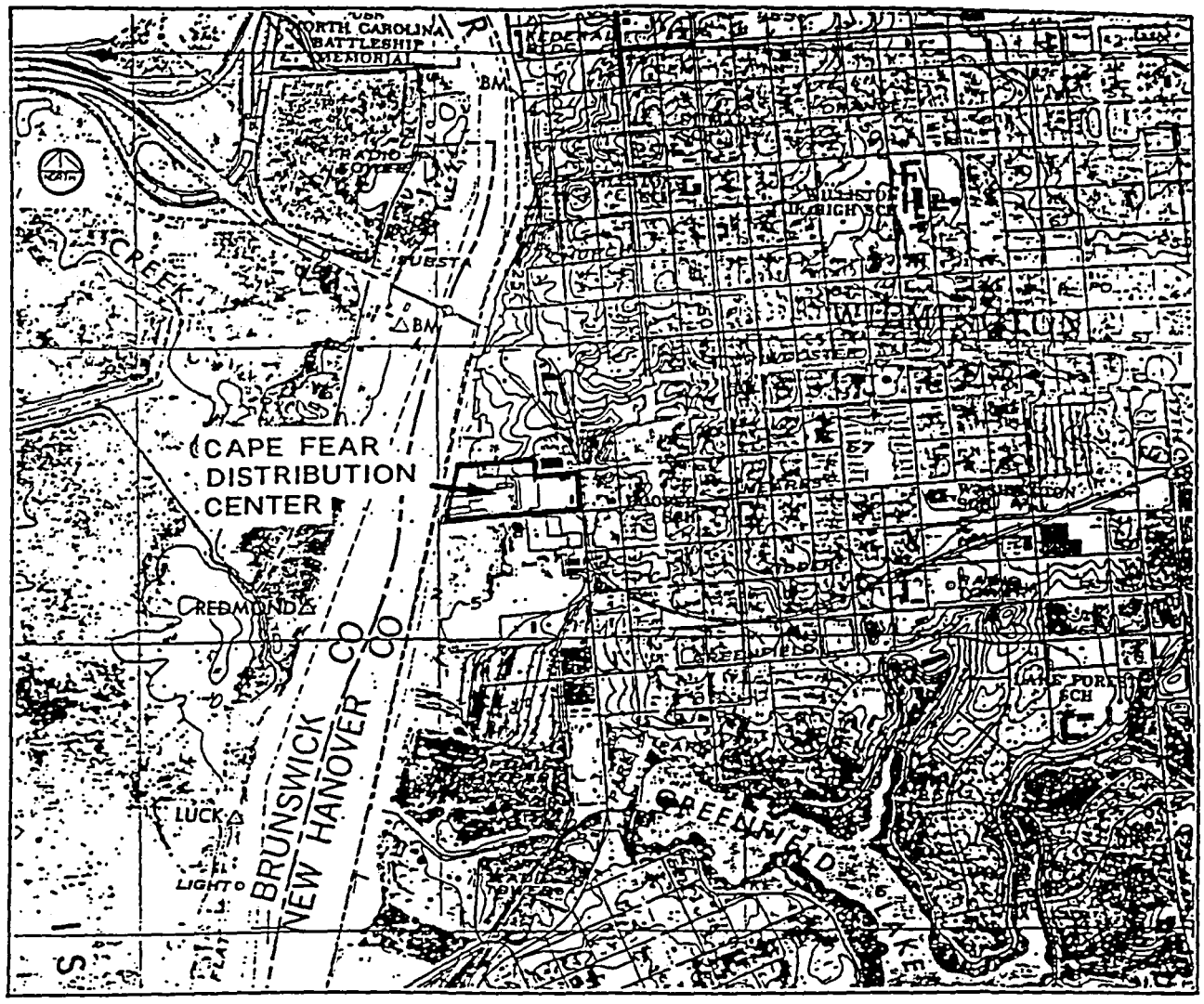
Parameters	Units	Sample No.: / Sample Date:	RW-4 14-May-92	RW-5 15-May-92	RW-6 15-May-92	UC-7 15-May-92	UC-8 9-Jun-92	UC-10 15-May-92
benzene	ug/L		9.0	< 50.0	< 5.0	< 50.0	< 5.0	< 5.0
2-butanone	ug/L		< 100	< 1000	< 100	< 1000	< 100	< 100
carbon disulfide	ug/L		< 5.0	< 50.0	< 5.0	< 50.0	19	< 5.0
ethylbenzene	ug/L		5.0	< 50.0	< 5.0	< 50.0	< 5.0	< 5.0
toluene	ug/L		< 5.0	< 50.0	< 5.0	< 50.0	< 5.0	< 5.0
xylenes, total	ug/L		12.0	< 50.0	< 5.0	< 50.0	< 5.0	< 5.0
#2 fuel oil	mg/L		< 0.05	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
gasoline	mg/L		< 0.1	0.29	< 0.05	< 0.05	< 0.05	< 0.05
oil and grease	mg/L		--	--	--	--	--	--

< = Not- detected
-- = Not analyzed

TABLE 7 (con't)
SUMMARY OF DETECTED COMPOUNDS
GROUNDWATER SAMPLE ANALYSIS
UNOCAL CAPE FEAR FACILITY

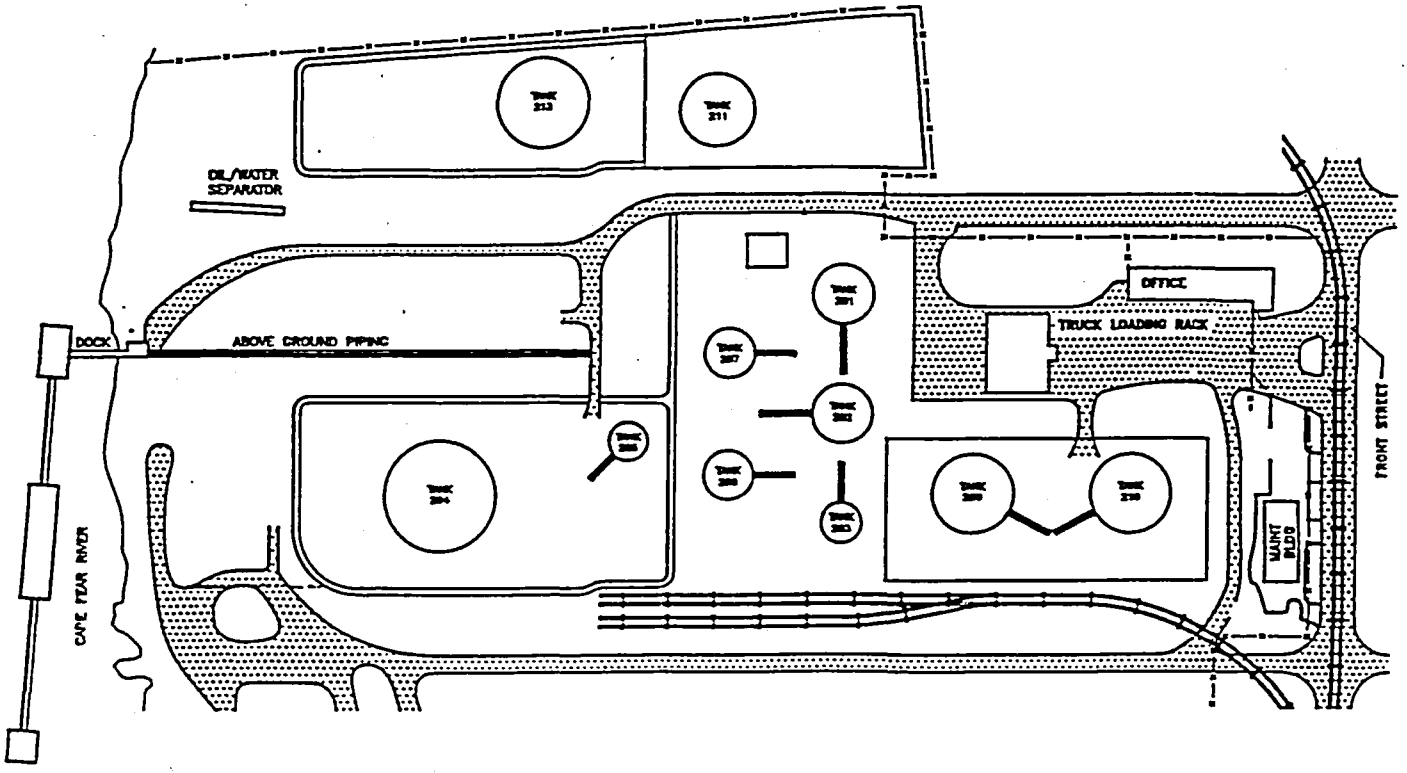
Parameters	Units	Sample No.: Sample Date:	UC-11 15-May-92	UC-13D 15-May-92
benzene	ug/L		< 5.0	< 5.0
2-butanone	ug/L		< 100	< 100
carbon disulfide	ug/L		< 5.0	< 5.0
ethylbenzene	ug/L		< 5.0	< 5.0
toluene	ug/L		< 5.0	16.0
xylenes, total	ug/L		< 5.0	< 5.0
#2 fuel oil	mg/L		< 1.0	< 1.0
gasoline	mg/L		0.66	0.38
oil and grease	mg/L		--	--

< = Not- detected
-- = Not analyzed



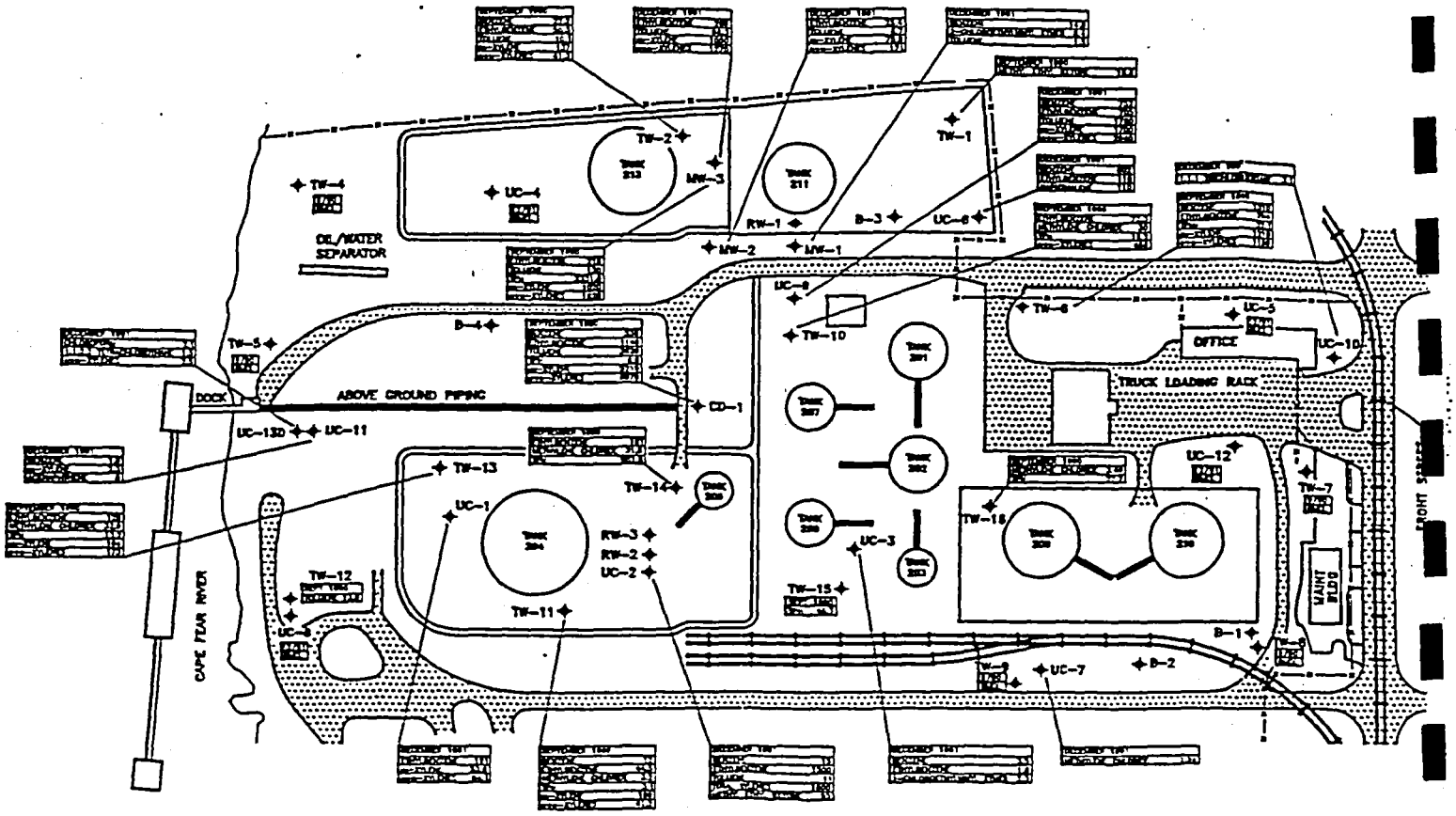
BASE MAP FROM WILMINGTON, NC 7.5 MINUTE USS ORTHOPHOTO (TOPOGRAPHIC) QUADRANGLE MAP DATED 1970, PHOTOREVISED 1979

UNOCAL 76 UNOCAL CHEMICALS DIVISION CAPE FEAR TERMINAL	FIGURE 1 LOCATION MAP WILMINGTON, NC
MAUDE ENVIRONMENTAL, INC. 22292 N. PEPPER ROAD, UNIT D BARRINGTON, IL 60010 708/382-1933	MEI NUMBER 91-0117.01 SCALE NTS DATE 3-5-92 DRAWN BY BC CHECKED BY RMU



0' 50' 100'

N[illegible]ENTAL, INC. R ROAD, UNIT D [illegible], IL 60010 2-[illegible]33	**UNOCAL** UNOCAL CHEMICALS DIVISION CAPE FEAR TERMINAL – WILMINGTON, NC	MEI NUMBER 91-0117.01 SCALE 1" = 100' DATE 3-5-92 DRAWN BY BC CHECKED BY RMU	FIGURE 2 SITE PLAN



PROXIMATE LOCATION OF EXISTING CONSTRUCTION
VATERING WELLS AND MONITORING WELLS

PROXIMATE LOCATION OF EXISTING
OVERY WELLS

L NUMBER

OW METHOD DETECTION LIMITS

NOTE – UNITS ARE ug/l (PARTS PER BILLION), EXCEPT FOR TPH UNITS WHICH ARE mg/l (PARTS PER MILLION).

0' 50' 1

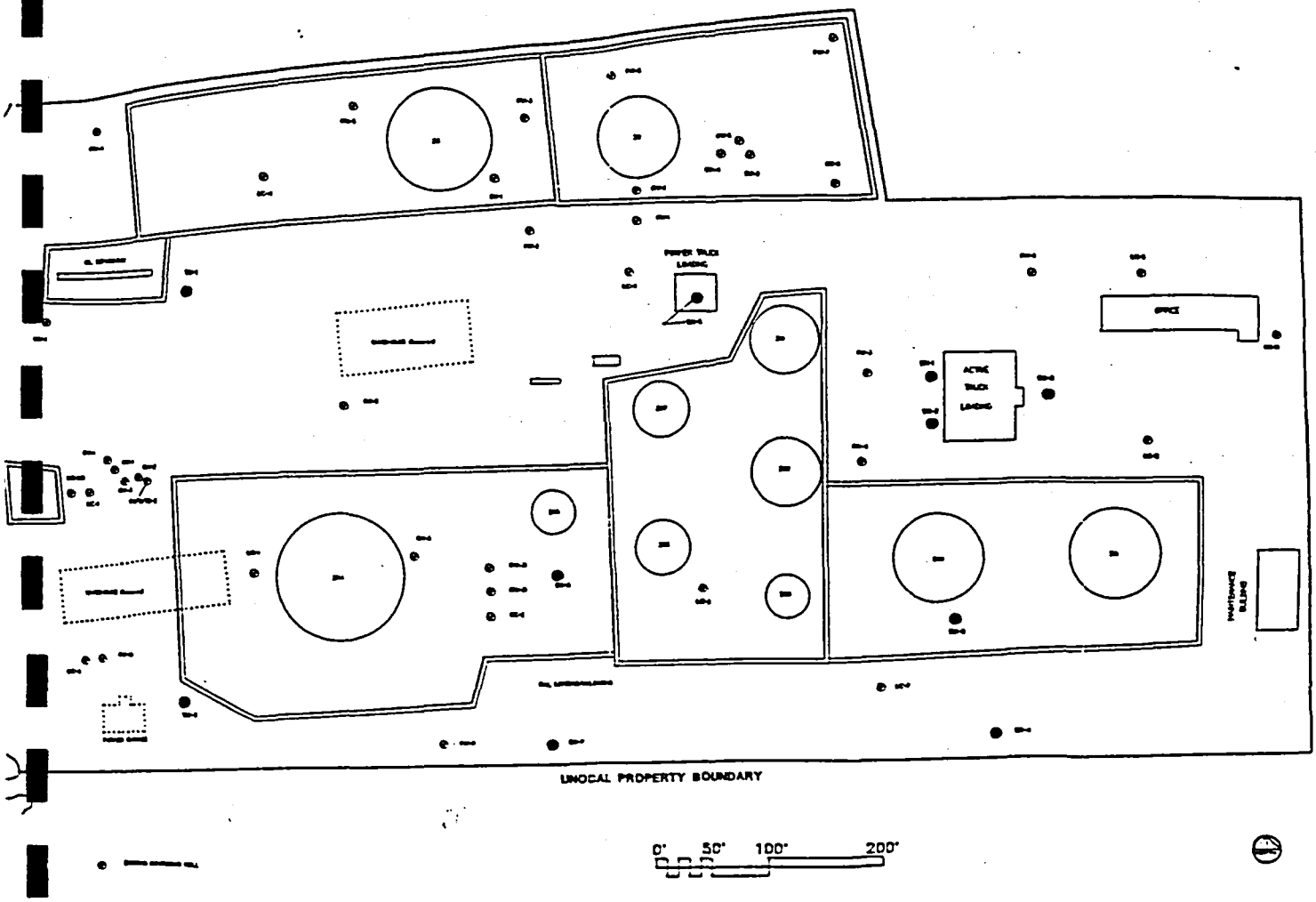
ENVIRONMENTAL, INC.
N. PEPPER ROAD, UNIT D
ARRINGTON, IL 60010
708/382-1933

UNOCAL
UNOCAL CHEMICALS DIVISION
CAPE FEAR TERMINAL – WILMINGTON, NC

MEI NUMBER 91-0117.01
SCALE 1" = 100'
DATE 3-5-92
DRAWN BY BC
CHECKED BY RMU

FIGURE

SITE PL
GROUNDWATER ANALY
SEPTEMBER 1990 & D

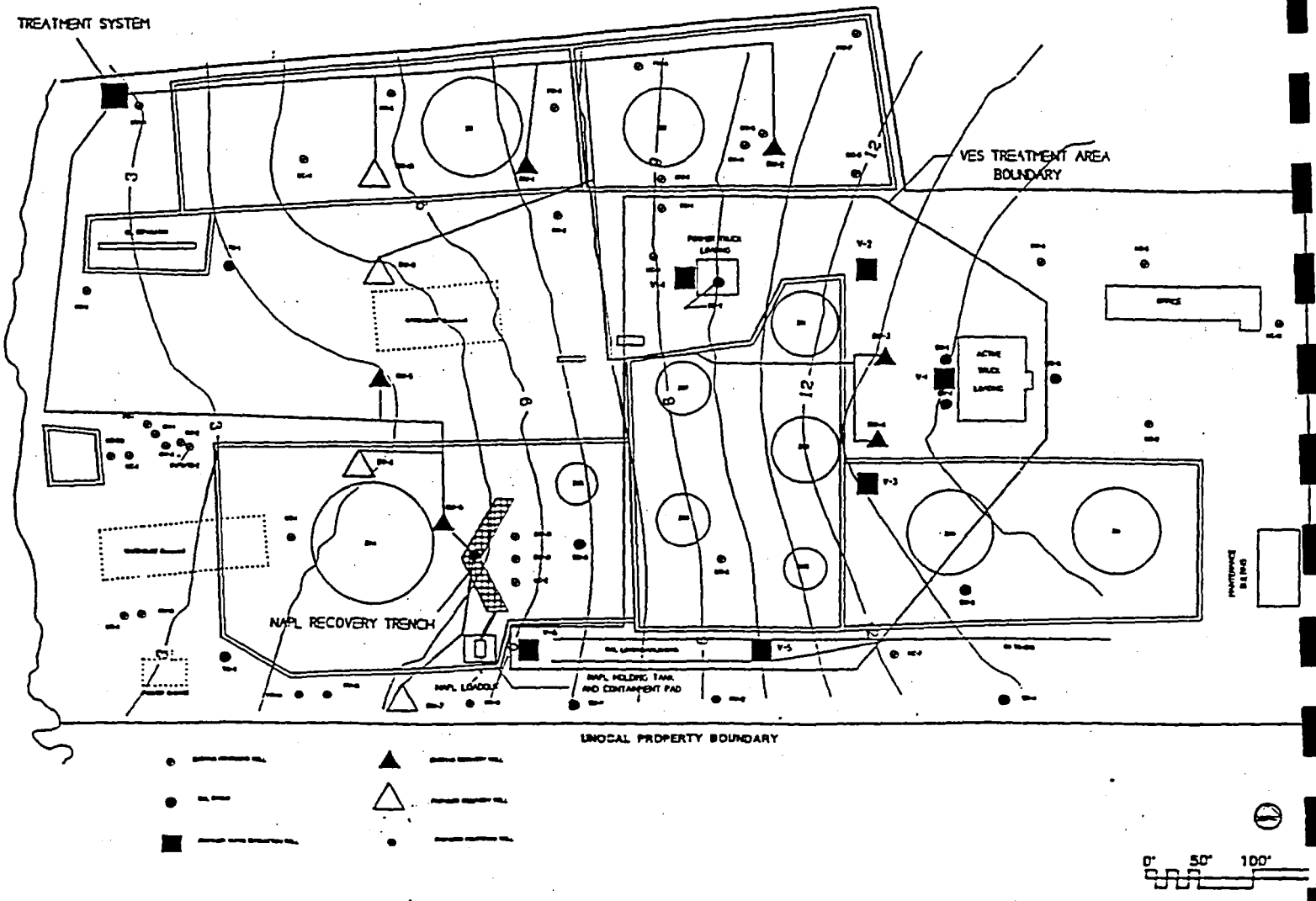


UNOCAL 76
UNOCAL CHEMICALS DIVISION

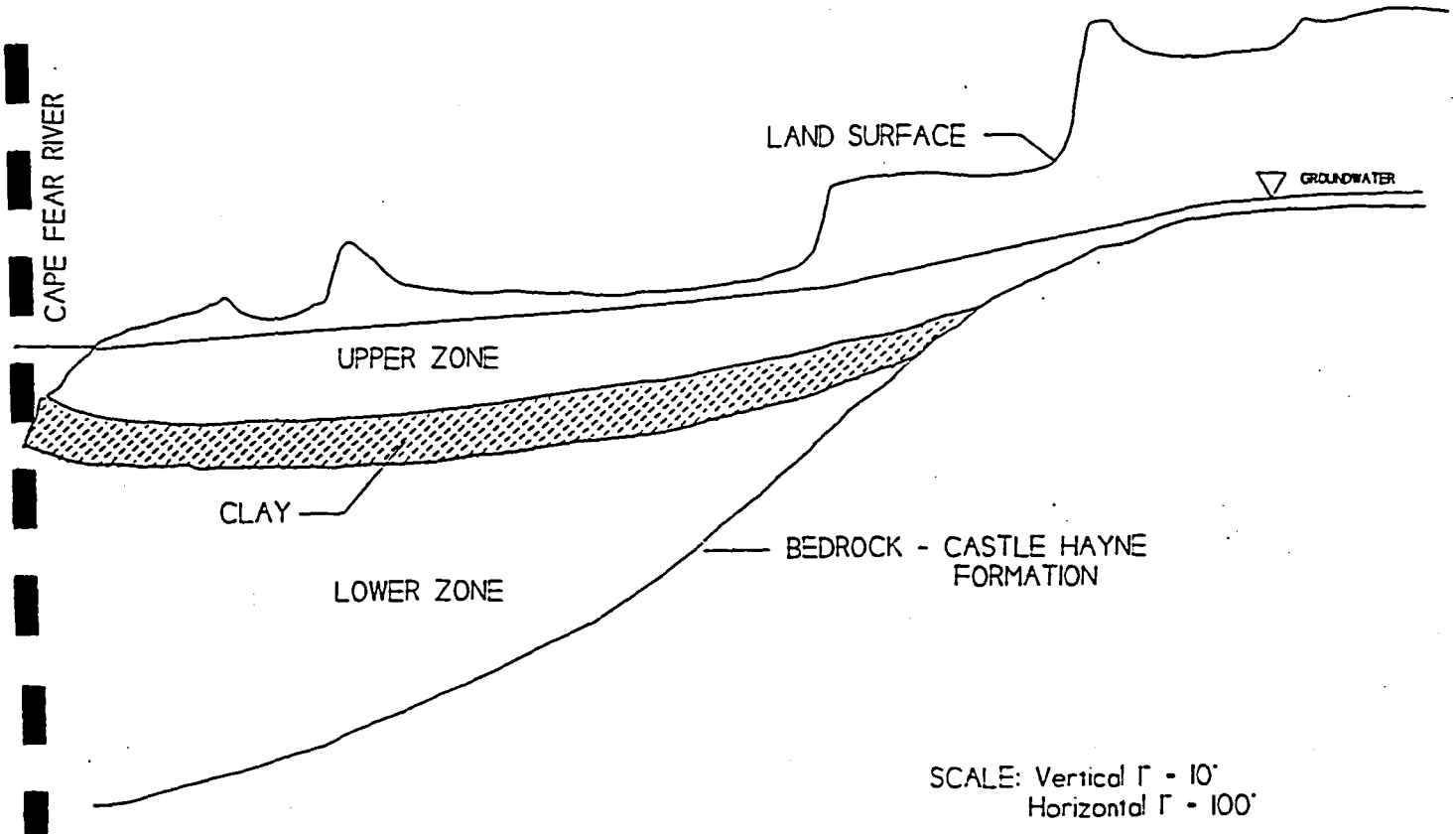
MEI NUMBER 91-0117.04
SCALE
DATE 8/1/97
DRAWN BY
CHECKED BY

FIGURE 4

SOIL BORING, MONITORING WELL, AND RECOVERY WELL LOCATIONS



DE INC	**UNOCAL** 76 UNOCAL CHEMICALS DIVISION	HCI NUMBER 91-0117.04 SCALE DATE DRAWN BY CHECKED BY	FIGURE 5 SHALLOW GROUNDWATER POTENTIOMETRIC SURFACE



UNOCAL 76
UNOCAL CHEMICALS DIVISION

HCI NUMBER 91-0117.04
SCALE
DATE 8/5/92
DRAWN BY
CHECKED BY

FIGURE 6

GEOLOGIC CROSS SECTION

PRE-CERCLIS SCREENING ASSESSMENT CHECKLIST/DECISION FORM

This checklist can assist the site investigator during the Pre-CERCLIS screening. It will be used to determine whether further steps in the site investigation process are required under CERCLA. Use additional sheets, if necessary.

Checklist Preparer: Stuart Parker (Name/Title) 10/17/02 (Date)
401 Oberlin Road, Raleigh, North Carolina (Address) 919-733-2801 x 280 (Phone)
stuart.parker@ncmail.net (E-Mail Address)

Site Name: Southern Metals Recycling

Previous Names (if any): N/A

Site Location: 13 Wright Street (Street)
Wilmington (City) North Carolina (ST) 28401 (Zip)

Latitude: 34° 13' 31.0" **Longitude:** 77° 56' 55.5

Complete the following checklist. If "yes" is marked, please explain below.	YES	NO
1. Does the site already appear in CERCLIS?	☐	✓
2. Is the release from products that are part of the structure of, and result in exposure within, residential buildings or businesses or community structures?	☐	✓
3. Does the site consist of a release of a naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found?	☐	✓
4. Is the release into a public or private drinking water supply due to deterioration of the system through ordinary use?	☐	✓
5. Is some other program actively involved with the site (i.e., another Federal, State, or Tribal program)?	☐	✓
6. Are the hazardous substances potentially released at the site regulated under a statutory exclusion (i.e., petroleum, natural gas, natural gas liquids, synthetic gas usable for fuel, normal application of fertilizer, release located in a workplace, naturally occurring, or regulated by the NRC, UMTRCA, or OSHA)?	☐	✓
7. Are the hazardous substances potentially released at the site excluded by policy considerations (e.g., deferral to RCRA Corrective Action)?	☐	✓
8. Is there sufficient documentation that clearly demonstrates that there is no potential for a release that could cause adverse environmental or human health impacts (e.g., comprehensive remedial investigation equivalent data showing no release above ARARs, completed removal action, documentation showing that no hazardous substance releases have occurred, EPA approved risk assessment completed)?	☐	✓

Please explain all "yes" answer(s), attach additional sheets if necessary: _____

_____

_____

_____

_____

_____

Site Determination: ✓ Enter the site into CERCLIS. Further assessment is recommended (explain below).

☐ The site is not recommended for placement into CERCLIS (explain below).

DECISION/DISCUSSION/RATIONALE:

The site consists of the Southern Metals Recycling (SMR) facility, and adjacent portions of the former JLM (now Colonial Oil) petroleum bulk storage terminal. The site is located off of Front Street on the east bank of the Cape Fear River, south of downtown Wilmington.

The SMR site was used as a junkyard for several decades. Subsequently, bundles of recyclable metals and newsprint were stored outdoors at the facility.

The JLM Terminal has operated since the 1920s. Petroleum leakage to the subsurface was discovered at JLM (then Unocal) in 1990. Monitoring wells, recovery wells, and a recovery trench system were installed on site in response to the spill.

In July 1998 a propane gas explosion and multi-alarm fire occurred at SMR. Runoff from firefighting efforts flowed onto the JLM terminal and collected in its oil/water separator, adjacent to the Cape Fear River. Smoke from the conflagration also deposited metalliferous fallout on the JLM property. A soil and groundwater investigation completed for JLM in 2000 revealed extensive metals contamination in soil and groundwater at SMR. Sampling at JLM revealed apparent downgradient migration of several metals, including arsenic and lead, to surface soil and groundwater.

Soil contamination at JLM generally does not exceed federal benchmarks or state remediation goals, but groundwater has been contaminated in excess of federal and state limits across an undetermined portion of the property. No groundwater well targets exist within 2 miles of the site. However, sampling to date is insufficient to evaluate potential contaminant migration to the Cape Fear River, which is a fishery and contains wetlands and rare species.

Regional EPA Reviewer: _____ _____
Print Name/Signature Date

State Agency/Tribe: _____ _____
Print Name/Signature Date