CAFB97

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 27th FIGHTER WING (ACC)
CANNON AIR FORCE BASE, NEW MEXICO

16 SEP 1997

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Mr. Benito J. Garcia, Chief
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2044 Galisteo
P.O. Box 26110
Santa Fe NM 87502

Dear Mr. Garcia

As Deputy Commander, 27th Support Group, I am forwarding this correspondence on behalf of Lt Col James A. Thomas III, Support Group Commander.

Enclosed for your review and approval is the Cannon AFB Background Investigation Report. This report will supersede the previous study titled Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon AFB, March 1994.

Questions regarding these documents and the Cannon AFB restoration program may be directed to Mr. John S. Pike or Mr. Sanford D. Hutsell, of my Civil Engineer Environmental Flight, at (505) 784-4348. I look forward to the continued cooperation between our organizations in addressing the environmental restoration concerns of Cannon AFB.

Sincerely

CHARLES A. HALE, Lt Col, USAF
Deputy Commander, 27th Support Group

Attachment:
Background Investigation Report

cc:
EPA (B. Sturdivant)
NMED (C. Will) Hazardous and Radioactive Waste Bureau w/o Attachment
HQ ACC CES/ESVW (M. Patterson) w/o Attachment

TRACK: CAFB/9-16-97/GARCIA/HALE/BACKGROUND STUDY TRANSMITTAL
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DRAFT REPORT

BACKGROUND INVESTIGATION

CANNON AIR FORCE BASE, NEW MEXICO

September 1997

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1.0 INTRODUCTION

The overall objective of this investigation for background sampling was to obtain the additional data necessary to sufficiently characterize naturally occurring background concentrations for metals and pesticides in soil at Cannon Air Force Base (AFB). The specific objectives of this investigation were to:

- Collect additional background soil samples to fill in data gaps in current data
- Develop new background concentrations for metals and pesticides in surface and subsurface soil
- Compare new background concentrations with previous background concentrations to evaluate the significance of changes in background concentrations

This report is organized in the following manner:

- Section 2 - Cannon AFB Facility Description
- Section 3 - Field Investigation and Data Collection
- Section 4 - Sampling and Analytical Results
- Section 5 - Statistical Methodology
- Section 6 - Results of the Statistical Analysis
- Section 7 - Summary and Conclusions
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2.0
CANNON AFB FACILITY DESCRIPTION

2.1 CANNON AFB OPERATIONAL HISTORY

The following information was obtained from the Installation Restoration Program (IRP) Records Search document prepared by CH_2M Hill (1983) and the Cannon AFB Joint Military Telephone Directory (American Publishers 1991).

Cannon AFB is located in Curry County, New Mexico, approximately 7 miles west of the City of Clovis. The Base is situated on approximately 4,320 acres of land. The vicinity map of Cannon AFB is shown on Figure 2-1, and the site plan and location of investigated sites at Cannon AFB are shown on Figure 2-2. Off-Base facilities include the Melrose Bombing Range, which is located approximately 25 miles southwest of Cannon AFB.

Cannon AFB dates to 1929, when Portair Field was established on the site. Portair Field was a civilian passenger terminal for early commercial transcontinental flights. In 1942, the Army Air Corps took control of the civilian airfield, and it became known as the Clovis Army Air Base. In early 1945, the Base was renamed Clovis Army Air Field. Flying, bombing, and gunnery classes continued through the end of World War II. By mid-1946, however, the airfield was placed on a reduced operational status and flying activities decreased. The installation was deactivated in May 1947. The types of aircraft stationed at Cannon AFB from 1942 to 1947 included B-17, B-24, and B-29 heavy bombers.

The Base was reassigned to the Tactical Air Command in July 1951. The first unit, the 140th Fighter-Bomber Wing, arrived in October of that year. The airfield was formally reactivated in November 1951 as Clovis Air Force Base. Between 1952 and 1957, the 50th and 388th Fighter-Bomber Wings were activated, and, upon their transfer, were replaced by the 312th and 474th Groups. Predominant aircraft stationed at Cannon AFB from 1951 to 1957 included the P-51 “Mustang” fighter and the F-86 “Sabre” fighter jet.

In June 1957, the Base became a permanent installation and was renamed Cannon AFB in honor of the late General John K. Cannon, a former commander of the Tactical Air

Command. In October 1957, the 312th and 474th Fighter-Bomber Groups were redesignated tactical fighter wings and the 832nd Air Division was activated to oversee their activities.

In 1959, the 312th Tactical Fighter Wing (TFW) was deactivated and replaced at Cannon AFB by the 27th TFW. In December 1965, the Base's mission changed to that of a replacement training unit, and the 27th TFW became the largest such unit in the Tactical Air Command. The predominant aircraft stationed at Cannon AFB from 1957 to 1965 was the F-100 "Super Sabre" fighter jet.

The 832nd Air Division was deactivated in July 1975, leaving the 27th TFW the principal Air Force unit at Cannon AFB. In early 1981, the 27th TFW was designated a Rapid Deployment Joint Task Force member.

The primary mission of Cannon AFB has remained relatively unchanged since 1965; i.e., to develop and maintain an F-111 tactical fighter wing capable of day, night, and all-weather combat operations and to provide replacement training of combat aircrews for tactical organizations worldwide. Aircraft stationed at Cannon AFB since 1965 include the F-100 "Super Sabre" fighter jet (1957-1969), the F-111A (1969), the F-111E (1969-1971) and the F-111D (1971-present). There are approximately 70 F-111D aircraft assigned to Cannon AFB. The total work force on Cannon AFB numbers approximately 4,000, which includes 3,500 military and 450 civil service.

In 1992, Cannon AFB became part of the Air Combat Command (ACC) as the result of the overall realignment of Air Force Commands and the ongoing downsizing of the U. S. Military.

2.2 SETTING - PHYSICAL GEOGRAPHY

Cannon AFB is situated in the Southern High Plains Physiographic Province in the Llano Estacado subprovince (Hawley et al. 1976). The Llano Estacado is a nearly flat plain sloping gently (10 to 15 feet per mile) to the east and southeast. Elevations in the eastern New Mexico portion of the Llano Estacado exceed 4,000 feet above mean sea level (msl). In the vicinity of Cannon AFB, elevations range from 4,250 feet to 4,350 feet above msl.

The most prominent geomorphic features in the vicinity of Cannon AFB are blowouts and broad, widely spaced valleys. Less common landforms are relict sand dunes located along the northern side of the Portales Valley south of the Base. Relict dunes are not found on or near Cannon AFB.

Blowouts are broad shallow depressions which form as the result of soil erosion by wind. Blowouts commonly collect surface runoff from small to moderate sized drainage areas. During periods of rainfall, runoff collects in blowouts to form ephemeral playa lakes. Playas have no external surface drainage. Water is lost by infiltration to the soil and evaporation; without recharge, playa lakes persist for only a few days or weeks. Three playas are located within the Base, and several more are found to the north and east of the Base.

Stream valleys tend to be fairly broad and widely spaced. Streams are ephemeral and drainages are poorly developed. No streams exist on or near Cannon AFB. Running Water Draw and Frio Draw, located about 10 and 20 miles, respectively, north of Cannon AFB, are the nearest streams (USGS 1984). These are second-order streams. Both streams are very straight, flow southeast, and have rectilinear drainage patterns with short laterals.

2.3 DEMOGRAPHICS AND LAND USE NEAR CANNON AFB

Cannon AFB is located just south of U.S. Highway 60-84 in a farming and ranching area (Figure 2-1). The majority of the land surrounding Cannon AFB is productive, irrigated farmland or grassland. The major crops are wheat, sorghum, sugar beets, corn, cotton, alfalfa, barley, and peanuts. The land is also used for cattle grazing, both beef and dairy, and Clovis is considered the "Cattle Capital of the Southwest." There were 32,767 people living in Clovis in 1990, while the Cannon AFB population was estimated to be 4,650 in 1990 (USAF 1991).

2.4 CLIMATOLOGY

The climate of east-central New Mexico is classified as tropical semi-arid, with summer temperature and precipitation maxima. Average monthly temperatures range from a January low of 12°C (39°F) to a July high of 26°C (78°F). Extreme daily temperatures range from

-24°C (-11°F) to 41°C (106°F) (Lee Wan and Associates 1990). Average monthly precipitation ranges from 1 cm (0.4 inches) in winter to 6.9 cm (2.7 inches) in July (W-C 1994a). The maximum recorded 24-hour rainfall is 12.2 cm (4.8 inches), which occurred in August. Rainfall occurs on eight or more days per month during the summer precipitation maximum. Mean annual precipitation is approximately 41 cm (16 inches). The mean annual evapotranspiration rate is 181.4 cm/yr (71.4 inches/yr) (Lee Wan and Associates 1990). Prevailing winds are from the west at an average of 5 km/hr (3.1 mph) during fall, winter, and spring. During the summer, winds are from the south at an average of 3.7 km/hr (2.3 mph).

The atmosphere around the area of Cannon AFB is generally well mixed. The seasonal and annual average mixing heights can vary from 400 meters in the morning to 4,000 meters in the afternoon. The afternoon mixing heights are typically greater during the spring and fall seasons. The morning mixing heights are usually low, due to nighttime heat loss from the ground, producing surface-based temperature inversions. After sunrise, these inversions break up, and solar heating of the earth's surface causes vertical mixing in the atmosphere.

Dust is frequently entrained into the atmosphere in this region of the country because of gusty winds and the semiarid climate. The Texas Panhandle-eastern New Mexico area is considered the worst area in the United States for windblown dust. Occasionally, this windblown dust is of sufficient quantity to restrict visibility. Most of the seasonal dust storms occur in March and April, when the wind speeds are typically high (average 5 km/hr) (W-C 1994a).

2.5 GEOLOGY

The near-surface stratigraphic units of interest at Cannon AFB are the Late Miocene-Late Pliocene-age Ogallala Formation and the Early Triassic Dockum Group as shown in Figure 2-3.

The Dockum Group consists of three formations. The stratigraphically lowest unit is the Santa Rosa Sandstone. Overlying the Santa Rosa Sandstone are the Chinle and Redonda Formations. The Chinle and Redonda Formations are composed mainly of red shales with lesser interbedded sands, and are known locally as "redbeds." The top of the Dockum Group is marked by an erosional nonconformity having relief of up to several hundred feet (Lee Wan and Associates 1990).

Overlying the Dockum Group redbeds is the Ogallala Formation. The Ogallala Formation extends from eastern New Mexico and Colorado into Texas, Oklahoma, Kansas, Nebraska, and South Dakota. Drillers' logs from Cannon AFB indicate that the Ogallala Formation varies from 360 feet to 415 feet in thickness. The incised upper surface of Triassic redbeds strongly influences Ogallala thickness. Stream valleys in the post-Triassic nonconformity are deep and trend dominantly east-west. Ogallala thickness may thus vary significantly over short north-south distances.

The Ogallala is erosionally truncated to the south along the abandoned Portales Valley, to the west along the Pecos River Valley, and to the north in a series of ephemeral stream valleys. The Ogallala Formation extends more than 125 miles to the east before terminating as an escarpment in Briscoe County, Texas. Springs and seeps are common along the erosional margins of the Ogallala.

The Ogallala dips gently and monoclinally to the southeast in the vicinity of Cannon AFB. As reported in Lee Wan and Associates (1990), data suggest that some Quaternary warping may have occurred; however, most of the structures are well to the northwest and southwest of Cannon AFB. No faults or buried structural lineaments are known in the vicinity of Cannon AFB.

The Ogallala Formation is composed of unconsolidated poorly sorted gravel, sand, silts, and clays. The Base of the Ogallala is generally marked by a gravel, cobble, and boulder deposit. This basal member contains sediments derived from igneous and sedimentary rocks transported from the mountains to the west. The Ogallala Formation was laid down by stream and overbank deposits formed within coalescing alluvial fans. These fans form a broad pediment along the eastern flank of the Rocky Mountains. As is typical of alluvial deposits, Ogallala internal stratigraphy varies vertically and horizontally over short distances.

Except where strongly cemented by calcium carbonate (caliche), the sediments of the Ogallala are loose and friable. Authigenic and allogenic clays are found as a trace to abundant matrix mineral (Lee Wan and Associates 1990). As reported by Lee Wan and Associates (1990), five zones have been distinguished within the Ogallala of east central New Mexico on the basis of clay minerals. Smectites (montmorillonites) and attapulgite (with sepeotite) are the dominant clays throughout the Ogallala. Illite is a lesser, but persistent clay, as is kaolinite. Smectite is a swelling clay, causing deep cracks to form in dry surface soils. Smectite in particular and, to a lesser extent, attapulgite and illite, are clays with moderate to high cation exchange capacities (CEC). The formation as a whole should therefore have a relatively high CEC, which should inhibit the migration of charged contaminants, and especially ionic forms of metals.

Caliche is a major feature of the Ogallala Formation, occurring as nearly continuous to discontinuous layers throughout. A generalized geologic section at Cannon AFB is shown in Figure 2-3. Caliche is hard, white to pale tan on fresh surfaces, weathering to gray, and has a chalky appearance. Caliche forms as calcium carbonate, leached from overlying sediments, and precipitates in the pore space of the host sediments. Precipitation is caused by the evaporation of downward percolating water. The caliche may thus mark the position of ancient vadose zones. As reported in Lee Wan and Associates (1990) radiocarbon dates for the upper "climax" caliche range from ~27,000 yrs. Before Present (B.P.) to ~42,000 yrs. B.P.

Caliche is relatively soluble in acidic water ($pH < 7$) or in waters containing dissolved CO_2. The top surface of the upper "climax" caliche in fresh outcrop shows solution etching.

The Ogallala has numerous continuous to discontinuous caliche layers throughout its thickness. The uppermost caliche, termed the "climax" caliche, is pisolitic (Lee Wan and Associates 1990). The pisolites are thought to have formed as the caliche was repeatedly chemically-weathered and brecciated during Pleistocene pluvials and later recemented during drier intervals. This upper caliche outcrops around playas and the bounding escarpments of the Ogallala, and is locally termed "caprock." The "climax" caliche is typically 3 to 5 feet thick. Caliches which occur lower in the Ogallala are platy and harder. Caliche may be thin or absent below playas (W-C 1994a).

2.6 HYDROGEOLOGY

The lower portion of the Ogallala Formation is the primary regional aquifer for both potable and irrigation water. No deeper aquifers are utilized in the vicinity of Cannon AFB. The Ogallala aquifer is part of the High Plains Aquifer which extends continuously from Wyoming and South Dakota into New Mexico and Texas. In east central New Mexico, the Ogallala aquifer rests on Dockum Group redbeds, which serve as the basal confining layer. The Ogallala is a water table, or unconfined, aquifer (Lee Wan and Associates 1990). The Ogallala aquifer has a southeasterly regional gradient of about 13 feet/mile. Well yields vary from less than one gallon per minute (gpm) in thin silts and sands, and up to 1,600 gpm in thick sands and gravels (Lee Wan and Associates 1990). Water quality is generally good, with hardness and fluorides being somewhat high (Lee Wan and Associates 1990).

At Cannon AFB, the Ogallala aquifer has an average saturated thickness of 120 feet based on mid-1960s data. Saturated thickness ranges from 93 to 143 feet, and is influenced by the configuration of the erosional nonconformity surface marking the top of the Dockum Group. The local groundwater gradient is southeasterly at 7.5 feet/mile (Lee Wan and Associates 1990). Figure 2-4 shows water table elevation contours for 1984. Flow within the saturated zone may be influenced by the configuration of the top of the Dockum Group. Yields in tests of Cannon AFB water wells have ranged from 776 l/min (205 gpm) to 4,353 l/min (1150 gpm). Specific capacities range from 0.14 m^3/m (11.4 gal/feet) to 0.35 m^3/m (27.9 gal/feet) (Lee Wan and Associates, 1990).

Very rough estimates of hydraulic conductivity were made from well pump tests in water wells 5 and 9 (Figure 2-5) using the Theis equation. An estimate of hydraulic conductivity for water well 8 was based on water level recovery data using the Bouwer and Rice approach (Lee Wan and Associates 1990). The data used in these calculations were obtained to evaluate pump rates, efficiency, and well yield, and were not intended for use in calculating aquifer properties. The results of these calculations should therefore be considered as first approximations.

Hydraulic conductivity values for water wells 5 and 9 were found to be approximately 2.0×10^{-3} cm/sec. Calculations for water well 8 result in a hydraulic conductivity of

2.0 x 10^{-2} cm/sec. In addition, slug tests were done on MW-O and MW-N by Woodward-Clyde in February 1995. Estimated hydraulic conductivities from these slug tests were 3 x 10^{-3} for both wells (W-C 1995). These estimates appear to be low when compared to published hydraulic conductivity data for sands and gravels. As reported in Lee Wan and Associates (1990) a groundwater flow velocity of about 45 m/yr (150 feet/yr) has been estimated. This calculates out to a hydraulic conductivity of approximately 1.0 x 10^{-1} cm/sec. Again, this appears to be low when compared with published data (Freeze and Cherry 1979).

The presence of interstitial clays may account for both the variability and low values of hydraulic conductivities. Boring logs from Cannon AFB IRP projects and published reports (Lee Wan and Associates 1990) indicated that interstitial and interstratified clays are abundant in the Ogallala Formation.

Recharge to the Ogallala is primarily through precipitation. As reported in Lee Wan and Associates (1990), a recharge rate of 0.5 inches/year as calculated using the Theis equation. Lee Wan and Associates (1990) reported that the recharge rate may be as much as 1.0 inches/yr. Due to the high evapotranspiration rate and low precipitation, recharge probably occurs only during heavy rainfall events in which the infiltration capacity of the soil is exceeded and runoff occurs, or during cool months when precipitation exceeds evapotranspiration. Excess runoff flows to playas, and the presence of water in playas may allow deep percolation to the aquifer. The occurrence of this process is evidenced by the presence of clay deposits in, and thin or nonexistent caliche layers directly below, playas. Caliche is soluble in acidic rain waters, and is leached over time to form percolation pathways.

Discharge from the Ogallala occurs through well pumping and springs along the eroded margins. Spring discharge does not occur on or near Cannon AFB. Domestic and irrigation water wells are common on and around the Base, however. The rate of discharge exceeds the rate of recharge. Water levels in the Ogallala have declined steadily from the 1930s to the present. A decline of 50 to 100 feet has been observed in the area around Clovis, New Mexico for the period from the 1930s to 1980. Lee Wan and Associates (1990), states "the largest area of water level decline exceeding 100 feet occurs south of the Canadian River extending from Curry Co., New Mexico to Crosby Co., Texas."

The dominant uses of groundwater in the Cannon AFB area are for potable and irrigation water. Numerous wells are found in the Cannon AFB area, most of which provide only irrigation water (Figure 2-5).

The Ogallala will continue to be used as the primary source of potable and irrigation water for eastern New Mexico. The New Mexico State Engineer designated Curry County as a Water Basin in 1989. This designation allows for regulation of water rights, usage, and well drilling (W-C 1994a).

2.7 SOILS

Soils in the vicinity of Cannon AFB are classified as SM to SC under the Unified Classification Systems, and as aridisols (calciorthids) under the Soil Conservation Service Comprehensive Soil Classification System. The following summary is based on the Soil Conservation Service Curry County Soil Survey as reported in Lee Wan and Associates (1990).

The most common soil type on the Base is the Amarillo fine sandy loam, 0 to 2 percent slope phase (map symbol Ab, Figure 2-6). This soil consists of a thin sandy A horizon, well defined clayey B_{1-3} horizons, with a calcic B_3 horizon at depths below 40 inches. The calcic B_3 horizon lies on a calcic C horizon, or on caliche. The Amarillo fine sandy loam is present on all relatively flat surfaces at the Base, but is also found on slopes associated with playas (map symbol Ac).

Clovis fine sandy loams, 0-2 percent slope phase (map symbol Cb) and 2-5 percent slope phase (map symbol Cc), are very similar to Amarillo fine sandy loams. In the Clovis soils, the depth to the calcic C horizon ranges from 28 to 56 inches. The depth to caliche exceeds 56 inches. Clovis and Amarillo fine sandy loams occur in close association.

In a few limited areas, particularly along the steeper slopes around playas, Mausker fine sandy loam, 0 to 2 percent slope phase (map symbol Ma), and 2 to 5 percent phase (map symbol M6) are found. Mausker fine sandy loams have no B horizons and are very calcareous. The calcic C horizon is within 2 feet of the surface.

The A and B horizons of Amarillo and Clovis fine sandy loams are rapidly to moderately permeable. Mausker fine sandy loam A and Ac horizons are rapidly permeable. Permeabilities in calcic B and C horizons are moderate (Lee Wan and Associates 1990).

2.8 BACKGROUND SOIL AND WATER QUALITY

The natural soils in the vicinity of Cannon AFB are alkaline and rich in metals in general. Typically high concentrations of aluminum, iron, magnesium, manganese, and potassium combine with elevated levels of many other metals in the natural soils. Calcium is naturally present in the soils at levels up to nearly 200,000 mg/kg. Tightly cemented layers of "caliche" are present in several horizons in the natural soils and the Ogallala aquifer below.

The uppermost groundwater aquifer is the Ogallala, and the groundwater is more than 200 feet deep. The groundwater from the lower portions of the aquifer is used for drinking water, irrigation, and industrial applications. No deeper aquifers are utilized in the vicinity of Cannon AFB. The water quality is generally good, with dissolved solids ranging from 250 to 500 mg/L (Gutentag et al. 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates, Inc. 1985).

2.9 BIOLOGICAL RESOURCES

Land adjacent to Cannon AFB is primarily used for agriculture, and there is little natural vegetation remaining in the area. The wildlife species that are common to agricultural areas throughout the region include bobwhite quail and pheasant. There are a few playa lakes in the area; these are used by upland game for cover, by waterfowl for resting and feeding, and by wildlife in general for drinking. Nearby riverbeds also provide water sources during rainy seasons. During periods of low rainfall, the riverbeds are dry (W-C 1994a).

2.9.1 Plant Resources

The climate of the Base area is considered to be semiarid. The thin layer of topsoil in the vicinity of Cannon AFB is sandy loam, which is highly susceptible to wind erosion. The undisturbed natural vegetation is mostly shortgrass prairie, including blue grama grassland and mixed grama grassland vegetation types, which have moderately fast recovery rates.

Much of the study area has been previously cleared for agricultural crops. The predominant land use of the region is rangeland, primarily for cattle grazing. In general, moderately grazed rangeland areas of the types occurring in the project area are highly productive in terms of both forage quality and quantity. The rangeland in the vicinity may support up to 15 to 20 head of cattle per section, depending on the rainfall. Large trees do not uniformly exist in the vicinity of the range except where planted around buildings and other structures on the Base. Woodlands composed of large shrubs and small trees are confined to riparian areas and playa lakes in the vicinity (W-C 1994a).

The following plants are candidate species for the Federal List of Endangered and Threatened Wildlife and Plants and are found within a 50-mile radius of Cannon AFB: chatterbox orchid (*Epipactus gigantea*), spiny aster (*Aster harridus*), Whittmans milkvetch (*Asragalus witmanil*), dune unicorn plant (*Proboscidea sabulosa*), and the tall plains spruce (*Eupjorbia strictior*). The dune unicorn plant is also on the state endangered plant species list. No federally protected endangered plants are known to be present on the Base (Lee Wan and Associates 1990).

2.9.2 Wildlife Resources

The eastern New Mexico area contains many nongame wildlife species that are typical of the High Plains. Most of these species are distributed widely throughout the western United States. Species diversity is low in most habitats because of the low vegetation diversity. Most amphibian species are associated with riparian habitats and playa lakes. Reptiles are found in all terrestrial habitat types but are most abundant in scrub/grasslands. Nocturnal rodents are the most abundant members of the small mammal community.

Grasslands on the High Plains support a variety of seed-eating sparrows and other ground-dwelling birds, both as residents and migrants. Raptors (hawks and owls) are relatively abundant in all habitats in the region. Insectivorous and tree-nesting species are most abundant in riparian areas. Shorebirds and waterbirds and migratory waterfowl in general utilize the rivers, playa lakes, and reservoirs of the region.

Two National Wildlife Refuges (NWRs) are located on the periphery of the Base area. The Grulla and Muleshoe NWRs are within 30 miles of Cannon AFB. These areas provide high-quality habitat for migratory and breeding waterfowl.

Big-game species in the area include mule deer, white-tailed deer, pronghorn, and barbary sheep. Pronghorn are the most abundant game animal in the area. Several species of upland game, such as quail, ring-necked pheasant, and turkey are common in the area. Reservoirs (Ute Lake, Conchas Lake, and Clayton Lake) and playa lakes are important waterfowl habitats in the region. Numerous species of native and introduced fish inhabit the rivers and perennial streams, and the reservoirs support recreational fishing of warm-water species such as walleye, crappie, channel catfish, largemouth bass, and bluegill.

As determined by the regional office of the U.S. Fish and Wildlife Service, two federally listed endangered animal species, the bald eagle and peregrine falcon, are known to inhabit the area within a 50-mile radius of Cannon AFB. The New Mexico Department of Game and Fish also indicated that the state endangered Mississippi Kite, Baird's Sparrow, and the Black-Footed Ferret may also occur in the vicinity of the Base. The federal- and state-protected species are listed in Table 2-1.

Within Curry County, the only state-protected bird that is expected to occur is the Mississippi Kite. In New Mexico, since the early 1960s, this kite summers regularly and breeds in the Clovis region. The birds frequent the golf course at Cannon AFB. Two other state-protected birds that may occur within Curry County are the McCown's Longspur and Baird's Sparrow. These two species have not been sighted regularly in recent years, however. No information is available on the McCown's Longspur in New Mexico; however, Baird's Sparrow occurs mainly in autumn during migration in the eastern plains and southern lowlands. Migrants appear as early as the first week of August and move further south by November. The species seems to have declined in abundance throughout its range in the Southwest due to the loss of shrubby shortgrass habitats.

State-protected birds known to occur infrequently are the bald eagle and the peregrine falcon. The bald eagle migrates and winters from the northern border of New Mexico to the Gila, lower Rio Grande, middle Pecos, and Canadian valleys. It is seen occasionally in summer and as a breeding bird, with nests reported in the extreme northern and western parts of the state. Winter and migrant populations appear to have increased with reservoir construction. The peregrine falcon is widely distributed but population numbers are low. The American subspecies breeds statewide in New Mexico, but mainly west of the eastern plains.

TABLE 2-1

FEDERAL- AND STATE-PROTECTED ANIMALS POTENTIALLY OCCURRING IN THE VICINITY OF CANNON AFB (CURRY COUNTRY)

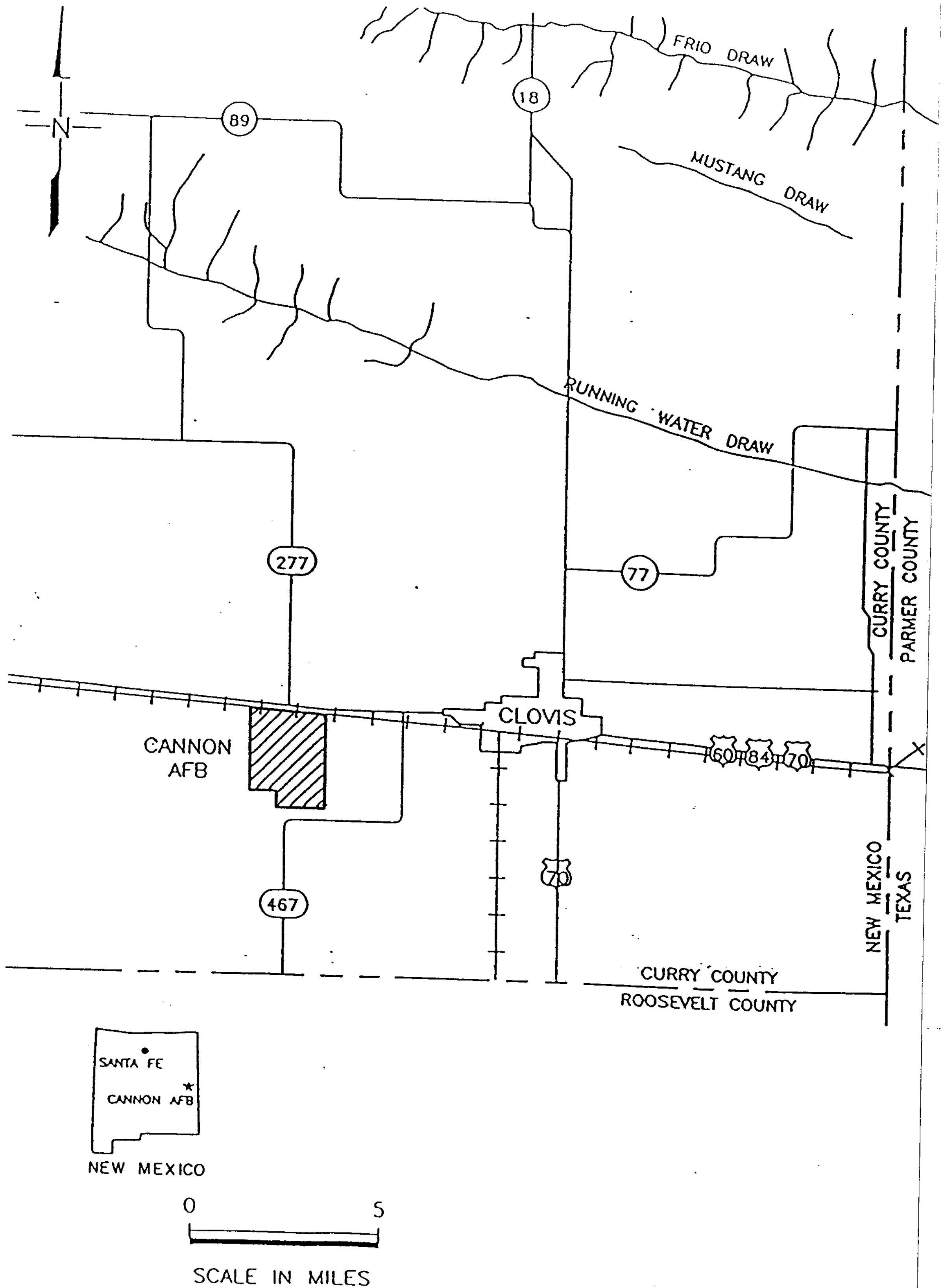
	Common Name	Scientific Name	Federal Status	State Status
Birds				
	Mississippi kite	Ictinia mississippiensis		Endangered (Group 2)
	Baird's sparrow	Ammodramus baridii		Endangered (Group 2)
	Bald eagle	Haliaeetus leucocephalus	Endangered	Endangered (Group 2)
	Peregrine falcon	Falco perigrinus	Endangered	Endangered (Group 1)
Mammals				
	Black-footed ferret	Mustela nigripes	Endangered	Possibly Extinct

Endangered (Group 1): Species whose prospects of survival or recruitment within the State are in jeopardy.

Endangered (Group 2): Species whose prospects of survival or recruitment within the State are likely to become jeopardized in the foreseeable future.

Possibly Extinct: Potentially no longer in existence in the State.

Source: Lee Wan and Associates 1990



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DRN. BY: TSSM	DATE: 07/31/97	REGIONAL MAP CANNON AIR FORCE BASE NEW MEXICO	PROJECT No. M9602M	FIG. No. 2-1
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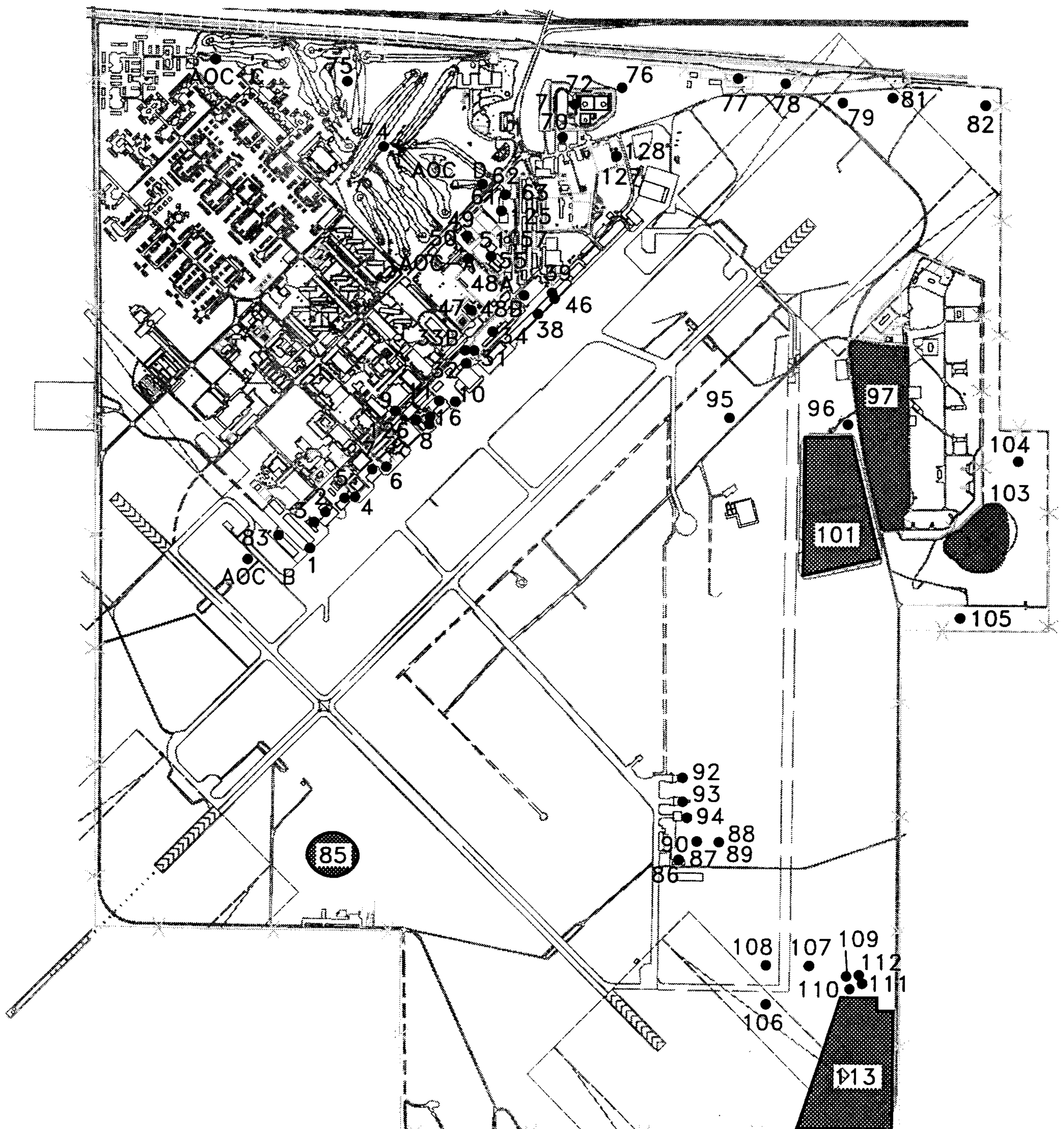


LEGEND

3 ● SOILD WASTE MANAGEMENT UNIT (SWMU) LOCATION AND NUMBER

SWMU No.	DESIGNATED AREA
1	OIL/WATER SEPARATOR No. 119
2	ST-28 RECOVERED DIESEL TANK No. 108
3	OIL/WATER SEPARATOR No. 108
4	ST-29 RECOVERED DIESEL TANK No 121
5	OIL/WATER SEPARATOR No. 121
6	POL TANK No. 129
7	OIL/WATER SEPARATOR No. 129
8	OIL/WATER SEPARATOR No. 165
9	POL AIRCRAFT WASHRACK DRAIN SYSTEM
10	POL TANK No. 170
11	OIL/WATER SEPARATOR No. 170
16	OIL/WATER SEPARATOR No. 680
31	AGE MAINTENANCE SHOP PAD
34	SD-15 AGE DRAINAGE DITCH
32	OIL/WATER SEPARATOR No. 186 #1
33	OIL/WATER SEPARATOR No. 186 #2
33B	LEAD ACID BATTERY
38	OIL/WATER SEPARATOR No. 194
39	OIL/WATER SEPARATOR No. 195
46	OIL/WATER SEPARATOR No. 196
47	OIL/WATER SEPARATOR No. 494
48A	OIL/WATER SEPARATOR No. 165
48B	ABOVEGROUND STORAGE TANK
49	ST-26 INACTIVE POL STORAGE TANK No. 4028A
50	ST-26 INACTIVE POL STORAGE TANK No. 4028B
51	OIL/WATER SEPARATOR No. 375
55	OIL/WATER SEPARATOR No. 186 ACCUMULATION POINT
57	OIL/WATER SEPARATOR No. 379
61	SAND TRAP No. 5077a
62	SAND TRAP No. 5077b
63	SD-13 SANITARY SEWAGE LIFT
70	OIL/WATER SEPARATOR No. 326
71	RECOVERED JP-4 FUEL TANK No. 390
72	OIL/WATER SEPARATOR No. 390
74	LF-1 LANDFILL No. 1
75	OIL/WATER SEPARATOR No. 5077 STATION OVERFLOW PIT
76	WP-14 SLUDGE WEATHERING PIT
77	CIVIL ENGINEERING CONTAINER STORAGE AREA
78	FT-6 FIRE DEPARTMENT TRAINING AREA No. 1
79	UNDERGROUND TANK

SWMU No.	DESIGNATED AREA
81	DP-16 SOLVENT DISPOSAL SITE
82	LF-2 LANDFILL No. 2
83	ST-27 SUMP
85	SD-12 STORMWATER COLLECTION POINT
86	SD-11 ENGINE TEST CELL
87	SD-11 FORMER OVERFLOW PIT
88	SD-11 FORMER LEACHING FIELD
89	SD-11 EVAPORATION POND
90	SD-11 OIL/WATER SEPARATOR No. 5114
91	RECOVERED FUEL TANK No. 5114
92	OIL/WATER SEPARATOR No. 5120
93	OIL/WATER SEPARATOR No. 5121
94	OIL/WATER SEPARATOR No. 5144
95	SD-20 NE STORMWATER DRAINAGE AREA
96	SD-17 OLD ENTOMOLOGY RINSE AREA
97	LF-25 CONCRETE RUBBLE PILE
98	SANITARY SEWERAGE LINE
101	WP-21 WASTEWATER TREATMENT SYSTEM-EFFLUENT DISCHARGE
102	WP-21 WASTEWATER TREATMENT SYSTEM-EFFLUENT DISCHARGE
103	WASTEWATER PLAYA LAKE
104	LF-4 LANDFILL No. 4
105	LF-3 LANDFILL No. 3
106	FT-7 FIRE DEPARTMENT TRAINING AREA No. 2
107	FT-8 FIRE DEPARTMENT TRAINING AREA No. 3
108	EXPLOSIVE ORDINANCE DISPOSAL (EOD) TRAINING AREA
109	FT-9 FIRE DEPARTMENT TRAINING AREA No. 4
110	UNDERGROUND WASTE OIL TANK No. 2336
111	UNLINED PIT
112	OIL/WATER SEPARATOR No. 2336
113	LF-5 LANDFILL No. 5
124	ST-30 INACTIVE UNDERGROUND TANK
125	ST-30 INACTIVE UNDERGROUND TANK
126	ST-30 INACTIVE UNDERGROUND TANK
127	OIL/WATER SEPARATOR No. 4095 #1 AND LEACH FIELD
128	OIL/WATER SEPARATOR No. 4095 #2 AND LEACH FIELD
AOC A	SS-19 MOGAS SPILL
AOC B	SS-18 JP-4 FUEL SPILL
AOC C	OT-10 BLOWN CAPACITORS SITE OT-23 MELROSE BOMBING RANGE OT-24 CONCHAS LAKE RECREATION ANNEX DP-33 DISPOSAL PIT
AOC D	HOLE #7 DISPOSAL PIT

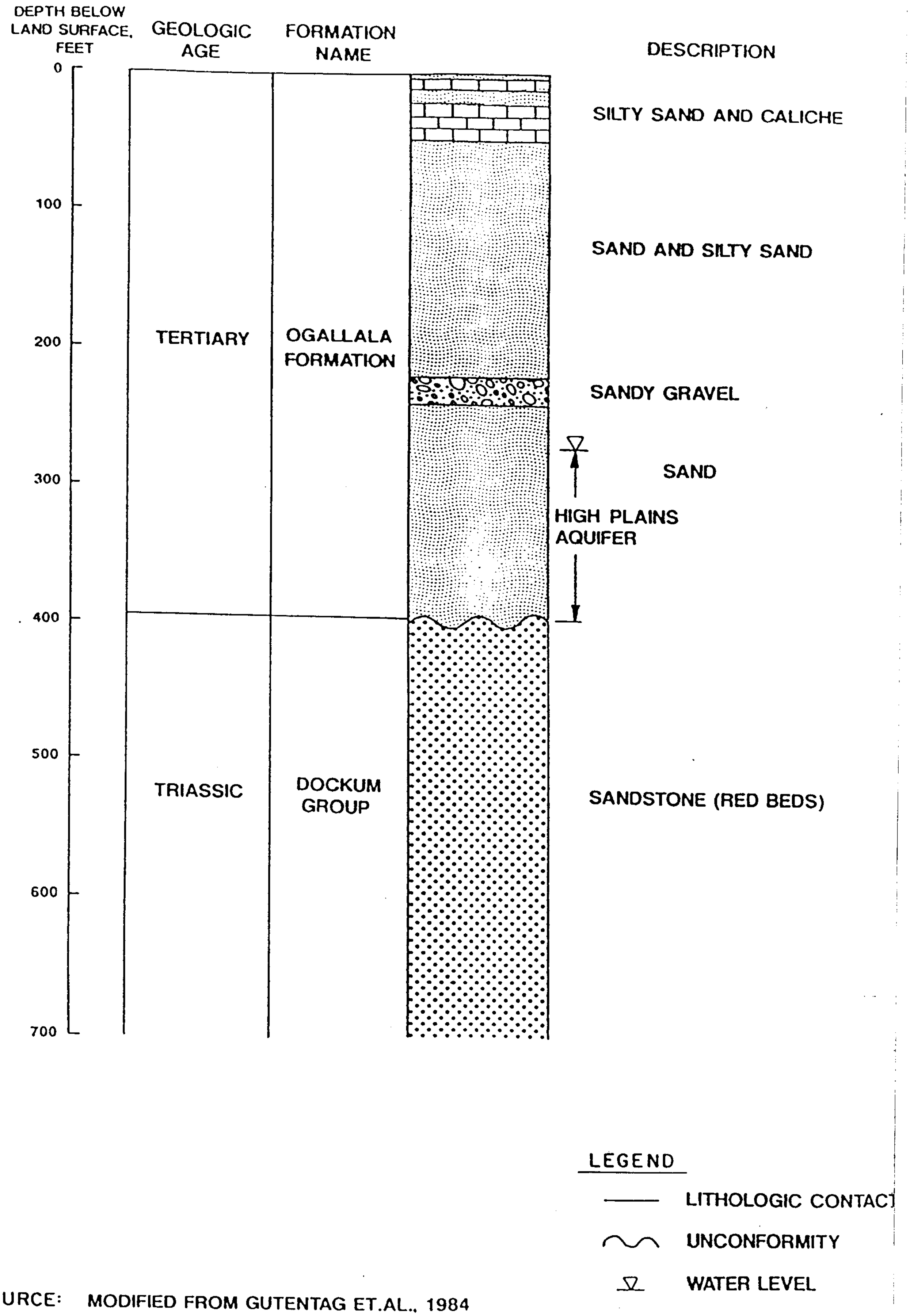
N

2000 1000 0 2000

SCALE IN FEET

July 31, 1997 12:25:30 p.m.
Drawing: T:\CANNON\F2-2M9602M.DWG (TSSM)
Xrefs: CAN-BASE.DWG

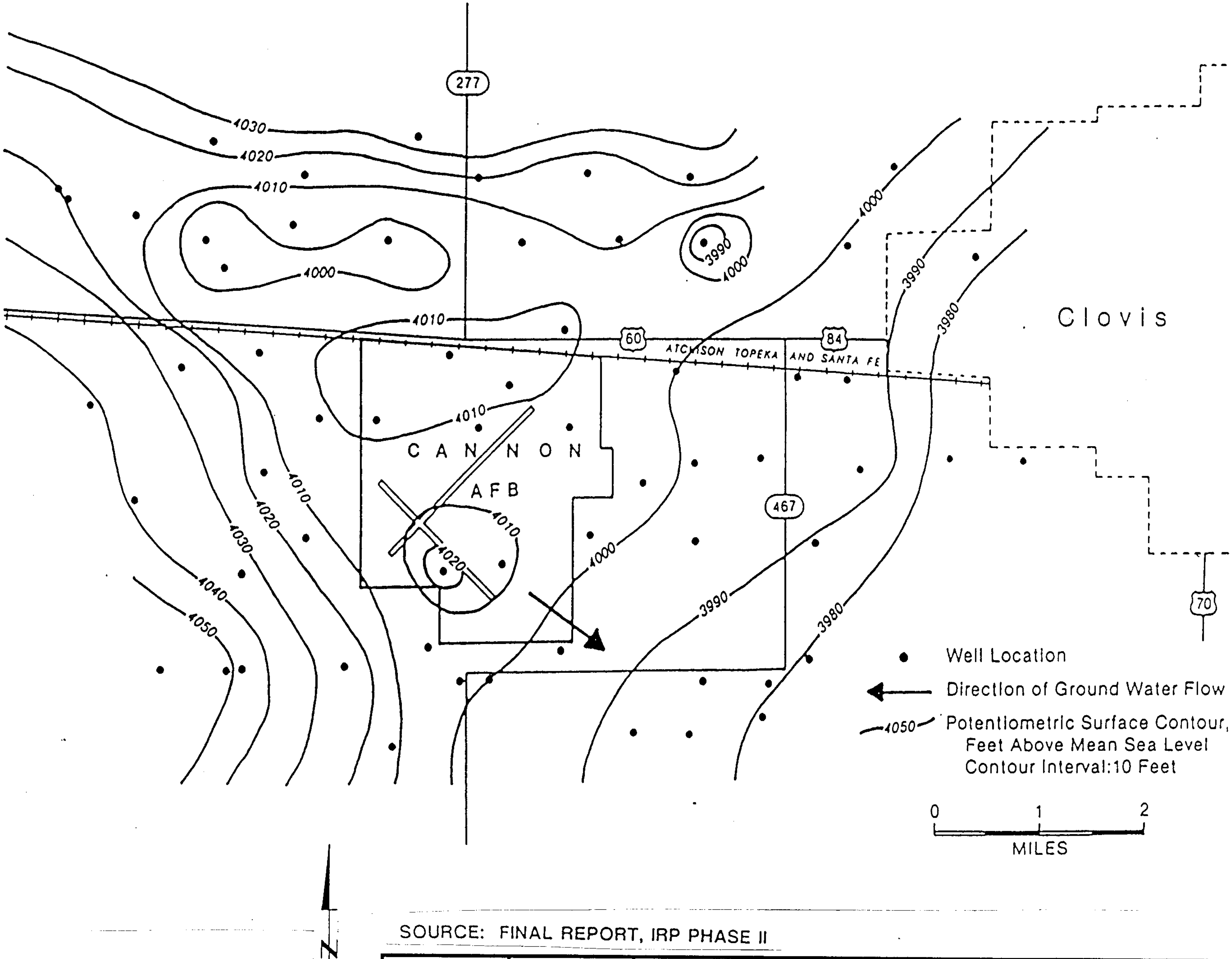
DRN. BY: TSSM	DATE: 07/31/07	SITE PLAN AND LOCATION OF INVESTIGATED SITES CANNON AIR FORCE BASE CLOVIS, NEW MEXICO	PROJECT NO.	FIG NO.
CHK'D. BY:	REVISION: 0		M9602M	2-2



SOURCE: MODIFIED FROM GUTENTAG ET.AL., 1984

July 30, 1997 1:04:50 p.m.
Drawing: T:\TITLES\DY8X11.DWG (TSSM)

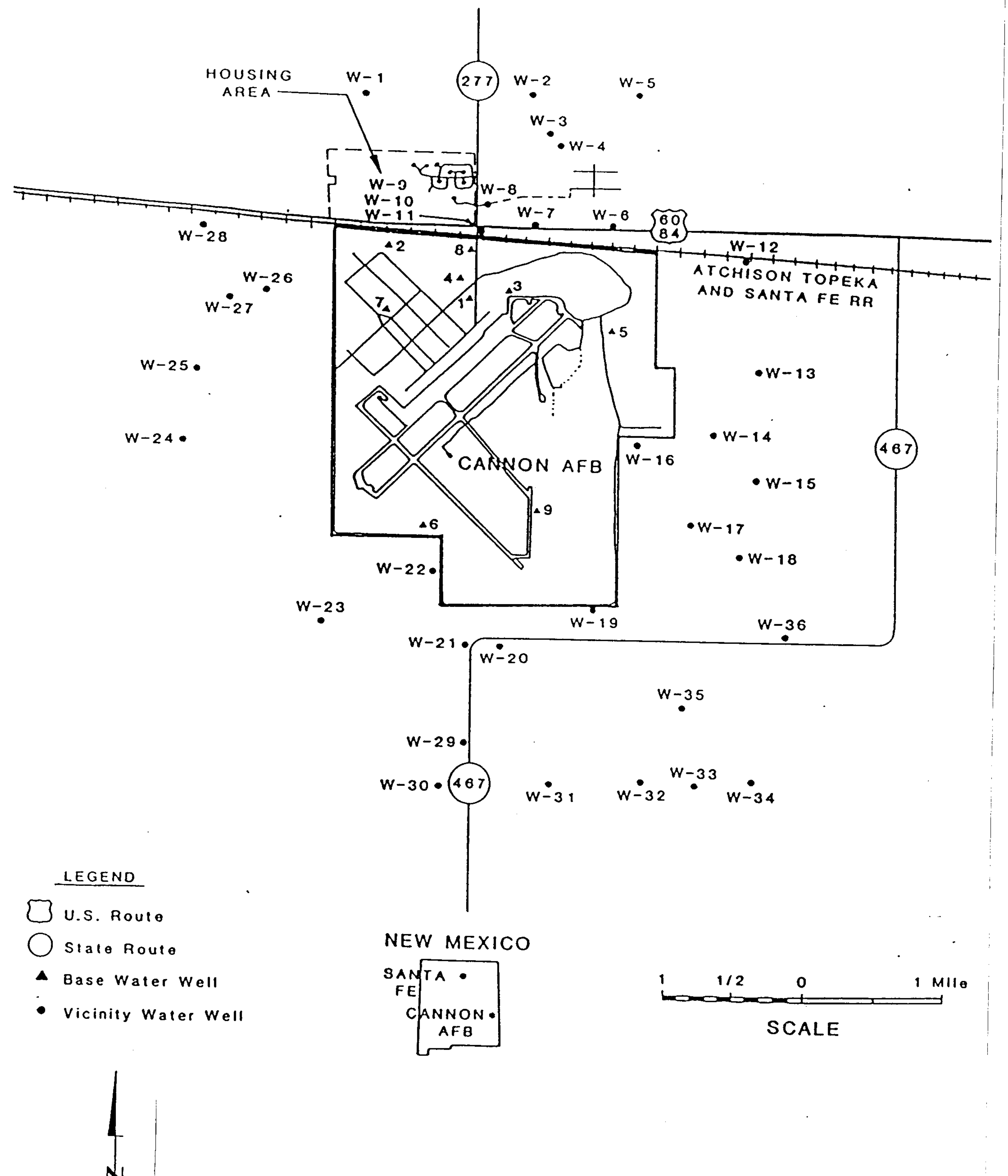
DRN. BY: TSSM	DATE: 07/31/97	GENERALIZED GEOLOGIC STRATA AT CANNON AIR FORCE BASE NEW MEXICO	PROJECT No. M9602M	FIG. No. 2-3
CHK'D. BY:	REVISIONS: 0			



SOURCE: FINAL REPORT, IRP PHASE II

July 30, 1997 1:13:21 p.m.
Drawing: T:\TITLES\DY11X8.DWG (TSSM)

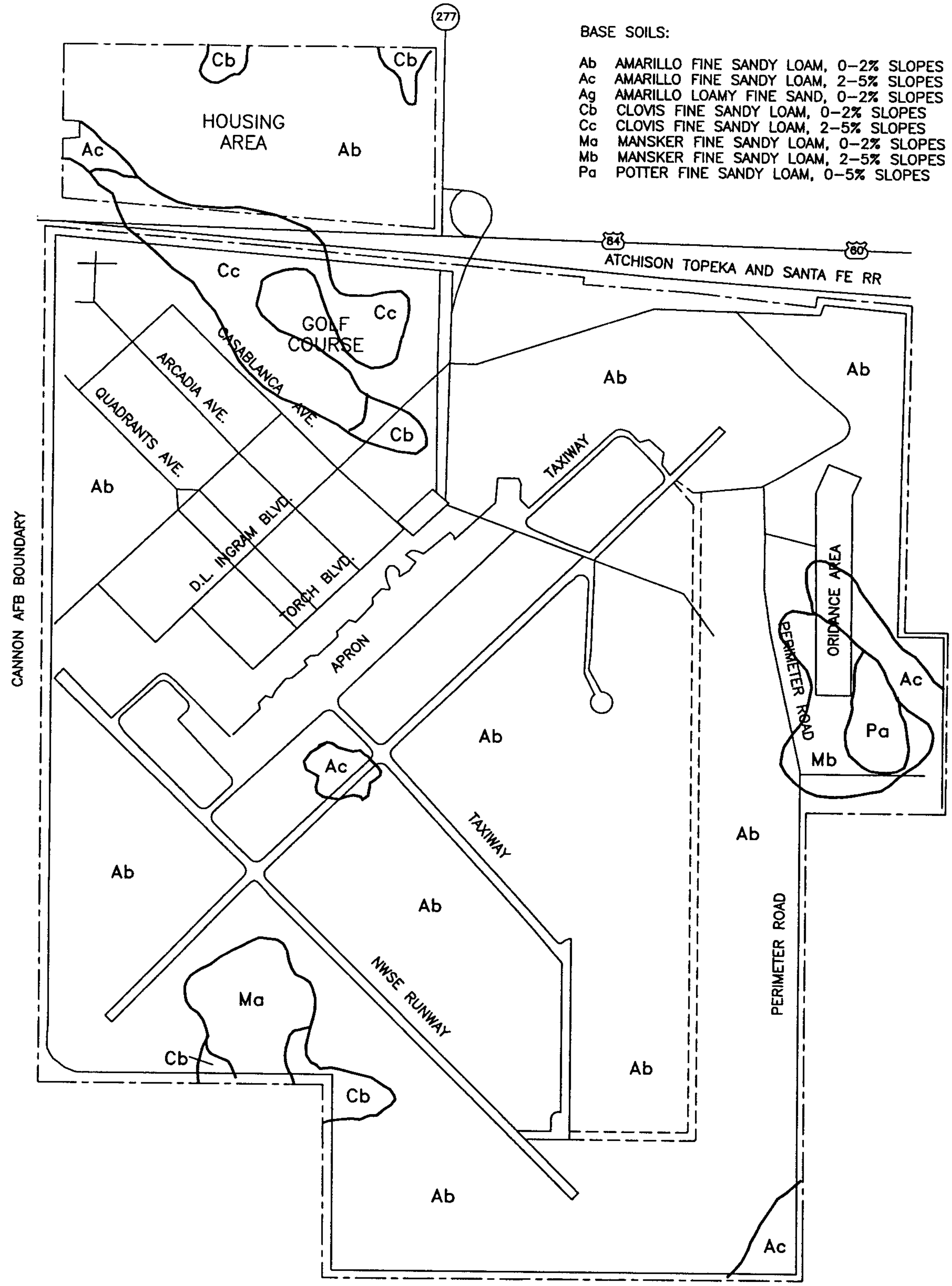
DRN BY TSSM	DATE 07/31/97	POTENTIOMETRIC SURFACE CONTOUR MAP, VICINITY OF CANNON AIR FORCE BASE NEW MEXICO	PROJECT No. M9602M	FIG. No. 2-4
CHK'D BY	REVISIONS: 0			



BASE MAP ADAPTED FROM: FINAL REPORT, IRP PHASE II

July 30, 1997 1:04:50 p.m.
Drawing: T:\TITLES\DY8X11.DWG (TSSM)

DRN. BY: TSSM	DATE: 07/31/97	WATER WELL LOCATIONS ON AND NEAR CANNON AIR FORCE BASE NEW MEXICO	PROJECT No. M9602M	FIG. No. 2-5
CHK'D. BY:	REVISIONS: 0			



SOURCE: USDA–S.C.S., SOIL SURVEY OF CURRY COUNTY N.M., 1958

July 30, 1997 1:02:36 p.m.
Drawing: T:\CANNON\F2-6M9602M.DWG (TSSM)

N

2000 1000 0 2000
SCALE IN FEET

DRN. BY: TSSM	DATE: 07/31/97	DISTRIBUTION OF SOILS, BY TYPE CANNON AIR FORCE BASE NEW MEXICO	PROJECT No. M9602M	FIG. No. 2-6
CHK'D. BY:	REVISIONS: 0			

3.0
FIELD INVESTIGATION AND DATA COLLECTION

Field activities for the Cannon AFB Background Investigation included surface soil sampling, subsurface soil sampling during the drilling of soil borings, and a sample location survey.

The field sampling program consisted of the following:

- Collecting surface soil samples from four locations for chemical analysis
- Drilling ten soil borings and sampling surface and subsurface soil for chemical analysis
- Determining horizontal and vertical control at sampling locations

The planned activities and investigative techniques for the Cannon AFB Background Investigation are described in the Field Sampling Plan (FSP), which is accompanied by the Quality Assurance Project Plan (QAPP), Site Safety and Health Plan (SSHP), and Standard Operating Procedures (SOPs) (USACE/W-C 1997). All field activities were completed in accordance with these documents. Locations of sampling points are shown on Figure 3-1.

3.1 SURFACE SOIL SAMPLING

Surface soil samples were collected at surface soil and soil boring locations for analysis of the following parameters:

- Pesticides by EPA Method 8081
- Target Analyte List (TAL) metals by Environmental Protection Agency (EPA) Methods 6010 and 7000

Surface soil samples were collected from the 0- to 0.5-foot interval, except at borings SB-01 and SB-07, where samples were collected from 0 to 1 feet to allow enough recovery for collection of quality assurance/quality control (QA/QC) samples. Samples were collected with a stainless-steel hand auger bucket at surface soil sampling locations and with a 3-inch-outside-diameter (OD), stainless-steel split spoon according to the procedures described below for soil boring drilling and sampling. Surface soil sampling activities followed the applicable SOPs (USACE/W-C 1997). A summary of soil sampling for chemical analysis is provided in Table 3-1.

3.2 SOIL BORING DRILLING AND SAMPLING

A total of ten soil borings (SB-01 through SB-10) were drilled for the Cannon AFB Background Investigation. Each boring was drilled using 4-1/4-inch-inside-diameter (ID), 8-inch nominal OD, hollow stem augers (HSA). These drilling methods allowed for the collection of soil samples.

Soil borings were sampled generally every 5 feet to the bottom of boring (i.e., 10 or 40 feet below ground surface [bgs]). Samples were collected for headspace analysis, chemical analysis, and description of subsurface materials. Soil samples were collected with a 3-inch OD, stainless-steel split spoon. All soil samples were placed in appropriate containers and labeled. Soil samples for chemical analysis were placed in a cooler for shipment to the designated laboratory. A Woodward-Clyde (W-C) geotechnical engineer classified each recovered sample in the field using the Unified Soil Classification System (USCS) and prepared a detailed boring log which included the boring identification, drilling, equipment, sample intervals, sample recovery, field screening results, and general observations. Boring logs from all borings are presented in Appendix A. Auger cuttings and excess or unused soil sample material were spread evenly on the ground surface adjacent to each boring location. Soil borings were abandoned with cement-bentonite grout. All applicable SOPs (USACE/W-C 1997) were followed.

Subsurface soil samples were collected for analysis of the following parameters:

- Pesticides by EPA Method 8081
- TAL metals by EPA Methods 6010 and 7000

A summary of soil sampling for chemical analysis is provided in Table 3-1. Photoionization detector (PID) headspace results were all nondetect above background with the exception of the 3- to 5-foot samples at SB-06 and SB-07, which were 1 part per million (ppm). Because fill material was encountered in the upper 5 feet at both SB-04 and nearby SB-09, soil samples for chemical analysis at the surface and at the 3- to 5-foot intervals were instead collected at SB-10.

Shallow stratigraphy at background soil boring locations is graphically shown in Figure 3-2. Silty clay fill material containing some fine-grained sand and occasional fine gravel was encountered to a depth of 6 feet at SB-04 and 5 feet (also bottom of boring) at SB-09. Fill material was of generally reddish-brown color and was not encountered at any other boring location. Natural soil encountered at boring locations consisted of varying layers of alluvial sediments of the Ogallala Formation. The upper layer is typically reddish-brown, silty clay with fine-grained sand. Thicknesses of this material ranged from 3 to 7.5 feet. Below this layer exists light reddish-brown with occasional light reddish-white, silty clay with fine-grained sand or sandy silt with occasional cemented zones (i.e., caliche layers). Thickness of this layer ranged from 10 to 20 feet as encountered at borings drilled deeper than 10 feet bgs (i.e., SB-02, SB-04, and SB-08). Underlying these materials is light reddish-brown or light reddish-white, fine-grained, silty sand or sand with silt. Cemented zone/caliche layers were encountered more frequently within this layer, beginning at about 25 to 30 feet bgs.

3.3 SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Certified, commercially cleaned sample containers were obtained from the contract analytical laboratory, Quanterra. Sample jars for quality assurance/quality control samples (QC field duplicates and QA field splits) were also provided by Quanterra. The bottles were labeled in the field indicating the required analysis. Sample preservation efforts commenced at the end of sample collection and continued until analyses were done. Samples were stored on ice at 4°C immediately following collection.

3.4 SURVEYING

Lydick Engineers and Surveyors provided professional surveying services to establish the locations of soil borings and other appropriate data points. Surveying included horizontal and vertical coordinates.

3.5 SUBCONTRACTORS

The following subcontractors were used for the Cannon AFB Background Investigation:

• Southwest Engineering, Inc. 475 Archuleta Road Las Cruces, New Mexico 88005	(drilling)
• Quanterra 4955 Yarrow Street Arvada, Colorado 80002	(chemical analysis of samples)
• Lydick Engineers and Surveyors 205 East 2nd Street Clovis, New Mexico 88102	(surveying)

TABLE 3-1

SUMMARY OF SOIL SAMPLING FOR CHEMICAL ANALYSIS
CANNON AFB BACKGROUND INVESTIGATION

Sample Location	Sample Identification	Sample Depth (feet)	Sample Date	Parameters: Pesticides[1]	Parameters: TAL Metals[2]	Comments
SS-01	CAN-BKG-SS01-0001	0-0.5	07/14/97	X	X	
SS-02	CAN-BKG-SS02-0001	0-0.5	07/14/97	X	X	
SS-03	CAN-BKG-SS03-0001	0-0.5	07/14/97	X	X	
SS-04	CAN-BKG-SS04-0001	0-0.5	07/14/97	X	X	
SB-01	CAN-BKG-SB01-0001	0-1	07/16/97	X	X	
	CAN-BKG-SB01-0201	0-1	07/16/97	X	X	QA field split to USACE-MR
	CAN-BKG-SB01-0005	3-5	07/16/97	X	X	
	CAN-BKG-SB01-0205	3-5	07/16/97	X	X	QA field split to USACE-MR
	CAN-BKG-SB01-0010	8-10	07/16/97	X	X	
SB-02	CAN-BKG-SB02-0001	0-0.5	07/16/97	X	X	
	CAN-BKG-SB02-0005	3-5	07/16/97	X	X	
	CAN-BKG-SB02-0010	8-10	07/16/97	X	X	
	CAN-BKG-SB02-0210	8-10	07/16/97	X	X	QA field split to USACE-MR
	CAN-BKG-SB02-0020	18-20	07/16/97	X	X	
	CAN-BKG-SB02-0220	18-20	07/16/97	X	X	QA field split to USACE-MR
	CAN-BKG-SB02-0029	28-29	07/16/97	X	X	
	CAN-BKG-SB02-0039	38-29	07/16/97	X	X	
SB-03	CAN-BKG-SB03-0001	0-0.5	07/15/97	X	X	
	CAN-BKG-SB03-0005	3-5	07/15/97	X	X	
	CAN-BKG-SB03-0010	8-10	07/15/97	X	X	
SB-04	CAN-BKG-SB04-0010	8-10	07/15/97	X	X	
	CAN-BKG-SB04-0020	18-20	07/15/97	X	X	
	CAN-BKG-SB04-0120	18-20	07/15/97	X	X	QC field duplicate
	CAN-BKG-SB04-0030	28-29.5	07/15/97	X	X	
	CAN-BKG-SB04-0041	40-41	07/15/97	X	X	extra volume for MS/MSD

TABLE 3-1

SUMMARY OF SOIL SAMPLING FOR CHEMICAL ANALYSIS
CANNON AFB BACKGROUND INVESTIGATION

Sample Location	Sample Identification	Sample Depth (feet)	Sample Date	Parameters: Pesticides[1]	Parameters: TAL Metals[2]	Comments
SB-05	CAN-BKG-SB05-0001	0-0.5	07/15/97	X	X	
	CAN-BKG-SB05-0005	3-5	07/15/97	X	X	
	CAN-BKG-SB05-0010	8-10	07/15/97	X	X	
	CAN-BKG-SB05-0110	8-10	07/15/97	X	X	QC field duplicate
SB-06	CAN-BKG-SB06-0001	0-0.5	07/15/97	X	X	
	CAN-BKG-SB06-0005	3-5	07/15/97	X	X	
	CAN-BKG-SB06-0105	3-5	07/15/97	X	X	QC field duplicate
	CAN-BKG-SB06-0010	8-10	07/15/97	X	X	
SB-07	CAN-BKG-SB07-0001	0-1	07/15/97	X	X	
	CAN-BKG-SB07-0101	0-1	07/15/97	X	X	QC field duplicate
	CAN-BKG-SB07-0005	3-5	07/15/97	X	X	
	CAN-BKG-SB07-0010	8-10	07/15/97	X	X	
SB-08	CAN-BKG-SB08-0001	0-0.5	07/15/97	X	X	
	CAN-BKG-SB08-0005	3-5	07/15/97	X	X	
	CAN-BKG-SB08-0010	8-10	07/15/97	X	X	
	CAN-BKG-SB08-0020	18-20	07/15/97	X	X	
	CAN-BKG-SB08-0030	29-30	07/15/97	X	X	
	CAN-BKG-SB08-0040	38-40	07/15/97	X	X	
SB-10	CAN-BKG-SB10-0001	0-0.5	07/16/97	X	X	
	CAN-BKG-SB10-0005	3-5	07/16/97	X	X	

[1] Pesticides (Method 8081)

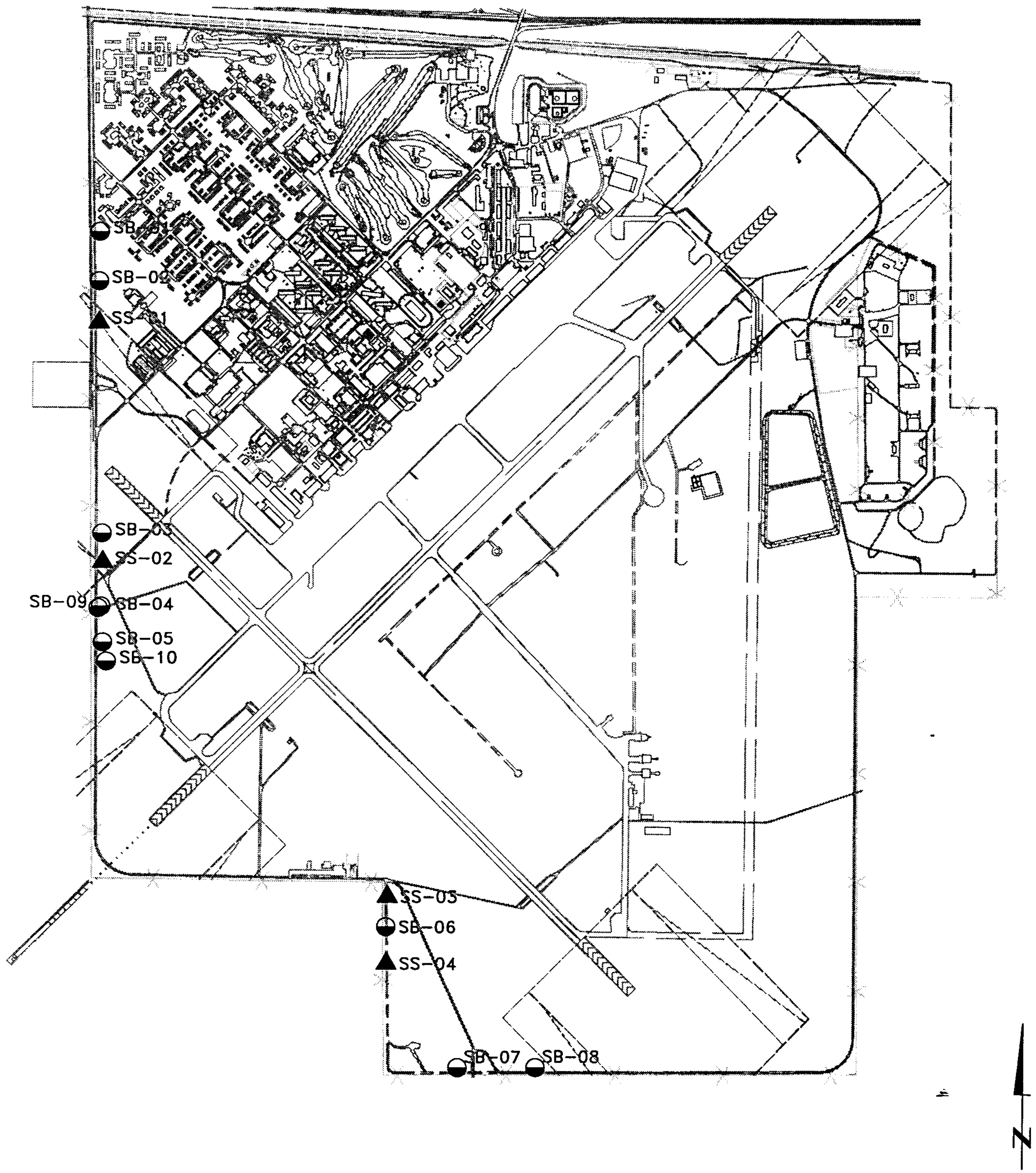
[2] Target Analyte List Metals (Method 6010 + 7060 (arsenic), 7740 (selenium), 7471 (mercury), 7420 (lead), 7841 (thallium))

QA = Quality Assurance

QC = Quality Control

MS/MSD = Matrix Spike / Matrix Spike Duplicate

USACE-MR - United States Army Corps of Engineers - Missouri River Laboratory



2000 1000 0 2000
SCALE IN FEET

LEGEND

▲ SURFACE SOIL SAMPLE LOCATION

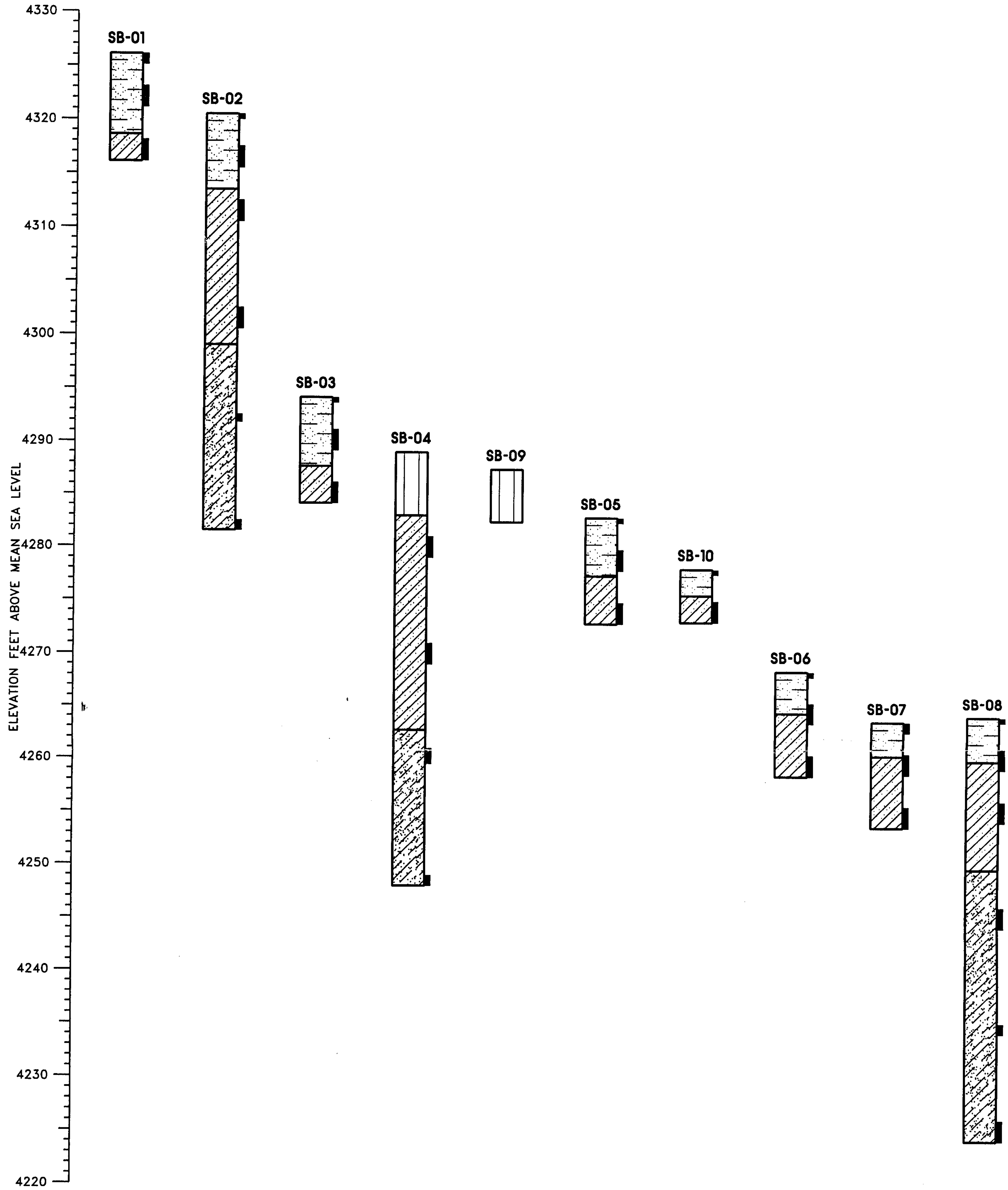
◒ SOIL BORING LOCATION

SURVEY DATA

SAMPLE LOCATION	NORTHING	EASTING	ELEVATION (FEET ABOVE MSL)
SB-01	1237413.54	800767.25	4326.13
SB-02	1236728.26	800761.07	4320.56
SB-03	1233214.06	800819.14	4294.19
SB-04	1232174.59	800835.03	4289.04
SB-05	1231695.88	800840.42	4282.87
SB-06	1227788.66	804760.44	4268.51
SB-07	1225858.42	805759.09	4263.69
SB-08	1225871.43	806833.50	4264.21
SB-09	1232173.23	800795.13	4287.43
SB-10	1231431.15	800891.17	4278.06
SS-01	1236151.48	800767.80	4313.96
SS-02	1232813.04	800822.44	4290.40
SS-03	1228203.57	804777.96	4267.57
SS-04	1227284.35	804770.41	4268.88

July 31, 1997 12:30:54 p.m.
Drawing: T:\CANNON\F3-1M9602M.DWG (TSSM)
Xrefs: CAN-BASE.DWG

DRN. BY: TSSM	DATE: 07/31/97	BACKGROUND SAMPLING LOCATION PLAN CANNON AIR FORCE BASE CLOVIS, NEW MEXICO	PROJECT NO. M9602M	FIG. NO. 3-1
CHK'D. BY:	REVISION: 0			



LEGEND

FILL, REDDISH-BROWN SILTY CLAY WITH FINE SAND AND OCCASIONAL FINE GRAVE (CL)

REDDISH-BROWN SILTY CLAY WITH FINE SAND (CL)

LIGHT REDDISH-BROWN WHITE SILTY CLAY WITH FINE SAND OR SANDY SILT (CL, ML)

LIGHT REDDISH-BROWN WHITE SILTY SAND OR FINE SAND WITH SILT (SM, SP-SM)

SOIL SAMPLE INTERVAL FOR CHEMICAL ANALYSIS

10 5 0 10
VERTICAL SCALE IN FEET

DRN BY TSSM	DATE 07/31/97	GRAPHICAL BACKGROUND SOIL BORING LOGS CANNON AIR FORCE BASE NEW MEXICO	PROJECT NO. M9602M	FIG. No. 3-2
CHK'D BY	REVISION 0			

f:\cannon\f3-2m9602m.dgn

4.0
SAMPLING AND ANALYTICAL RESULTS

This section presents results of the Background Investigation sampling and analysis for pesticides and metals at Cannon AFB, including a discussion of data quality review/validation and data assessment.

4.1 SUMMARY OF RESULTS

Thirty-seven soil boring samples and four surface soil samples were collected and analyzed for pesticides by EPA Method 8080 and for metals by EPA Methods 6010 and 7471 to meet the objectives in the FSP (USACE/W-C 1997). A summary of results for all compounds which were detected above the reporting limit in one or more samples is included in Table 4-1 (surface soil) and Table 4-2 (soil borings).

The following describes the sample identification designation system used for all samples reported in the tables (e.g. sample CBSB010001). CB indicates Cannon Air Force Base Background samples. The characters SB01 indicate soil boring sample No. 1. The next two characters, 01, indicate the type of sample:

- 00 for soil sample
- 01 for QC sample

The last two characters indicate the bottom depth of the sample in feet bgs for all soil samples.

4.2 DATA QUALITY REVIEW AND ASSESSMENT

Chemical data generated from samples collected during the Background Investigation sampling activities were reviewed following procedures presented in EPA Contract Laboratory Program, Functional Guidelines for Organic Data Review (EPA 1994b) and National Functional Guidelines for Inorganic Data Review (EPA 1994a), where applicable to the SW-846 Methodologies utilized. Additionally, ten percent of the data underwent a full validation. The specific criteria utilized for the review and validation were those presented in the Cannon AFB Background Investigation QAPP (USACE/W-C 1997). Review of the data indicated that all QC parameters were satisfactory. No data was qualified as unusable "R". Therefore, no limitations of data exists, and all data should be used for their intended purpose. More detailed information, including data quality review and validation reports is provided in the Cannon AFB Background Investigation Quality Control Summary Report (QCSR) (W-C 1997).

TABLE 4-1
DETECTED COMPOUNDS FOR SURFACE SOIL SAMPLES ASSOCIATED WITH THE BACKGROUND INVESTIGATION STUDY
CANNON AIR FORCE BASE, NEW MEXICO

PARAMETER	Metals			Metals			Metals			Metals			Metals			Metals		
ANALYTE	ALUMINUM			ARSENIC			BARIUM			BERYLLIUM			CALCIUM			CHROMIUM		
UNITS	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSS01001	3700	10.3		1.9	1		42.7	1		0.3	0.21		1470	20.6		5.9	1	
CBSS02001	4640	10.3		2.1	1		57.7	1		0.26	0.21		3800	20.7		6.6	1	
CBSS03001	4260	10.3		1.7	1		49.1	1		0.3	0.21		6640	20.7		6	1	
CBSS04001	3880	10.3		1.8	1		39.2	1		0.26	0.21		968	20.5		6	1	
Maximum		4640			2.1			57.7			0.3			6640			6.6	
Frequency		4/ 4			4/ 4			4/ 4			4/ 4			4/ 4			4/ 4	

PARAMETER	Metals			Metals			Metals			Metals			Metals			Metals		
ANALYTE	COBALT			COPPER			IRON			LEAD			MAGNESIUM			MANGANESE		
UNITS	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSS01001	2.7	1		4.3	2.1		5480	10.3		5.6	0.31		754	20.6		115	1	
CBSS02001	2.8	1		4.9	2.1		6400	10.3		7.1	0.31		933	20.7		127	1	
CBSS03001	2.9	1		4.1	2.1		5530	10.3		7.4	0.31		839	20.7		93.3	1	
CBSS04001	2.5	1		3.8	2.1		5440	10.3		5.2	0.31		696	20.5		105	1	
Maximum		2.9			4.9			6400			7.4			933			127	
Frequency		4/ 4			4/ 4			4/ 4			4/ 4			4/ 4			4/ 4	

PARAMETER	Metals			Metals			Metals			Metals			Metals		
ANALYTE	NICKEL			POTASSIUM			SODIUM			VANADIUM			ZINC		
UNITS	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSS01001	3.9	4.1	J	1080	515		<	515	U	12.5	1		11.6	2.1	
CBSS02001	4.9	4.1		1230	516		<	516	U	14.5	1		14	2.1	
CBSS03001	4.6	4.1		1010	517		<	517	U	12.9	1		12	2.1	
CBSS04001	3.8	4.1	J	1050	513		85.5	513	J	12	1		11.2	2.1	
Maximum		4.9			1230			85.5 J			14.5			14	
Frequency		4/ 4			4/ 4			1/ 4			4/ 4			4/ 4	

Results presented here are only those chemicals which were detected at least once for background samples and have passed data review.

RL = Reporting Limit

U = Nondetected value

J = Estimated value

TABLE 4-2
DETECTED COMPOUNDS FOR SOIL BORING SAMPLES ASSOCIATED WITH THE BACKGROUND INVESTIGATION STUDY
CANNON AIR FORCE BASE, NEW MEXICO

PARAMETER	Pesticides/PCB			Metals			Metals			Metals			Metals			Metals			Metals			Metals		
ANALYTE	4,4'-DDT			ALUMINUM			ARSENIC			BARIUM			BERYLLIUM			CALCIUM			CHROMIUM, TOTAL			COBALT		
UNITS	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSB010001	<	0.0034	U	4300	10.3		1.8	1		40.2	1		0.21	0.21		1350	20.6		6.5	1		1.8	1	
CBSB010005	<	0.0036	U	7950	10.8		3	1.1		73.5	1.1		0.5	0.22		4100	21.5		10	1.1		3.5	1.1	
CBSB010010	<	0.0035	U	4990	21.3		3.5	2.1		170	2.1		0.26	0.43	J	171000	42.6		4.5	2.1		<	2.1	U
CBSB020001	<	0.0034	U	4520	10.3		1.5	1		47.1	1		0.31	0.21		1580	20.6		6.5	1		1.9	1	
CBSB020005	<	0.0035	U	6610	10.7		2.7	1.1		66.3	1.1		0.46	0.21		1750	21.4		8.9	1.1		3.1	1.1	
CBSB020010	<	0.0036	U	7080	10.8		3.5	1.1		285	1.1		0.45	0.22		66600	21.7		6.5	1.1		2.7	1.1	
CBSB020020	<	0.0036	U	4560	22.1		1.6	2.2	J	117	2.2		<	0.44	U	190000	44.2		3	2.2		<	2.2	U
CBSB020029	<	0.0038	U	4910	22.8		<	2.3	U	339	2.3		<	0.46	U	150000	45.6		4.4	2.3		<	2.3	U
CBSB020039	<	0.0037	U	5050	22.3		<	2.2	U	317	2.2		<	0.45	U	158000	44.6		3.6	2.2		<	2.2	U
CBSB030001	<	0.0034	U	4150	10.3		2.2	1		47.5	1		0.26	0.21		2500	20.5		6.4	1		1.9	1	
CBSB030005	<	0.0035	U	6160	10.6		2.6	1.1		91.2	1.1		0.31	0.21		19900	21.2		7.7	1.1		3.5	1.1	
CBSB030010	<	0.0037	U	3370	22.3		<	2.2	U	805	2.2		<	0.45	U	136000	44.5		2.7	2.2		<	2.2	U
CBSB040010	<	0.0036	U	5110	21.7		3.1	2.2		137	2.2		0.31	0.43	J	135000	43.3		4.9	2.2		4.1	2.2	
CBSB040020	<	0.0036	U	3960	10.8		1.7	1.1		86	1		0.62	0.21		4190	20.8		9.5	1		4.9	1	
CBSB040030	<	0.0036	U	3730	10.9		1.2	1.1		47.9	1.1		0.12	0.22	J	34900	21.9		2.8	1.1		<	1.1	U
CBSB040041	<	0.0036	U	3560	10.8		1.2	1.1		57.2	1.1		<	0.22	U	88400	21.6		3	1.1		<	1.1	U
CBSB040120	<	0.0036	U	4250	10.9		1.5	1.1		467	1.1		0.36	0.22		50100	21.7		4.3	1.1		2.8	1.1	
CBSB050001	0.0039	0.0035		7090	10.5		2.7	1		670	1		0.55	0.21		44800	20.9		7.7	1		4.5	1	
CBSB050005	<	0.0036	U	12200	10.9		2.2	1.1		82.3	1.1		0.66	0.22		23700	21.7		11.1	1.1		4.7	1.1	
CBSB050010	<	0.0035	U	9290	21.5		2	2.1	J	264	2.1		0.39	0.43	J	167000	42.9		7.5	2.1		4	2.1	
CBSB050110	<	0.0036	U	6720	21.8		3	2.2		193	2.2		0.4	0.44	J	128000	43.7		5.7	2.2		3.6	2.2	
CBSB060001	<	0.0034	U	4580	10.4		2.2	1		58.6	1		0.39	0.21		3360	20.8		6.6	1		3.3	1	
CBSB060005	<	0.0038	U	4400	11.4		2.5	1.1		103	1.1		0.43	0.23		55000	22.8		4.6	1.1		3.3	1.1	
CBSB060010	<	0.0035	U	7330	10.6		2.1	1.1		79.4	1.1		0.4	0.21		38300	21.1		7.1	1.1		3	1.1	
CBSB060105	<	0.0035	U	8620	10.5		2.3	1.1		75.5	1.1		0.39	0.21		33600	21		8.4	1.1		3.4	1.1	
CBSB070001	<	0.0034	U	5150	10.4		2.6	1		71.5	1		0.38	0.21		3930	20.9		7.6	1		3.9	1	
CBSB070005	<	0.0035	U	3730	52.8		3.6	5.3	J	167	5.3		<	1.1	U	253000	106		4.5	5.3	J	4.5	5.3	J
CBSB070010	<	0.0036	U	9530	11.1		1.8	1.1		162	1.1		0.58	0.22		52500	22.1		6.9	1.1		3.2	1.1	

TABLE 4-2
DETECTED COMPOUNDS FOR SOIL BORING SAMPLES ASSOCIATED WITH THE BACKGROUND INVESTIGATION STUDY
CANNON AIR FORCE BASE, NEW MEXICO

PARAMETER	Pesticides/PCB			Metals			Metals			Metals			Metals			Metals			Metals			Metals		
ANALYTE	4,4'-DDT			ALUMINUM			ARSENIC			BARIUM			BERYLLIUM			CALCIUM			CHROMIUM, TOTAL			COBALT		
UNITS	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSB070101	0.0018	0.0034	J	7790	10.4																			
CBSB080001	<	0.0034	U	8950	10.4		3.3	1		90.6	1		0.62	0.21		2930	20.8		10.5	1		5.3	1	
CBSB080005	<	0.0036	U	8160	10.8		3.3	1.1		100	1.1		0.57	0.22		81900	21.7		8	1.1		4.7	1.1	
CBSB080010	<	0.0035	U	5040	10.7		2.6	1.1		168	1.1		0.54	0.21		71800	21.4		5.9	1.1		4.3	1.1	
CBSB080020	<	0.0036	U	4250	10.8		1.5	1.1		74.3	1.1		0.23	0.22		89500	21.6		3.9	1.1		2.9	1.1	
CBSB080030	<	0.0036	U	5680	10.9		<	1.1	U	508	1.1		0.1	0.22	J	87900	21.7		5.3	1.1		1	1.1	J
CBSB080040	<	0.0034	U	3380	10.4		<	1	U	134	1		0.11	0.21	J	43700	20.8		3	1		1.8	1	
CBSB100001	<	0.0034	U	4390	10.4		2.4	1		51.6	1		0.31	0.21		1570	20.7		6.4	1		1.8	1	
CBSB100005	<	0.0036	U	6030	11		3.3	1.1		185	1.1		0.45	0.22		65900	22		5.9	1.1		3.4	1.1	
Maximum		0.0039			12200			3.6 J			805			0.66			253000			11.1			5.3	
Frequency		2/ 37			37/ 37			32/ 37			37/ 37			31/ 37			37/ 37			37/ 37			30/ 37	

Results presented here are only those chemicals which were detected at least once for background samples and have passed data review.

RL = Reporting Limit

U = Nondetected value

J = Estimated value

Samples CBSB040120, CBSB050110, CBSB060105, and CBSB070101 are QC field duplicates.

TABLE 4-2
DETECTED COMPOUNDS FOR SOIL BORING SAMPLES ASSOCIATED WITH THE BACKGROUND INVESTIGATION STUDY
CANNON AIR FORCE BASE, NEW MEXICO

PARAMETER	Metals			Metals			Metals			Metals			Metals			Metals		
ANALYTE	COPPER			IRON			LEAD			MAGNESIUM			MANGANESE			MERCURY		
UNITS	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSB010001	4.1	2.1		5680	10.3		5.7	0.31		784	20.6		99.4	1		<	0.034	U
CBSB010005	6.2	2.2		9700	10.8		7	0.32		1570	21.5		131	1.1		<	0.036	U
CBSB010010	3.2	4.3	J	5200	21.3		6.1	0.64		3250	42.6		63.7	2.1		<	0.035	U
CBSB020001	4.3	2.1		5920	10.3		6.3	0.31		792	20.6		103	1		<	0.034	U
CBSB020005	5.2	2.1		7840	10.7		6.2	0.32		1510	21.4		83.2	1.1		<	0.035	U
CBSB020010	4.5	2.2		6930	10.8		6.7	0.33		3140	21.7		102	1.1		<	0.036	U
CBSB020020	<	4.4	U	3720	22.1		4.3	0.66		3900	44.2		48.3	2.2		<	0.036	U
CBSB020029	2.3	4.6	J	2590	22.8		2.2	0.68		19300	45.6		17.6	2.3		<	0.038	U
CBSB020039	<	4.5	U	3020	22.3		1.5	0.67		11600	44.6		23.1	2.2		<	0.037	U
CBSB030001	4.6	2.1		5670	10.3		6.2	0.31		811	20.5		122	1		<	0.034	U
CBSB030005	6.6	2.1		7390	10.6		6.6	0.32		1400	21.2		179	1.1		<	0.035	U
CBSB030010	<	4.5	U	3110	22.3		4.3	0.67		2450	44.5		42	2.2		<	0.037	U
CBSB040010	4.1	4.3	J	4550	21.7		5.2	0.65		2780	43.3		94.9	2.2		<	0.036	U
CBSB040020	2.7	2.2		4220	10.8		7.2	0.31		2480	21.7		87.3	1.1		<	0.036	U
CBSB040030	<	2.2	U	2620	10.9		2.7	0.33		5310	21.9		23.3	1.1		<	0.036	U
CBSB040041	<	2.2	U	2430	10.8		2.2	0.32		6390	21.6		27.5	1.1		<	0.036	U
CBSB040120	2.3	2.2		3470	10.9		5	0.33		2710	21.7		92.2	1.1		0.025	0.036	J
CBSB050001	7	2.1		6840	10.5		8.5	0.31		1930	20.9		181	1		0.056	0.035	
CBSB050005	7.4	2.2		9620	10.9		6.3	0.33		3030	21.7		115	1.1		<	0.036	U
CBSB050010	4	4.3	J	6240	21.5		4.6	0.64		4390	42.9		71.9	2.1		<	0.035	U
CBSB050110	3.3	4.4	J	5070	21.8		4.7	0.65		3560	43.7		60.4	2.2		0.014	0.036	J
CBSB060001	5.2	2.1		5660	10.4		5.9	0.31		966	20.8		132	1		<	0.034	U
CBSB060005	4.3	2.3		4490	11.4		5.2	0.34		2390	22.8		115	1.1		<	0.038	U
CBSB060010	5.3	2.1		6400	10.6		5.1	0.32		2050	21.1		95	1.1		<	0.035	U
CBSB060105	5.1	2.1		7260	10.5		5.4	0.32		2130	21		100	1.1		<	0.035	U
CBSB070001	6.4	2.1		6270	10.4		6.6	0.31		1120	20.9		183	1		<	0.034	U
CBSB070005	<	10.6		2720	52.8		3.1	1.6		2860	106		32.8	5.3		<	0.035	U
CBSB070010	3.4	2.2		6560	11.1		5.8	0.33		3200	22.1		99.9	1.1		<	0.036	U

TABLE 4-2
DETECTED COMPOUNDS FOR SOIL BORING SAMPLES ASSOCIATED WITH THE BACKGROUND INVESTIGATION STUDY
CANNON AIR FORCE BASE, NEW MEXICO

PARAMETER	Metals			Metals			Metals			Metals			Metals			Metals		
ANALYTE	COPPER			IRON			LEAD			MAGNESIUM			MANGANESE			MERCURY		
UNITS	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSB070101																		
CBSB080001	9.7	2.1		10100	10.4		10	0.31		1700	20.8		275	1		<	0.034	U
CBSB080005	7.3	2.2		7680	10.8		7.1	0.33		2640	21.7		184	1.1		<	0.036	U
CBSB080010	5	2.1		5600	10.7		5.3	0.32		3010	21.4		152	1.1		<	0.035	U
CBSB080020	1.8	2.2	J	3170	10.8		3.8	0.32		3070	21.6		68.5	1.1		<	0.036	U
CBSB080030	1.3	2.2	J	3500	10.9		3	0.33		8280	21.7		30.2	1.1		<	0.036	U
CBSB080040	1.1	2.1	J	2500	10.4		2.3	0.31		3660	20.8		37.2	1		<	0.034	U
CBSB100001	3.7	2.1		5550	10.4		4.9	0.31		804	20.7		85.1	1		<	0.034	U
CBSB100005	5.1	2.2		6890	11		7	0.33		2840	22		148	1.1		<	0.036	U
Maximum		9.7			10100			10 B			19300			275			0.056	
Frequency		31/ 37			37/ 37			37/ 37			37/ 37			37/ 37			3/ 37	

Results presented here are only those chemicals which were detected at least once for background samples and have passed data review.

RL = Reporting Limit

U = Nondetected value

J = Estimated value

Samples CBSB040120, CBSB050110, CBSB060105, and CBSB070101 are QC field duplicates.

TABLE 4-2
DETECTED COMPOUNDS FOR SOIL BORING SAMPLES ASSOCIATED WITH THE BACKGROUND INVESTIGATION STUDY
CANNON AIR FORCE BASE, NEW MEXICO

PARAMETER	Metals			Metals			Metals			Metals			Metals			Metals			Metals		
ANALYTE	NICKEL			POTASSIUM			SELENIUM			SILVER			SODIUM			VANADIUM			ZINC		
UNITS	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSB010001	4.2	4.1		1080	516		<	0.52	U	<	1	U	<	516	U	12.6	1		15	2.1	
CBSB010005	8	4.3		1460	538		<	0.54	U	<	1.1	U	<	538	U	22.6	1.1		16.9	2.2	
CBSB010010	4.3	8.5	J	1010	1070	J	0.99	1.1	J	<	2.1	U	<	1070	U	17.4	2.1		11.2	4.3	
CBSB020001	4.4	4.1		1060	516		<	0.52	U	<	1	U	<	516	U	13.2	1		11.7	2.1	
CBSB020005	7	4.3		1220	535		<	0.53	U	<	1.1	U	<	535	U	18.2	1.1		13.9	2.1	
CBSB020010	6.7	4.3		1310	542		<	0.54	U	<	1.1	U	<	542	U	23.2	1.1		14.5	2.2	
CBSB020020	<	8.8	U	1200	1110		<	1.1	U	<	2.2	U	<	1110	U	11.9	2.2		8.7	4.4	
CBSB020029	<	9.1	U	642	1140	J	<	1.1	U	<	2.3	U	<	1140	U	23.3	2.3		6	4.6	
CBSB020039	<	8.9	U	886	1110	J	1.1	1.1		<	2.2	U	<	1110	U	13.5	2.2		7.1	4.5	
CBSB030001	4.2	4.1		1060	513		<	0.52	U	<	1	U	<	513	U	12.9	1		12.7	2.1	
CBSB030005	6.5	4.2		1300	529		<	0.53	U	<	1.1	U	<	529	U	17.3	1.1		18.9	2.1	
CBSB030010	<	8.9	U	777	1110	J	1	1.1	J	<	2.2	U	<	1110	U	9.3	2.2		12	4.5	
CBSB040010	5.8	8.7	J	1300	1080		<	1.1	U	<	2.2	U	359	1080	J	15.3	2.2		13.5	4.3	
CBSB040020	4.5	4.3		1900	520		<	0.52	U	<	1	U	100	520	J	14.7	1.1		9.9	2.2	
CBSB040030	2.5	4.4	J	660	546		<	0.55	U	<	1.1	U	133	546	J	12.4	1.1		4.5	2.2	
CBSB040041	<	4.3	U	725	540		0.73	0.54		<	1.1	U	82.6	540	J	9.3	1.1		4.8	2.2	
CBSB040120	5	4.3		1300	544		<	0.54	U	<	1.1	U	334	544	J	13.2	1.1		9.6	2.2	
CBSB050001	7.2	4.2		1540	523		<	0.52	U	0.4	1	J	84.1	523	J	17.8	1		20.3	2.1	
CBSB050005	11.4	4.3		2370	543		<	0.54	U	<	1.1	U	<	543	U	18.4	1.1		20.5	2.2	
CBSB050010	7.3	8.6	J	1690	1070		<	1.1	U	<	2.1	U	325	1070	J	16.2	2.1		18.9	4.3	
CBSB050110	5.8	8.7	J	1350	1090		<	1.1	U	<	2.2	U	382	1090	J	15	2.2		13	4.4	
CBSB060001	6	4.2		1300	519		<	0.52	U	<	1	U	<	519	U	14.2	1		12.6	2.1	
CBSB060005	5.5	4.6		1120	570		<	0.57	U	<	1.1	U	200	570	J	14.1	1.1		11.3	2.3	
CBSB060010	7	4.2		1460	528		<	0.53	U	<	1.1	U	85.5	528	J	12.8	1.1		15.4	2.1	
CBSB060105	8	4.2		1640	526		<	0.58	U	<	1.1	U	81.9	526	J	14	1.1		16.6	2.1	
CBSB070001	6.5	4.2		1510	522		<	0.52	U	<	1	U	102	522	J	16.5	1		14.9	2.1	
CBSB070005	<	21.1	U	754	2640	J	<	2.6	U	<	5.3	U	<	2640	U	11.8	5.3		8.9	10.6	J
CBSB070010	5.8	4.4		1800	553		<	0.55	U	<	1.1	U	224	553	J	17.6	1.1		15.5	2.2	

TABLE 4-2
DETECTED COMPOUNDS FOR SOIL BORING SAMPLES ASSOCIATED WITH THE BACKGROUND INVESTIGATION STUDY
CANNON AIR FORCE BASE, NEW MEXICO

PARAMETER	Metals			Metals			Metals			Metals			Metals			Metals			Metals		
ANALYTE	NICKEL			POTASSIUM			SELENIUM			SILVER			SODIUM			VANADIUM			ZINC		
UNITS	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSB070101																					
CBSB080001	9.4	4.2		2310	521		<	0.52	U	<	1	U	<	521	U	21.3	1		29	2.1	
CBSB080005	8.8	4.3		1900	542		<	0.54	U	<	1.1	U	136	542	J	16.1	1.1		18.8	2.2	
CBSB080010	8.5	4.3		1310	536		<	0.54	U	<	1.1	U	503	536	J	26.3	1.1		13.8	2.1	
CBSB080020	4.6	4.3		1230	540		<	0.54	U	<	1.1	U	366	540	J	12.3	1.1		9	2.2	
CBSB080030	2.5	4.3	J	1030	543		<	0.54	U	<	1.1	U	216	543	J	12.7	1.1		7.5	2.2	
CBSB080040	2.8	4.2	J	817	521		<	0.52	U	<	1	U	222	521	J	6.5	1		6	2.1	
CBSB100001	4.8	4.1		911	518		<	0.52	U	<	1	U	<	518	U	13	1		10.2	2.1	
CBSB100005	7.1	4.4		1350	550		<	0.55	U	<	1.1	U	<	550	U	25.8	1.1		14.6	2.2	
Maximum		11.4			2370			1.1			.4 J			503 J			26.3			29	
Frequency		31/ 37			37/ 37			4/ 37			1/ 37			19/ 37			37/ 37			37/ 37	

Results presented here are only those chemicals which were detected at least once for background samples and have passed data review.

RL = Reporting Limit

U = Nondetected value

J = Estimated value

Samples CBSB040120, CBSB050110, CBSB060105, and CBSB070101 are QC field duplicates.

5.0
STATISTICAL METHODOLOGY

The procedures used to develop background concentrations for metals and pesticides at Cannon AFB were conducted in accordance with the following regulations and guidance:

- Statistical Methods for Evaluating Groundwater Monitoring From Hazardous Waste Facilities Final Rule (EPA 1989b)

- Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Interim Final Guidance (EPA 1989c)

- Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance (EPA 1992a)

Although these guidance refer to the statistical analysis of groundwater data, it is acceptable to apply the same procedures to soils. Because the background data will be used to evaluate human health risks at Cannon AFB, EPA Risk Assessment Guidance for Superfund (EPA 1989a) was also used as guidance.

All soils at the Base are fine sandy loams from 0 to 5 percent slopes. There is no reason to differentiate soil types at the facility. Therefore, it is appropriate to use the background data samples for comparison to other data collected from various portions of the Base.

Data were evaluated separately for surface and subsurface soils. Surface soil samples are those collected from 0 to 1 foot bgs, and subsurface soil samples are those collected from 1 foot bgs and deeper. It should be noted that subsurface soil samples CBSB040120, CBSB050110, CBSB060105, and CBSB070101 are QC field duplicates and were not included in the subsurface soil data set. The following steps were completed for each metal or pesticide data set in surface and subsurface soil.

- Review of all data used in the previous background study (W-C 1994b) to determine suitability for inclusion in the new data set (i.e., data collected during current Background Investigation).

- Linear regression analysis for each metal against calcium concentrations to identify those metals whose concentrations correlate to the calcium content of the soils.

- Identification of outlier values.

- Distribution analysis.

- Use of statistical procedures to calculate background concentrations.

- Evaluation of metals concentrations versus depth.

5.1 USE OF PREVIOUSLY COLLECTED DATA

Data utilized in the previous report on background concentrations of inorganics, Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon Air Force Base (W-C 1994b), were reviewed for suitability for inclusion in the new data set. Two surface soil samples, OFS1 and OFS2 (collected from 0 to 0.5 feet bgs during the W-C 1991 Remedial Investigation (RI) for 18 Solid Waste Management Units [W-C 1992]), were chosen for inclusion in the new data set for surface soil for the following reasons.

- The samples were located off Base in a field west of the Chavez Housing Area

- The off-Base area appeared to be an undisturbed open field, indicating that no Base operations had taken place in the past.

- There are no known construction activities or base operations in the immediate vicinity. Current use of the land around the background sites is minimal. The closest facilities are single-family homes approximately 200 feet east of sample OFS1 and approximately 400 feet north of OFS2. The samples did not appear to be near high pedestrian traffic areas.

- The off-Base site has soil similar to that found over the majority of the Base.

- There were no visible indications of soil discoloration were present at the sample locations.

- There were no detectable levels of polychlorinated biphenyls (PCBs) and pesticides present in the samples.

The remaining samples used to calculate background concentrations in the W-C 1994b background study were not included in the new data set because they are located within or near Solid Waste Management Unit (SWMU) areas. Conclusive evidence cannot be presented indicating that these areas have not been affected by known or possible contamination sources.

5.2 LINEAR REGRESSION ANALYSIS

Caliche is primarily composed of calcium carbonate ($CaCO_3$). Caliche zones occur throughout Cannon AFB, and extremely high, naturally occurring calcium concentrations are common. In addition to calcium, other 2+ cations (e.g., barium, copper, iron, lead, magnesium) may be present in high concentrations and are believed to be associated with these caliche zones. Due to the fact that most of the soils at the Base contain some caliche, and contacts between caliche zones and non-caliche zones are gradational, only an arbitrary concentration could be used to differentiate between caliche zones and non-caliche zones. Linear regressions were performed for all metals versus calcium to identify those metals which are also concentrated in the caliche zones. Further statistical analysis was used to identify those values which are related to caliche and are naturally occurring (see Section 5.3 for methodology).

Line fit plots and regression statistics were generated for each metal versus calcium. The coefficient of determination, R^2, ranges from 0 to 1 and is closer to 1 if calcium is a good linear predictor of the concentrations of a given metal. If the number of samples (N) in the data set is small, however, R^2 may not be a particularly reliable indicator of the strength of the relationship in the population and should be interpreted with caution. Thus, R^2 should be considered a good estimator of the true proportion of the total variability explained only if N is rather large (i.e., at least 20) (Woolson 1987).

5.3 METHODOLOGY FOR OUTLIER ANALYSIS

An outlier is defined as a constituent concentration value that is much different from most other values for that constituent in a data set. There are many reasons for outlying concentrations:

- Catastrophic unnatural occurrence, such as a spill
- Transcription errors of data values or decimal points
- True but extreme constituent concentration values

Outlier values were identified using the methodology suggested in EPA 1989c and EPA 1992a. Potential outliers were identified in surface and subsurface soil by calculating the difference between the minimum and maximum detected concentrations in the data set. If the maximum detected concentration was no more than 5 times the minimum detected concentration, it was determined that no potential outliers existed in the data set and no outlier analysis was necessary. If the maximum detected concentration exceeded the minimum detected concentration by a factor of 5 or more, potential outliers existed in the data set, and further outlier evaluation was done as described below. EPA guidance (EPA 1989c, 1992a) discusses potential outliers as concentrations which are an order of magnitude higher than other concentrations in a data set. A factor of 5 (i.e., half of an order of magnitude) was used in this analysis to be conservative.

Outlier analysis was performed using the following 4-step process as identified in EPA 1992a:

Step 1. Take logarithms for each data point in the data set

Step 2. Calculate mean $\bar{x}$ and standard deviation s for the log-transformed data

Step 3. Calculate the outlier test statistic, T_n:

$$T_n = \frac{(x_n - \bar{x})}{s}$$

where n is equal to the number of samples in the data set.

Therefore, T_n is the difference between the highest detected concentration and the sample mean, divided by the sample standard deviation.

Step 4. Compare T_n to a critical value for the sample size, n. The critical values used for the surface and subsurface soil data set were provided in the EPA guidance (Table 8, Appendix B; EPA 1989c).

If T_n exceeded the critical value for the data set, the concentration was considered to be an outlier. The validity of the outlier concentration was further investigated for errors (e.g., recording errors, typographical errors, sampling errors, laboratory errors). If an error was identified that could be corrected, the correction was made, and the corrected concentration was used in subsequent statistical analysis. If the outlier concentration was determined to be valid, it was retained for use in further statistical analysis. This methodology is in accordance with EPA guidance pertaining to the determination of outliers (EPA 1992a).

5.4 DISTRIBUTION ANALYSIS

The background data set for each metal in surface and subsurface soil was evaluated to determine if the data followed a normal distribution, lognormal distribution, or other distribution. All data in the new data set were log-transformed, and the Shapiro-Wilk test of normality, probability plots, and the coefficient of skewness were used to determine if the data followed a lognormal distribution. If the distribution was not lognormal, the same tests were applied to the original, non-transformed data to check for normality. If the data were determined to be neither lognormally nor normally distributed, they were described as "neither" for purposes of this background evaluation.

The Shapiro-Wilk test is based on the premise that if a set of data are normally distributed, the ordered values should be highly correlated with corresponding quantiles taken for a normal distribution (EPA 1992a). Normality of the data should be rejected if the calculated Shapiro-Wilk statistic (W) is lower than the critical value of the W statistic at the 95 percent confidence level, provided in Table A-2 of Appendix A of EPA 1992a. The Shapiro-Wilk test is especially sensitive to non-normality in the tails of a distribution where the normality assumption is most severely affected. The Shapiro-Wilk test is considered to be one of the very best tests of normality available.

Probability plots were generated for all metals with greater than eight detections. A normal distribution is indicated by a near straight-line fit of the data set.

The coefficient of skewness indicates to what extent a data set is asymmetrical with respect to the mean. A normally distributed data set will have a coefficient of skewness of zero with a range of -1 to 1. Data sets with coefficients of skewness outside this range are considered to be non-normally distributed. A coefficient of skewness was calculated as part of the summary statistics for each metal.

Of the three tests of normality, the Shapiro-Wilk test is considered to be the most reliable. In most cases, the three tests demonstrated the same results. However, in cases where the results did not agree, or if the results of the probability plots and/or coefficient of skewness were inconclusive, the results of the Shapiro-Wilk test were used to determine distribution.

5.5 CALCULATION OF BACKGROUND CONCENTRATIONS

One of the specific objectives of the Background Investigation was to develop new background concentrations for metals and pesticides in surface and subsurface soil. Upper tolerance limits (UTLs) and upper confidence limits (UCLs) were calculated to represent background concentrations. A UTL represents the upper range of the data and a UCL represents the upper range of the mean.

5.5.1 Upper Tolerance Limit

The primary statistical measure of a background data set that can be used to evaluate whether concentrations detected at an investigation site are within background is the 95 percent upper tolerance limit (UTL). The approach used to generate UTLs for the background data follows EPA guidance for statistical analysis of data (EPA 1992b).

The 95 percent UTL is the concentration at the 95th percentile of the background population. That is, 95 percent of all background (naturally occurring) data would be below the 95 percent UTL at a given confidence level. For this evaluation, the 90 percent confidence level of the 95th percentile was used to define the UTL. Therefore, the 95 percent UTL was calculated to represent a reasonable upper boundary on background levels.

The type of UTL that was used for a background data set depended on the statistical distribution of the data set. That is, if the data set was normally or lognormally distributed, a parametric UTL (i.e., the 90 percent upper confidence level [UCL] of the 95th percentile) was calculated. Otherwise, a nonparametric UTL (i.e., the highest detected concentration or highest detection limit, if the data set was nondetect) was used. For very small data sets (i.e., less than 10 samples) or for data sets that had more than 50 percent nondetects, a nonparametric UTL was used. This method is in accordance with EPA guidance for calculating UTLs (EPA 1992b). The methods for calculation of the UTLs are presented below.

For data sets assumed to be lognormally distributed (with fewer than 50 percent nondetects), the UTLs were calculated using a modified equation:

$$95\%\ UTL = e^{(\bar{x} + s^{*}k)}$$

where:

$\bar{x}$ = Mean of log-transformed data (using natural logs)

s' = Standard deviation of log-transformed data

k = Tolerance Limit Factor for normal distributions

The UTLs for normally distributed data sets (with fewer than 50 percent nondetects) was calculated using the formula:

$$95\%\ UTL = \bar{x} + s * k$$

where:

$\bar{x}$ = Arithmetic mean of background concentrations

s = Standard deviation of background concentrations

k = Tolerance Limit Factor for normal distributions

5.5.2 Upper Confidence Limit

The 95 percent UCL of the mean concentration was calculated for each data set in surface and subsurface soil in order to account for the uncertainty associated with the estimation of the mean. The 95 percent UCL provides reasonable confidence that the true site average will not be underestimated.

The type of UCL calculated for a background metal data set also depended on the statistical distribution of the data set. The 95 percent UCL of lognormally distributed data was calculated using the following equation (EPA 1992b):

$$UCL = e^{(\bar{x} + 0.5 s^2 + sH / \sqrt{n-1})}$$

where:

UCL = Upper confidence limit

e = Constant (base of the natural log, equal to 2.718)

$\bar{x}$ = Mean of the transformed data

s = Standard deviation of the transformed data

H = H-statistic (e.g., from table published in Gilbert 1987)

n = Number of samples

If tests for normality support the assumption that the data set is normally distributed, the 95 percent UCL of normally distributed data was calculated using the following equation (EPA 1992b):

$$UCL = \bar{x} + t(s / \sqrt{n})$$

where:

UCL	=	Upper confidence limit
$\bar{x}$	=	Mean of the untransformed data
s	=	Standard deviation of the transformed data
H	=	Student-t statistic (e.g., from table published in Gilbert 1987)
n	=	Number of samples

For those data sets that were determined to be neither lognormally nor normally distributed, the UCL was calculated using the equation for normally distributed data.

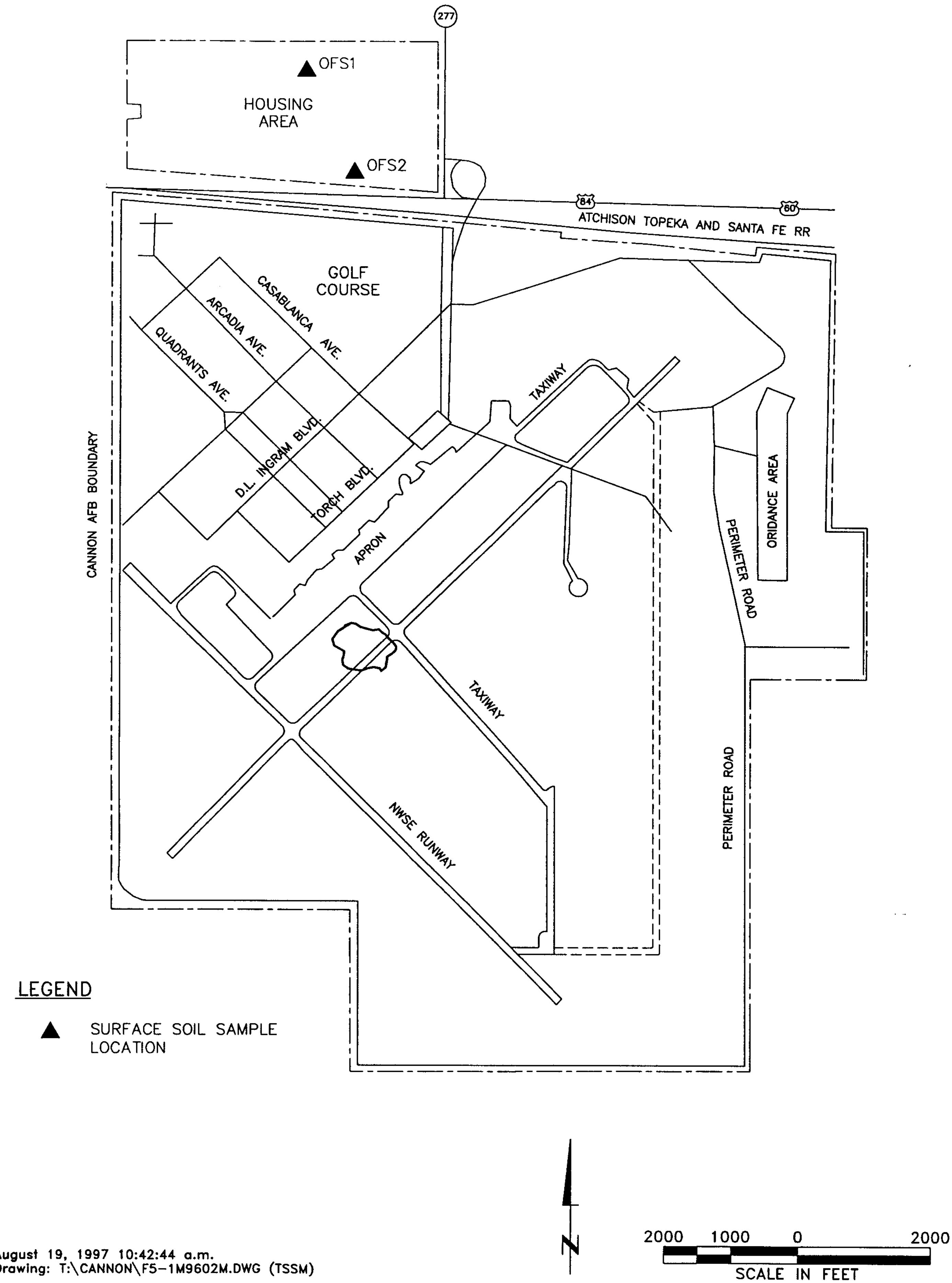
It should be noted that sampling data from Superfund sites have shown that data sets with fewer than 10 samples per exposure area provide poor estimates of the mean concentration (i.e., there is a large difference between the sample mean and the 95 percent UCL), while data sets with 10 to 20 samples per exposure area provide somewhat better estimates of the mean, and data sets with 20 to 30 or more samples provide fairly consistent estimates of the mean (i.e., the 95 percent UCL is close to the sample mean).

5.5.3 Use of Nondetect Results

When determining data set distribution and calculating background UTLs and UCLs, one-half the sample quantitation limit (SQL, shown as reporting limit [RL]) was used to represent the concentration of metals and pesticides that were not detected in a particular sample. However, according to USEPA guidance (EPA 1989a), these samples should be excluded from the data set if they cause the calculated mean concentration to exceed the maximum detected concentration in that sample set.

5.6 METALS CONCENTRATIONS AT DEPTH

Concentrations of each metal were plotted against depth to determine any trends. Concentrations were plotted by soil boring.



August 19, 1997 10:42:44 a.m.
Drawing: T:\CANNON\F5-1M9602M.DWG (TSSM)

DRN. BY: TSSM	DATE: 08/19/97	LOCATION OF W-C 1991 BACKGROUND SURFACE SOIL SAMPLES AT OFF-SITE AREAS CANNON AIR FORCE BASE NEW MEXICO	PROJECT No. M9602M	FIG. No. 5-1
CHK'D. BY:	REVISIONS: 0			

6.0
RESULTS OF THE STATISTICAL ANALYSIS

6.1 METALS

6.1.1 Surface Soil

The results of the linear regression, outlier, and distribution analyses for metals in surface soil are presented in Appendix B.1.

Based on the available data, linear regression analysis indicated that only barium concentrations in surface soil appear to correlate with calcium concentrations (i.e., caliche) in surface soil. The outlier analysis identified one outlier for barium in surface soils. The maximum detected concentration of 670 mg/kg is significantly higher than the other detected concentrations. A review of the data found no recording or typographical errors. Additionally, a review of field activities did not indicate any potential sampling problems. It was concluded that the "apparent" outlier is a naturally occurring concentration that is related to the caliche content of the soil. As per EPA guidance (EPA 1992a), the outlier was included in the statistical analysis for the barium data set.

Table 6-1 presents the calculated background concentrations for metals in surface soil. This table includes the analytical data, number of detects, minimum detected concentration, maximum detected concentration, mean, standard deviation, UTL, UCL, and data set distribution. Table 6-2 summarizes the distribution assessment and basis of the calculated UTLs and UCLs for each metal in surface soil.

Table 6-3 presents a comparison of the calculated UTLs for metals in surface soil for the new data set to UTLs generated for the W-C 1994b background study. UCLs were not calculated for the W-C 1994b background study; therefore, a comparison is not possible. It should be noted that the W-C 1994b UTLs were calculated for total soil (i.e., surface and subsurface soil). Regional values for Clovis, New Mexico (USGS 1984) are also shown in the table. The UTLs are within an order of magnitude, with the exception of thallium (0.6 mg/kg for the new data set compared to 6.2 mg/kg for the W-C 1994b data set). The UTLs for aluminum, barium, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, potassium, vanadium, and zinc differ by two times or less. The UTLs for all other metals differ by factors ranging from two times to an order of magnitude. There appears to be no trend in the new data set concentrations. Several of the new UTLs are higher, while others are lower, than the W-C 1994b UTLs. The new UTLs are lower or within the range of the Clovis concentrations, with the exception of antimony, barium, and calcium. Clovis values are not available for cadmium, silver, and thallium. The new data set UTLs for cadmium and thallium are one-half the highest reporting limits, because all samples were nondetect for those metals.

6.1.2 Subsurface Soil

The results of the linear regression, outlier, and distribution analyses for metals in subsurface soil are presented in Appendix B.2.

Based on the available data, linear regression analysis indicated that no metals in subsurface soil appear to correlate with calcium concentrations (i.e., caliche) in subsurface soil. The outlier analysis identified one outlier for magnesium in subsurface soil. The maximum detected concentration of 19,300 mg/kg is significantly higher than the other detected concentrations. A review of the data found no recording or typographical errors. Additionally, a review of field activities did not indicate any potential sampling problems. Based on the linear regression analysis, it was concluded that the "apparent" magnesium outlier is not related to the caliche content of the soil. As per EPA guidance (EPA 1992a), the maximum detected concentration was considered to be a naturally occurring anomaly and was included in the statistical analysis for the magnesium data set.

Table 6-4 presents the calculated background concentrations for metals in subsurface soil. This table includes the analytical data, number of detects, minimum detected concentration, maximum detected concentration, mean, standard deviation, UTL, UCL, and data set distribution. Table 6-5 summarizes the distribution assessment and basis of the calculated UTLs and UCLs for each metal in subsurface soil.

Table 6-3 shows a comparison of the calculated UTLs for metals in subsurface soil for the new data set to UTLs generated for the W-C 1994b background study. UCLs were not calculated for the W-C 1994b background study; therefore, a comparison is not possible. The UTLs are within an order of magnitude, with the exception of mercury (0.019 mg/kg for the new data set compared to 0.2 mg/kg for the W-C 1994b data set) and selenium (1.1 mg/kg compared to 36.8 mg/kg). The W-C 1994b report indicated that two-thirds of the concentration values used to calculate the mean and standard deviation for selenium were the contract required reporting limits (CRQLs) for nondetects (i.e., 0.21 to 2.3 mg/kg). In addition, the four soil samples from the Walk, Haydel and Associates investigation had selenium concentrations ranging from 48.1 to 123.9 mg/kg, much higher than any other investigation's results. This would account for order of magnitude difference.

The UTLs for aluminum, antimony, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, manganese, nickel, potassium, silver, sodium, vanadium, and zinc differ by two times or less. The UTLs for all other metals differ by factors ranging from two times to an order of magnitude. As with the new surface soil UTLs, there appears to be no trend in the new subsurface soil UTLs. Several of the new UTLs are higher, while others are lower, than the W-C 1994b UTLs. The new UTLs are lower or within the range of the Clovis values, with the exception of antimony, barium, calcium, magnesium, selenium, and thallium. The new data set UTLs for antimony, cadmium, selenium, and thallium are one-half the highest reporting limits, because all samples were nondetect for those metals.

6.1.3 Metals Concentrations Versus Depth

Appendix B.3 presents variations in background metals concentrations by depth. In general for most metals, from the ground surface to 10 feet bgs, there is no consistent correlation between metals concentration and depth. From 10 to 40 feet bgs, concentrations tend to decrease with depth.

6.2 PESTICIDES

Table 6-6 presents the background concentrations for 4,4-DDT in surface soil. Because 4,4-DDT was only detected in one sample, no statistics could be performed. Background concentrations are presented for 4,4-DDT only, because results for all other pesticides were nondetect. All pesticides in samples used for the W-C 1994b background study were nondetect. Therefore, a comparison of background concentrations is not possible

6.3 UNCERTAINTIES AND LIMITATIONS OF THE STATISTICAL EVALUATION

The uncertainties and limitations of this background study are related to sample size, types of analyses performed, elevated reporting limits, and differences between data sets. The following sections discuss these points individually.

6.3.1 Sample Size

The most limiting aspect of this background study is related to the size of the data sets. There were 14 surface soil samples and 25 subsurface soil samples. Data sets of these few samples are considered small and may provide inconclusive or erroneous results (e.g., a small N may not provide a particularly reliable indicator of the strength of the relationship in the population for linear regression analyses). Also, a small data set may have a large variance (i.e., standard deviation). This affects such statistical elements as UTL and UCL. Estimation of the elements using small data sets may result in numbers which are several orders of magnitude greater than the maximum detected concentration.

6.3.2 Reporting Limits

Reporting limits were elevated approximately 5 times for metals in sample CBSB-07-0005 in the subsurface soil data set. Most metals were detected and reported at concentrations that exceeded the elevated reporting limits. In those cases, the elevated reporting limits do not limit the usability of the data. However, use of the reporting limits may affect background concentrations for those metals that were nondetect for that sample (e.g., antimony, cadmium, copper, selenium, sodium, and thallium). Use of one-half of the elevated reporting limits to calculate the mean, standard deviation, the UTL, and UCL may result in estimated concentrations that my be higher than actual background levels.

6.3.3 Comparative Data Sets

Finally, the available data from previous reports and regional sources were not divided into surface and subsurface soils. Therefore, any conclusions drawn from the direct comparison between these data sets must be used cautiously.

TABLE 6-1

BACKGROUND CONCENTRATIONS OF METALS IN SURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	ALUMINUM mg/kg			ANTIMONY mg/kg			ARSENIC mg/kg				BARIUM mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	Log Result	RL	Qual	Result	RL	Qual
CBSS01001	3700	10.3			6.2	U	1.9	0.6419	1		42.7	1	
CBSS02001	4640	10.3			6.2	U	2.1	0.7419	1		57.7	1	
CBSS03001	4260	10.3			6.2	U	1.7	0.5306	1		49.1	1	
CBSS04001	3880	10.3			6.2	U	1.8	0.5878	1		39.2	1	
CBSB010001	4300	10.3			6.2	U	1.8	0.5878	1		40.2	1	
CBSB020001	4520	10.3			6.2	U	1.5	0.4055	1		47.1	1	
CBSB030001	4150	10.3			6.2	U	2.2	0.7885	1		47.5	1	
CBSB050001	7090	10.5			6.3	U	2.7	0.9933	1		670	1	
CBSB060001	4580	10.4			6.2	U	2.2	0.7885	1		58.6	1	
CBSB070001	5150	10.4			6.3	U	2.6	0.9555	1		71.5	1	
CBSB080001	8950	10.4			6.3	U	3.3	1.1939	1		90.6	1	
CBSB100001	4390	10.4			6.2	U	2.4	0.8755	1		51.6	1	
CANOFS-OFS1-0000	8670				5	U	1.8	0.5878		J	67.2		
CANOFS-OFS2-0000	8830				5	U	1.9	0.6419		J	62.3		
Number of detects	14			0			14				14		
Count (N)	14			----			14				14		
Minimum	3700			----			1.5				39.2		
Maximum	8950			----			3.3				670		
Mean (x)	5508			----			2.1	0.74			100		
Standard deviation (s)	1964			----			0.48	0.21			165		
k statistic [1]	----			----				2.614			----		
95% UTL [2]	**8950**[a]			**3.15**[a]				**3.3**[b]			**670**[a]		
h statistic/*t* statistic [3]	1.761			----				1.857			1.761		
95% UCL [4]	**2891664** [c]			**3.15**[d]				**2.4**			**4466** [c]		
Distribution [5]	neither			neither			lognormal				neither		

RL = reporting limit   Qual = qualifier   J = estimated value below reporting limit   U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] Source: Gilbert 1987

[2] 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

[3] Source: W-C 1993

[4] 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

[5] See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

[a] For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

[b] The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

[c] The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

[d] For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-1

BACKGROUND CONCENTRATIONS OF METALS IN SURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	BERYLLIUM mg/kg				CADMIUM mg/kg			CALCIUM mg/kg			CHROMIUM, TOTAL mg/kg		
	Result	Log Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSS01001	0.3	-1.2040	0.21			0.52	U	1470	20.6		5.9	1	
CBSS02001	0.26	-1.3471	0.21			0.52	U	3800	20.7		6.6	1	
CBSS03001	0.3	-1.2040	0.21			0.52	U	6640	20.7		6	1	
CBSS04001	0.26	-1.3471	0.21			0.51	U	968	20.5		6	1	
CBSB010001	0.21	-1.5606	0.21			0.52	U	1350	20.6		6.5	1	
CBSB020001	0.31	-1.1712	0.21			0.52	U	1580	20.6		6.5	1	
CBSB030001	0.26	-1.3471	0.21			0.51	U	2500	20.5		6.4	1	
CBSB050001	0.55	-0.5978	0.21			0.52	U	44800	20.9		7.7	1	
CBSB060001	0.39	-0.9416	0.21			0.52	U	3360	20.8		6.6	1	
CBSB070001	0.38	-0.9676	0.21			0.52	U	3930	20.9		7.6	1	
CBSB080001	0.62	-0.4780	0.21			0.52	U	2930	20.8		10.5	1	
CBSB100001	0.31	-1.1712	0.21			0.52	U	1570	20.7		6.4	1	
CANOFS-OFS1-0000	0.49	-0.7133		J		0.87	U	2220			8.6		
CANOFS-OFS2-0000	0.22	-1.5141	0.44	U		0.87	U	1910			8.7		
Number of detects	13				0			14			14		
Count (N)	14				----			14			14		
Minimum	0.21				----			968			5.9		
Maximum	0.62				----			44800			10.5		
Mean (x)	0.35	-1.11			----			5645			7.1		
Standard deviation (s)	0.13	0.33			----			11366			1.3		
k statistic [1]		2.614			----			----			----		
95% UTL [2]		**0.62**[b]			**0.435**[a]			**44800**[a]			**10.5**[a]		
h statistic/*t* statistic [3]		1.940			----			1.761			1.761		
95% UCL [4]		**0.42**			**0.435**[d]			**17153081** [c]			**3.2**		
Distribution [5]	lognormal				neither			neither			neither		

RL = reporting limit Qual = qualifier J = estimated value below reporting limit U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] Source: Gilbert 1987

[2] 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

[3] Source: W-C 1993

[4] 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

[5] See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

[a] For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

[b] The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

[c] The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

[d] For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-1

BACKGROUND CONCENTRATIONS OF METALS IN SURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	COBALT mg/kg Result	COBALT Log Result	COBALT RL	COBALT Qual	COPPER mg/kg Result	COPPER RL	COPPER Qual	IRON mg/kg Result	IRON RL	IRON Qual	LEAD mg/kg Result	LEAD Log Result	LEAD RL	LEAD Qual
CBSS01001	2.7	0.9933	1		4.3	2.1		5480	10.3		5.6	1.7228	0.31	
CBSS02001	2.8	1.0296	1		4.9	2.1		6400	10.3		7.1	1.9601	0.31	
CBSS03001	2.9	1.0647	1		4.1	2.1		5530	10.3		7.4	2.0015	0.31	
CBSS04001	2.5	0.9163	1		3.8	2.1		5440	10.3		5.2	1.6487	0.31	
CBSB010001	1.8	0.5878	1		4.1	2.1		5680	10.3		5.7	1.7405	0.31	
CBSB020001	1.9	0.6419	1		4.3	2.1		5920	10.3		6.3	1.8405	0.31	
CBSB030001	1.9	0.6419	1		4.6	2.1		5670	10.3		6.2	1.8245	0.31	
CBSB050001	4.5	1.5041	1		7	2.1		6840	10.5		8.5	2.1401	0.31	
CBSB060001	3.3	1.1939	1		5.2	2.1		5660	10.4		5.9	1.7750	0.31	
CBSB070001	3.9	1.3610	1		6.4	2.1		6270	10.4		6.6	1.8871	0.31	
CBSB080001	5.3	1.6677	1		9.7	2.1		10100	10.4		10	2.3026	0.31	
CBSB100001	1.8	0.5878	1		3.7	2.1		5550	10.4		4.9	1.5892	0.31	
CANOFS-OFS1-0000	2.7	0.9933		J	18.3			7860			5.7	1.7405		
CANOFS-OFS2-0000	2.7	0.9933		J	15.3			8010			10	2.3026		
Number of detects	14				14			14			14			
Count (N)	14				14			14			14			
Minimum	1.8				3.7			5440			4.9			
Maximum	5.3				18.3			10100			10			
Mean (x)	2.9	1.01			6.8			6458			6.8	1.9		
Standard deviation (s)	1.0	0.34			4.6			1349			1.6	0.23		
k statistic (1)		2.614			----			----				2.614		
95% UTL (2)		**5.3(b)**			**18.3(a)**			**10100(a)**				**10.0(b)**		
h statistic/*t* statistic (3)		1.940			1.761			1.761				1.857		
95% UCL (4)		**3.5**			**10.5**			**2328755** (c)				**7.6**		
Distribution (5)	lognormal				neither			neither			lognormal			

RL = reporting limit   Qual = qualifier   J = estimated value below reporting limit   U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

(1) Source: Gilbert 1987

(2) 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

(3) Source: W-C 1993

(4) 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

(5) See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

(a) For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

(b) The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

(c) The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

(d) For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-1

BACKGROUND CONCENTRATIONS OF METALS IN SURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	MAGNESIUM mg/kg			MANGANESE mg/kg				MERCURY mg/kg			NICKEL mg/kg			
	Result	RL	Qual	Result	Log Result	RL	Qual	Result	RL	Qual	Result	Log Result	RL	Qual
CBSS01001	754	20.6		115	4.7449	1		0.017	0.034	U	3.9	1.3610	4.1	J
CBSS02001	933	20.7		127	4.8442	1		0.017	0.034	U	4.9	1.5892	4.1	
CBSS03001	839	20.7		93.3	4.5358	1		0.017	0.034	U	4.6	1.5261	4.1	
CBSS04001	696	20.5		105	4.6540	1		0.017	0.034	U	3.8	1.3350	4.1	J
CBSB010001	784	20.6		99.4	4.5992	1		0.017	0.034	U	4.2	1.4351	4.1	
CBSB020001	792	20.6		103	4.6347	1		0.017	0.034	U	4.4	1.4816	4.1	
CBSB030001	811	20.5		122	4.8040	1		0.017	0.034	U	4.2	1.4351	4.1	
CBSB050001	1930	20.9		181	5.1985	1		0.056	0.035		7.2	1.9741	4.2	
CBSB060001	966	20.8		132	4.8828	1		0.017	0.034	U	6	1.7918	4.2	
CBSB070001	1120	20.9		183	5.2095	1		0.017	0.034	U	6.5	1.8718	4.2	
CBSB080001	1700	20.8		275	5.6168	1		0.017	0.034	U	9.4	2.2407	4.2	
CBSB100001	804	20.7		85.1	4.4438	1		0.017	0.034	U	4.8	1.5686	4.1	
CANOFS-OFS1-0000	1390			150	5.0106			0.055	0.11	U	6.9	1.9315		J
CANOFS-OFS2-0000	1410			172	5.1475			0.055	0.11	U	6.7	1.9021		J
Number of detects	14			14				1			14			
Count (N)	14			14				14			14			
Minimum	696			85.1				0.056			3.8			
Maximum	1930			275				0.056			9.4			
Mean (x)	1066			139	4.9			0.025			5.5	1.7		
Standard deviation (s)	390			51	0.32			0.016			1.6	0.28		
k statistic (1)	----				2.614			----				2.614		
95% UTL (2)	**1930(a)**				**275(b)**			**0.056(a)**				**9.4(b)**		
h statistic/*t* statistic (3)	1.761				1.940			1.761				1.897		
95% UCL (4)	**111307** (c)				**165**			**0.008**				**6.4**		
Distribution (5)	neither			lognormal				neither			lognormal			

RL = reporting limit   Qual = qualifier   J = estimated value below reporting limit   U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

(1) Source: Gilbert 1987

(2) 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

(3) Source: W-C 1993

(4) 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

(5) See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

(a) For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

(b) The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

(c) The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

(d) For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-1

BACKGROUND CONCENTRATIONS OF METALS IN SURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	POTASSIUM mg/kg				SELENIUM mg/kg			SILVER mg/kg			SODIUM mg/kg		
	Result	Log Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
CBSS01001	1080	6.9847	515			0.52	U		1	U		515	U
CBSS02001	1230	7.1148	516			0.52	U		1	U		516	U
CBSS03001	1010	6.9177	517			0.52	U		1	U		517	U
CBSS04001	1050	6.9565	513			0.51	U		1	U	85.5	513	J
CBSB010001	1080	6.9847	516			0.52	U		1	U		516	U
CBSB020001	1060	6.9660	516			0.52	U		1	U		516	U
CBSB030001	1060	6.9660	513			0.52	U		1	U		513	U
CBSB050001	1540	7.3395	523			0.52	U	0.4	1	J	84.1	523	J
CBSB060001	1300	7.1701	519			0.52	U		1	U		519	U
CBSB070001	1510	7.3199	522			0.52	U		1	U	102	522	J
CBSB080001	2310	7.7450	521			0.52	U		1	U		521	U
CBSB100001	911	6.8145	518			0.52	U		1	U		518	U
CANOFS-OFS1-0000	1760	7.4731				0.22	U		0.87	U		286	U
CANOFS-OFS2-0000	1930	7.5653				0.22	U		0.87	U		288	U
Number of detects	14				0			1			3		
Count (N)	14				----			1			3		
Minimum	911				----			0.4			84.1		
Maximum	2310				----			0.4			102		
Mean (x)	1345	7.2			----			----			91		
Standard deviation (s)	413	0.28			----			----			10.0		
k statistic (1)		2.614			----			----			----		
95% UTL (2)		**2310(b)**			**0.26(a)**			**0.4(a)**			**102(a)**		
h statistic/*t* statistic (3)		1.897			----			----			2.353		
95% UCL (4)		**1560**			**0.26(d)**			**0.4(d)**			**534**		
Distribution (5)	lognormal				neither			neither			neither		

RL = reporting limit Qual = qualifier J = estimated value below reporting limit U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

(1) Source: Gilbert 1987

(2) 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

(3) Source: W-C 1993

(4) 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

(5) See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

(a) For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

(b) The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

(c) The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

(d) For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-1

BACKGROUND CONCENTRATIONS OF METALS IN SURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	THALLIUM mg/kg			VANADIUM mg/kg				ZINC mg/kg			
	Result	RL	Qual	Result	Log Result	RL	Qual	Result	Log Result	RL	Qual
CBSS01001		1.1	U	12.5	2.5257	1		11.6	2.4510	2.1	
CBSS02001		1.2	U	14.5	2.6741	1		14	2.6391	2.1	
CBSS03001		1	U	12.9	2.5572	1		12	2.4849	2.1	
CBSS04001		1.2	U	12	2.4849	1		11.2	2.4159	2.1	
CBSB010001		1.1	U	12.6	2.5337	1		15	2.7081	2.1	
CBSB020001		1	U	13.2	2.5802	1		11.7	2.4596	2.1	
CBSB030001		1	U	12.9	2.5572	1		12.7	2.5416	2.1	
CBSB050001		1	U	17.8	2.8792	1		20.3	3.0106	2.1	
CBSB060001		1	U	14.2	2.6532	1		12.6	2.5337	2.1	
CBSB070001		1.1	U	16.5	2.8034	1		14.9	2.7014	2.1	
CBSB080001		1	U	21.3	3.0587	1		29	3.3673	2.1	
CBSB100001		1	U	13	2.5649	1		10.2	2.3224	2.1	
CANOFS-OFS1-0000		0.22	U	17.7	2.8736			18.6	2.9232		
CANOFS-OFS2-0000		0.22	U	17.6	2.8679			21.4	3.0634		
Number of detects	0			14				14			
Count (N)	----			14				14			
Minimum	----			12				10.2			
Maximum	----			21.3				29.0			
Mean (x)	----			14.9	2.7			15.4	2.7		
Standard deviation (s)	----			2.8	0.18			5.2	0.30		
k statistic [1]	----				2.614				2.614		
95% UTL [2]	**0.6**[a]				**21.3**[b]				**29.0**[b]		
h statistic/*t* statistic [3]	----				1.820				1.897		
95% UCL [4]	**0.6**[d]				**16.3**				**18.0**		
Distribution [5]	neither			lognormal				lognormal			

RL = reporting limit Qual = qualifier J = estimated value below reporting limit U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] Source: Gilbert 1987

[2] 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

[3] Source: W-C 1993

[4] 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

[5] See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

[a] For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

[b] The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

[c] The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

[d] For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-2

UPPER TOLERANCE LIMITS (UTLs) AND UPPER CONFIDENCE LIMITS (UCLs) FOR METALS IN SURFACE SOIL AT CANNON AIR FORCE BASE

Chemical	Distribution[(a)]	UTL[(b)]	Basis of UTL	UCL[(d)]
Aluminum	neither	8,950	highest detection	2,891,664
Antimony	neither	3.15	nondetect, one-half highest RL	3.15
Arsenic	lognormal	3.3	highest detection [(c)]	2.4
Barium	neither	670	highest detection	4466
Beryllium	lognormal	0.62	highest detection [(c)]	0.42
Cadmium	neither	0.435	nondetect, one-half highest RL	0.435
Calcium	neither	44,800	highest detection	17,153,081
Chromium	neither	10.5	highest detection	3.2
Cobalt	lognormal	5.3	highest detection [(c)]	3.5
Copper	neither	18.3	highest detection	10.5
Iron	neither	10,100	highest detection	2328755
Lead	lognormal	10	highest detection [(c)]	7.6
Magnesium	neither	1,930	highest detection	111307
Manganese	lognormal	275	highest detection [(c)]	165
Mercury	neither	0.056	highest detection	0.008
Nickel	lognormal	9.4	highest detection [(c)]	6.4
Potassium	lognormal	2,310	highest detection [(c)]	1560
Selenium	neither	0.26	nondetect, one-half highest RL	0.26
Silver	neither	0.4	highest detection	0.4
Sodium	neither	102	highest detection	534
Thallium	neither	0.6	nondetect, one-half highest RL	0.6
Vanadium	lognormal	21.3	highest detection [(c)]	16.3
Zinc	lognormal	29	highest detection [(c)]	18

[(a)] Distribution based on Shapiro-Wilk test, coefficient of skewness, and probability plots (see Appendix C.1).

[(b)] See Section 5.5.1 for equations. Those metals which were greater than 50% nondetect were assumed to be neither normally nor lognormally distributed. The UTLs for metals which were neither normally nor lognormally distributed are either the highest concentration or one-half the highest reporting limit if the metal was nondetect.

[(c)] Data set exhibited a high variance; therefore, the calculated 95% UTL exceeded the maximum detection. When this occurs, the 95% UTL is the maximum detection.

[(d)] See Section 5.5.2 for equations. UCLs for metals which were neither normally nor lognormally distributed were estimated using the assumption of normal distribution.

RL = Reporting Limit

All concentrations are in mg/kg.

TABLE 6-3

BACKGROUND CONCENTRATION COMPARISON FOR METALS

Chemical	New Data Set UTL for Surface Soil[a]	New Data Set UTL for Subsurface Soil[b]	W-C 1994(b) Total Soil UTL[c]	Clovis, NM Values[d]
Aluminum	8,950	12,200	10,796	50,000
Antimony	3.15	16	29.6	<1
Arsenic	3.3	3.6	10.5	6.5
Barium	670	805	548	500
Beryllium	0.62	0.66	0.6	1 to 2
Cadmium	0.435	1.3	2.1	----
Calcium	44,800	237,498	166,119	7,900 to 18,000
Chromium	10.5	13.3	12	30
Cobalt	5.3	4.7	4	3 to 7
Copper	18.3	7.4	10.1	20
Iron	10,100	9,700	8,654	100 to 15,000
Lead	10	7.1	18.4	15
Magnesium	1,930	19,300	9,912	2,000 to 5,000
Manganese	275	184	151.8	500
Mercury	0.056	0.019	0.2	0.032 to 0.082
Nickel	9.4	11.4	9.7	15
Potassium	2,310	2,370	2,531	16,000
Selenium	0.26	1.1	36.8	0.15 to 0.30
Silver	0.4	2.65	1.8	----
Sodium	102	503	834	7,000
Thallium	0.6	2.65	6.2	----
Vanadium	21.3	26.3	25	30 to 70
Zinc	29	20.5	20.7	45

All concentrations are in mg/kg.

[a] See Table 5-1 for surface soil UTL calculations.

[b] See Table 5-4 for subsurface soil UTL calculations.

[c] Concentrations of Selected Naturally Occurring Chemical Constituents in Soil and Groundwater at Cannon Air Force Base, Clovis, New Mexico (W-C 1994b). It should be noted that the UTLs calculated for this study were for total (i.e., combined surface and subsurface soil).

[d] Concentrations are from USGS 1984 data for samples collected in the vicinity of Clovis, NM. Some of the analytical test methods are no longer used (i.e., EDTA for calcium, colorimetric for zinc, X-ray fluorescence spectrometry for calcium, iron, potassium). Caution should be used when interpreting these data.

---- No concentration given for this element.

TABLE 6-4

BACKGROUND CONCENTRATIONS OF METALS IN SUBSURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	ALUMINUM mg/kg				ANTIMONY mg/kg			ARSENIC mg/kg			BARIUM mg/kg			
	Result	Log Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	Log Result	RL	Qual
CBSB010005	7950	8.9809	10.8			6.5	U	3	1.1		73.5	4.2973	1.1	
CBSB010010	4990	8.5152	21.3			12.8	U	3.5	2.1		170	5.1358	2.1	
CBSB020005	6610	8.7963	10.7			6.4	U	2.7	1.1		66.3	4.1942	1.1	
CBSB020010	7080	8.8650	10.8			6.5	U	3.5	1.1		285	5.6525	1.1	
CBSB020020	4560	8.4251	22.1			13.3	U	1.6	2.2	J	117	4.7622	2.2	
CBSB020029	4910	8.4990	22.8			13.7	U	1.15	2.3	U	339	5.8260	2.3	
CBSB020039	5050	8.5271	22.3			13.4	U	1.1	2.2	U	317	5.7589	2.2	
CBSB030005	6160	8.7258	10.6			6.4	U	2.6	1.1		91.2	4.5131	1.1	
CBSB030010	3370	8.1227	22.3			13.4	U	1.1	2.2	U	805	6.6908	2.2	
CBSB040010	5110	8.5390	21.7			13	U	3.1	2.2		137	4.9200	2.2	
CBSB040020	3960	8.2840	10.8			6.5	U	1.7	1.1		723	6.5834	1.1	
CBSB040030	3730	8.2242	10.9			6.6	U	1.2	1.1		47.9	3.8691	1.1	
CBSB040041	5800	8.6656	10.8			6.5	U	1.2	1.1		57.2	4.0466	1.1	
CBSB050005	12200	9.4092	10.9			6.5	U	2.2	1.1		82.3	4.4104	1.1	
CBSB050010	9290	9.1367	21.5			12.9	U	2	2.1	J	264	5.5759	2.1	
CBSB060005	4400	8.3894	11.4			6.8	U	2.5	1.1		103	4.6347	1.1	
CBSB060010	7330	8.8997	10.6			6.3	U	2.1	1.1		79.4	4.3745	1.1	
CBSB070005	3730	8.2242	52.8			31.7	U	3.6	5.3	J	167	5.1180	5.3	
CBSB070010	9530	9.1622	11.1			6.6	U	1.8	1.1		162	5.0876	1.1	
CBSB080005	8160	9.0070	10.8			6.5	U	3.3	1.1		100	4.6052	1.1	
CBSB080010	5040	8.5252	10.7			6.4	U	2.6	1.1		168	5.1240	1.1	
CBSB080020	4250	8.3547	10.8			6.5	U	1.5	1.1		74.3	4.3081	1.1	
CBSB080030	5680	8.6447	10.9			6.5	U	0.55	1.1	U	508	6.2305	1.1	
CBSB080040	3380	8.1256	10.4			6.2	U	0.5	1	U	134	4.8978	1	
CBSB100005	6030	8.7045	11			6.6	U	3.3	1.1		185	5.2204	1.1	
Number of detects	25				0			20			25			
Count (N)	25				----			25			25			
Minimum	3370				----			1.2			47.9			
Maximum	12200				----			3.6			805			
Mean (x)	5932	8.63			----			2.1			210	5.03		
Standard deviation (sd)	2183	0.34			----			0.962			199	0.77		
k statistic (1)		2.292			----			2.292				2.292		
95% UTL (2)		**12,200[(b)]**			**16[(a)]**			**3.6[(b)]**				**805[(b)]**		
h statistic/*t* statistic (3)		1.849			-----			1.708				2.262		
95% UCL (4)		**6745**			**16.0[(d)]**			**0.7**				**293**		
Distribution (5)	lognormal				neither			normal			lognormal			

RL = reporting limit Qual = qualifier J = estimated value below reporting limit U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

(1) Source: Gilbert 1987 (2) 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

(3) Source: W-C 1993 (4) 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

(5) See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

(a) For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

(b) The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

(c) The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

(d) For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-4

BACKGROUND CONCENTRATIONS OF METALS IN SUBSURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	BERYLLIUM mg/kg			CADMIUM mg/kg			CALCIUM mg/kg			CHROMIUM, TOTAL mg/kg			
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	Log Result	RL	Qual
CBSB010005	0.5	0.22			0.54	U	4100	21.5		10	2.3026	1.1	
CBSB010010	0.26	0.43	J		1.1	U	171000	42.6		4.5	1.5041	2.1	
CBSB020005	0.46	0.21			0.53	U	1750	21.4		8.9	2.1861	1.1	
CBSB020010	0.45	0.22			0.54	U	66600	21.7		6.5	1.8718	1.1	
CBSB020020	0.2	0.44	U		1.1	U	190000	44.2		3	1.0986	2.2	
CBSB020029	0.25	0.46	U		1.1	U	150000	45.6		4.4	1.4816	2.3	
CBSB020039	0.25	0.45	U		1.1	U	158000	44.6		3.6	1.2809	2.2	
CBSB030005	0.31	0.21			0.53	U	19900	21.2		7.7	2.0412	1.1	
CBSB030010	0.25	0.45	U		1.1	U	136000	44.5		2.7	0.9933	2.2	
CBSB040010	0.31	0.43	J		1.1	U	135000	43.3		4.9	1.5892	2.2	
CBSB040020	0.17	0.22	J		0.54	U	42500	21.7		4	1.3863	1.1	
CBSB040030	0.12	0.22	J		0.55	U	34900	21.9		2.8	1.0296	1.1	
CBSB040041	0.11	0.22	U		0.54	U	95300	21.6		3	1.0986	1.1	
CBSB050005	0.66	0.22			0.54	U	23700	21.7		11.1	2.4069	1.1	
CBSB050010	0.39	0.43	J		1.1	U	167000	42.9		7.5	2.0149	2.1	
CBSB060005	0.43	0.23			0.57	U	55000	22.8		4.6	1.5261	1.1	
CBSB060010	0.4	0.21			0.53	U	38300	21.1		7.1	1.9601	1.1	
CBSB070005	0.55	1.1	U		2.6	U	253000	106		4.5	1.5041	5.3	J
CBSB070010	0.58	0.22			0.55	U	52500	22.1		6.9	1.9315	1.1	
CBSB080005	0.57	0.22			0.54	U	81900	21.7		8	2.0794	1.1	
CBSB080010	0.54	0.21			0.54	U	71800	21.4		5.9	1.7750	1.1	
CBSB080020	0.23	0.22			0.54	U	89500	21.6		3.9	1.3610	1.1	
CBSB080030	0.1	0.22	J		0.54	U	87900	21.7		5.3	1.6677	1.1	
CBSB080040	0.11	0.21	J		0.52	U	43700	20.8		3	1.0986	1	
CBSB100005	0.45	0.22			0.55	U	65900	22		5.9	1.7750	1.1	
Number of detects	19			0			25			25			
Count (N)	25			----			25			25			
Minimum	0.1			----			1750			2.7			
Maximum	0.66			----			253000			11.1			
Mean (x)	0.35			----			89410			5.59	1.64		
Standard deviation (sd)	0.17			----			64611			2.33	0.41		
k statistic (1)	2.292			---			2.292				2.292		
95% UTL (2)	**0.66**[b]			**1.3**[a]			**237,498**				**11.1**[b]		
h statistic/*t* statistic (3)	1.708			----			1.708				1.963		
95% UCL (4)	**0.07**			**1.3**[d]			**1,155,395,848** [c]				**6.6**		
Distribution (5)	normal			neither			normal			lognormal			

RL = reporting limit Qual = qualifier J = estimated value below reporting limit U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

(1) Source: Gilbert 198 (2) 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

(3) Source: W-C 1993 (4) 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

(5) See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

(a) For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

(b) The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

(c) The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

(d) For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-4

BACKGROUND CONCENTRATIONS OF METALS IN SUBSURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	COBALT mg/kg			COPPER mg/kg			IRON mg/kg				LEAD mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	Log Result	RL	Qual	Result	RL	Qual
CBSB010005	3.5	1.1		6.2	2.2		9700	9.1799	10.8		7	0.32	
CBSB010010	1.05	2.1	U	3.2	4.3	J	5200	8.5564	21.3		6.1	0.64	
CBSB020005	3.1	1.1		5.2	2.1		7840	8.9670	10.7		6.2	0.32	
CBSB020010	2.7	1.1		4.5	2.2		6930	8.8436	10.8		6.7	0.33	
CBSB020020	1.1	2.2	U	2.2	4.4	U	3720	8.2215	22.1		4.3	0.66	
CBSB020029	1.15	2.3	U	2.3	4.6	J	2590	7.8594	22.8		2.2	0.68	
CBSB020039	1.1	2.2	U	2.25	4.5	U	3020	8.0130	22.3		1.5	0.67	
CBSB030005	3.5	1.1		6.6	2.1		7390	8.9079	10.6		6.6	0.32	
CBSB030010	1.1	2.2	U	2.25	4.5	U	3110	8.0424	22.3		4.3	0.67	
CBSB040010	4.1	2.2		4.1	4.3	J	4550	8.4229	21.7		5.2	0.65	
CBSB040020	1.9	1.1		2.7	2.2		4220	8.3476	10.8		4.8	0.33	
CBSB040030	0.55	1.1	U	1.1	2.2	U	2620	7.8709	10.9		2.7	0.33	
CBSB040041	0.55	1.1	U	1.1	2.2	U	2430	7.7956	10.8		2.2	0.32	
CBSB050005	4.7	1.1		7.4	2.2		9620	9.1716	10.9		6.3	0.33	
CBSB050010	4	2.1		4	4.3	J	6240	8.7387	21.5		4.6	0.64	
CBSB060005	3.3	1.1		4.3	2.3		4490	8.4096	11.4		5.2	0.34	
CBSB060010	3	1.1		5.3	2.1		6400	8.7641	10.6		5.1	0.32	
CBSB070005	4.5	5.3	J	5.3	10.6	U	2720	7.9084	52.8		3.1	1.6	
CBSB070010	3.2	1.1		3.4	2.2		6560	8.7887	11.1		5.8	0.33	
CBSB080005	4.7	1.1		7.3	2.2		7680	8.9464	10.8		7.1	0.33	
CBSB080010	4.3	1.1		5	2.1		5600	8.6305	10.7		5.3	0.32	
CBSB080020	2.9	1.1		1.8	2.2	J	3170	8.0615	10.8		3.8	0.32	
CBSB080030	1	1.1	J	1.3	2.2	J	3500	8.1605	10.9		3	0.33	
CBSB080040	1.8	1		1.1	2.1	J	2500	7.8240	10.4		2.3	0.31	
CBSB100005	3.4	1.1		5.1	2.2		6890	8.8378	11		7	0.33	
Number of detects	18			19			25				25		
Count (N)	25			25			25				25		
Minimum	0.55			1.1			2430				1.5		
Maximum	4.7			7.4			9700				7.1		
Mean (x)	2.6			3.80			5148	8.45			4.7		
Standard deviation (sd)	1.4			1.97			2262	0.45			1.7		
k statistic (1)	----			2.292				2.292			2.292		
95% UTL (2)	**4.7**[a]			**7.4**[b]				**9700**[b]			**7.1**[b]		
h statistic/*t* statistic (3)	1.708			1.708				1.922			1.708		
95% UCL (4)	**1.2**			**2.2**				**6181**			**2.2**		
Distribution (5)	neither			normal			lognormal				normal		

RL = reporting limit Qual = qualifier J = estimated value below reporting limit U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

(1) Source: Gilbert 198 (2) 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

(3) Source: W-C 1993 (4) 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

(5) See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

(a) For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

(b) The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

(c) The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

(d) For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-4

BACKGROUND CONCENTRATIONS OF METALS IN SUBSURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	MAGNESIUM mg/kg			MANGANESE mg/kg				MERCURY mg/kg			NICKEL mg/kg			
	Result	RL	Qual	Result	Log Result	RL	Qual	Result	RL	Qual	Result	Log Result	RL	Qual
CBSB010005	1570	21.5		131	4.8752	1.1			0.036	U	8	2.0794	4.3	
CBSB010010	3250	42.6		63.7	4.1542	2.1			0.035	U	4.3	1.4586	8.5	J
CBSB020005	1510	21.4		83.2	4.4212	1.1			0.035	U	7	1.9459	4.3	
CBSB020010	3140	21.7		102	4.6250	1.1			0.036	U	6.7	1.9021	4.3	
CBSB020020	3900	44.2		48.3	3.8774	2.2			0.036	U	4.4	1.4816	8.8	U
CBSB020029	19300	45.6		17.6	2.8679	2.3			0.038	U	4.55	1.5151	9.1	U
CBSB020039	11600	44.6		23.1	3.1398	2.2			0.037	U	4.45	1.4929	8.9	U
CBSB030005	1400	21.2		179	5.1874	1.1			0.035	U	6.5	1.8718	4.2	
CBSB030010	2450	44.5		42	3.7377	2.2			0.037	U	4.45	1.4929	8.9	U
CBSB040010	2780	43.3		94.9	4.5528	2.2			0.036	U	5.8	1.7579	8.7	J
CBSB040020	2480	21.7		87.3	4.4694	1.1			0.036	U	4.5	1.5041	4.3	
CBSB040030	5310	21.9		23.3	3.1485	1.1			0.036	U	2.5	0.9163	4.4	J
CBSB040041	6390	21.6		27.5	3.3142	1.1			0.036	U	2.15	0.7655	4.3	U
CBSB050005	3030	21.7		115	4.7449	1.1			0.036	U	11.4	2.4336	4.3	
CBSB050010	4390	42.9		71.9	4.2753	2.1			0.035	U	7.3	1.9879	8.6	J
CBSB060005	2390	22.8		115	4.7449	1.1			0.038	U	5.5	1.7047	4.6	
CBSB060010	2050	21.1		95	4.5539	1.1			0.035	U	7	1.9459	4.2	
CBSB070005	2860	106		32.8	3.4904	5.3			0.035	U	10.55	2.3561	21.1	U
CBSB070010	3200	22.1		99.9	4.6042	1.1			0.036	U	5.8	1.7579	4.4	
CBSB080005	2640	21.7		184	5.2149	1.1			0.036	U	8.8	2.1748	4.3	
CBSB080010	3010	21.4		152	5.0239	1.1			0.035	U	8.5	2.1401	4.3	
CBSB080020	3070	21.6		68.5	4.2268	1.1			0.036	U	4.6	1.5261	4.3	
CBSB080030	8280	21.7		30.2	3.4078	1.1			0.036	U	2.5	0.9163	4.3	J
CBSB080040	3660	20.8		37.2	3.6163	1			0.034	U	2.8	1.0296	4.2	J
CBSB100005	2840	22		148	4.9972	1.1			0.036	U	7.1	1.9601	4.4	
Number of detects	25			25				0			19			
Count (N)	25			25				----			25			
Minimum	1400			17.6				----			2.15			
Maximum	19300			184				----			11.4			
Mean (x)	4260			83	4.21			----			5.89	1.68		
Standard deviation (sd)	3856			50	0.70			----			2.41	0.44		
k statistic (1)	----				2.292			----				2.292		
95% UTL (2)	**19300**[a]				**184**[b]			**0.019**[a]				**11.4**[b]		
h statistic/*t* statistic (3)	1.708				2.153			----				1.922		
95% UCL (4)	**3286714** [c]				**117**			**0.019**[d]				**7.1**		
Distribution (5)	neither			lognormal				neither			lognormal			

RL = reporting limit Qual = qualifier J = estimated value below reporting limit U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

(1) Source: Gilbert 1987 (2) 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

(3) Source: W-C 1993 (4) 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

(5) See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

(a) For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

(b) The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

(c) The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

(d) For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-4

BACKGROUND CONCENTRATIONS OF METALS IN SUBSURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	POTASSIUM mg/kg				SELENIUM mg/kg			SILVER mg/kg			SODIUM mg/kg			
	Result	Log Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	Log Result	RL	Qual
CBSB010005	1460	7.2862	538		0.27	0.54	U		1.1	U	269	5.5947	538	U
CBSB010010	1010	6.9177	1070	J	0.99	1.1	J		2.1	U	535	6.2823	1070	U
CBSB020005	1220	7.1066	535		0.265	0.53	U		1.1	U	267.5	5.5891	535	U
CBSB020010	1310	7.1778	542		0.27	0.54	U		1.1	U	271	5.6021	542	U
CBSB020020	1200	7.0901	1110		0.55	1.1	U		2.2	U	555	6.3190	1110	U
CBSB020029	642	6.4646	1140	J	0.55	1.1	U		2.3	U	570	6.3456	1140	U
CBSB020039	886	6.7867	1110	J	1.1	1.1			2.2	U	555	6.3190	1110	U
CBSB030005	1300	7.1701	529		0.265	0.53	U		1.1	U	264.5	5.5778	529	U
CBSB030010	777	6.6554	1110	J	1	1.1	J		2.2	U	555	6.3190	1110	U
CBSB040010	1300	7.1701	1080		0.55	1.1	U		2.2	U	359	5.8833	1080	J
CBSB040020	1220	7.1066	542		0.27	0.54	U		1.1	U	205	5.3230	542	J
CBSB040030	660	6.4922	546		0.275	0.55	U		1.1	U	133	4.8903	546	J
CBSB040041	725	6.5862	540		0.73	0.54			1.1	U	82.6	4.4140	540	J
CBSB050005	2370	7.7706	543		0.27	0.54	U		1.1	U	271.5	5.6040	543	U
CBSB050010	1690	7.4325	1070		0.55	1.1	U		2.1	U	325	5.7838	1070	J
CBSB060005	1120	7.0211	570		0.285	0.57	U		1.1	U	200	5.2983	570	J
CBSB060010	1460	7.2862	528		0.265	0.53	U		1.1	U	85.5	4.4485	528	J
CBSB070005	754	6.6254	2640	J	1.3	2.6	U		5.3	U	1320	7.1854	2640	U
CBSB070010	1800	7.4955	553		0.275	0.55	U		1.1	U	224	5.4116	553	J
CBSB080005	1900	7.5496	542		0.27	0.54	U		1.1	U	136	4.9127	542	J
CBSB080010	1310	7.1778	536		0.27	0.54	U		1.1	U	503	6.2206	536	J
CBSB080020	1230	7.1148	540		0.27	0.54	U		1.1	U	366	5.9026	540	J
CBSB080030	1030	6.9373	543		0.27	0.54	U		1.1	U	216	5.3753	543	J
CBSB080040	817	6.7056	521		0.26	0.52	U		1	U	222	5.4027	521	J
CBSB100005	1350	7.2079	550		0.275	0.55	U		1.1	U	275	5.6168	550	U
Number of detects	25				4			0			13			
Count (N)	25				25			----			25			
Minimum	642				0.73			----			82.6			
Maximum	2370				1.1			----			503			
Mean (x)	1222	7.05			0.47			----			351	5.66		
Standard deviation (sd)	417	0.34			0.31			----			253	0.63		
k statistic (1)		2.292			----			----				2.292		
95% UTL (2)		**2370**[b]			**1.1**[a]			**2.65**[b]				**503**[b]		
h statistic/*t* statistic (3)		1.849			1.708			----				2.102		
95% UCL (4)		**1392**			**0.14**			**2.65**[d]				**462**		
Distribution (5)	lognormal				neither			neither			lognormal			

RL = reporting limit   Qual = qualifier   J = estimated value below reporting limit   U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

(1) Source: Gilbert 1987   (2) 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

(3) Source: W-C 1993   (4) 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

(5) See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

(a) For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

(b) The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

(c) The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

(d) For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-4

BACKGROUND CONCENTRATIONS OF METALS IN SUBSURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	THALLIUM mg/kg			VANADIUM mg/kg				ZINC mg/kg			
	Result	RL	Qual	Result	Log Result	RL	Qual	Result	Log Result	RL	Qual
CBSB010005		1.1	U	22.6	3.1179	1.1		16.9	2.8273	2.2	
CBSB010010		2.1	U	17.4	2.8565	2.1		11.2	2.4159	4.3	
CBSB020005		1.1	U	18.2	2.9014	1.1		13.9	2.6319	2.1	
CBSB020010		1.1	U	23.2	3.1442	1.1		14.5	2.6741	2.2	
CBSB020020		2.2	U	11.9	2.4765	2.2		8.7	2.1633	4.4	
CBSB020029		2.3	U	23.3	3.1485	2.3		6	1.7918	4.6	
CBSB020039		2.2	U	13.5	2.6027	2.2		7.1	1.9601	4.5	
CBSB030005		1.1	U	17.3	2.8507	1.1		18.9	2.9392	2.1	
CBSB030010		2.2	U	9.3	2.2300	2.2		12	2.4849	4.5	
CBSB040010		2.2	U	15.3	2.7279	2.2		13.5	2.6027	4.3	
CBSB040020		1.1	U	14.7	2.6878	1.1		9.9	2.2925	2.2	
CBSB040030		1.3	U	12.4	2.5177	1.1		4.5	1.5041	2.2	
CBSB040041		1.1	U	9.3	2.2300	1.1		4.8	1.5686	2.2	
CBSB050005		1.2	U	18.4	2.9124	1.1		20.5	3.0204	2.2	
CBSB050010		2.1	U	16.2	2.7850	2.1		18.9	2.9392	4.3	
CBSB060005		1.1	U	14.1	2.6462	1.1		11.3	2.4248	2.3	
CBSB060010		1.5	U	12.8	2.5494	1.1		15.4	2.7344	2.1	
CBSB070005		5.3	U	11.8	2.4681	5.3		8.9	2.1861	10.6	J
CBSB070010		1.1	U	17.6	2.8679	1.1		15.5	2.7408	2.2	
CBSB080005		1.1	U	16.1	2.7788	1.1		18.8	2.9339	2.2	
CBSB080010		1.1	U	26.3	3.2696	1.1		13.8	2.6247	2.1	
CBSB080020		1.1	U	12.3	2.5096	1.1		9	2.1972	2.2	
CBSB080030		1.2	U	12.7	2.5416	1.1		7.5	2.0149	2.2	
CBSB080040		1.1	U	6.5	1.8718	1		6	1.7918	2.1	
CBSB100005		1.1	U	25.8	3.2504	1.1		14.6	2.6810	2.2	
Number of detects	0			25				25			
Count (N)	----			25				25			
Minimum	----			6.5				4.5			
Maximum	----			26.3				20.5			
Mean (x)	----			16.0	2.72			12.1	2.41		
Standard deviation (sd)	----			5.2	0.34			4.8	0.44		
k statistic (1)	----				2.292				2.292		
95% UTL (2)	**2.65**[(a)]				**26.3**[(b)]				**20.5**[(b)]		
h statistic/*t* statistic (3)	----				1.849				1.922		
95% UCL (4)	**2.65**[(d)]				**18.2**				**14.5**		
Distribution (5)	neither			lognormal				lognormal			

RL = reporting limit   Qual = qualifier   J = estimated value below reporting limit   U = nondetect

Shading indicates actual detection

Average, 95%UTL, and 95% UCL are calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[(1)] Source: Gilbert 1987   [(2)] 95% UTL = Upper Tolerance Limit (see Section 5.5.1 for equations)

[(3)] Source: W-C 1993   [(4)] 95% UCL = Upper Confidence Limit (see Section 5.5.2 for equations)

[(5)] See Appendix C.1 for tests for normality. Those metals which were greater than 50% nondetect were assumed to be neither normally or lognormally distributed.

[(a)] For data sets that are neither lognormally or normally distributed or have more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

[(b)] The calculated 95% UTL exceeded the maximum detection. When this occurs, the maximum detection is used as the 95% UTL.

[(c)] The calculated UCL exceeded the maximum detection because of the small sample size and large variance.

[(d)] For those data sets that were nondetect, the maximum detected concentration is used as the 95% UCL.

TABLE 6-5

UPPER TOLERANCE LIMITS (UTLs) AND UPPER CONFIDENCE LIMITS (UCLs) FOR METALS IN SUBSURFACE SOIL AT CANNON AIR FORCE BASE

Chemical	Distribution[a]	UTL[b]	Basis of UTL	UCL[d]
Aluminum	lognormal	12,200	highest detection [c]	6745
Antimony	neither	16	nondetect, one-half highest RL	16
Arsenic	normal	3.6	highest detection [c]	0.7
Barium	lognormal	805	highest detection [c]	293
Beryllium	normal	0.66	highest detection [c]	0.1
Cadmium	neither	1.3	nondetect, one-half highest RL	1.3
Calcium	normal	237,498	90% UCL of 95th percentile	1.16E+09
Chromium	lognormal	13.3	highest detection [c]	6.6
Cobalt	neither	4.7	highest detection	1.2
Copper	normal	7.4	highest detection [c]	2.2
Iron	lognormal	9,700	highest detection [c]	6181
Lead	normal	7.1	highest detection [c]	2.2
Magnesium	neither	19,300	highest detection	3286714
Manganese	lognormal	184	highest detection [c]	117
Mercury	neither	0.019	nondetect, one-half highest RL	0.019
Nickel	lognormal	11.4	highest detection [c]	7.1
Potassium	lognormal	2,370	highest detection [c]	1392
Selenium	neither	1.1	highest detection	0.14
Silver	neither	2.65	nondetect, one-half highest RL	2.65
Sodium	lognormal	503	highest detection [c]	462
Thallium	neither	2.65	nondetect, one-half highest RL	2.65
Vanadium	lognormal	26.3	highest detection [c]	18.2
Zinc	lognormal	20.5	highest detection [c]	14.5

[a] Distribution based on Shapiro-Wilk test, coefficient of skewness, and probability plots (see Appendix C.2).

[b] See Section 5.5.1 for equations. Those metals which were greater than 50% nondetect were assumed to be neither normally nor lognormally distributed.The UTLs for metals which were neither normally nor lognormally distributed are either the highest hit or the highest reporting limit if the metal was nondetect.

[c] Data set exhibited a high variance; therefore, the calculated 95% UTL exceeded the maximum detection. When this occurs, the 95% UTL is the maximum detection.

[d] See Section 5.5.2 for equations. UCLs for metals which were neither normally nor lognormally distributed were estimated using the assumption of normal distribution (ref).

RL = Reporting Limit

All concentrations are in mg/kg.

TABLE 6-6

BACKGROUND CONCENTRATIONS OF PESTICIDES IN SURFACE SOIL AT CANNON AIR FORCE BASE

SAMPLE	P,P'-DDT mg/kg Result	RL	Qual
CBSS01001	0.0017	0.0034	U
CBSS02001	0.0017	0.0034	U
CBSS03001	0.0017	0.0034	U
CBSS04001	0.0017	0.0034	U
CBSB010001	0.0017	0.0034	U
CBSB020001	0.0017	0.0034	U
CBSB030001	0.0017	0.0034	U
CBSB050001	0.0039	0.0035	
CBSB060001	0.0017	0.0034	U
CBSB070001	0.0017	0.0034	U
CBSB080001	0.0017	0.0034	U
CBSB100001	0.0017	0.0034	U
CANOFS-OFS1-0000	0.0018	0.0036	U
CANOFS-OFS2-0000	0.0018	0.0036	U
Number of detects	1		
Count (N)	14		
Minimum	0.0039		
Maximum	0.0039		
Mean (x)	0.0019		
Standard deviation (s)	0.0006		
95% UTL (1)	0.0039(a)		
95% UCL (2)	0.0039(b)		
Distribution (3)	neither		

RL = reporting limit Qual = qualifier U = nondetect

Shading indicates actual detection

Average and standard deviation calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

(1) 95% UTL = Upper Tolerance Limit

(2) 95% UCL = Upper Confidence Limit

(3) Data set was greater than 50% nondetect; therefore, pesticide was assumed to be neither normally nor lognormally distributed.

(a) For data sets with unknown distributions or more than 50% nondetects, a nonparametric UTL (i.e., maximum detection or one-half the highest RL, if the data set was nondetect) is shown.

7.0
SUMMARY AND CONCLUSIONS

Background concentrations (i.e., UTLs and UCLs) were calculated for metals in surface soil and subsurface soil at Cannon Air Force Base. Background concentrations are presented for 4,4-DDT in surface soil only, because results for all other pesticides were nondetect. Fourteen surface soil samples collected during July 1997 and two samples (CANOFS-OFS1-0000 and CANOFS-OFS2-0000) used in the previous background report (W-C 1994b) were used to calculate 95 percent UTLs and UCLs for surface soil. Twenty five samples subsurface samples collected during July 1997 were used to calculate 95 percent UTLs and UCLs for subsurface soil. Subsurface soil data from the previous background study were not used.

There appears to be no trend in the new data set background concentrations of metals in either surface or subsurface soil compared to the previous background study. Several of the new UTLs are higher, while others are lower, than the W-C 1994b UTLs. New UTLs for both surface and subsurface soil are within an order of magnitude of the W-C 1994b background concentrations, with the exception of thallium in surface soil and mercury and selenium in subsurface soil. However, the available data from the previous background report were not divided into surface and subsurface soils. Therefore, any conclusions drawn from the direct comparison between these data sets must be used cautiously.

The new UTLs for metals are lower or within the range of regional concentrations expected for the Clovis area, with the exception of antimony, barium, and calcium in surface soil and antimony, barium, calcium, magnesium, selenium, and thallium in subsurface soil. Again, available data on regional concentrations were not divided into surface and subsurface soils. Therefore, any conclusions drawn from the direct comparison between these data sets must be used cautiously.

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9.0
ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
bgs	below ground surface
CEC	Cation Exchange Capacities
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
gpm	gallon per minute
HSA	Hollow Stem Auger
ID	Inside Diameter
IRP	Installation Restoration Program
J	estimated value below reporting limit
msl	mean sea level
NWRs	National Wildlife Refuges
OD	Outside Diameter
PID	Photoionization Detector
QAPP	Quality Assurance Project Plan
QCSR	Quality Control Summary Report
RI	Remedial Investigation
RL	Reporting Limit
SB	Soil Boring
SOPs	Standard Operating Procedures
SQL	Sample Quantitation Limit
SSHP	Site Safety and Health Plan
TAL	Target Analyte List
TFW	Tactical Fighter Wing
U	nondetect value
UCL	Upper Confidence Limit
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
UTL	Upper Tolerance Limit
W-C	Woodward Clyde

APPENDIX B
STATISTICAL RESULTS

APPENDIX B.1
STATISTICAL RESULTS FOR SURFACE SOIL

B.1
STATISTICAL RESULTS FOR SURFACE SOIL

B.1.1 Aluminum

A nonlinear regression line fit plot and coefficient of determination (R^2) of -6.1 (Table B.1-1) indicates that aluminum concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No outlier analysis was done for aluminum in surface soils because no potential outliers were identified (i.e., the maximum detected concentration did not exceed the minimum detected concentration by a factor of 5 or more; see Table B.1-2).

The Shapiro-Wilk test (Table B.1-3) and probability plots (Figures B.1-1 and B.1-2) indicate that the aluminum data set in surface soil has neither a lognormal or normal distribution. The coefficient of skewness (Table B.1-4) indicated that the distribution may be lognormal. However, since two of three tests indicated the same result, and the Shapiro-Wilk test is considered to be one of the best tests for normality, it was concluded that the aluminum data set has neither a lognormal nor normal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR ALUMINUM IN SURFACE SOIL

ALUMINUM (mg/kg)	CALCIUM (mg/kg)
3700	1470
4640	3800
4260	6640
3880	968
4300	1350
4520	1580
4150	2500
7090	44800
4580	3360
5150	3930
8950	2930
4390	1570
8670	2220
8830	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-6.116963052
Adjusted R Square	-6.193886129
Standard Error	5238.870715
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-306661927.1	-306661927	-11.173378	#NUM!
Residual	13	356794962.8	27445766.4		
Total	14	50133035.71			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.23566254	0.113631096	2.07392649	0.05851273	-0.00982247	0.48114755	-0.00982247	0.48114755

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR ALUMINUM IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted ALUMINUM (mg/kg)*	*Residuals*
1	346.4239332	3353.576067
2	895.5176505	3744.482349
3	1564.799263	2695.200737
4	228.1213383	3651.878662
5	318.1444285	3981.855572
6	372.3468126	4147.653187
7	589.156349	3560.843651
8	10557.68177	-3467.681775
9	791.8261331	3788.173867
10	926.1537807	4223.846219
11	690.4912411	8259.508759
12	369.9901872	4020.009813
13	523.1708379	8146.829162
14	450.1154507	8379.884549

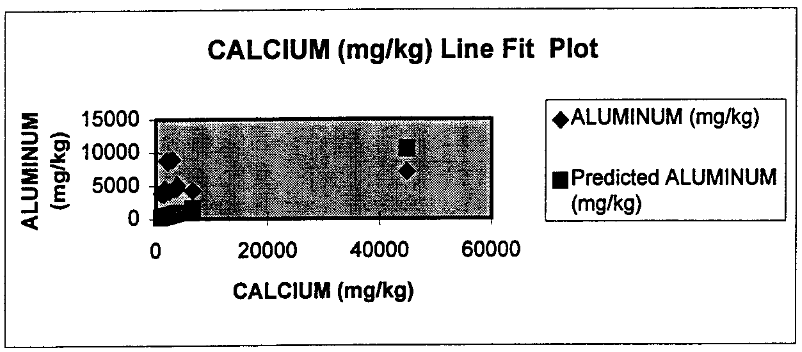


TABLE B.1-2

OUTLIER ANALYSIS RESULTS FOR SURFACE SOIL - ALUMINUM CANNON AIR FORCE BASE

SAMPLE	Metals ALUMINUM mg/kg Result	RL	Qual
CBSS01001	3700	10.3	
CBSS02001	4640	10.3	
CBSS03001	4260	10.3	
CBSS04001	3880	10.3	
CBSB010001	4300	10.3	
CBSB020001	4520	10.3	
CBSB030001	4150	10.3	
CBSB050001	7090	10.5	
CBSB060001	4580	10.4	
CBSB070001	5150	10.4	
CBSB080001	8950	10.4	
CBSB100001	4390	10.4	
CANOFS-OFS1-0000	8670		
CANOFS-OFS2-0000	8830		
Number of detects	14		
Count (N)	14		
Minimum	3700		
Maximum	8950		
Mean (x)	5508		
Standard deviation (sd)	1964		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - \overline{X})/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - ALUMINUM IN SURFACE SOIL

i	Aluminum Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	9.0994	8.2161	-0.8833	0.5251	-0.4638
2	9.0859	8.2636	-0.8223	0.3318	-0.2728
3	9.0676	8.3309	-0.7368	0.246	-0.1812
4	8.8664	8.3570	-0.5094	0.1802	-0.0918
5	8.5468	8.3664	-0.1804	0.124	-0.0224
6	8.4425	8.3871	-0.0554	0.0727	-0.0040
7	8.4295	8.4163	-0.0132	0.024	-0.0003
8	8.4163	8.4295	0.0132		-1.0364
9	8.3871	8.4425	0.0554		
10	8.3664	8.5468	0.1804		
11	8.3570	8.8664	0.5094		
12	8.3309	9.0676	0.7368		
13	8.2636	9.0859	0.8223		
14	8.2161	9.0994	0.8833		
				N	14
				StdDev	0.3208
				W	0.8028
				Wcritical	0.8740
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - ALUMINUM IN SURFACE SOIL

	Aluminum Result, cont.				
i	X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	8950	3700	-5250.0000	0.5251	-2756.7750
2	8830	3880	-4950.0000	0.3318	-1642.4100
3	8670	4150	-4520.0000	0.246	-1111.9200
4	7090	4260	-2830.0000	0.1802	-509.9660
5	5150	4300	-850.0000	0.124	-105.4000
6	4640	4390	-250.0000	0.0727	-18.1750
7	4580	4520	-60.0000	0.024	-1.4400
8	4520	4580	60.0000		-6146.0860
9	4390	4640	250.0000		
10	4300	5150	850.0000		
11	4260	7090	2830.0000		
12	4150	8670	4520.0000		
13	3880	8830	4950.0000		
14	3700	8950	5250.0000		
				N	14
				StdDev	1964
				W	0.7535
				Wcritical	0.8740
					Not Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR ALUMINUM IN SURFACE SOIL

ALUMINUM (mg/kg)	log-transformed
3700	8.2161
4640	8.4425
4260	8.3570
3880	8.2636
4300	8.3664
4520	8.4163
4150	8.3309
7090	8.8664
4580	8.4295
5150	8.5468
8950	9.0994
4390	8.3871
8670	9.0676
8830	9.0859

ALUMINUM (mg/kg)		*log-transformed*	
Mean	5507.8571	Mean	8.5625249
Standard Error	524.83925	Standard Error	0.0857405
Median	4550	Median	8.4228608
Mode	#N/A	Mode	#N/A
Standard Deviation	1963.7687	Standard Deviation	0.3208116
Sample Variance	3856387.4	Sample Variance	0.1029201
Kurtosis	-0.56635	Kurtosis	-0.811617
Skewness	1.0989771	Skewness	0.9390521
Range	5250	Range	0.8833207
Minimum	3700	Minimum	8.2160881
Maximum	8950	Maximum	9.0994088
Sum	77110	Sum	119.87535
Count	14	Count	14
Confidence Level(95.0%)	1133.8461	Confidence Level(95.0%)	0.1852311

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL

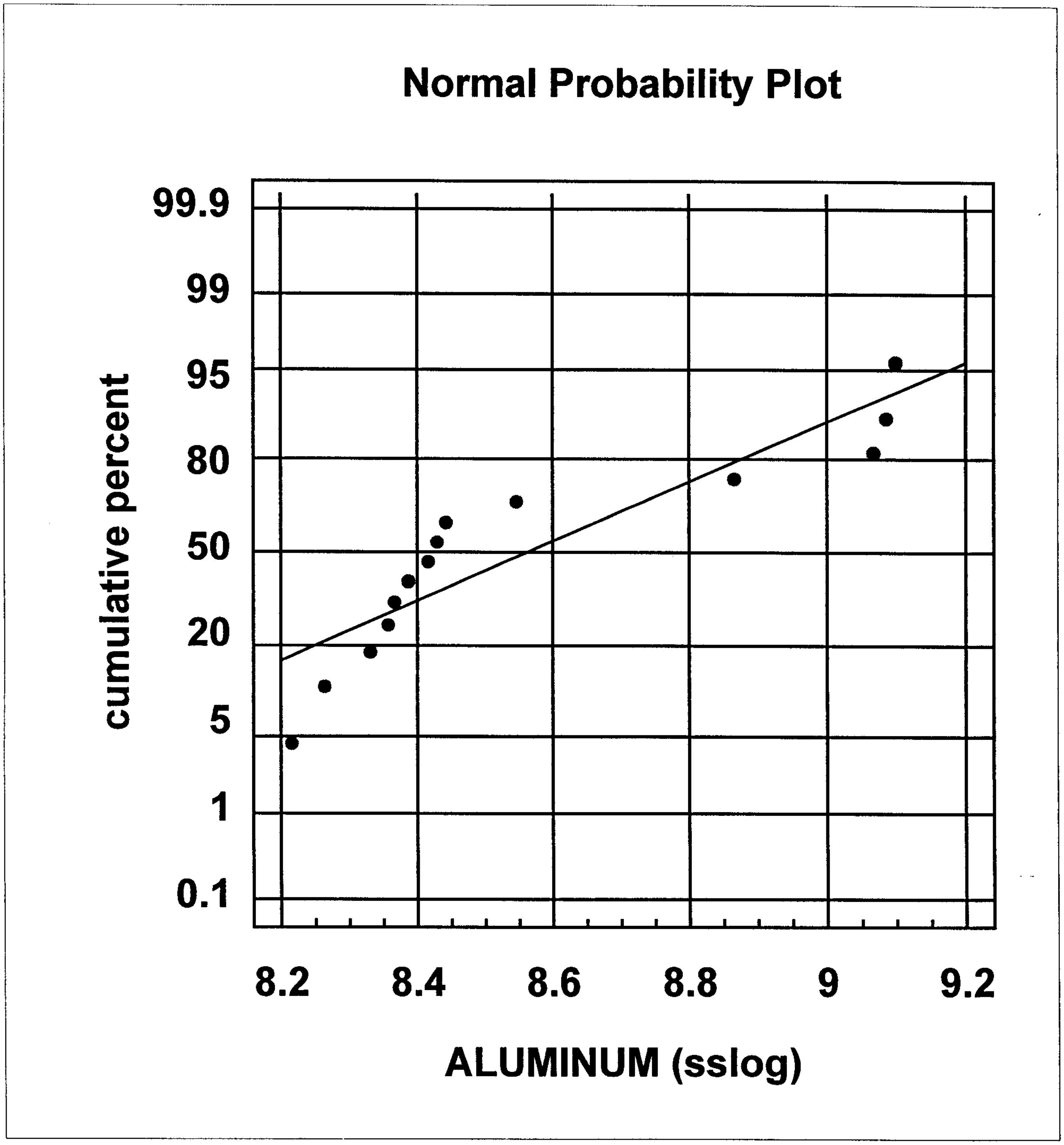
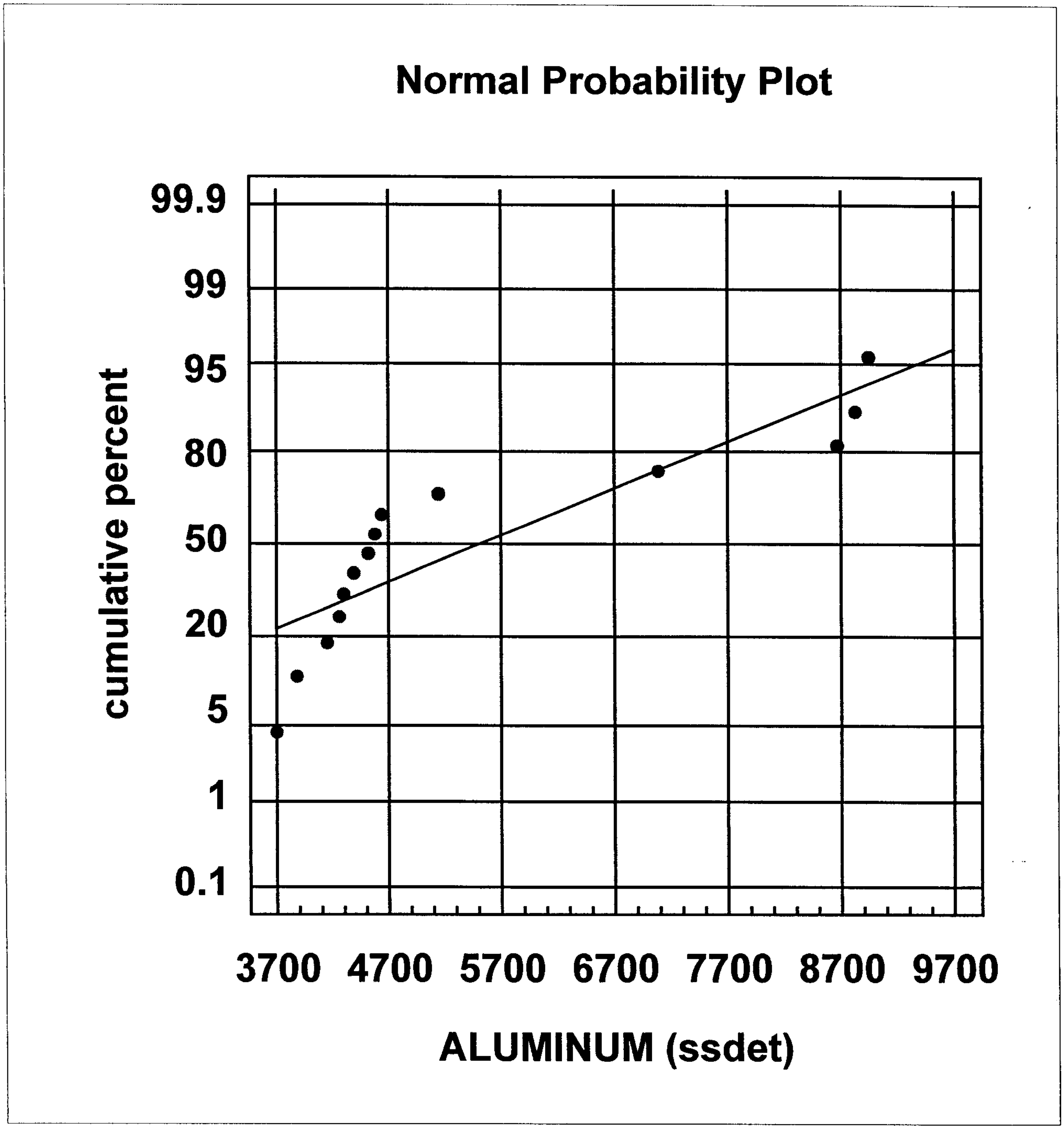


FIGURE B.1-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SURFACE SOIL



B.1.2 Antimony

The antimony results for all surface samples were nondetect. Therefore, no linear regression, outlier, or distribution analyses were conducted.

B.1.3 Arsenic

A nonlinear regression line fit plot and coefficient of determination (R^2) of -15.3 (Table B.1-1) indicates that arsenic concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the surface soil samples for arsenic (i.e., the maximum detected concentration did not exceed the minimum detected concentration by a factor of 5; see Table B.1-2). Therefore, no outlier analysis was done for surface soil arsenic data set.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plot (Figure B.1-1) indicate that the arsenic data set in surface soil has a lognormal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR ARSENIC IN SURFACE SOIL

ARSENIC (mg/kg)	CALCIUM (mg/kg)
1.9	1470
2.1	3800
1.7	6640
1.8	968
1.8	1350
1.5	1580
2.2	2500
2.7	44800
2.2	3360
2.6	3930
3.3	2930
2.4	1570
1.8	2220
1.9	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-15.33793153
Adjusted R Square	-15.4148546
Standard Error	1.945649659
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-46.20004089	-46.200041	-12.204306	#NUM!
Residual	13	49.21218375	3.7855526		
Total	14	3.012142857			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	9.1144E-05	4.22011E-05	2.15975185	0.05005642	-2.60124E-08	0.00018231	-2.601E-08	0.00018231

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR ARSENIC IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted ARSENIC (mg/kg)*	*Residuals*
1	0.133981657	1.766018343
2	0.34634714	1.75365286
3	0.605196056	1.094803944
4	0.088227377	1.711772623
5	0.123044379	1.676955621
6	0.144007495	1.355992505
7	0.227859961	1.972140039
8	4.083250496	-1.383250496
9	0.306243787	1.893756213
10	0.358195858	2.241804142
11	0.267051874	3.032948126
12	0.143096055	2.256903945
13	0.202339645	1.597660355
14	0.17408501	1.72591499

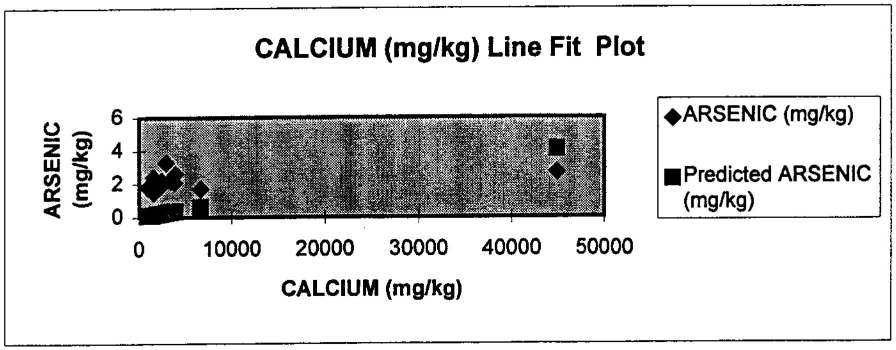


TABLE B.1-2

OUTLIER ANALYSIS RESULTS
FOR SURFACE SOIL - ARSENIC
CANNON AIR FORCE BASE

SAMPLE	Metals ARSENIC mg/kg Result	RL	Qual
CBSS01001	1.9	1	
CBSS02001	2.1	1	
CBSS03001	1.7	1	
CBSS04001	1.8	1	
CBSB010001	1.8	1	
CBSB020001	1.5	1	
CBSB030001	2.2	1	
CBSB050001	2.7	1	
CBSB060001	2.2	1	
CBSB070001	2.6	1	
CBSB080001	3.3	1	
CBSB100001	2.4	1	
CANOFS-OFS1-0000	1.8		J
CANOFS-OFS2-0000	1.9		J
Number of detects	14		
Count (N)	14		
Minimum	1.5		
Maximum	3.3		
Mean (x)	2.1		
Standard deviation (sd)	0.48		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - ARSENIC IN SURFACE SOIL

i	Arsenic Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	1.1939	0.4055	-0.7885	0.5251	-0.4140
2	0.9933	0.5306	-0.4626	0.3318	-0.1535
3	0.9555	0.5878	-0.3677	0.246	-0.0905
4	0.8755	0.5878	-0.2877	0.1802	-0.0518
5	0.7885	0.5878	-0.2007	0.124	-0.0249
6	0.7885	0.6419	-0.1466	0.0727	-0.0107
7	0.7419	0.6419	-0.1001	0.024	-0.0024
8	0.6419	0.7419	0.1001		-0.7478
9	0.6419	0.7885	0.1466		
10	0.5878	0.7885	0.2007		
11	0.5878	0.8755	0.2877		
12	0.5878	0.9555	0.3677		
13	0.5306	0.9933	0.4626		
14	0.4055	1.1939	0.7885		
				N	14
				StdDev	0.2120
				W	0.9573
				Wcritical	0.8740
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR ARSENIC IN SURFACE SOIL

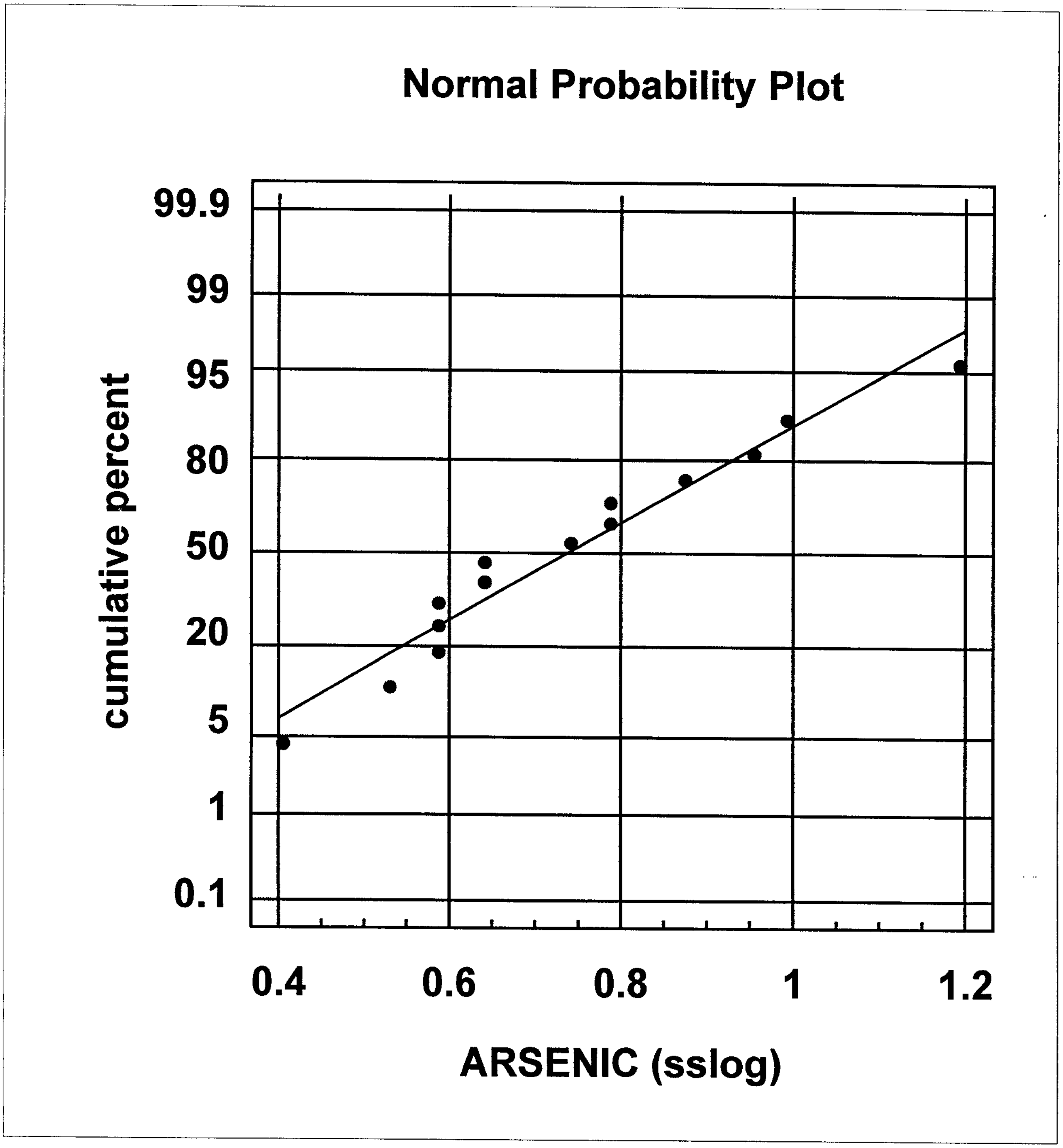
ARSENIC (mg/kg)	log-transformed
1.9	0.6419
2.1	0.7419
1.7	0.5306
1.8	0.5878
1.8	0.5878
1.5	0.4055
2.2	0.7885
2.7	0.9933
2.2	0.7885
2.6	0.9555
3.3	1.1939
2.4	0.8755
1.8	0.5878
1.9	0.6419

ARSENIC (mg/kg)	
Mean	2.1357143
Standard Error	0.1286477
Median	2
Mode	1.8
Standard Deviation	0.4813557
Sample Variance	0.2317033
Kurtosis	1.2513867
Skewness	1.1246002
Range	1.8
Minimum	1.5
Maximum	3.3
Sum	29.9
Count	14
Confidence Level(95.0%)	0.2779264

log-transformed	
Mean	0.7371548
Standard Error	0.0566505
Median	0.6918956
Mode	0.5877867
Standard Deviation	0.2119666
Sample Variance	0.0449298
Kurtosis	0.1641332
Skewness	0.6444809
Range	0.7884574
Minimum	0.4054651
Maximum	1.1939225
Sum	10.320168
Count	14
Confidence Level(95.0%)	0.1223858

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL



B.1.4 Barium

A linear regression line fit plot and coefficient of determination (R^2) of 0.97 (Table B.1-1) indicates that barium concentrations in surface soil correlate with calcium concentrations (i.e., caliche) in surface soil.

The outlier analysis identified one outlier for barium in surface soils. Table B.1-2 shows that the maximum detected concentration of 670 mg/kg is significantly higher than the other detected concentrations. A review of the data found no recording or typographical errors. Additionally, a review of field activities did not indicate any potential sampling problems. Therefore, this concentration is a valid result and was used in further statistical evaluations.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plots (Figures B.1-1 and B.1-2) indicate that the barium data set in surface soil has neither a lognormal nor normal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR BARIUM IN SURFACE SOIL

BARIUM (mg/kg)	CALCIUM (mg/kg)
42.7	1470
57.7	3800
49.1	6640
39.2	968
40.2	1350
47.1	1580
47.5	2500
670	44800
58.6	3360
71.5	3930
90.6	2930
51.6	1570
67.2	2220
62.3	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.985585837
R Square	0.971379443
Adjusted R Square	0.894456366
Standard Error	27.87137347
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	342744.8372	342744.837	441.218974	7.86208E-11
Residual	13	10098.57497	776.813459		
Total	14	352843.4121			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.015055521	0.00060453	24.9045052	2.3496E-12	0.013749514	0.01636153	0.01374951	0.01636153

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR BARIUM IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted BARIUM (mg/kg)*	*Residuals*
1	22.13161653	20.56838347
2	57.21098151	0.48901849
3	99.96866243	-50.86866243
4	14.57374476	24.62625524
5	20.32495396	19.87504604
6	23.78772389	23.31227611
7	37.63880363	9.861196375
8	674.487361	-4.48736096
9	50.58655207	8.013447928
10	59.1681993	12.3318007
11	44.11267785	46.48732215
12	23.63716868	27.96283132
13	33.42325762	33.77674238
14	28.75604597	33.54395403

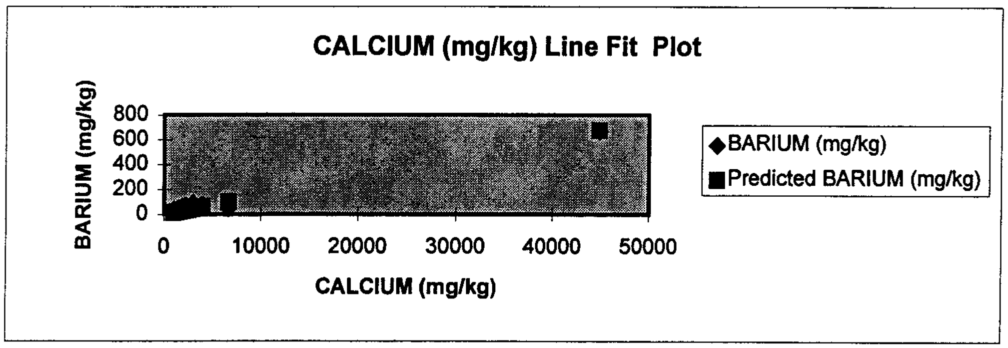


TABLE B.1-2

OUTLIER ANALYSIS RESULTS FOR SURFACE SOIL - BARIUM CANNON AIR FORCE BASE

SAMPLE	Metals BARIUM mg/kg Result	Log Result	RL	Qual
CBSS01001	42.7	3.7542	1	
CBSS02001	57.7	4.0553	1	
CBSS03001	49.1	3.8939	1	
CBSS04001	39.2	3.6687	1	
CBSB010001	40.2	3.6939	1	
CBSB020001	47.1	3.8523	1	
CBSB030001	47.5	3.8607	1	
CBSB050001	670	6.5073	1	
CBSB060001	58.6	4.0707	1	
CBSB070001	71.5	4.2697	1	
CBSB080001	90.6	4.5065	1	
CBSB100001	51.6	3.9435	1	
CANOFS-OFS1-0000	67.2	4.2077		
CANOFS-OFS2-0000	62.3	4.1320		
Number of detects	14			
Count (N)	14			
Minimum	39.2			
Maximum	670			
Mean (x)	100	4.17		
Standard deviation (sd)	165	0.71		
Max > Min*5	Yes			
Outlier		Yes		
Tn[1]		3.280		
Critical Value[2]		2.371		

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - BARIUM IN SURFACE SOIL

i	Barium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	6.5073	3.6687	-2.8386	0.5251	-1.4905
2	4.5065	3.6939	-0.8126	0.3318	-0.2696
3	4.2697	3.7542	-0.5155	0.246	-0.1268
4	4.2077	3.8523	-0.3554	0.1802	-0.0640
5	4.1320	3.8607	-0.2712	0.124	-0.0336
6	4.0707	3.8939	-0.1769	0.0727	-0.0129
7	4.0553	3.9435	-0.1117	0.024	-0.0027
8	3.9435	4.0553	0.1117		-2.0002
9	3.8939	4.0707	0.1769		
10	3.8607	4.1320	0.2712		
11	3.8523	4.2077	0.3554		
12	3.7542	4.2697	0.5155		
13	3.6939	4.5065	0.8126		
14	3.6687	6.5073	2.8386		
				N	14
				StdDev	0.7118
				W	0.6074
				Wcritical	0.8740
					Not Lognormal

X(i) = Log-transformed values; descending order
X(n-i+1) = Log-transformed values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - BARIUM IN SURFACE SOIL

i	Barium Result, cont. X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	670	39.2	-630.8000	0.5251	-331.2331
2	90.6	40.2	-50.4000	0.3318	-16.7227
3	71.5	42.7	-28.8000	0.246	-7.0848
4	67.2	47.1	-20.1000	0.1802	-3.6220
5	62.3	47.5	-14.8000	0.124	-1.8352
6	58.6	49.1	-9.5000	0.0727	-0.6907
7	57.7	51.6	-6.1000	0.024	-0.1464
8	51.6	57.7	6.1000		-361.3349
9	49.1	58.6	9.5000		
10	47.5	62.3	14.8000		
11	47.1	67.2	20.1000		
12	42.7	71.5	28.8000		
13	40.2	90.6	50.4000		
14	39.2	670	630.8000		
				N	14
				StdDev	165
				W	0.3700
				Wcritical	0.8740
					Not Normal

X(i) = Detected values; descending order
X(n-i+1) = Detected values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR BARIUM IN SURFACE SOIL

BARIUM (mg/kg)	log-transformed
42.7	3.7542
57.7	4.0553
49.1	3.8939
39.2	3.6687
40.2	3.6939
47.1	3.8523
47.5	3.8607
670	6.5073
58.6	4.0707
71.5	4.2697
90.6	4.5065
51.6	3.9435
67.2	4.2077
62.3	4.1320

BARIUM (mg/kg)		*log-transformed*	
Mean	99.664286	Mean	4.1725844
Standard Error	44.030672	Standard Error	0.1902408
Median	54.65	Median	3.9993894
Mode	#N/A	Mode	#N/A
Standard Deviation	164.74769	Standard Deviation	0.7118158
Sample Variance	27141.801	Sample Variance	0.5066818
Kurtosis	13.748299	Kurtosis	10.412145
Skewness	3.6953552	Skewness	3.0739309
Range	630.8	Range	2.838601
Minimum	39.2	Minimum	3.6686767
Maximum	670	Maximum	6.5072777
Sum	1395.3	Sum	58.416182
Count	14	Count	14
Confidence Level(95.0%)	95.122465	Confidence Level(95.0%)	0.4109902

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL

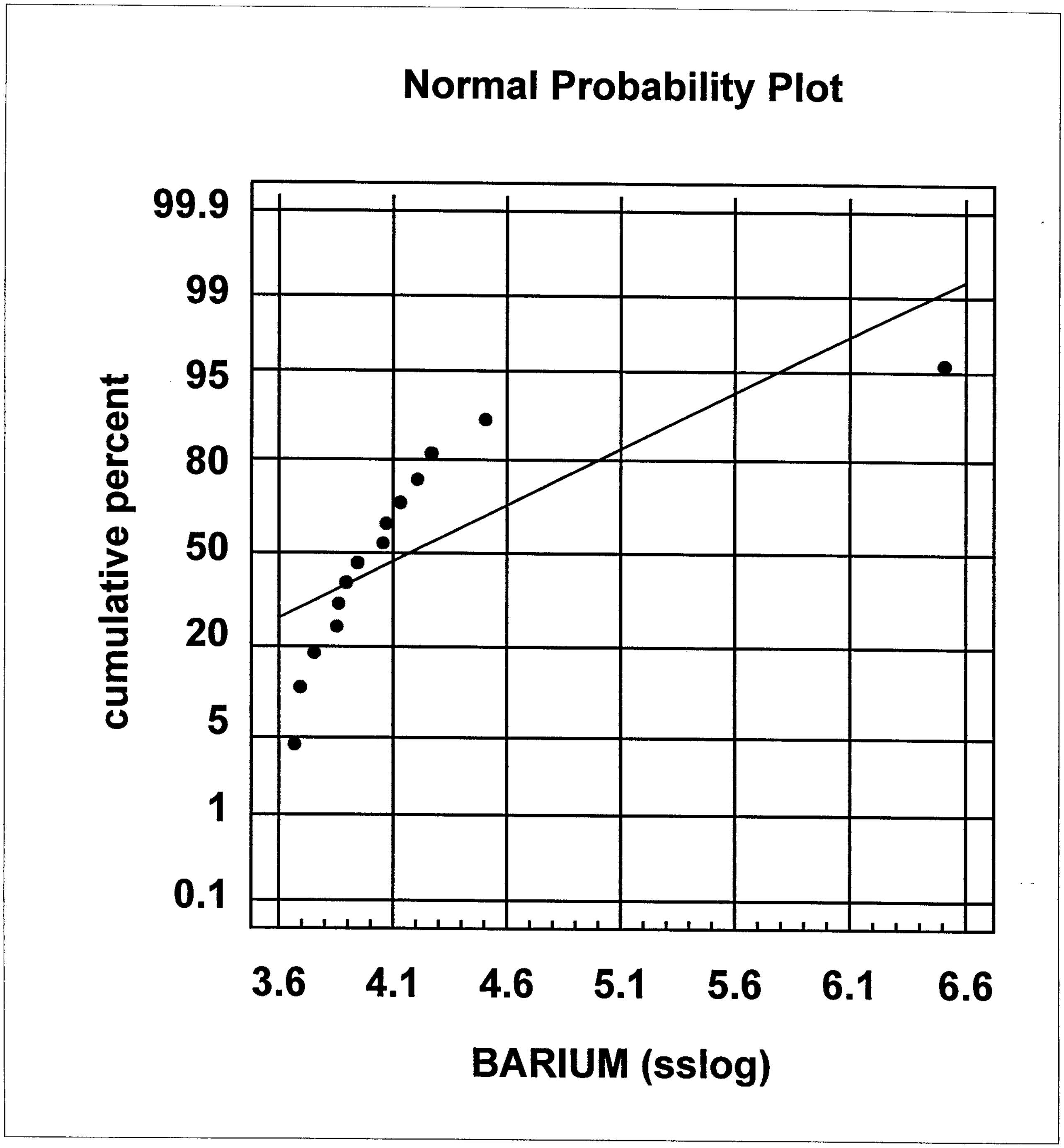
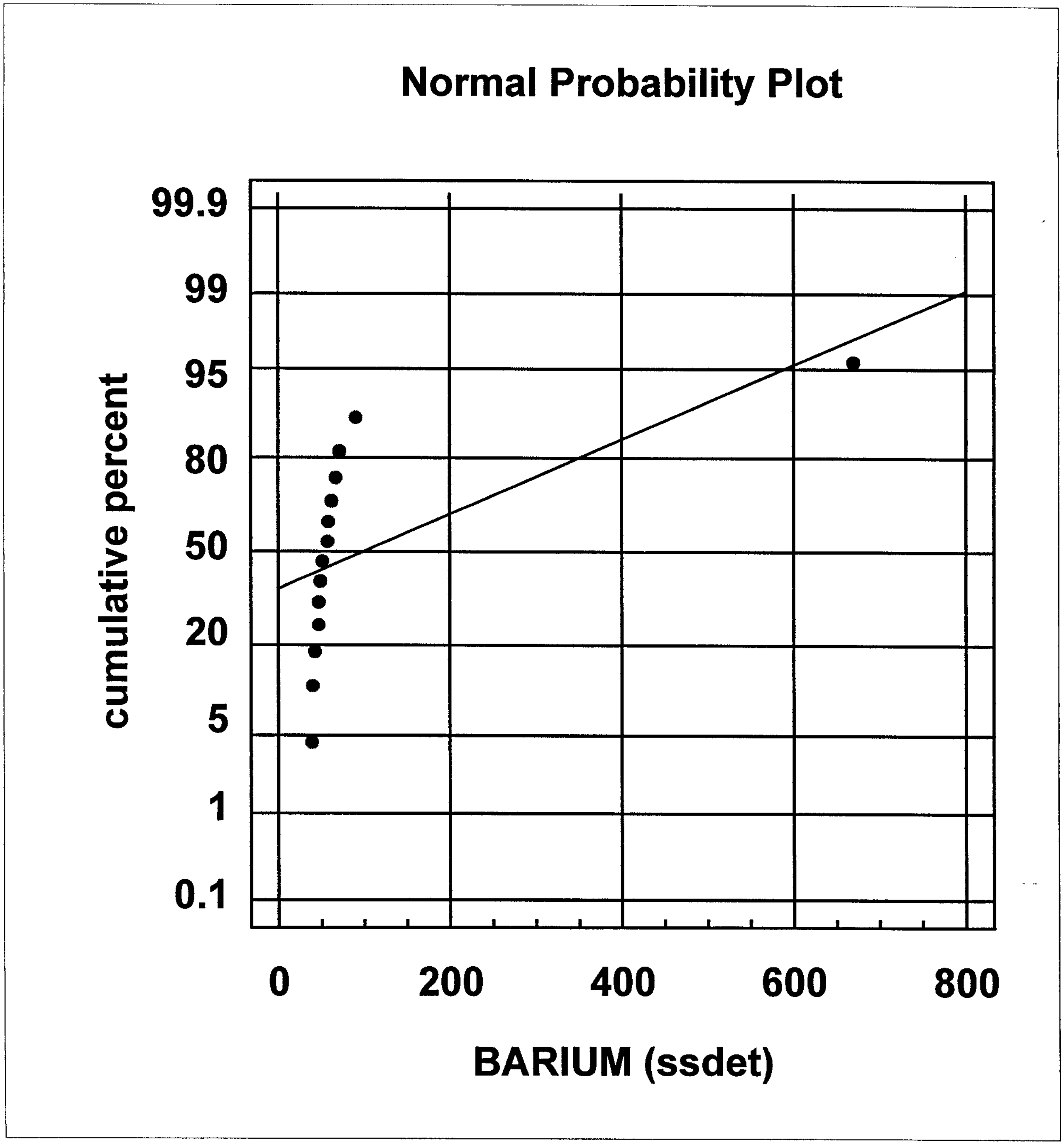


FIGURE B.1-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SURFACE SOIL



B.1.5 Beryllium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -5.3 (Table B.1-1) indicates that beryllium concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified for beryllium in surface soils. The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5 or more (see Table B.1-2). Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plot (Figure B.1-1) indicate that the beryllium data set in surface soil has a lognormal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR BERYLLIUM IN SURFACE SOIL

BERYLLIUM (mg/kg)	CALCIUM (mg/kg)
0.3	1470
0.26	3800
0.3	6640
0.26	968
0.21	1350
0.31	1580
0.26	2500
0.55	44800
0.39	3360
0.38	3930
0.62	2930
0.31	1570
0.49	2220
0.22	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-5.225737528
Adjusted R Square	-5.302660605
Standard Error	0.312476331
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-1.065453229	-1.0654532	-10.911894	#NUM!
Residual	13	1.269338943	0.09764146		
Total	14	0.203885714			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	1.71016E-05	6.77761E-06	2.52324665	0.02544751	2.45945E-06	3.1744E-05	2.4594E-06	3.1744E-05

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR BERYLLIUM IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted BERYLLIUM (mg/kg)*	*Residuals*
1	0.025139329	0.274860671
2	0.06498602	0.19501398
3	0.113554519	0.186445481
4	0.016554334	0.243445666
5	0.023087139	0.186912861
6	0.027020503	0.282979497
7	0.042753961	0.217246039
8	0.766150974	-0.216150974
9	0.057461323	0.332538677
10	0.067209226	0.312790774
11	0.050107642	0.569892358
12	0.026849487	0.283150513
13	0.037965517	0.452034483
14	0.032664026	0.187335974

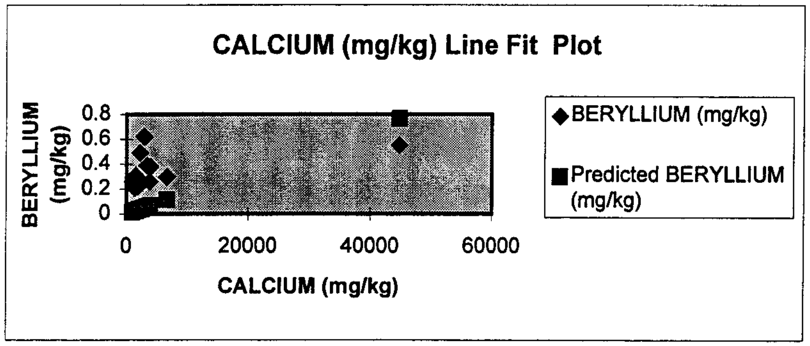


TABLE B.1-2

OUTLIER ANALYSIS RESULTS FOR SURFACE SOIL - BERYLLIUM CANNON AIR FORCE BASE

SAMPLE	Metals BERYLLIUM mg/kg Result	Log Result	RL	Qual
CBSS01001	0.3	-1.2040	0.21	
CBSS02001	0.26	-1.3471	0.21	
CBSS03001	0.3	-1.2040	0.21	
CBSS04001	0.26	-1.3471	0.21	
CBSB010001	0.21	-1.5606	0.21	
CBSB020001	0.31	-1.1712	0.21	
CBSB030001	0.26	-1.3471	0.21	
CBSB050001	0.55	-0.5978	0.21	
CBSB060001	0.39	-0.9416	0.21	
CBSB070001	0.38	-0.9676	0.21	
CBSB080001	0.62	-0.4780	0.21	
CBSB100001	0.31	-1.1712	0.21	
CANOFS-OFS1-0000	0.49	-0.7133		J
CANOFS-OFS2-0000	0.22	-1.5141	0.44	U
Number of detects	13			
Count (N)	14			
Minimum	0.21			
Maximum	0.62			
Mean (x)	0.35	-1.11		
Standard deviation (sd)	0.13	0.33		
Max > Min*5	No			
Outlier	NA			
Tn[1]				
Critical Value[2]				

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - BERYLLIUM IN SURFACE SOIL

i	Beryllium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	-0.4780	-1.5606	-1.0826	0.5251	-0.5685
2	-0.5978	-1.5141	-0.9163	0.3318	-0.3040
3	-0.7133	-1.3471	-0.6337	0.246	-0.1559
4	-0.9416	-1.3471	-0.4055	0.1802	-0.0731
5	-0.9676	-1.3471	-0.3795	0.124	-0.0471
6	-1.1712	-1.2040	-0.0328	0.0727	-0.0024
7	-1.1712	-1.2040	-0.0328	0.024	-0.0008
8	-1.2040	-1.1712	0.0328		-1.1517
9	-1.2040	-1.1712	0.0328		
10	-1.3471	-0.9676	0.3795		
11	-1.3471	-0.9416	0.4055		
12	-1.3471	-0.7133	0.6337		
13	-1.5141	-0.5978	0.9163		
14	-1.5606	-0.4780	1.0826		
				N	14
				StdDev	0.3314
				W	0.9290
				Wcritical	0.8740
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR BERYLLIUM IN SURFACE SOIL

BERYLLIUM (mg/kg)	log-transformed
0.3	-1.2040
0.26	-1.3471
0.3	-1.2040
0.26	-1.3471
0.21	-1.5606
0.31	-1.1712
0.26	-1.3471
0.55	-0.5978
0.39	-0.9416
0.38	-0.9676
0.62	-0.4780
0.31	-1.1712
0.49	-0.7133
0.22	-1.5141

BERYLLIUM (mg/kg)	
Mean	0.3471429
Standard Error	0.0334702
Median	0.305
Mode	0.26
Standard Deviation	0.1252338
Sample Variance	0.0156835
Kurtosis	0.3677283
Skewness	1.1313252
Range	0.41
Minimum	0.21
Maximum	0.62
Sum	4.86
Count	14
Confidence Level(95.0%)	0.0723079

log-transformed	
Mean	-1.111766
Standard Error	0.0885716
Median	-1.187578
Mode	-1.347074
Standard Deviation	0.3314047
Sample Variance	0.1098291
Kurtosis	-0.455413
Skewness	0.6527994
Range	1.0826119
Minimum	-1.560648
Maximum	-0.478036
Sum	-15.56472
Count	14
Confidence Level(95.0%)	0.1913474

B.1.6 Cadmium

The cadmium results for all surface samples were nondetect. Therefore, no linear regression, outlier, or distribution analyses were conducted.

B.1.7 Calcium

Outlier analysis identified one outlier in the surface soil data set for calcium (see Table B.1-2). A review of the data and sample collection activities did not show any problems which would indicate that this result is not valid. Therefore, this concentration was retained in the data set and used in further statistical evaluations.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plots (Figures B.1-1 and B.1-2) indicate that the calcium data set in surface soil has neither a lognormal nor normal distribution.

TABLE B.1-2

OUTLIER ANALYSIS RESULTS
FOR SURFACE SOIL - CALCIUM
CANNON AIR FORCE BASE

SAMPLE	Metals CALCIUM mg/kg Result	Log Result	RL	Qual
CBSS01001	1470	7.2930	20.6	
CBSS02001	3800	8.2428	20.7	
CBSS03001	6640	8.8009	20.7	
CBSS04001	968	6.8752	20.5	
CBSB010001	1350	7.2079	20.6	
CBSB020001	1580	7.3652	20.6	
CBSB030001	2500	7.8240	20.5	
CBSB050001	44800	10.7100	20.9	
CBSB060001	3360	8.1197	20.8	
CBSB070001	3930	8.2764	20.9	
CBSB080001	2930	7.9828	20.8	
CBSB100001	1570	7.3588	20.7	
CANOFS-OFS1-0000	2220	7.7053		
CANOFS-OFS2-0000	1910	7.5549		
Number of detects	14			
Count (N)	14			
Minimum	968			
Maximum	44800			
Mean (x)	5645	7.95		
Standard deviation (sd)	11366	0.95		
Max > Min*5	Yes			
Outlier		Yes		
Tn[1]		2.918		
Critical Value[2]		2.371		

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - CALCIUM IN SURFACE SOIL

i	Calcium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	10.7100	6.8752	-3.8347	0.5251	-2.0136
2	8.8009	7.2079	-1.5930	0.3318	-0.5286
3	8.2764	7.2930	-0.9834	0.246	-0.2419
4	8.2428	7.3588	-0.8839	0.1802	-0.1593
5	8.1197	7.3652	-0.7545	0.124	-0.0936
6	7.9828	7.5549	-0.4279	0.0727	-0.0311
7	7.8240	7.7053	-0.1188	0.024	-0.0029
8	7.7053	7.8240	0.1188		-3.0709
9	7.5549	7.9828	0.4279		
10	7.3652	8.1197	0.7545		
11	7.3588	8.2428	0.8839		
12	7.2930	8.2764	0.9834		
13	7.2079	8.8009	1.5930		
14	6.8752	10.7100	3.8347		
				N	14
				StdDev	0.9456
				W	0.8113
				Wcritical	0.8740
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - CALCIUM IN SURFACE SOIL

	Calcium Result, cont.				
i	X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	44800	968	-43832.0000	0.5251	-23016.183
2	6640	1350	-5290.0000	0.3318	-1755.222
3	3930	1470	-2460.0000	0.246	-605.160
4	3800	1570	-2230.0000	0.1802	-401.846
5	3360	1580	-1780.0000	0.124	-220.720
6	2930	1910	-1020.0000	0.0727	-74.154
7	2500	2220	-280.0000	0.024	-6.720
8	2220	2500	280.0000		-26080.005
9	1910	2930	1020.0000		
10	1580	3360	1780.0000		
11	1570	3800	2230.0000		
12	1470	3930	2460.0000		
13	1350	6640	5290.0000		
14	968	44800	43832.0000		
				N	14
				StdDev	11366
				W	0.4050
				Wcritical	0.8740
					Not Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR CALCIUM IN SURFACE SOIL

CALCIUM (mg/kg)	log-transformed
1470	7.2930
3800	8.2428
6640	8.8009
968	6.8752
1350	7.2079
1580	7.3652
2500	7.8240
44800	10.7100
3360	8.1197
3930	8.2764
2930	7.9828
1570	7.3588
2220	7.7053
1910	7.5549

CALCIUM (mg/kg)		*log-transformed*	
Mean	5644.8571	Mean	7.9511945
Standard Error	3037.7618	Standard Error	0.2527256
Median	2360	Median	7.7646542
Mode	#N/A	Mode	#N/A
Standard Deviation	11366.264	Standard Deviation	0.9456125
Sample Variance	129191958	Sample Variance	0.894183
Kurtosis	13.409259	Kurtosis	5.4293097
Skewness	3.6348335	Skewness	2.0424958
Range	43832	Range	3.8347313
Minimum	968	Minimum	6.8752321
Maximum	44800	Maximum	10.709963
Sum	79028	Sum	111.31672
Count	14	Count	14
Confidence Level(95.0%)	6562.6842	Confidence Level(95.0%)	0.5459803

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL

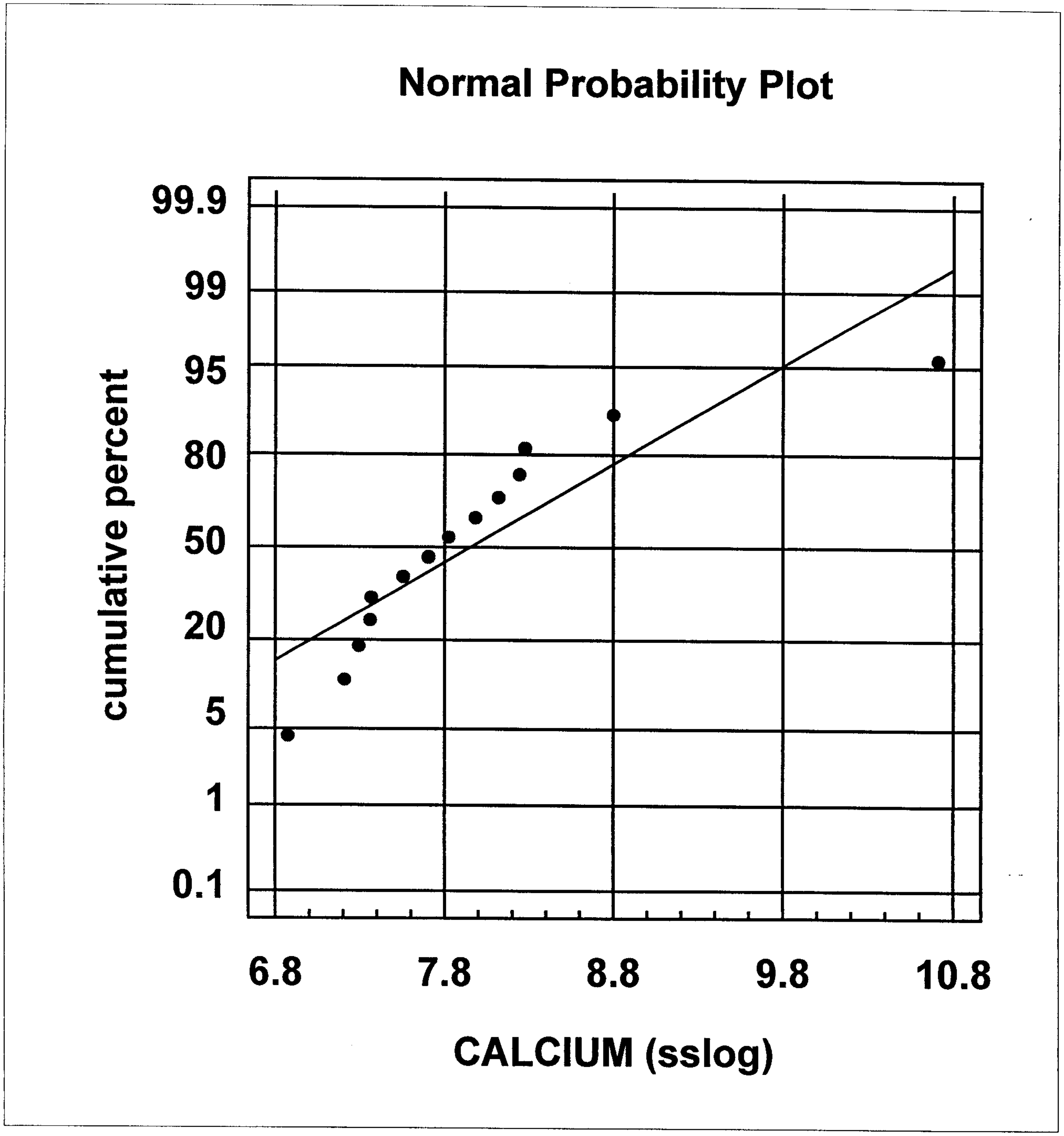
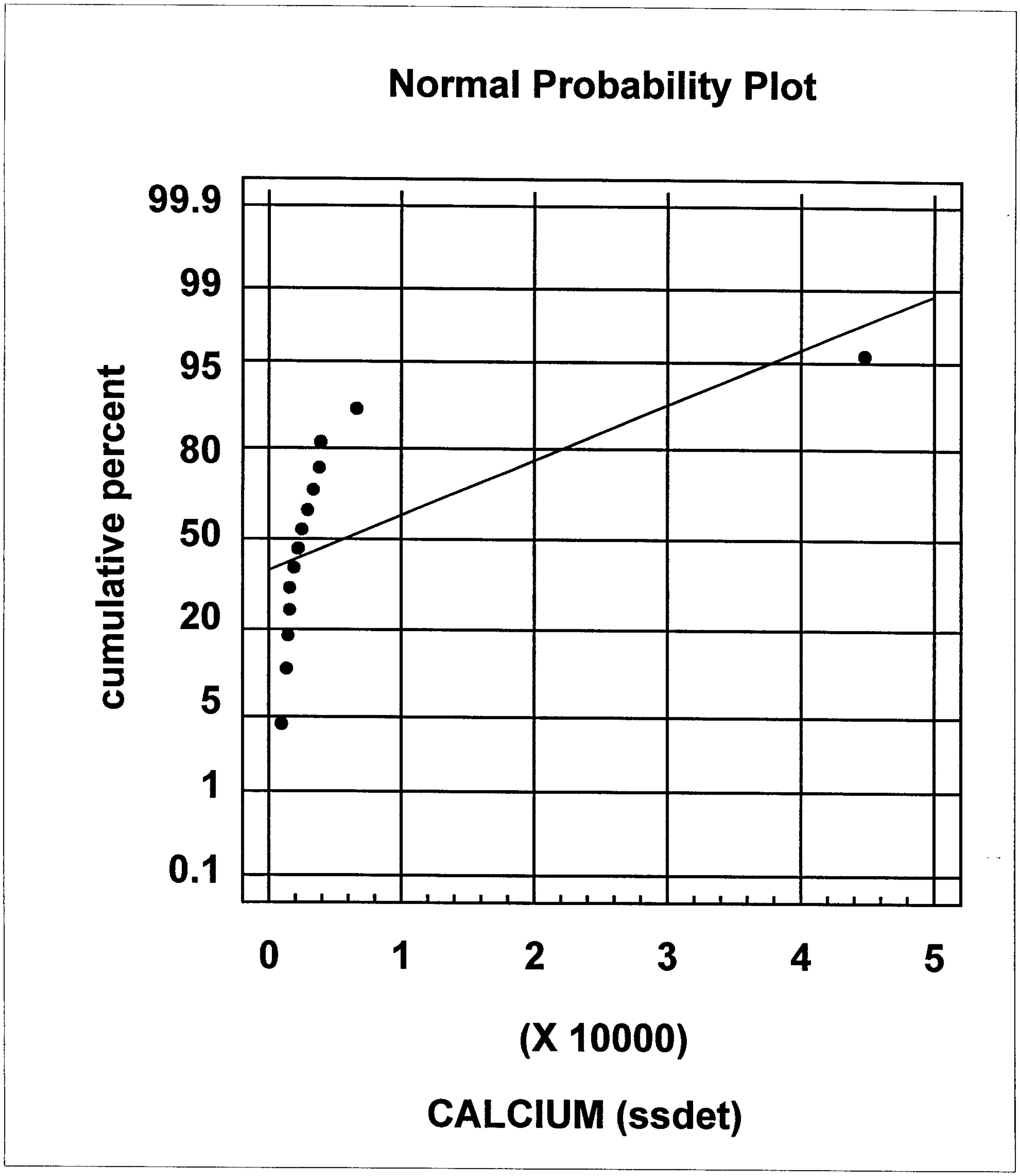


FIGURE B.1-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SURFACE SOIL



B.1.8 Chromium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -24 (Table B.1-1) indicates that chromium concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the data set for chromium (see Table B.1-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plots (Figures B.1-1 and B.1-2) indicate that the chromium data set in surface soil has neither a lognormal nor normal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR CHROMIUM IN SURFACE SOIL

CHROMIUM, TOTAL (mg/kg)	CALCIUM (mg/kg)
5.9	1470
6.6	3800
6	6640
6	968
6.5	1350
6.5	1580
6.4	2500
7.7	44800
6.6	3360
7.6	3930
10.5	2930
6.4	1570
8.6	2220
8.7	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-23.96962771
Adjusted R Square	-24.04655079
Standard Error	6.648644433
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-551.6438606	-551.64386	-12.479367	#NUM!
Residual	13	574.6581463	44.2044728		
Total	14	23.01428571			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.000276615	0.000144209	1.91815214	0.07732236	-3.49298E-05	0.00058816	-3.493E-05	0.00058816

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR CHROMIUM IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted CHROMIUM, TOTAL (mg/kg)*	*Residuals*
1	0.406623997	5.493376003
2	1.051136864	5.548863136
3	1.836723362	4.163276638
4	0.267763285	5.732236715
5	0.373430202	6.126569798
6	0.437051643	6.062948357
7	0.69153741	5.70846259
8	12.3923504	-4.692350396
9	0.92942628	5.67057372
10	1.087096809	6.512903191
11	0.810481845	9.689518155
12	0.434285494	5.965714506
13	0.614085221	7.985914779
14	0.528334582	8.171665418

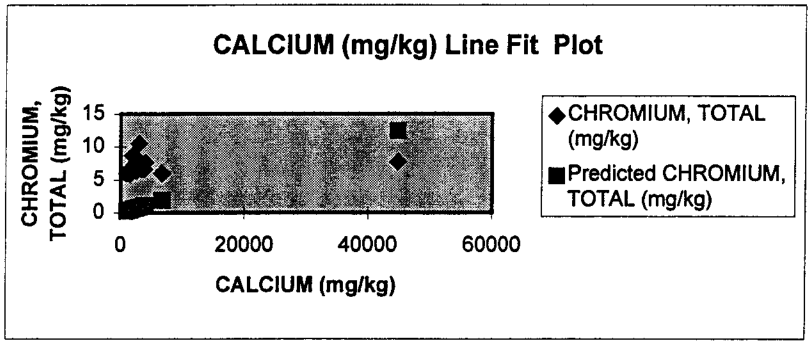


TABLE B.1-2

OUTLIER ANALYSIS RESULTS
FOR SURFACE SOIL - CHROMIUM (TOTAL)
CANNON AIR FORCE BASE

SAMPLE	Metals CHROMIUM, TOTAL mg/kg Result	RL	Qual
CBSS01001	5.9	1	
CBSS02001	6.6	1	
CBSS03001	6	1	
CBSS04001	6	1	
CBSB010001	6.5	1	
CBSB020001	6.5	1	
CBSB030001	6.4	1	
CBSB050001	7.7	1	
CBSB060001	6.6	1	
CBSB070001	7.6	1	
CBSB080001	10.5	1	
CBSB100001	6.4	1	
CANOFS-OFS1-0000	8.6		
CANOFS-OFS2-0000	8.7		
Number of detects	14		
Count (N)	14		
Minimum	5.9		
Maximum	10.5		
Mean (x)	7.1		
Standard deviation (sd)	1.3		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - CHROMIUM IN SURFACE SOIL

	Chromium Log Result				
i	X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	2.3514	1.7750	-0.5764	0.5251	-0.3027
2	2.1633	1.7918	-0.3716	0.3318	-0.1233
3	2.1518	1.7918	-0.3600	0.246	-0.0886
4	2.0412	1.8563	-0.1849	0.1802	-0.0333
5	2.0281	1.8563	-0.1719	0.124	-0.0213
6	1.8871	1.8718	-0.0153	0.0727	-0.0011
7	1.8871	1.8718	-0.0153	0.024	-0.0004
8	1.8718	1.8871	0.0153		-0.5706
9	1.8718	1.8871	0.0153		
10	1.8563	2.0281	0.1719		
11	1.8563	2.0412	0.1849		
12	1.7918	2.1518	0.3600		
13	1.7918	2.1633	0.3716		
14	1.7750	2.3514	0.5764		
				N	14
				StdDev	0.1710
				W	0.8566
				Wcritical	0.8740
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - CHROMIUM IN SURFACE SOIL

i	Chromium Result, cont. X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	10.5	5.9	-4.6000	0.5251	-2.4155
2	8.7	6	-2.7000	0.3318	-0.8959
3	8.6	6	-2.6000	0.246	-0.6396
4	7.7	6.4	-1.3000	0.1802	-0.2343
5	7.6	6.4	-1.2000	0.124	-0.1488
6	6.6	6.5	-0.1000	0.0727	-0.0073
7	6.6	6.5	-0.1000	0.024	-0.0024
8	6.5	6.6	0.1000		-4.3437
9	6.5	6.6	0.1000		
10	6.4	7.6	1.2000		
11	6.4	7.7	1.3000		
12	6	8.6	2.6000		
13	6	8.7	2.7000		
14	5.9	10.5	4.6000		
				N	14
				StdDev	1
				W	0.8198
				Wcritical	0.8740
					Not Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR CHROMIUM IN SURFACE SOIL

CHROMIUM, TOTAL (mg/kg)	log-transformed
5.9	1.7750
6.6	1.8871
6	1.7918
6	1.7918
6.5	1.8718
6.5	1.8718
6.4	1.8563
7.7	2.0412
6.6	1.8871
7.6	2.0281
10.5	2.3514
6.4	1.8563
8.6	2.1518
8.7	2.1633

CHROMIUM, TOTAL (mg/kg)	
Mean	7.1428571
Standard Error	0.3556011
Median	6.55
Mode	6.6
Standard Deviation	1.3305374
Sample Variance	1.7703297
Kurtosis	1.8003608
Skewness	1.4629514
Range	4.6
Minimum	5.9
Maximum	10.5
Sum	100
Count	14
Confidence Level(95.0%)	0.7682293

log-transformed	
Mean	1.95176
Standard Error	0.0457017
Median	1.8794359
Mode	1.8870696
Standard Deviation	0.1710002
Sample Variance	0.0292411
Kurtosis	0.7067483
Skewness	1.1742201
Range	0.5764229
Minimum	1.7749524
Maximum	2.3513753
Sum	27.32464
Count	14
Confidence Level(95.0%)	0.0987326

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL

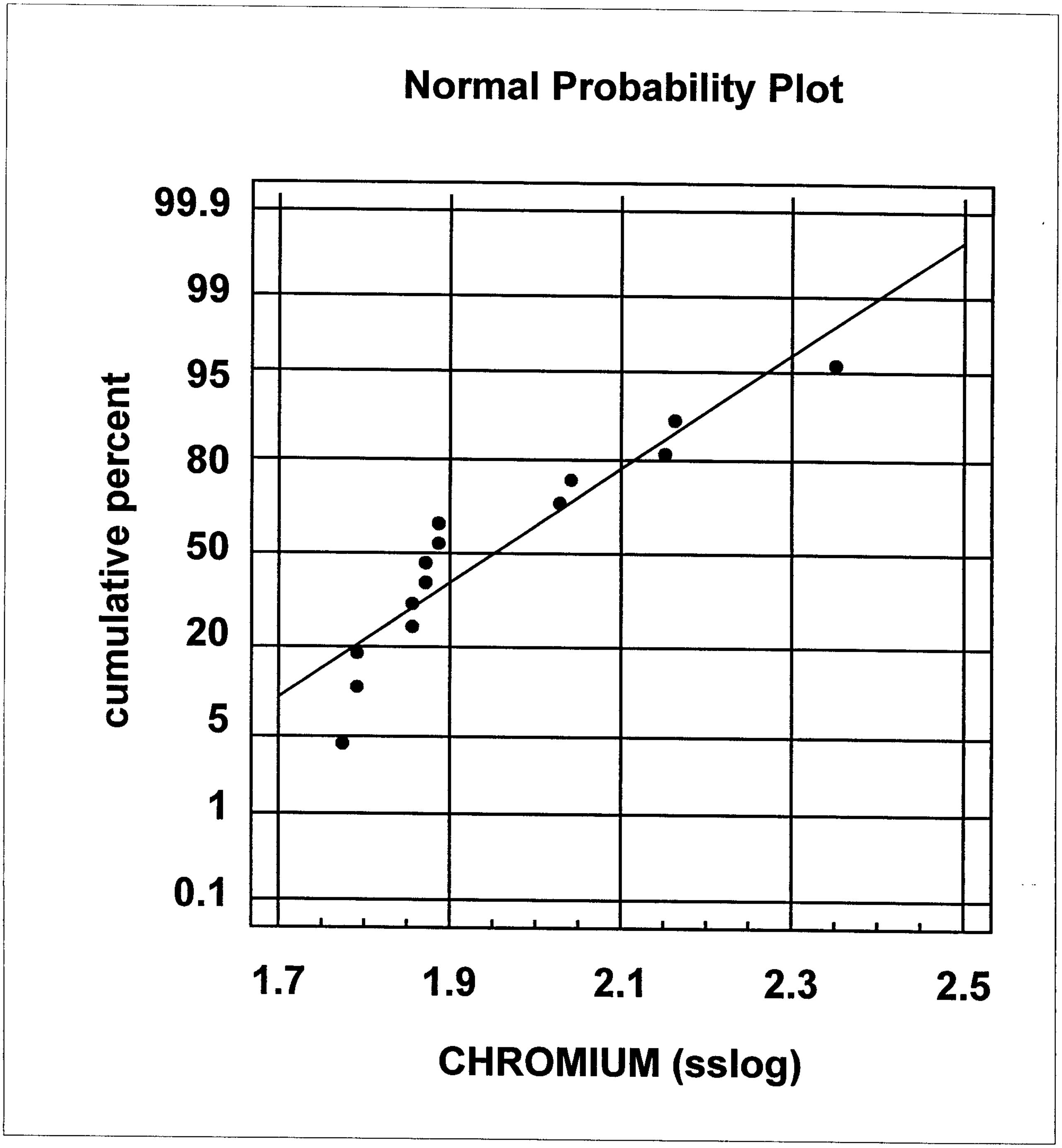
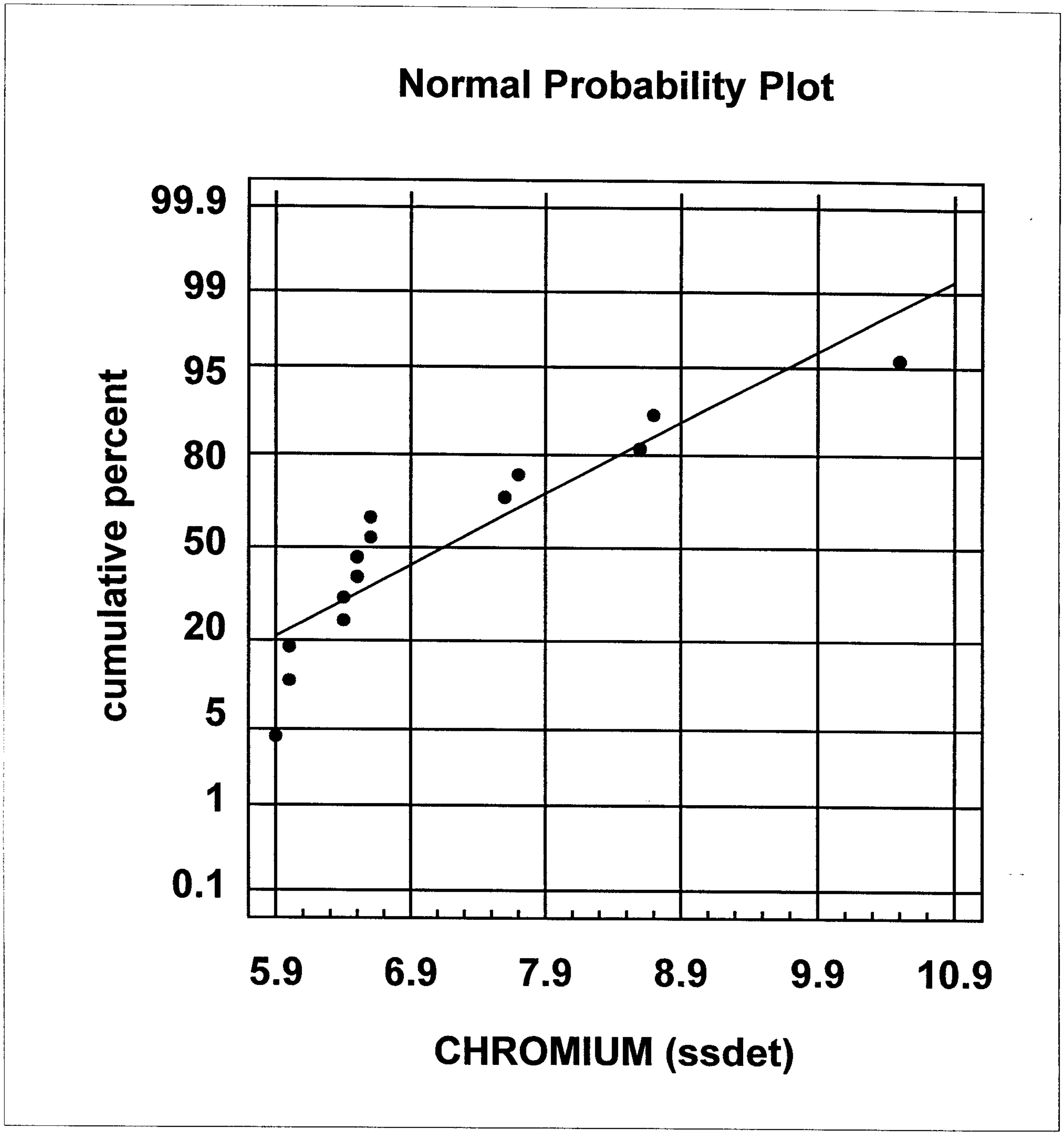


FIGURE B.1-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SURFACE SOIL



B.1.9 Cobalt

A nonlinear regression line fit plot and coefficient of determination (R^2) of -5.3 (Table B.1-1) indicates that cobalt concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the data set for cobalt (see Table B.1-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plot (Figure B.1-1) indicate that the cobalt data set in surface soil has a lognormal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR COBALT IN SURFACE SOIL

COBALT (mg/kg)	CALCIUM (mg/kg)
2.7	1470
2.8	3800
2.9	6640
2.5	968
1.8	1350
1.9	1580
1.9	2500
4.5	44800
3.3	3360
3.9	3930
5.3	2930
1.8	1570
2.7	2220
2.7	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-5.274859149
Adjusted R Square	-5.351782225
Standard Error	2.617041331
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-74.84648356	-74.846484	-10.92824	#NUM!
Residual	13	89.03576928	6.84890533		
Total	14	14.18928571			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.000143013	5.67636E-05	2.51944784	0.02563072	2.03827E-05	0.00026564	2.0383E-05	0.00026564

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR COBALT IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted COBALT (mg/kg)*	*Residuals*
1	0.210229085	2.489770915
2	0.543449336	2.256550664
3	0.949606208	1.950393792
4	0.138436568	2.361563432
5	0.193067527	1.606932473
6	0.225960513	1.674039487
7	0.357532458	1.542467542
8	6.406981646	-1.906981646
9	0.480523623	2.819476377
10	0.562041024	3.337958976
11	0.419028041	4.880971959
12	0.224530384	1.575469616
13	0.317488823	2.382511177
14	0.273154798	2.426845202

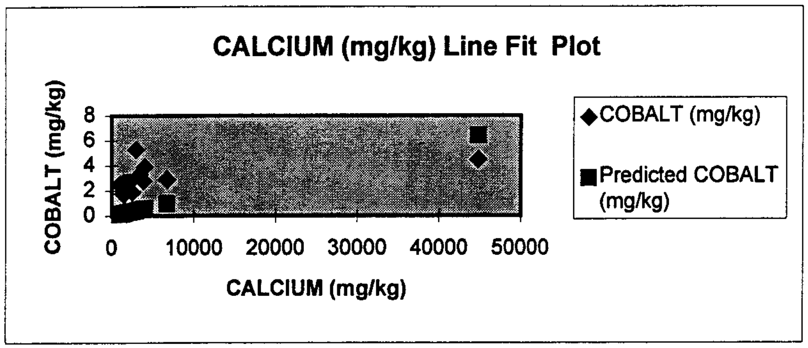


TABLE B.1-2

OUTLIER ANALYSIS RESULTS FOR SURFACE SOIL - COBALT CANNON AIR FORCE BASE

SAMPLE	Metals COBALT mg/kg Result	RL	Qual
CBSS01001	2.7	1	
CBSS02001	2.8	1	
CBSS03001	2.9	1	
CBSS04001	2.5	1	
CBSB010001	1.8	1	
CBSB020001	1.9	1	
CBSB030001	1.9	1	
CBSB050001	4.5	1	
CBSB060001	3.3	1	
CBSB070001	3.9	1	
CBSB080001	5.3	1	
CBSB100001	1.8	1	
CANOFS-OFS1-0000	2.7		J
CANOFS-OFS2-0000	2.7		J
Number of detects	14		
Count (N)	14		
Minimum	1.8		
Maximum	5.3		
Mean (x)	2.9		
Standard deviation (sd)	1.0		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - COBALT IN SURFACE SOIL

i	Cobalt Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	1.6677	0.5878	-1.0799	0.5251	-0.5671
2	1.5041	0.5878	-0.9163	0.3318	-0.3040
3	1.3610	0.6419	-0.7191	0.246	-0.1769
4	1.1939	0.6419	-0.5521	0.1802	-0.0995
5	1.0647	0.9163	-0.1484	0.124	-0.0184
6	1.0296	0.9933	-0.0364	0.0727	-0.0026
7	0.9933	0.9933	0.0000	0.024	0.0000
8	0.9933	0.9933	0.0000		-1.1685
9	0.9933	1.0296	0.0364		
10	0.9163	1.0647	0.1484		
11	0.6419	1.1939	0.5521		
12	0.6419	1.3610	0.7191		
13	0.5878	1.5041	0.9163		
14	0.5878	1.6677	1.0799		
				N	14
				StdDev	0.3367
				W	0.9262
				Wcritical	0.8740
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR COBALT IN SURFACE SOIL

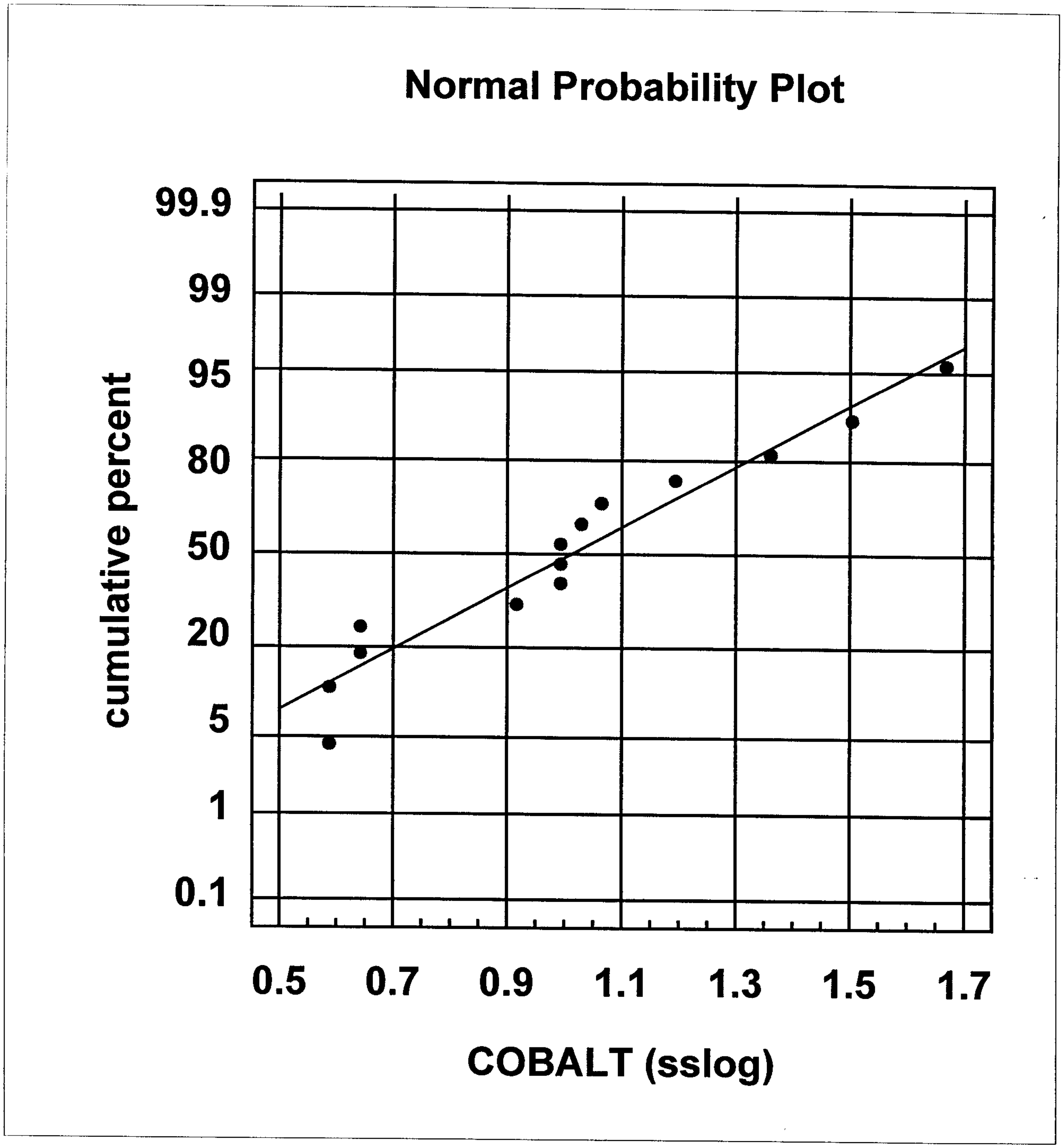
COBALT (mg/kg)	log-transformed
2.7	0.9933
2.8	1.0296
2.9	1.0647
2.5	0.9163
1.8	0.5878
1.9	0.6419
1.9	0.6419
4.5	1.5041
3.3	1.1939
3.9	1.3610
5.3	1.6677
1.8	0.5878
2.7	0.9933
2.7	0.9933

COBALT (mg/kg)	
Mean	2.9071429
Standard Error	0.2792187
Median	2.7
Mode	2.7
Standard Deviation	1.0447409
Sample Variance	1.0914835
Kurtosis	0.8137969
Skewness	1.0962149
Range	3.5
Minimum	1.8
Maximum	5.3
Sum	40.7
Count	14
Confidence Level(95.0%)	0.6032153

log-transformed	
Mean	1.0125958
Standard Error	0.09
Median	0.9932518
Mode	0.9932518
Standard Deviation	0.3367493
Sample Variance	0.1134001
Kurtosis	-0.402046
Skewness	0.4514722
Range	1.0799202
Minimum	0.5877867
Maximum	1.6677068
Sum	14.176341
Count	14
Confidence Level(95.0%)	0.1944332

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL



B.1.10 Copper

A nonlinear regression line fit plot and coefficient of determination (R^2) of -1.9 (Table B.1-1) indicates that copper concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the data set for copper (see Table B.1-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plots (Figures B.1-1 and B.1-2) indicate that the copper data set in surface soil has neither a lognormal nor normal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR COPPER IN SURFACE SOIL

COPPER (mg/kg)	CALCIUM (mg/kg)
4.3	1470
4.9	3800
4.1	6640
3.8	968
4.1	1350
4.3	1580
4.6	2500
7	44800
5.2	3360
6.4	3930
9.7	2930
3.7	1570
18.3	2220
15.3	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-1.916310002
Adjusted R Square	-1.993233079
Standard Error	7.779645655
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-517.0053819	-517.00538	-8.542312	#NUM!
Residual	13	786.7975247	60.5228865		
Total	14	269.7921429			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.000254035	0.00016874	1.50547543	0.15610763	-0.000110507	0.00061858	-0.0001105	0.00061858

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR COPPER IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted COPPER (mg/kg)*	*Residuals*
1	0.373430972	3.926569028
2	0.965331765	3.934668235
3	1.686790242	2.413209758
4	0.245905565	3.554094435
5	0.342946811	3.757053189
6	0.401374787	3.898625213
7	0.635086688	3.964913312
8	11.38075344	-4.38075344
9	0.853556508	4.346443492
10	0.998356273	5.401643727
11	0.744321598	8.955678402
12	0.39883444	3.30116556
13	0.563956979	17.73604302
14	0.485206229	14.81479377

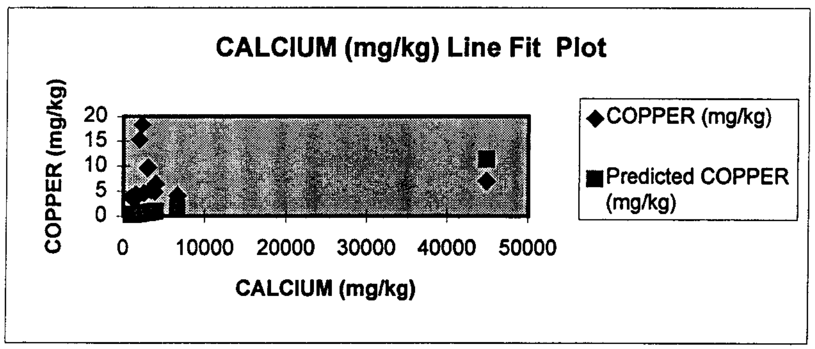


TABLE B.1-2

OUTLIER ANALYSIS RESULTS FOR SURFACE SOIL - COPPER CANNON AIR FORCE BASE

SAMPLE	Metals COPPER mg/kg Result	RL	Qual
CBSS01001	4.3	2.1	
CBSS02001	4.9	2.1	
CBSS03001	4.1	2.1	
CBSS04001	3.8	2.1	
CBSB010001	4.1	2.1	
CBSB020001	4.3	2.1	
CBSB030001	4.6	2.1	
CBSB050001	7	2.1	
CBSB060001	5.2	2.1	
CBSB070001	6.4	2.1	
CBSB080001	9.7	2.1	
CBSB100001	3.7	2.1	
CANOFS-OFS1-0000	18.3		
CANOFS-OFS2-0000	15.3		
Number of detects	14		
Count (N)	14		
Minimum	3.7		
Maximum	18.3		
Mean (x)	6.8		
Standard deviation (sd)	4.6		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - COPPER IN SURFACE SOIL

i	Copper Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	2.9069	1.3083	-1.5986	0.5251	-0.8394
2	2.7279	1.3350	-1.3929	0.3318	-0.4621
3	2.2721	1.4110	-0.8611	0.246	-0.2118
4	1.9459	1.4110	-0.5349	0.1802	-0.0964
5	1.8563	1.4586	-0.3977	0.124	-0.0493
6	1.6487	1.4586	-0.1900	0.0727	-0.0138
7	1.5892	1.5261	-0.0632	0.024	-0.0015
8	1.5261	1.5892	0.0632		-1.6744
9	1.4586	1.6487	0.1900		
10	1.4586	1.8563	0.3977		
11	1.4110	1.9459	0.5349		
12	1.4110	2.2721	0.8611		
13	1.3350	2.7279	1.3929		
14	1.3083	2.9069	1.5986		
				N	14
				StdDev	0.5160
				W	0.8101
				Wcritical	0.8740
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - COPPER IN SURFACE SOIL

i	Copper Result, cont. X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	18.3	3.7	-14.6000	0.5251	-7.6665
2	15.3	3.8	-11.5000	0.3318	-3.8157
3	9.7	4.1	-5.6000	0.246	-1.3776
4	7	4.1	-2.9000	0.1802	-0.5226
5	6.4	4.3	-2.1000	0.124	-0.2604
6	5.2	4.3	-0.9000	0.0727	-0.0654
7	4.9	4.6	-0.3000	0.024	-0.0072
8	4.6	4.9	0.3000		-13.7154
9	4.3	5.2	0.9000		
10	4.3	6.4	2.1000		
11	4.1	7	2.9000		
12	4.1	9.7	5.6000		
13	3.8	15.3	11.5000		
14	3.7	18.3	14.6000		
				N	14
				StdDev	5
				W	0.6972
				Wcritical	0.8740
					Not Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR COPPER IN SURFACE SOIL

COPPER (mg/kg)	log-transformed
4.3	1.4586
4.9	1.5892
4.1	1.4110
3.8	1.3350
4.1	1.4110
4.3	1.4586
4.6	1.5261
7	1.9459
5.2	1.6487
6.4	1.8563
9.7	2.2721
3.7	1.3083
18.3	2.9069
15.3	2.7279

COPPER (mg/kg)	
Mean	6.8357143
Standard Error	1.217528
Median	4.75
Mode	4.3
Standard Deviation	4.5555726
Sample Variance	20.753242
Kurtosis	2.6648779
Skewness	1.8808328
Range	14.6
Minimum	3.7
Maximum	18.3
Sum	95.7
Count	14
Confidence Level(95.0%)	2.6303088

log-transformed	
Mean	1.7753983
Standard Error	0.1379025
Median	1.5576458
Mode	1.458615
Standard Deviation	0.5159838
Sample Variance	0.2662393
Kurtosis	0.7684573
Skewness	1.3516816
Range	1.5985682
Minimum	1.3083328
Maximum	2.9069011
Sum	24.855576
Count	14
Confidence Level(95.0%)	0.2979201

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL

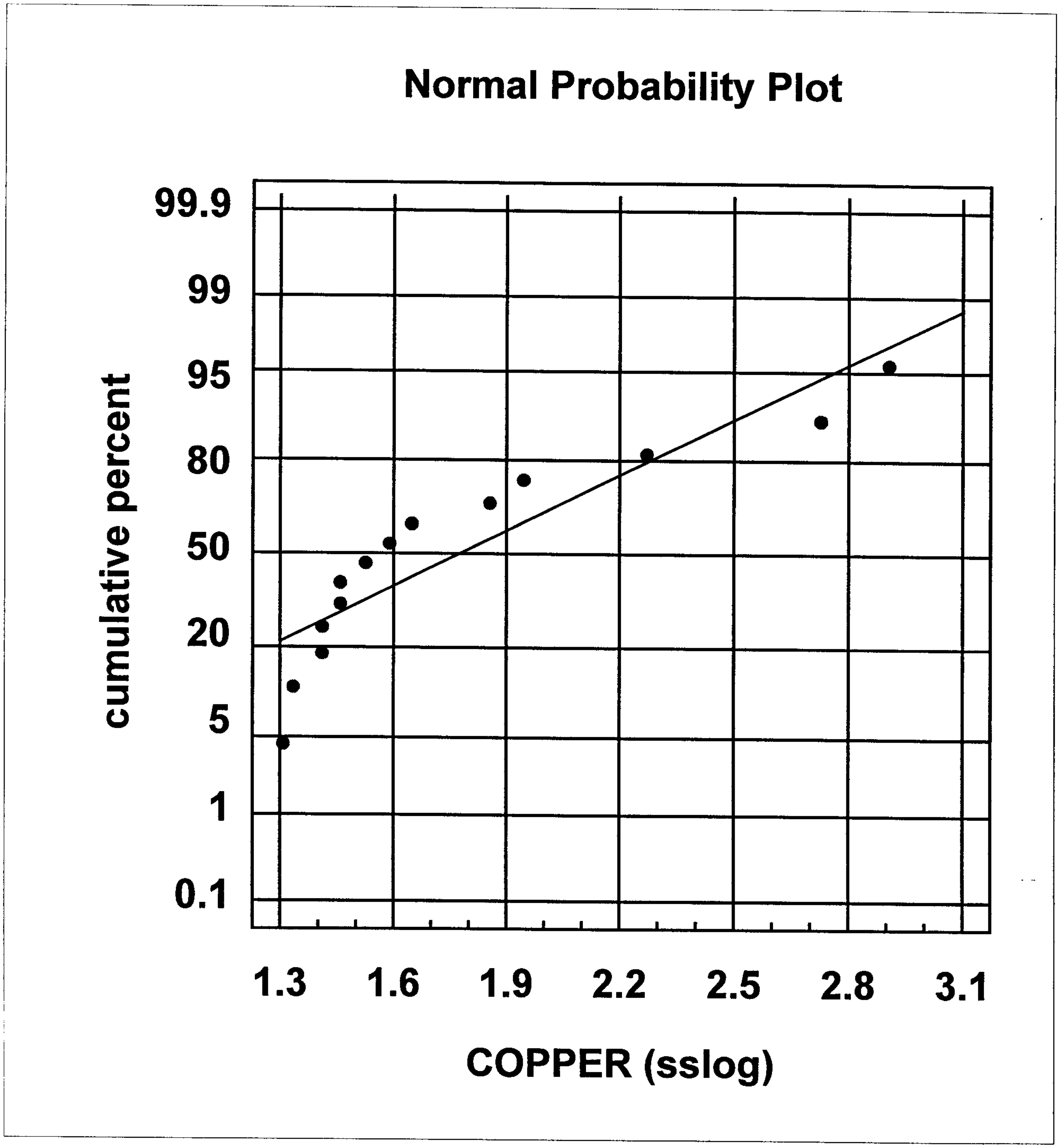
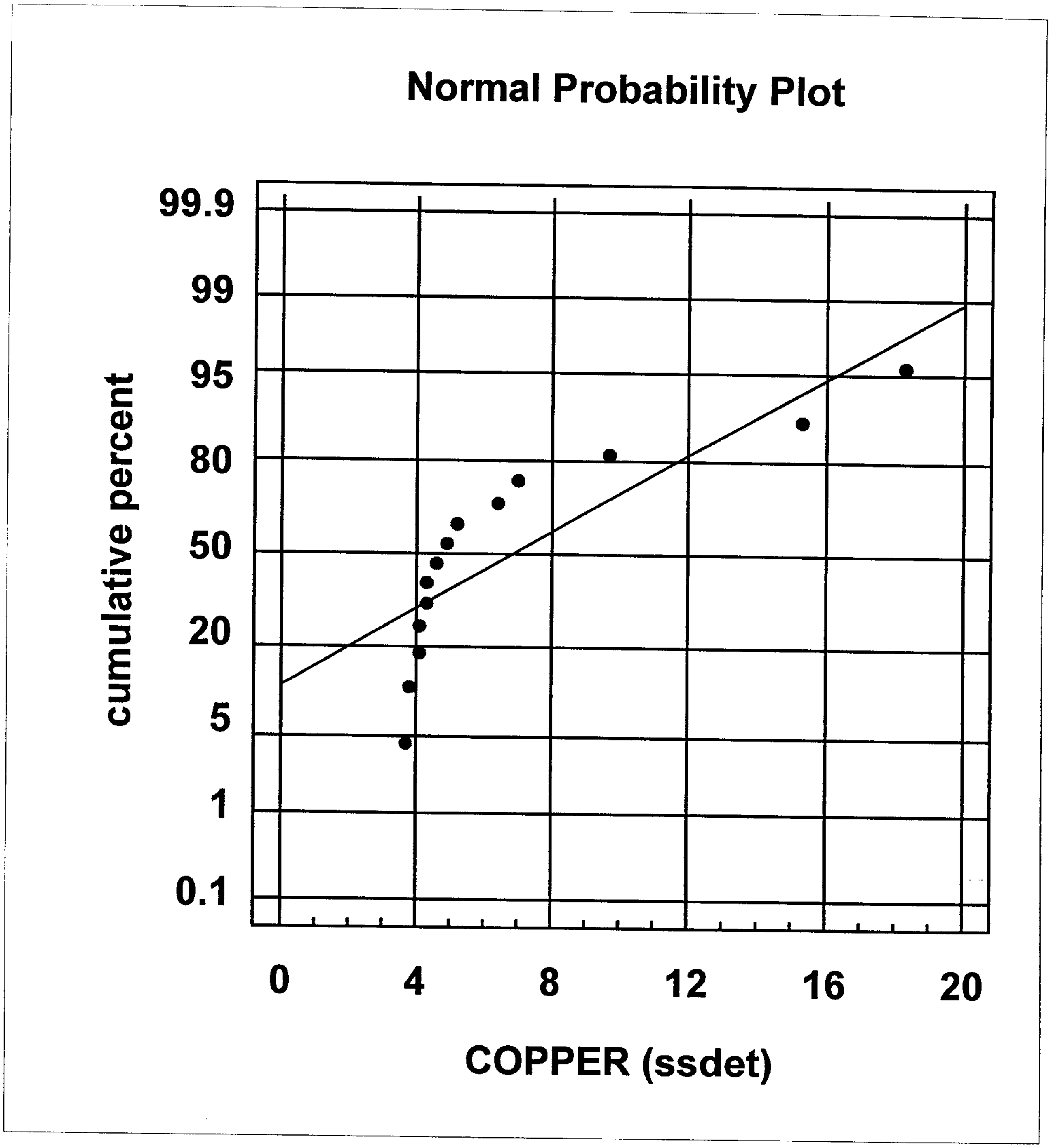


FIGURE B.1-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SURFACE SOIL



B.1.11 Iron

A nonlinear regression line fit plot and coefficient of determination (R^2) of -19.1 (Table B.1-1) indicates that iron concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the data set for iron (see Table B.1-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plots (Figures B.1-1 and B.1-2) indicate that the iron data set in surface soil has neither a lognormal nor normal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR IRON IN SURFACE SOIL

IRON (mg/kg)	CALCIUM (mg/kg)
5480	1470
6400	3800
5530	6640
5440	968
5680	1350
5920	1580
5670	2500
6840	44800
5660	3360
6270	3930
10100	2930
5550	1570
7860	2220
8010	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-19.16556267
Adjusted R Square	-19.24248575
Standard Error	6057.398145
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-453342903.9	-453342904	-12.355337	#NUM!
Residual	13	476996939.7	36692072.3		
Total	14	23654035.71			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.24779051	0.131384954	1.88598848	0.08183651	-0.036049372	0.53163039	-0.0360494	0.53163039

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR IRON IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted IRON (mg/kg)*	*Residuals*
1	364.2520496	5115.74795
2	941.6039377	5458.396062
3	1645.328986	3884.671014
4	239.8612136	5200.138786
5	334.5171884	5345.482812
6	391.5090057	5528.490994
7	619.4762748	5050.523725
8	11101.01484	-4261.014844
9	832.5761133	4827.423887
10	973.8167039	5296.183296
11	726.026194	9373.973806
12	389.0311006	5160.968899
13	550.094932	7309.905068
14	473.2798739	7536.720126

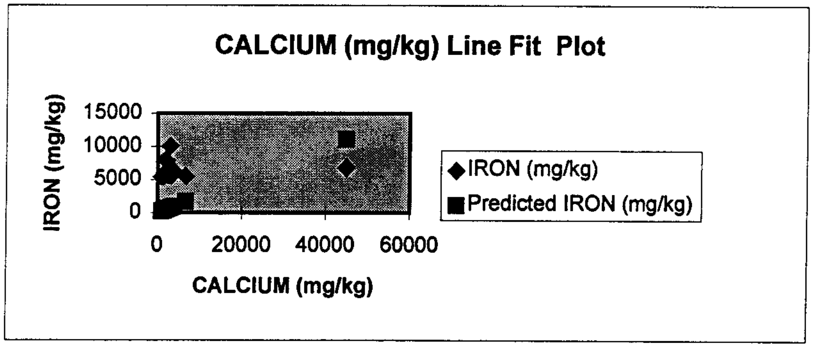


TABLE B.1-2

OUTLIER ANALYSIS RESULTS
FOR SURFACE SOIL - IRON
CANNON AIR FORCE BASE

SAMPLE	Metals IRON mg/kg Result	RL	Qual
CBSS01001	5480	10.3	
CBSS02001	6400	10.3	
CBSS03001	5530	10.3	
CBSS04001	5440	10.3	
CBSB010001	5680	10.3	
CBSB020001	5920	10.3	
CBSB030001	5670	10.3	
CBSB050001	6840	10.5	
CBSB060001	5660	10.4	
CBSB070001	6270	10.4	
CBSB080001	10100	10.4	
CBSB100001	5550	10.4	
CANOFS-OFS1-0000	7860		
CANOFS-OFS2-0000	8010		
Number of detects	14		
Count (N)	14		
Minimum	5440		
Maximum	10100		
Mean (x)	6458		
Standard deviation (sd)	1349		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - IRON IN SURFACE SOIL

i	Iron Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	9.2203	8.6015	-0.6188	0.5251	-0.3249
2	8.9884	8.6089	-0.3796	0.3318	-0.1259
3	8.9695	8.6179	-0.3516	0.246	-0.0865
4	8.8305	8.6216	-0.2090	0.1802	-0.0377
5	8.7641	8.6412	-0.1229	0.124	-0.0152
6	8.7435	8.6429	-0.1006	0.0727	-0.0073
7	8.6861	8.6447	-0.0414	0.024	-0.0010
8	8.6447	8.6861	0.0414		-0.5986
9	8.6429	8.7435	0.1006		
10	8.6412	8.7641	0.1229		
11	8.6216	8.8305	0.2090		
12	8.6179	8.9695	0.3516		
13	8.6089	8.9884	0.3796		
14	8.6015	9.2203	0.6188		
				N	14
				StdDev	0.1854
				W	0.8017
				Wcritical	0.8740
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - IRON IN SURFACE SOIL

i	Iron Result, cont. X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	10100	5440	-4660.0000	0.5251	-2446.9660
2	8010	5480	-2530.0000	0.3318	-839.4540
3	7860	5530	-2330.0000	0.246	-573.1800
4	6840	5550	-1290.0000	0.1802	-232.4580
5	6400	5660	-740.0000	0.124	-91.7600
6	6270	5670	-600.0000	0.0727	-43.6200
7	5920	5680	-240.0000	0.024	-5.7600
8	5680	5920	240.0000		-4233.1980
9	5670	6270	600.0000		
10	5660	6400	740.0000		
11	5550	6840	1290.0000		
12	5530	7860	2330.0000		
13	5480	8010	2530.0000		
14	5440	10100	4660.0000		
				N	14
				StdDev	1349
				W	0.7576
				Wcritical	0.8740
					Not Normal

X(i) = Detected values; descending order
X(n-i+1) = Detected values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR IRON IN SURFACE SOIL

IRON (mg/kg)	log-transformed
5480	8.6089
6400	8.7641
5530	8.6179
5440	8.6015
5680	8.6447
5920	8.6861
5670	8.6429
6840	8.8305
5660	8.6412
6270	8.7435
10100	9.2203
5550	8.6216
7860	8.9695
8010	8.9884

IRON (mg/kg)	
Mean	6457.8571
Standard Error	360.50968
Median	5800
Mode	#N/A
Standard Deviation	1348.9037
Sample Variance	1819541.2
Kurtosis	3.1935461
Skewness	1.8172192
Range	4660
Minimum	5440
Maximum	10100
Sum	90410
Count	14
Confidence Level(95.0%)	778.83366

log-transformed	
Mean	8.7558014
Standard Error	0.0495506
Median	8.6653991
Mode	#N/A
Standard Deviation	0.1854014
Sample Variance	0.0343737
Kurtosis	1.73398
Skewness	1.4990229
Range	0.6187564
Minimum	8.6015343
Maximum	9.2202907
Sum	122.58122
Count	14
Confidence Level(95.0%)	0.1070475

TABLE B.1-1
PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL

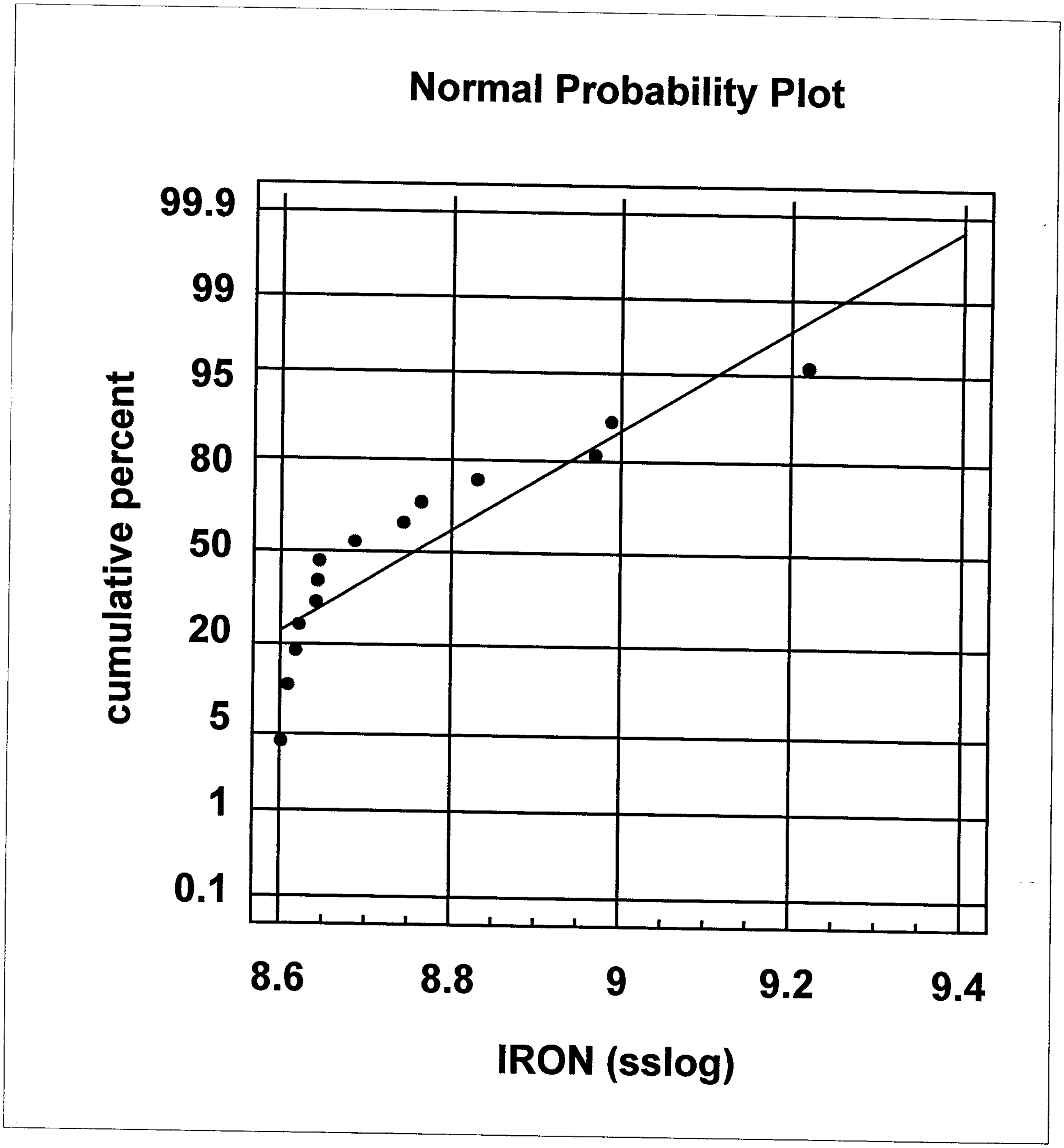
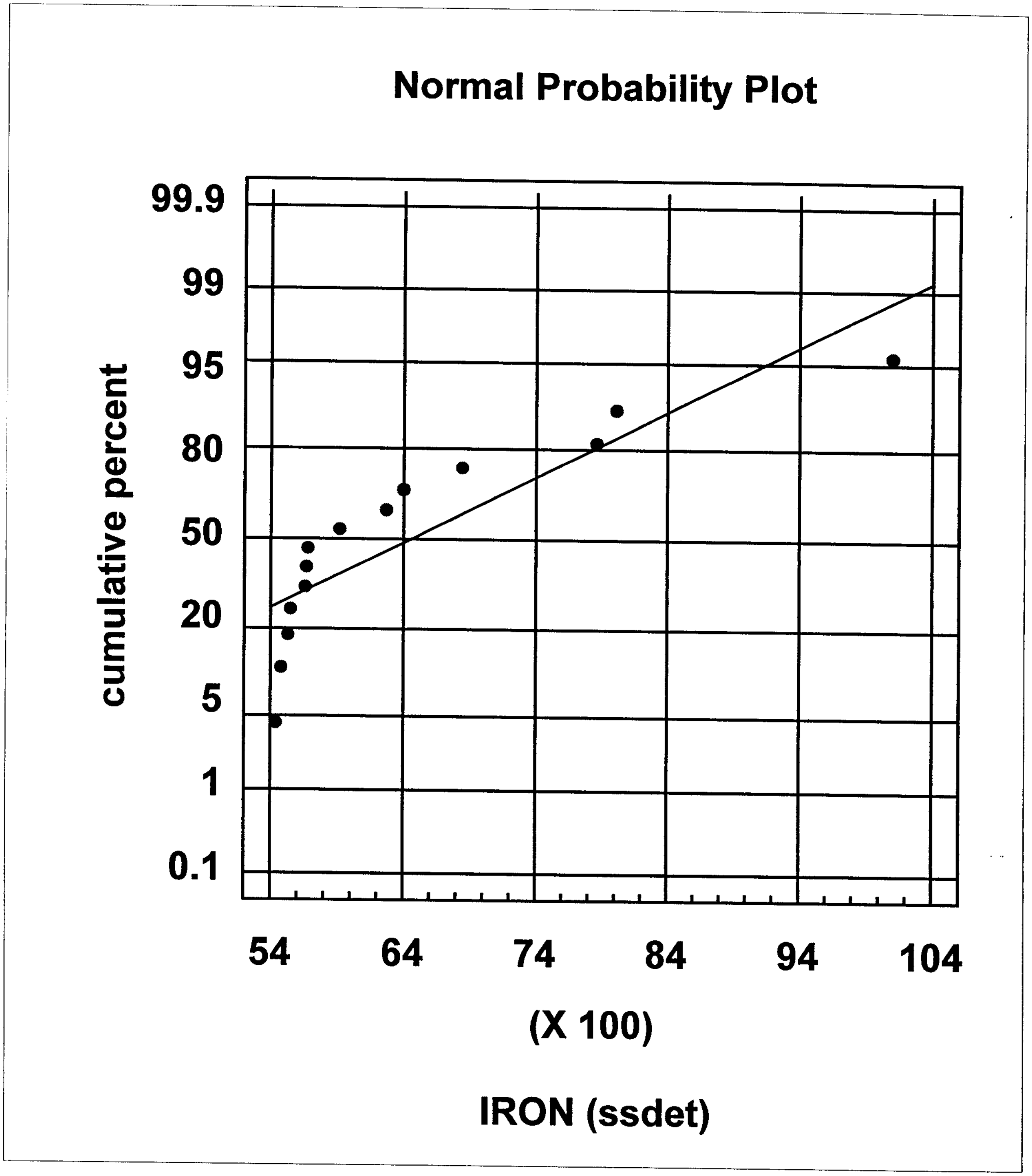


FIGURE B.1-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SURFACE SOIL



B.1.12 Lead

A nonlinear regression line fit plot and coefficient of determination (R^2) of -13.2 (Table B.1-1) indicates that lead concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the data set for lead (see Table B.1-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plot (Figure B.1-1) indicate that the lead data set in surface soil has a lognormal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR LEAD IN SURFACE SOIL

LEAD (mg/kg)	CALCIUM (mg/kg)
5.6	1470
7.1	3800
7.4	6640
5.2	968
5.7	1350
6.3	1580
6.2	2500
8.5	44800
5.9	3360
6.6	3930
10	2930
4.9	1570
5.7	2220
10	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-13.20942975
Adjusted R Square	-13.28635282
Standard Error	6.212424367
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-466.415529	-466.41553	-12.085115	#NUM!
Residual	13	501.7248147	38.5942165		
Total	14	35.30928571			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.000290666	0.000134747	2.15711917	0.05029789	-4.37803E-07	0.00058177	-4.378E-07	0.00058177

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR LEAD IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted LEAD (mg/kg)*	*Residuals*
1	0.427279544	5.172720456
2	1.104532154	5.995467846
3	1.930024606	5.469975394
4	0.281365033	4.918634967
5	0.392399581	5.307600419
6	0.459252843	5.840747157
7	0.726665891	5.473334109
8	13.02185276	-4.521852761
9	0.976638957	4.923361043
10	1.14231878	5.45768122
11	0.851652424	9.148347576
12	0.456346179	4.443653821
13	0.645279311	5.054720689
14	0.55517274	9.44482726

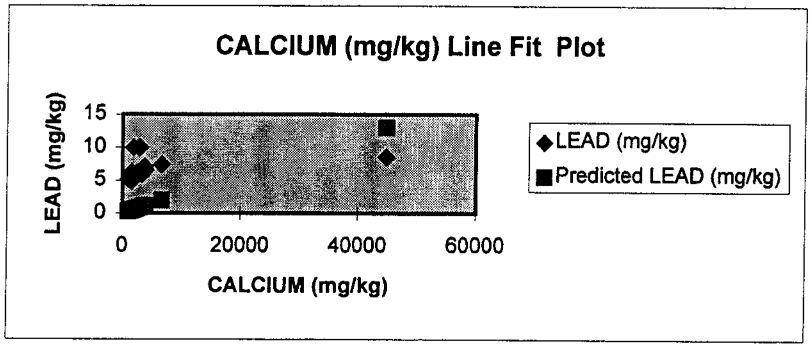


TABLE B.1-2

OUTLIER ANALYSIS RESULTS FOR SURFACE SOIL - LEAD CANNON AIR FORCE BASE

SAMPLE	Metals LEAD mg/kg Result	RL	Qual
CBSS01001	5.6	0.31	
CBSS02001	7.1	0.31	
CBSS03001	7.4	0.31	
CBSS04001	5.2	0.31	
CBSB010001	5.7	0.31	
CBSB020001	6.3	0.31	
CBSB030001	6.2	0.31	
CBSB050001	8.5	0.31	
CBSB060001	5.9	0.31	
CBSB070001	6.6	0.31	
CBSB080001	10	0.31	
CBSB100001	4.9	0.31	
CANOFS-OFS1-0000	5.7		
CANOFS-OFS2-0000	10		
Number of detects	14		
Count (N)	14		
Minimum	4.9		
Maximum	10		
Mean (x)	6.8		
Standard deviation (sd)	1.6		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - LEAD IN SURFACE SOIL

i	Lead Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	2.3026	1.5892	-0.7133	0.5251	-0.3746
2	2.3026	1.6487	-0.6539	0.3318	-0.2170
3	2.1401	1.7228	-0.4173	0.246	-0.1027
4	2.0015	1.7405	-0.2610	0.1802	-0.0470
5	1.9601	1.7405	-0.2196	0.124	-0.0272
6	1.8871	1.7750	-0.1121	0.0727	-0.0082
7	1.8405	1.8245	-0.0160	0.024	-0.0004
8	1.8245	1.8405	0.0160		-0.7770
9	1.7750	1.8871	0.1121		
10	1.7405	1.9601	0.2196		
11	1.7405	2.0015	0.2610		
12	1.7228	2.1401	0.4173		
13	1.6487	2.3026	0.6539		
14	1.5892	2.3026	0.7133		
				N	14
				StdDev	0.2256
				W	0.9125
				Wcritical	0.8740
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR LEAD IN SURFACE SOIL

LEAD (mg/kg)	log-transformed
5.6	1.7228
7.1	1.9601
7.4	2.0015
5.2	1.6487
5.7	1.7405
6.3	1.8405
6.2	1.8245
8.5	2.1401
5.9	1.7750
6.6	1.8871
10	2.3026
4.9	1.5892
5.7	1.7405
10	2.3026

LEAD (mg/kg)	
Mean	6.7928571
Standard Error	0.4404623
Median	6.25
Mode	5.7
Standard Deviation	1.6480591
Sample Variance	2.7160989
Kurtosis	0.2266867
Skewness	1.1031895
Range	5.1
Minimum	4.9
Maximum	10
Sum	95.1
Count	14
Confidence Level(95.0%)	0.9515608

log-transformed	
Mean	1.8911089
Standard Error	0.0602958
Median	1.8325495
Mode	1.7404662
Standard Deviation	0.2256063
Sample Variance	0.0508982
Kurtosis	-0.291069
Skewness	0.7899731
Range	0.7133499
Minimum	1.5892352
Maximum	2.3025851
Sum	26.475525
Count	14
Confidence Level(95.0%)	0.1302612

B.1.13 Magnesium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -4.5 (Table B.1-1) indicates that magnesium concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the data set for magnesium (see Table B.1-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3) and probability plots (Figures B.1-1 and B.1-2) indicate that the magnesium data set in surface soil has neither a lognormal or normal distribution. The coefficient of skewness indicated that the distribution may be lognormal. However, since two of three tests indicated the same result, and the Shapiro-Wilk test is considered to be one of the best tests for normality, it was concluded that the magnesium data set has neither a lognormal nor normal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR MAGNESIUM IN SURFACE SOIL

MAGNESIUM (mg/kg)	CALCIUM (mg/kg)
754	1470
933	3800
839	6640
696	968
784	1350
792	1580
811	2500
1930	44800
966	3360
1120	3930
1700	2930
804	1570
1390	2220
1410	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-4.548447638
Adjusted R Square	-4.625370715
Standard Error	918.4436265
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-8989593.823	-8989593.8	-10.657002	#NUM!
Residual	13	10966003.04	843538.695		
Total	14	1976409.214			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.057098902	0.01992104	2.86626104	0.01323771	0.014062119	0.10013569	0.01406212	0.10013569

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR MAGNESIUM IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted MAGNESIUM (mg/kg)*	*Residuals*
1	83.93538623	670.0646138
2	216.9758283	716.0241717
3	379.1367106	459.8632894
4	55.27173733	640.7282627
5	77.08351796	706.916482
6	90.21626547	701.7837345
7	142.7472555	668.2527445
8	2558.030818	-628.0308184
9	191.8523114	774.1476886
10	224.3986856	895.6013144
11	167.2997834	1532.700217
12	89.64527645	714.3547236
13	126.7595629	1263.240437
14	109.0589032	1300.941097

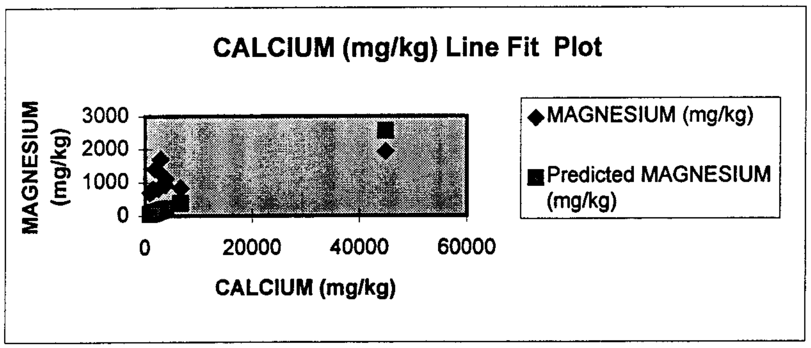


TABLE B.1-2

OUTLIER ANALYSIS RESULTS
FOR SURFACE SOIL - MAGNESIUM
CANNON AIR FORCE BASE

SAMPLE	Metals MAGNESIUM mg/kg		
	Result	RL	Qual
CBSS01001	754	20.6	
CBSS02001	933	20.7	
CBSS03001	839	20.7	
CBSS04001	696	20.5	
CBSB010001	784	20.6	
CBSB020001	792	20.6	
CBSB030001	811	20.5	
CBSB050001	1930	20.9	
CBSB060001	966	20.8	
CBSB070001	1120	20.9	
CBSB080001	1700	20.8	
CBSB100001	804	20.7	
CANOFS-OFS1-0000	1390		
CANOFS-OFS2-0000	1410		
Number of detects	14		
Count (N)	14		
Minimum	696		
Maximum	1930		
Mean (x)	1066		
Standard deviation (sd)	390		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - MAGNESIUM IN SURFACE SOIL

i	Magnesium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	7.5653	6.5453	-1.0199	0.5251	-0.5356
2	7.4384	6.6254	-0.8130	0.3318	-0.2698
3	7.2513	6.6644	-0.5869	0.246	-0.1444
4	7.2371	6.6746	-0.5625	0.1802	-0.1014
5	7.0211	6.6896	-0.3315	0.124	-0.0411
6	6.8732	6.6983	-0.1749	0.0727	-0.0127
7	6.8384	6.7322	-0.1062	0.024	-0.0025
8	6.7322	6.8384	0.1062		-1.1074
9	6.6983	6.8732	0.1749		
10	6.6896	7.0211	0.3315		
11	6.6746	7.2371	0.5625		
12	6.6644	7.2513	0.5869		
13	6.6254	7.4384	0.8130		
14	6.5453	7.5653	1.0199		
				N	14
				StdDev	0.3287
				W	0.8731
				Wcritical	0.8740
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - MAGNESIUM IN SURFACE SOIL

	Magnesium Result, cont.				
i	X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	1930	696	-1234.0000	0.5251	-647.9734
2	1700	754	-946.0000	0.3318	-313.8828
3	1410	784	-626.0000	0.246	-153.9960
4	1390	792	-598.0000	0.1802	-107.7596
5	1120	804	-316.0000	0.124	-39.1840
6	966	811	-155.0000	0.0727	-11.2685
7	933	839	-94.0000	0.024	-2.2560
8	839	933	94.0000		-1276.3203
9	811	966	155.0000		
10	804	1120	316.0000		
11	792	1390	598.0000		
12	784	1410	626.0000		
13	754	1700	946.0000		
14	696	1930	1234.0000		
				N	14
				StdDev	390
				W	0.8242
				Wcritical	0.8740
					Not Normal

X(i) = Detected values; descending order
X(n-i+1) = Detected values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR MAGNESIUM IN SURFACE SOIL

MAGNESIUM (mg/kg)	log-transformed
754	6.6254
933	6.8384
839	6.7322
696	6.5453
784	6.6644
792	6.6746
811	6.6983
1930	7.5653
966	6.8732
1120	7.0211
1700	7.4384
804	6.6896
1390	7.2371
1410	7.2513

MAGNESIUM (mg/kg)	
Mean	1066.3571
Standard Error	104.2084
Median	886
Mode	#N/A
Standard Deviation	389.91214
Sample Variance	152031.48
Kurtosis	0.3677874
Skewness	1.2095252
Range	1234
Minimum	696
Maximum	1930
Sum	14929
Count	14
Confidence Level(95.0%)	225.12852

log-transformed	
Mean	6.918179
Standard Error	0.0878522
Median	6.785308
Mode	#N/A
Standard Deviation	0.3287129
Sample Variance	0.1080522
Kurtosis	-0.570689
Skewness	0.8714541
Range	1.0199256
Minimum	6.5453497
Maximum	7.5652753
Sum	96.854506
Count	14
Confidence Level(95.0%)	0.1897931

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL

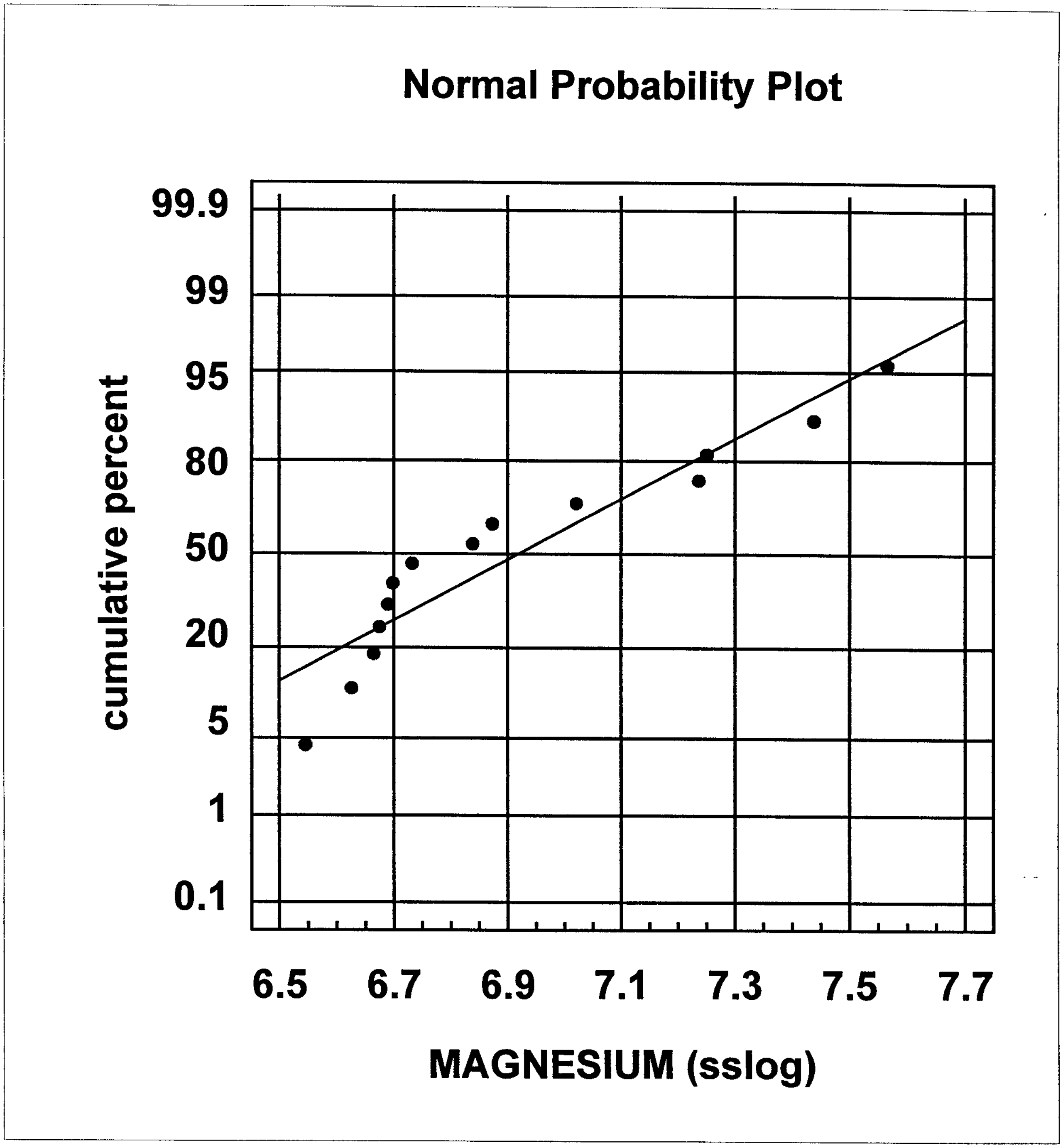
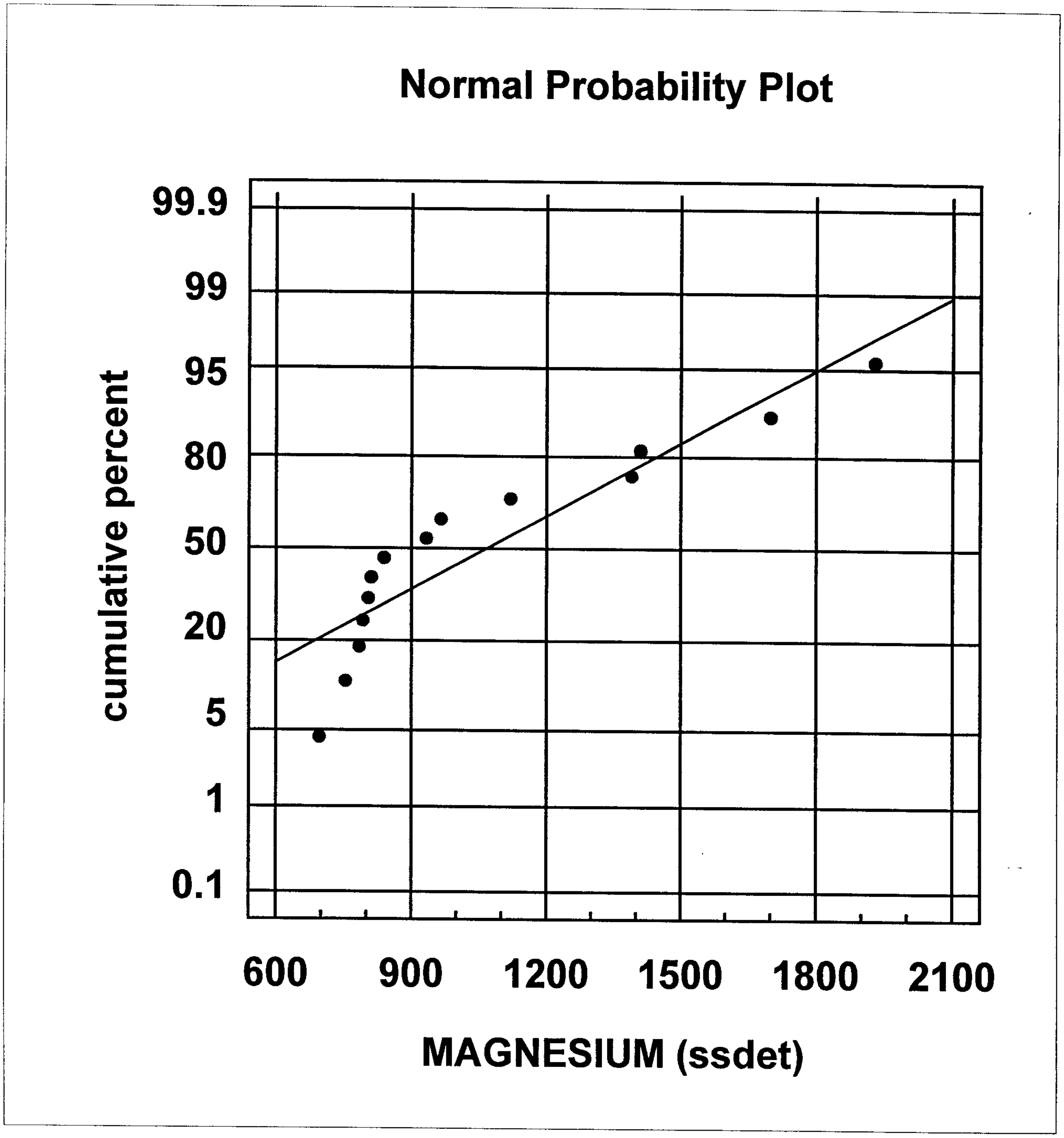


FIGURE B.1-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SURFACE SOIL



B.1.14 Manganese

A nonlinear regression line fit plot and coefficient of determination (R^2) of -5.7 (Table B.1-1) indicates that manganese concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the data set for manganese (see Table B.1-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plot (Figure B.1-1) indicate that the manganese data set in surface soil has a lognormal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR MANGANESE IN SURFACE SOIL

MANGANESE (mg/kg)	CALCIUM (mg/kg)
115	1470
127	3800
93.3	6640
105	968
99.4	1350
103	1580
122	2500
181	44800
132	3360
183	3930
275	2930
85.1	1570
150	2220
172	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-5.733977067
Adjusted R Square	-5.810900144
Standard Error	131.6855859
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-191957.0875	-191957.09	-11.069491	#NUM!
Residual	13	225434.2161	17341.0935		
Total	14	33477.12857			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.006044004	0.00285626	2.11605533	0.05420808	-0.000126569	0.01221458	-0.0001266	0.01221458

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR MANGANESE IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted MANGANESE (mg/kg)*	*Residuals*
1	8.884686486	106.1153135
2	22.96721677	104.0327832
3	40.1321893	53.1678107
4	5.850596271	99.14940373
5	8.159405956	91.24059404
6	9.549526971	93.45047303
7	15.11001103	106.889989
8	270.7713977	-89.77139766
9	20.30785482	111.6921452
10	23.75293734	159.2470627
11	17.70893293	257.2910671
12	9.489086927	75.61091307
13	13.41768979	136.5823102
14	11.54404843	160.4559516

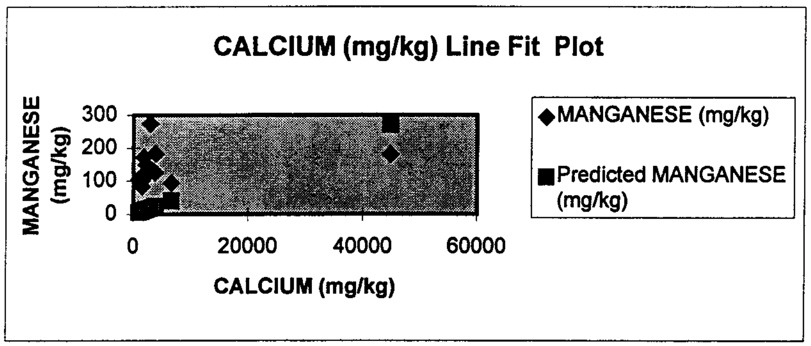


TABLE B.1-2

OUTLIER ANALYSIS RESULTS
FOR SURFACE SOIL - MANGANESE
CANNON AIR FORCE BASE

SAMPLE	Metals MANGANESE mg/kg Result	RL	Qual
CBSS01001	115	1	
CBSS02001	127	1	
CBSS03001	93.3	1	
CBSS04001	105	1	
CBSB010001	99.4	1	
CBSB020001	103	1	
CBSB030001	122	1	
CBSB050001	181	1	
CBSB060001	132	1	
CBSB070001	183	1	
CBSB080001	275	1	
CBSB100001	85.1	1	
CANOFS-OFS1-0000	150		
CANOFS-OFS2-0000	172		
Number of detects	14		
Count (N)	14		
Minimum	85.1		
Maximum	275		
Mean (x)	139		
Standard deviation (sd)	51		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - MANGANESE IN SURFACE SOIL

i	Manganese Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	5.6168	4.4438	-1.1729	0.5251	-0.6159
2	5.2095	4.5358	-0.6737	0.3318	-0.2235
3	5.1985	4.5992	-0.5993	0.246	-0.1474
4	5.1475	4.6347	-0.5128	0.1802	-0.0924
5	5.0106	4.6540	-0.3567	0.124	-0.0442
6	4.8828	4.7449	-0.1379	0.0727	-0.0100
7	4.8442	4.8040	-0.0402	0.024	-0.0010
8	4.8040	4.8442	0.0402		-1.1345
9	4.7449	4.8828	0.1379		
10	4.6540	5.0106	0.3567		
11	4.6347	5.1475	0.5128		
12	4.5992	5.1985	0.5993		
13	4.5358	5.2095	0.6737		
14	4.4438	5.6168	1.1729		
				N	14
				StdDev	0.3241
				W	0.9425
				Wcritical	0.8740
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

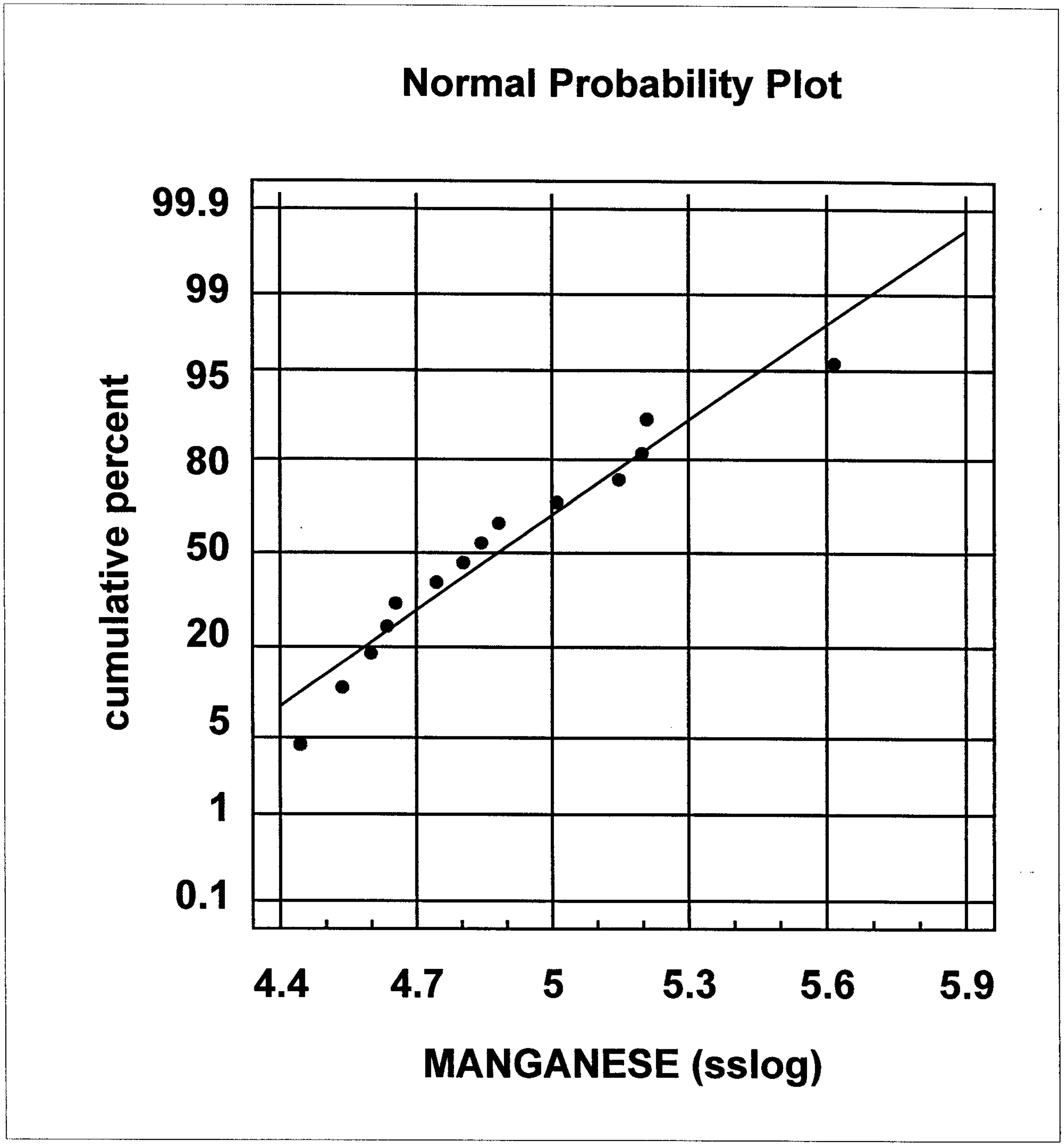
SUMMARY STATISTICS FOR MANGANESE IN SURFACE SOIL

MANGANESE (mg/kg)	log-transformed
115	4.7449
127	4.8442
93.3	4.5358
105	4.6540
99.4	4.5992
103	4.6347
122	4.8040
181	5.1985
132	4.8828
183	5.2095
275	5.6168
85.1	4.4438
150	5.0106
172	5.1475

MANGANESE (mg/kg)		*log-transformed*	
Mean	138.77143	Mean	4.8804511
Standard Error	13.562458	Standard Error	0.0866212
Median	124.5	Median	4.8241041
Mode	#N/A	Mode	#N/A
Standard Deviation	50.746071	Standard Deviation	0.324107
Sample Variance	2575.1637	Sample Variance	0.1050454
Kurtosis	3.0052419	Kurtosis	0.4248348
Skewness	1.5891647	Skewness	0.8234336
Range	189.9	Range	1.1729441
Minimum	85.1	Minimum	4.443827
Maximum	275	Maximum	5.6167711
Sum	1942.8	Sum	68.326315
Count	14	Count	14
Confidence Level(95.0%)	29.299904	Confidence Level(95.0%)	0.1871338

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL



B.1.15 Mercury

Due to the large number of nondetects (i.e., greater than 30 percent) in the mercury subsurface soil data set, regression analysis was not conducted.

The outlier analysis was not applicable because mercury was detected in only one surface soil sample (see Table B.1-2).

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plots (Figures B.1-1 and B.1-2) indicate that the mercury data set in surface soil has neither a lognormal nor normal distribution.

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - MERCURY IN SURFACE SOIL

i	Mercury Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	-2.8824	-4.0745	-1.1921	0.5251	-0.6260
2	-2.9004	-4.0745	-1.1741	0.3318	-0.3896
3	-2.9004	-4.0745	-1.1741	0.246	-0.2888
4	-4.0745	-4.0745	0.0000	0.1802	0.0000
5	-4.0745	-4.0745	0.0000	0.124	0.0000
6	-4.0745	-4.0745	0.0000	0.0727	0.0000
7	-4.0745	-4.0745	0.0000	0.024	0.0000
8	-4.0745	-4.0745	0.0000		-1.3044
9	-4.0745	-4.0745	0.0000		
10	-4.0745	-4.0745	0.0000		
11	-4.0745	-4.0745	0.0000		
12	-4.0745	-2.9004	1.1741		
13	-4.0745	-2.9004	1.1741		
14	-4.0745	-2.8824	1.1921		
				N	14
				StdDev	0.5025
				W	0.5183
				Wcritical	0.8740
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - MERCURY IN SURFACE SOIL

i	Mercury Result, cont. X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	0.056	0.017	-0.0390	0.5251	-0.0205
2	0.055	0.017	-0.0380	0.3318	-0.0126
3	0.055	0.017	-0.0380	0.246	-0.0093
4	0.017	0.017	0.0000	0.1802	0.0000
5	0.017	0.017	0.0000	0.124	0.0000
6	0.017	0.017	0.0000	0.0727	0.0000
7	0.017	0.017	0.0000	0.024	0.0000
8	0.017	0.017	0.0000		-0.0424
9	0.017	0.017	0.0000		
10	0.017	0.017	0.0000		
11	0.017	0.017	0.0000		
12	0.017	0.055	0.0380		
13	0.017	0.055	0.0380		
14	0.017	0.056	0.0390		
				N	14
				StdDev	0
				W	0.5198
				Wcritical	0.8740
					Not Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR MERCURY IN SURFACE SOIL

MERCURY (mg/kg)	log-transformed
0.017	-4.0745
0.017	-4.0745
0.017	-4.0745
0.017	-4.0745
0.017	-4.0745
0.017	-4.0745
0.017	-4.0745
0.056	-2.8824
0.017	-4.0745
0.017	-4.0745
0.017	-4.0745
0.017	-4.0745
0.055	-2.9004
0.055	-2.9004

MERCURY (mg/kg)	
Mean	0.0252143
Standard Error	0.0043629
Median	0.017
Mode	0.017
Standard Deviation	0.0163245
Sample Variance	0.0002665
Kurtosis	0.5060058
Skewness	1.5664193
Range	0.039
Minimum	0.017
Maximum	0.056
Sum	0.353
Count	14
Confidence Level(95.0%)	0.0094255

log-transformed	
Mean	-3.821658
Standard Error	0.1343074
Median	-4.074542
Mode	-4.074542
Standard Deviation	0.5025323
Sample Variance	0.2525387
Kurtosis	0.5029567
Skewness	1.5658958
Range	1.1921383
Minimum	-4.074542
Maximum	-2.882404
Sum	-53.50321
Count	14
Confidence Level(95.0%)	0.2901535

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL

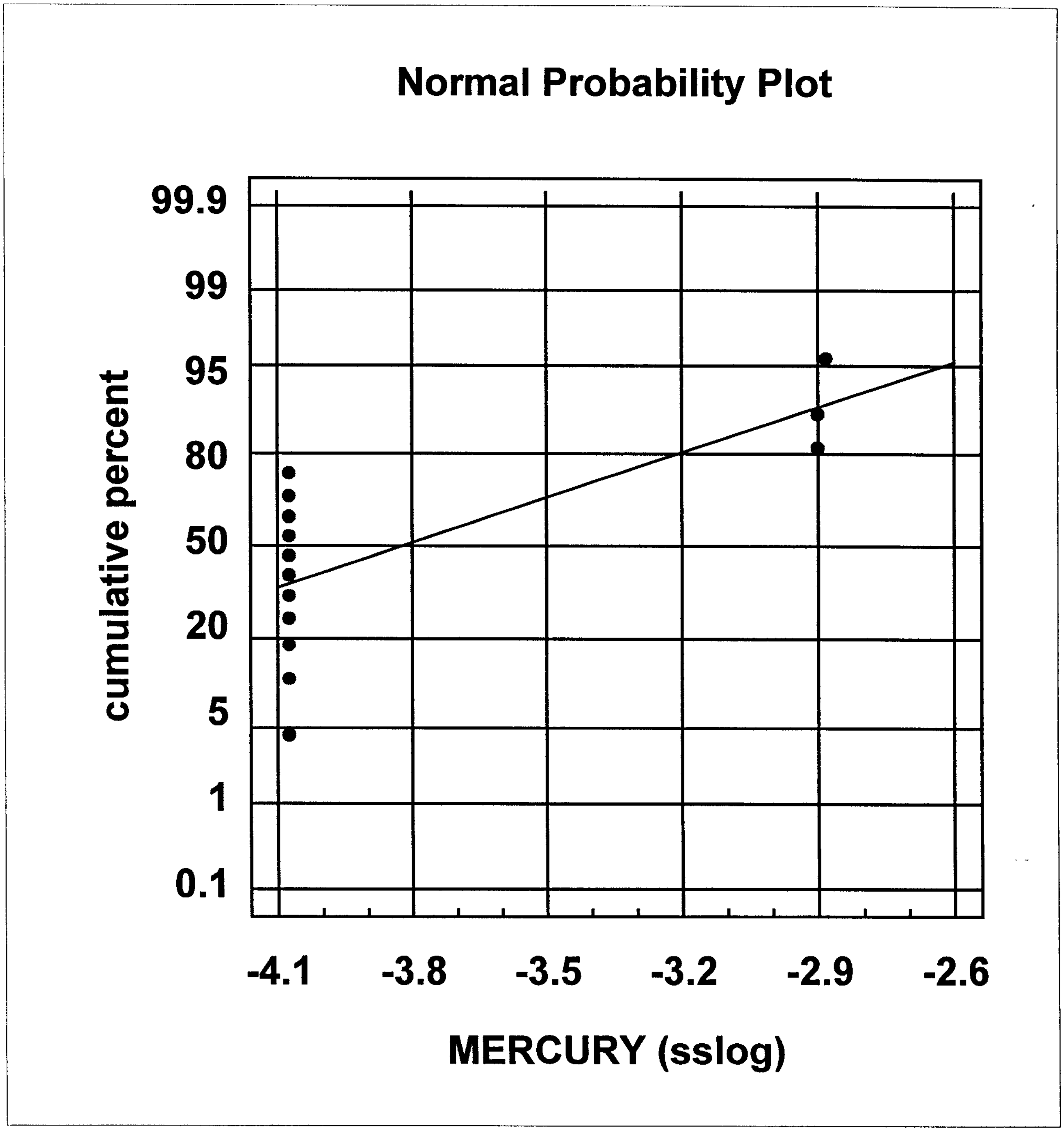
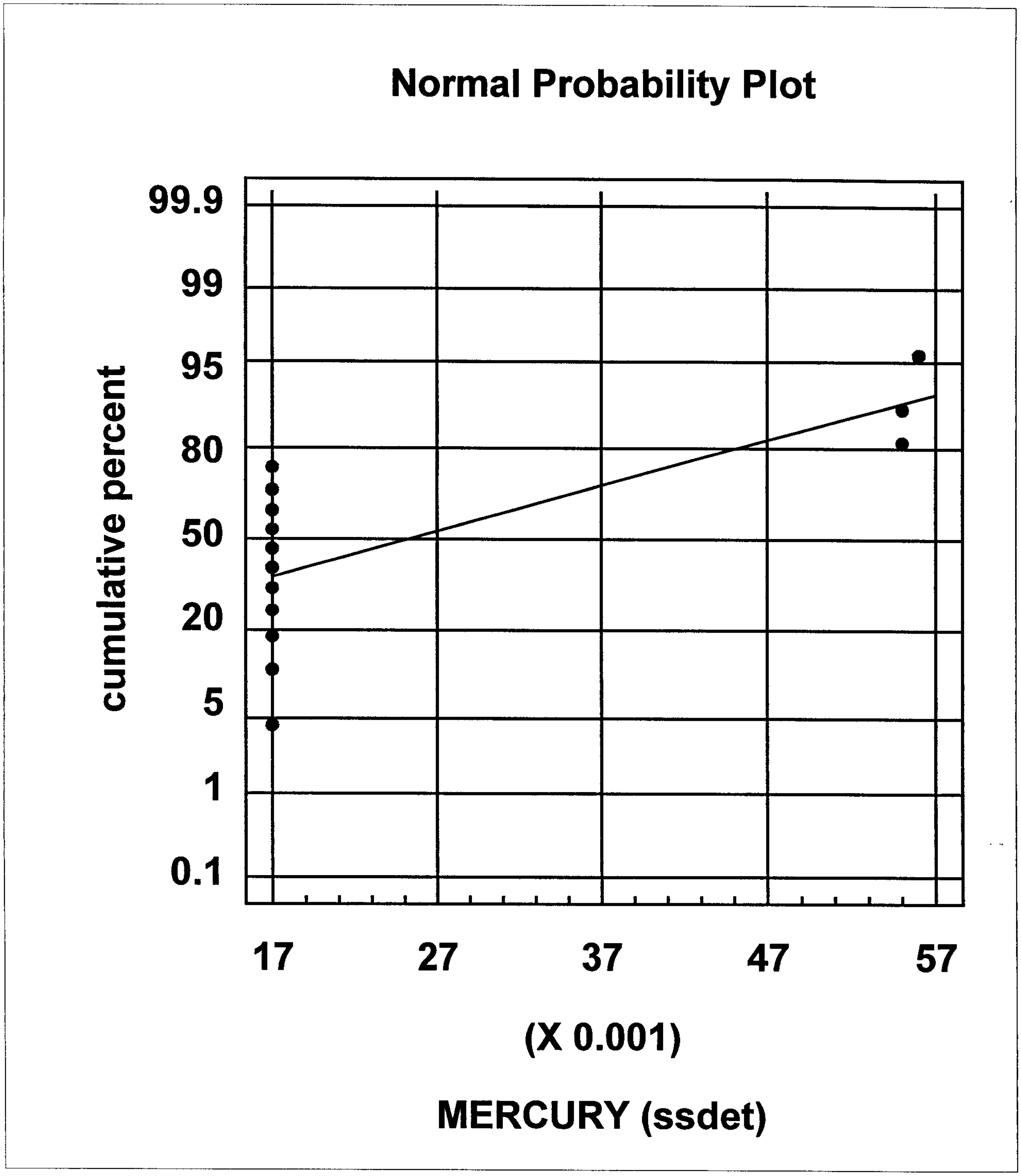


FIGURE B.1-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SURFACE SOIL



B.1.16 Nickel

A nonlinear regression line fit plot and coefficient of determination (R^2) of -8.9 (Table B.1-1) indicates that nickel concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the data set for nickel (see Table B.1-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plot (Figure B.1-1) indicate that the nickel data set in surface soil has a lognormal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR NICKEL IN SURFACE SOIL

NICKEL (mg/kg)	CALCIUM (mg/kg)
3.9	1470
4.9	3800
4.6	6640
3.8	968
4.2	1350
4.4	1580
4.2	2500
7.2	44800
6	3360
6.5	3930
9.4	2930
4.8	1570
6.9	2220
6.7	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-8.861876482
Adjusted R Square	-8.938799559
Standard Error	5.110814626
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-305.133397	-305.1334	-11.681792	#NUM!
Residual	13	339.5655399	26.1204261		
Total	14	34.43214286			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.000241417	0.000110854	2.17780147	0.04842992	1.93254E-06	0.0004809	1.9325E-06	0.0004809

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR NICKEL IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted NICKEL (mg/kg)*	*Residuals*
1	0.354883056	3.545116944
2	0.91738477	3.98261523
3	1.603009177	2.996990823
4	0.233691699	3.566308301
5	0.32591301	3.87408699
6	0.381438931	4.018561069
7	0.603542612	3.596457388
8	10.8154836	-3.615483602
9	0.81116127	5.18883873
10	0.948768986	5.551231014
11	0.707351941	8.692648059
12	0.37902476	4.42097524
13	0.535945839	6.364054161
14	0.461106555	6.238893445

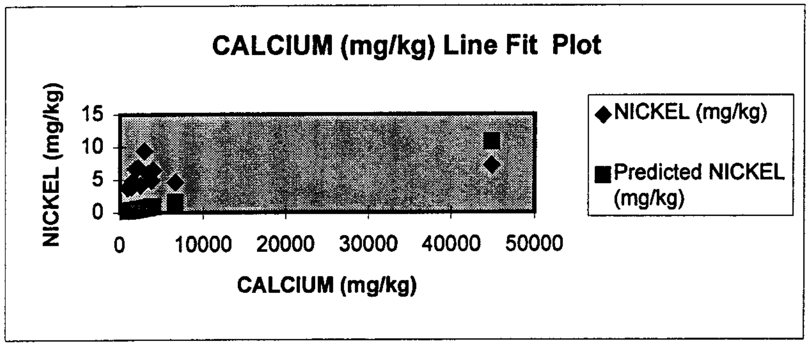


TABLE B.1-2

OUTLIER ANALYSIS RESULTS
FOR SURFACE SOIL - NICKEL
CANNON AIR FORCE BASE

SAMPLE	Metals NICKEL mg/kg Result	RL	Qual
CBSS01001	3.9	4.1	J
CBSS02001	4.9	4.1	
CBSS03001	4.6	4.1	
CBSS04001	3.8	4.1	J
CBSB010001	4.2	4.1	
CBSB020001	4.4	4.1	
CBSB030001	4.2	4.1	
CBSB050001	7.2	4.2	
CBSB060001	6	4.2	
CBSB070001	6.5	4.2	
CBSB080001	9.4	4.2	
CBSB100001	4.8	4.1	
CANOFS-OFS1-0000	6.9		J
CANOFS-OFS2-0000	6.7		J
Number of detects	14		
Count (N)	14		
Minimum	3.8		
Maximum	9.4		
Mean (x)	5.5		
Standard deviation (sd)	1.6		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - NICKEL IN SURFACE SOIL

i	Nickel Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	2.2407	1.3350	-0.9057	0.5251	-0.4756
2	1.9741	1.3610	-0.6131	0.3318	-0.2034
3	1.9315	1.4351	-0.4964	0.246	-0.1221
4	1.9021	1.4351	-0.4670	0.1802	-0.0842
5	1.8718	1.4816	-0.3902	0.124	-0.0484
6	1.7918	1.5261	-0.2657	0.0727	-0.0193
7	1.5892	1.5686	-0.0206	0.024	-0.0005
8	1.5686	1.5892	0.0206		-0.9535
9	1.5261	1.7918	0.2657		
10	1.4816	1.8718	0.3902		
11	1.4351	1.9021	0.4670		
12	1.4351	1.9315	0.4964		
13	1.3610	1.9741	0.6131		
14	1.3350	2.2407	0.9057		
				N	14
				StdDev	0.2755
				W	0.9213
				Wcritical	0.8740
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR NICKEL IN SURFACE SOIL

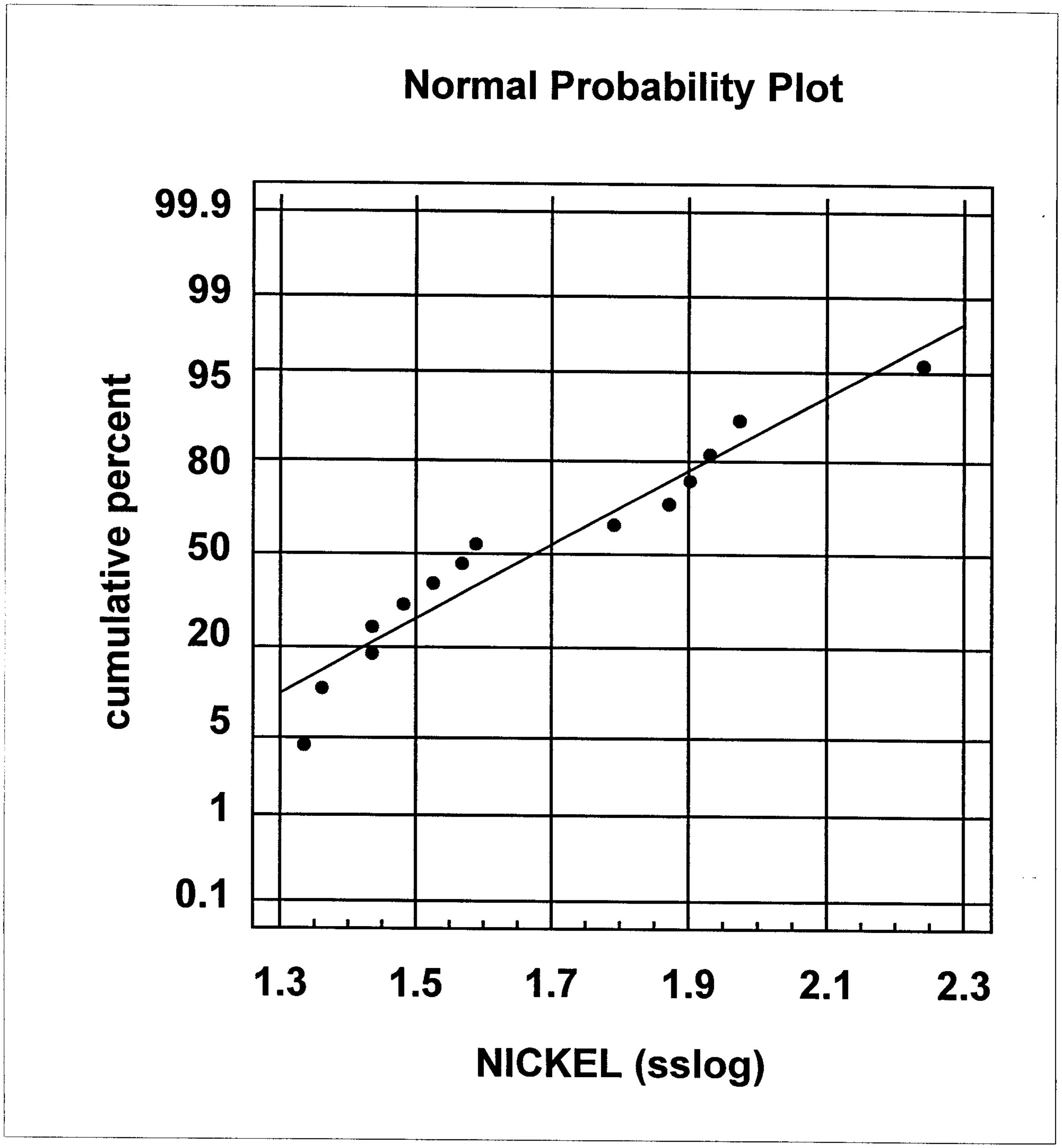
NICKEL (mg/kg)	log-transformed
3.9	1.3610
4.9	1.5892
4.6	1.5261
3.8	1.3350
4.2	1.4351
4.4	1.4816
4.2	1.4351
7.2	1.9741
6	1.7918
6.5	1.8718
9.4	2.2407
4.8	1.5686
6.9	1.9315
6.7	1.9021

NICKEL (mg/kg)	
Mean	5.5357143
Standard Error	0.434957
Median	4.85
Mode	4.2
Standard Deviation	1.6274601
Sample Variance	2.6486264
Kurtosis	0.7358269
Skewness	1.0434202
Range	5.6
Minimum	3.8
Maximum	9.4
Sum	77.5
Count	14
Confidence Level(95.0%)	0.9396673

log-transformed	
Mean	1.6745457
Standard Error	0.0736343
Median	1.5789256
Mode	1.4350845
Standard Deviation	0.2755145
Sample Variance	0.0759082
Kurtosis	-0.631155
Skewness	0.5865397
Range	0.9057086
Minimum	1.3350011
Maximum	2.2407097
Sum	23.44364
Count	14
Confidence Level(95.0%)	0.1590773

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL



B.1.17 Potassium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -8.6 (Table B.1-1) indicates that potassium concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

No potential outliers were identified in the data set for potassium (see Table B.1-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plot (Figure B.1-1) indicate that the potassium data set in surface soil has a lognormal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR POTASSIUM IN SURFACE SOIL

POTASSIUM (mg/kg)	CALCIUM (mg/kg)
1080	1470
1230	3800
1010	6640
1050	968
1080	1350
1060	1580
1060	2500
1540	44800
1300	3360
1510	3930
2310	2930
911	1570
1760	2220
1930	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-8.626904024
Adjusted R Square	-8.703827101
Standard Error	1281.218607
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-19123093.62	-19123094	-11.649618	#NUM!
Residual	13	21339774.55	1641521.12		
Total	14	2216680.929			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.054033553	0.027789629	1.94437834	0.07381056	-0.006002279	0.11406938	-0.0060023	0.11406938

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR POTASSIUM IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted POTASSIUM (mg/kg)*	*Residuals*
1	79.42932273	1000.570677
2	205.3275009	1024.672499
3	358.7827911	651.2172089
4	52.30447919	997.6955208
5	72.94529639	1007.054704
6	85.37301355	974.6269865
7	135.0838822	924.9161178
8	2420.703169	-880.7031689
9	181.5527377	1118.447262
10	212.3518628	1297.648137
11	158.3183099	2151.68169
12	84.83267802	826.167322
13	119.9544874	1640.045513
14	103.204086	1826.795914

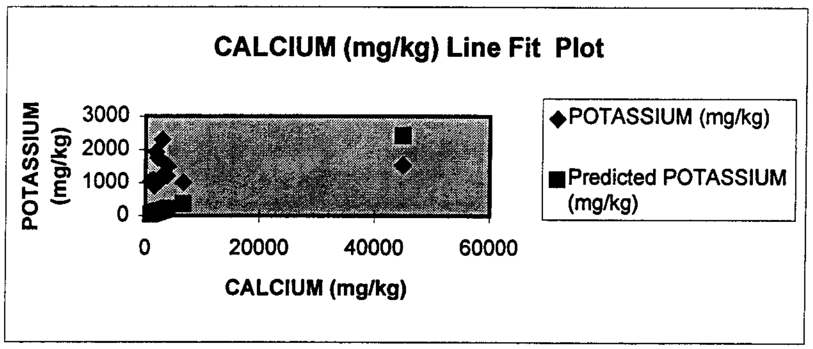


TABLE B.1-2

OUTLIER ANALYSIS RESULTS
FOR SURFACE SOIL - POTASSIUM
CANNON AIR FORCE BASE

SAMPLE	Metals POTASSIUM mg/kg Result	RL	Qual
CBSS01001	1080	515	
CBSS02001	1230	516	
CBSS03001	1010	517	
CBSS04001	1050	513	
CBSB010001	1080	516	
CBSB020001	1060	516	
CBSB030001	1060	513	
CBSB050001	1540	523	
CBSB060001	1300	519	
CBSB070001	1510	522	
CBSB080001	2310	521	
CBSB100001	911	518	
CANOFS-OFS1-0000	1760		
CANOFS-OFS2-0000	1930		
Number of detects	14		
Count (N)	14		
Minimum	911		
Maximum	2310		
Mean (x)	1345		
Standard deviation (sd)	413		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting li nondetects (qualifier "U"), except where they cause the exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - POTASSIUM IN SURFACE SOIL

i	Potassium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	7.7450	6.8145	-0.9305	0.5251	-0.4886
2	7.5653	6.9177	-0.6476	0.3318	-0.2149
3	7.4731	6.9565	-0.5165	0.246	-0.1271
4	7.3395	6.9660	-0.3735	0.1802	-0.0673
5	7.3199	6.9660	-0.3538	0.124	-0.0439
6	7.1701	6.9847	-0.1854	0.0727	-0.0135
7	7.1148	6.9847	-0.1301	0.024	-0.0031
8	6.9847	7.1148	0.1301		-0.9583
9	6.9847	7.1701	0.1854		
10	6.9660	7.3199	0.3538		
11	6.9660	7.3395	0.3735		
12	6.9565	7.4731	0.5165		
13	6.9177	7.5653	0.6476		
14	6.8145	7.7450	0.9305		
				N	14
				StdDev	0.2801
				W	0.9002
				Wcritical	0.8740
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR POTASSIUM IN SURFACE SOIL

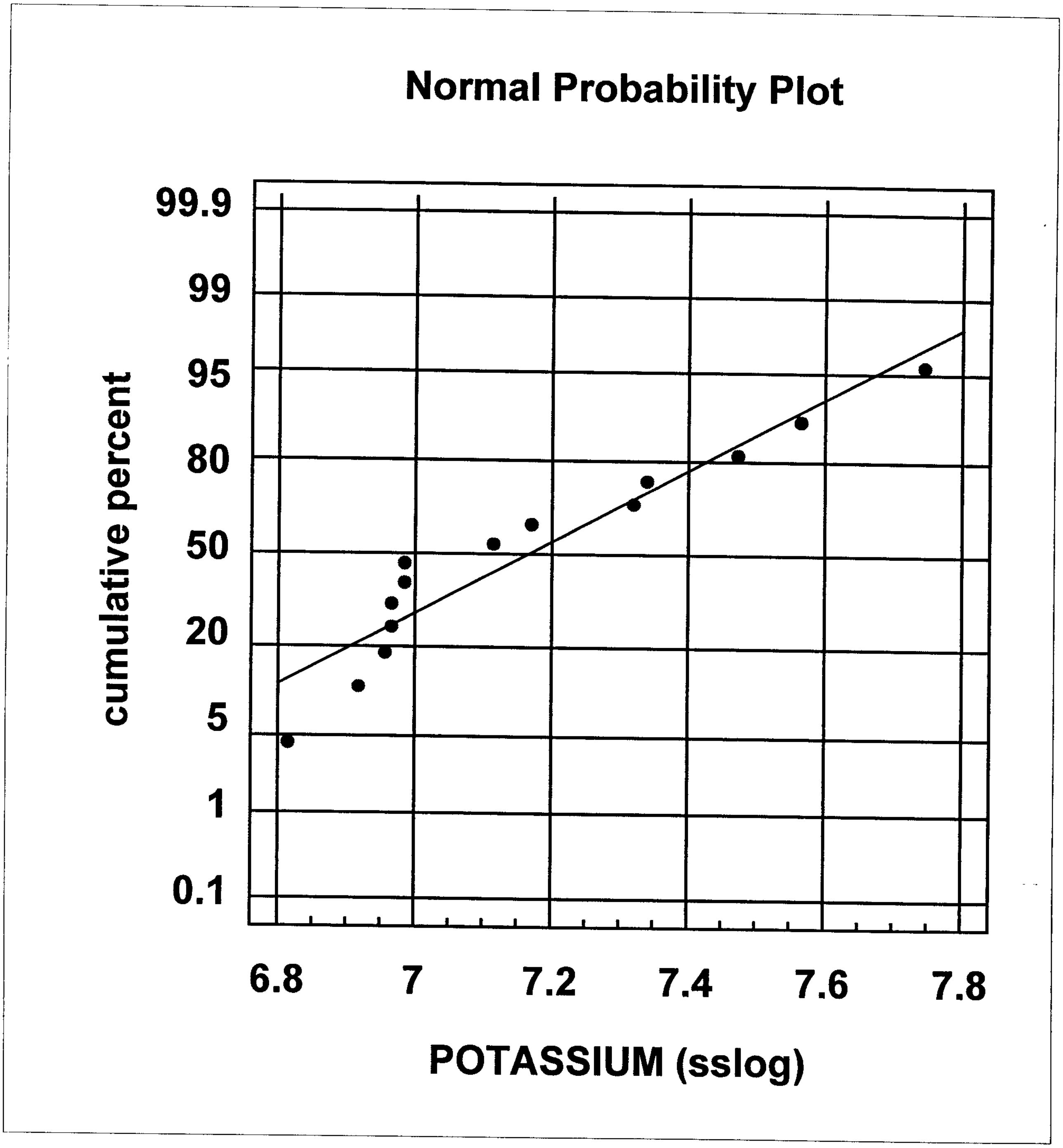
POTASSIUM (mg/kg)	log-transformed
1080	6.9847
1230	7.1148
1010	6.9177
1050	6.9565
1080	6.9847
1060	6.9660
1060	6.9660
1540	7.3395
1300	7.1701
1510	7.3199
2310	7.7450
911	6.8145
1760	7.4731
1930	7.5653

POTASSIUM (mg/kg)	
Mean	1345.0714
Standard Error	110.36107
Median	1155
Mode	1080
Standard Deviation	412.93331
Sample Variance	170513.92
Kurtosis	0.7669613
Skewness	1.2128749
Range	1399
Minimum	911
Maximum	2310
Sum	18831
Count	14
Confidence Level(95.0%)	238.42055

log-transformed	
Mean	7.1655653
Standard Error	0.0748675
Median	7.0497429
Mode	6.9847163
Standard Deviation	0.2801286
Sample Variance	0.0784721
Kurtosis	-0.365872
Skewness	0.8204295
Range	0.9304599
Minimum	6.8145429
Maximum	7.7450028
Sum	100.31791
Count	14
Confidence Level(95.0%)	0.1617414

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL



B.1.18 Selenium

The selenium results for all surface samples were nondetect. Therefore, no linear regression, outlier, or distribution analyses were conducted.

B.1.19 Silver

Silver was only detected in one surface soil sample. Addition of one-half of the reporting limits caused the mean to exceed the maximum detected concentration. Therefore, no linear regression, outlier, or distribution analyses were conducted.

B.1.20 Sodium

Due to the large number of nondetects (i.e., greater than 30 percent) in the sodium surface soil data set, regression analysis was not conducted. Addition of one-half of the reporting limit caused the mean to exceed the maximum detected concentration. Therefore, distribution analysis was not conducted.

Outlier analysis was not applicable to the silver data set because the maximum detected concentration did not exceed the minimum detected concentration by a factor of 5 or more (see Table B.1-2). Therefore, there were no potential outlier concentrations in the data set.

TABLE B.1-2

OUTLIER ANALYSIS RESULTS FOR SURFACE SOIL - SODIUM CANNON AIR FORCE BASE

SAMPLE	Result	Metals SODIUM mg/kg RL	Qual
CBSS01001		515	U
CBSS02001		516	U
CBSS03001		517	U
CBSS04001	85.5	513	J
CBSB010001		516	U
CBSB020001		516	U
CBSB030001		513	U
CBSB050001	84.1	523	J
CBSB060001		519	U
CBSB070001	102	522	J
CBSB080001		521	U
CBSB100001		518	U
CANOFS-OFS1-0000		286	U
CANOFS-OFS2-0000		288	U
Number of detects	3		
Count (N)	3		
Minimum	84.1		
Maximum	102		
Mean (x)	91		
Standard deviation (sd)	10.0		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

B.1.21 Thallium

The thallium results for all surface samples were nondetect. Therefore, no linear regression, outlier, or distribution analyses were conducted.

B.1.22 Vanadium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -22.7 (Table B.1-1) indicates that vanadium concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

Outlier analysis was not applicable to the vanadium data set because the maximum detected concentration did not exceed the minimum detected concentration by a factor of 5 or more (see Table B.1-2). Therefore, there were no potential outlier concentrations in the data set.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plot (Figure B.1-1) indicate that the vanadium data set in surface soil has a lognormal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR VANADIUM IN SURFACE SOIL

VANADIUM (mg/kg)	CALCIUM (mg/kg)
12.5	1470
14.5	3800
12.9	6640
12	968
12.6	1350
13.2	1580
12.9	2500
17.8	44800
14.2	3360
16.5	3930
21.3	2930
13	1570
17.7	2220
17.6	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-22.70075999
Adjusted R Square	-22.77768307
Standard Error	13.61458307
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-2307.9701	-2307.9701	-12.451494	#NUM!
Residual	13	2409.63934	185.356872		
Total	14	101.669286			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.000614693	0.0002953	2.08158507	0.0577073	-2.32647E-05	0.00125265	-2.326E-05	0.00125265

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR VANADIUM IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted VANADIUM (mg/kg)*	*Residuals*
1	0.903598202	11.5964018
2	2.335832087	12.1641679
3	4.081559226	8.81844077
4	0.59502249	11.4049775
5	0.829835084	11.7701649
6	0.971214394	12.2287856
7	1.536731636	11.3632684
8	27.53823092	-9.7382309
9	2.065367319	12.1346327
10	2.415742132	14.0842579
11	1.801049478	19.4989505
12	0.965067468	12.0349325
13	1.364617693	16.3353823
14	1.17406297	16.425937

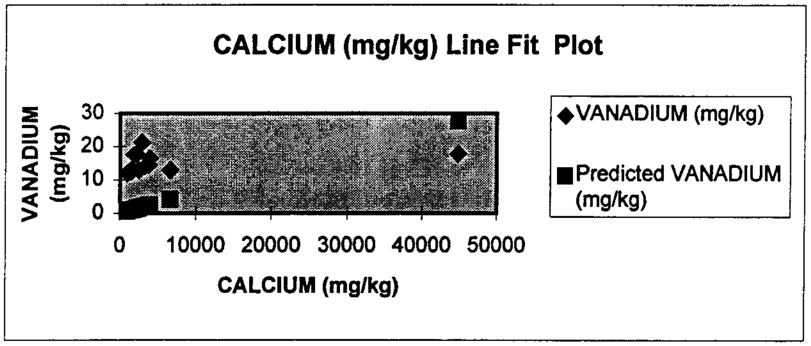


TABLE B.1-2

OUTLIER ANALYSIS RESULTS FOR SURFACE SOIL - VANADIUM CANNON AIR FORCE BASE

SAMPLE	Metals VANADIUM mg/kg Result	RL	Qual
CBSS01001	12.5	1	
CBSS02001	14.5	1	
CBSS03001	12.9	1	
CBSS04001	12	1	
CBSB010001	12.6	1	
CBSB020001	13.2	1	
CBSB030001	12.9	1	
CBSB050001	17.8	1	
CBSB060001	14.2	1	
CBSB070001	16.5	1	
CBSB080001	21.3	1	
CBSB100001	13	1	
CANOFS-OFS1-0000	17.7		
CANOFS-OFS2-0000	17.6		
Number of detects	14		
Count (N)	14		
Minimum	12		
Maximum	21.3		
Mean (x)	14.9		
Standard deviation (sd)	2.8		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - VANADIUM IN SURFACE SOIL

i	Vanadium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	3.0587	2.4849	-0.5738	0.5251	-0.3013
2	2.8792	2.5257	-0.3535	0.3318	-0.1173
3	2.8736	2.5337	-0.3399	0.246	-0.0836
4	2.8679	2.5572	-0.3107	0.1802	-0.0560
5	2.8034	2.5572	-0.2461	0.124	-0.0305
6	2.6741	2.5649	-0.1092	0.0727	-0.0079
7	2.6532	2.5802	-0.0730	0.024	-0.0018
8	2.5802	2.6532	0.0730		-0.5984
9	2.5649	2.6741	0.1092		
10	2.5572	2.8034	0.2461		
11	2.5572	2.8679	0.3107		
12	2.5337	2.8736	0.3399		
13	2.5257	2.8792	0.3535		
14	2.4849	3.0587	0.5738		
				N	14
				StdDev	0.1771
				W	0.8780
				Wcritical	0.8740
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR VANADIUM IN SURFACE SOIL

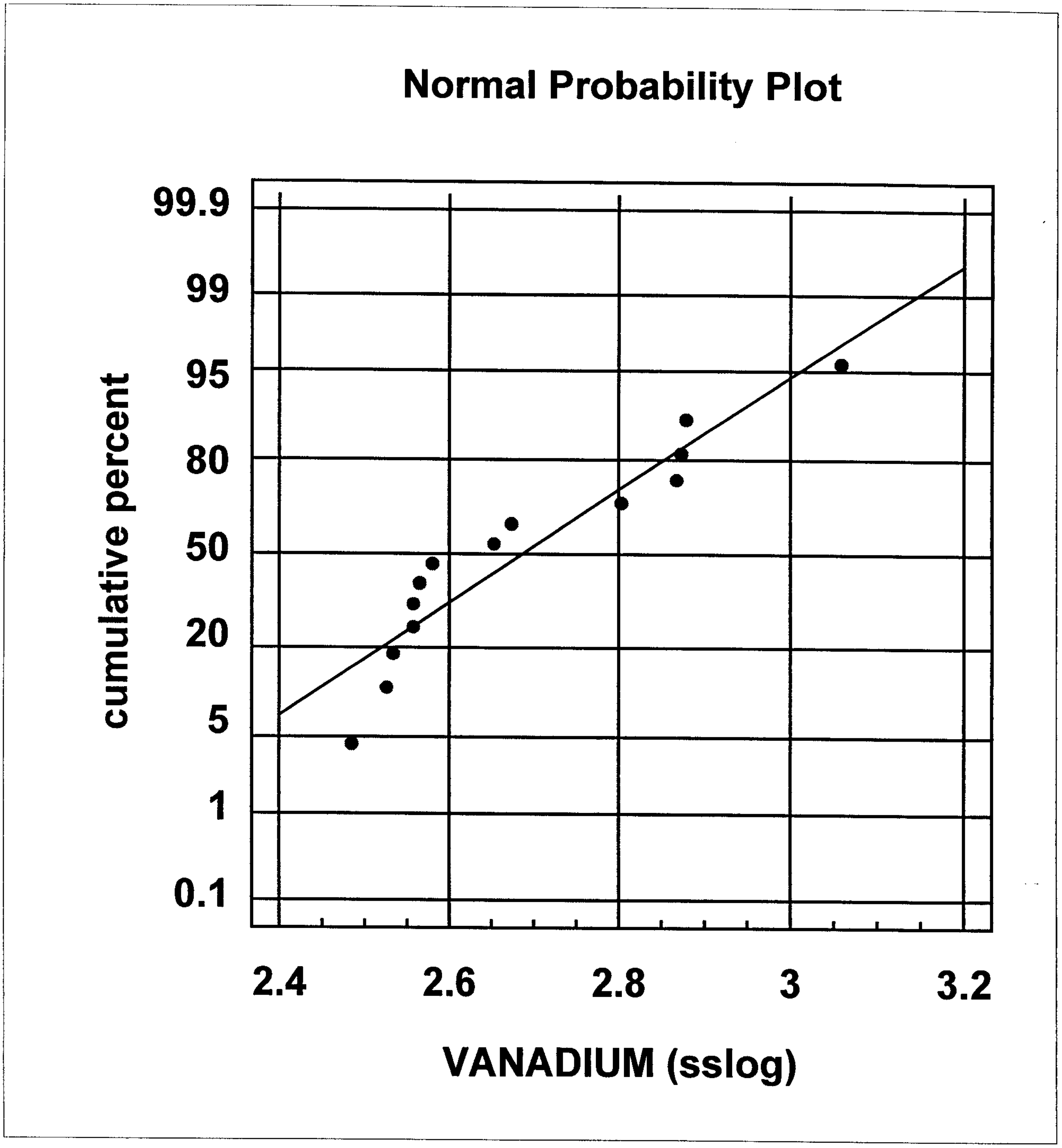
VANADIUM (mg/kg)	log-transformed
12.5	2.5257
14.5	2.6741
12.9	2.5572
12	2.4849
12.6	2.5337
13.2	2.5802
12.9	2.5572
17.8	2.8792
14.2	2.6532
16.5	2.8034
21.3	3.0587
13	2.5649
17.7	2.8736
17.6	2.8679

VANADIUM (mg/kg)	
Mean	14.907143
Standard Error	0.7474105
Median	13.7
Mode	12.9
Standard Deviation	2.796554
Sample Variance	7.8207143
Kurtosis	0.2566513
Skewness	1.0320894
Range	9.3
Minimum	12
Maximum	21.3
Sum	208.7
Count	14
Confidence Level(95.0%)	1.6146819

log-transformed	
Mean	2.6867195
Standard Error	0.0473364
Median	2.6167294
Mode	2.5572273
Standard Deviation	0.1771165
Sample Variance	0.0313703
Kurtosis	-0.509101
Skewness	0.796145
Range	0.5738004
Minimum	2.4849066
Maximum	3.0587071
Sum	37.614073
Count	14
Confidence Level(95.0%)	0.102264

TABLE B.1-1

PROBABILITY PLOT (LOGNORMAL) FOR METALS IN SURFACE SOIL



B.1.23 Zinc

A nonlinear regression line fit plot and coefficient of determination (R^2) of -6.6 (Table B.1-1) indicates that zinc concentrations in surface soil do not correlate with calcium concentrations (i.e., caliche) in surface soil.

Outlier analysis was not applicable to the zinc data set because the maximum detected concentration did not exceed the minimum detected concentration by a factor of 5 or more (see Table B.1-2). Therefore, there were no potential outlier concentrations in the data set.

The Shapiro-Wilk test (Table B.1-3), coefficient of skewness (Table B.1-4), and probability plot (Figure B.1-1) indicate that the zinc data set in surface soil has a lognormal distribution.

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR ZINC IN SURFACE SOIL

ZINC (mg/kg)	CALCIUM (mg/kg)
11.6	1470
14	3800
12	6640
11.2	968
15	1350
11.7	1580
12.7	2500
20.3	44800
12.6	3360
14.9	3930
29	2930
10.2	1570
18.6	2220
21.4	1910

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-6.589649612
Adjusted R Square	-6.666572689
Standard Error	14.43826472
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-2352.9568	-2352.9568	-11.287141	#NUM!
Residual	13	2710.02534	208.463488		
Total	14	357.068571			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.000670279	0.00031317	2.14033091	0.05186352	-6.27501E-06	0.00134683	-6.275E-06	0.00134683

TABLE B.1-1

LINEAR REGRESSION ANALYSIS FOR ZINC IN SURFACE SOIL

RESIDUAL OUTPUT

Observation	*Predicted ZINC (mg/kg)*	*Residuals*
1	0.985309728	10.6146903
2	2.54705916	11.4529408
3	4.450650743	7.54934926
4	0.648829807	10.5511702
5	0.904876281	14.0951237
6	1.059040388	10.6409596
7	1.675696816	11.0243032
8	30.02848694	-9.7284869
9	2.25213652	10.3478635
10	2.634195394	12.2658046
11	1.963916668	27.0360833
12	1.0523376	9.1476624
13	1.488018772	17.1119812
14	1.280232367	20.1197676

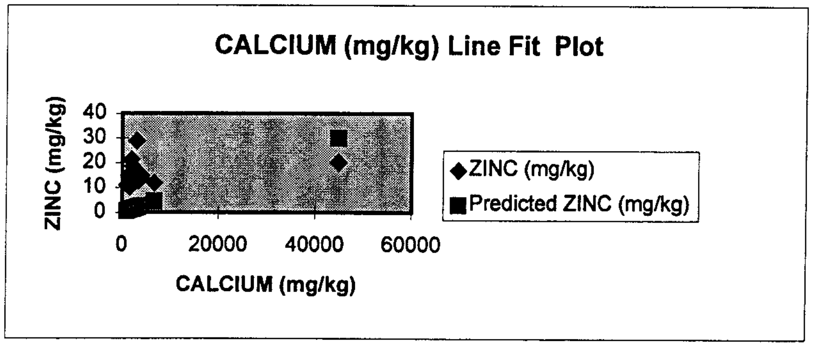


TABLE B.1-2

OUTLIER ANALYSIS RESULTS
FOR SURFACE SOIL - ZINC
CANNON AIR FORCE BASE

SAMPLE	Result	Metals ZINC mg/kg RL	Qual
CBSS01001	11.6	2.1	
CBSS02001	14	2.1	
CBSS03001	12	2.1	
CBSS04001	11.2	2.1	
CBSB010001	15	2.1	
CBSB020001	11.7	2.1	
CBSB030001	12.7	2.1	
CBSB050001	20.3	2.1	
CBSB060001	12.6	2.1	
CBSB070001	14.9	2.1	
CBSB080001	29	2.1	
CBSB100001	10.2	2.1	
CANOFS-OFS1-0000	18.6		
CANOFS-OFS2-0000	21.4		
Number of detects	14		
Count (N)	14		
Minimum	10.2		
Maximum	29.0		
Mean (x)	15.4		
Standard deviation (sd)	5.2		
Max > Min*5	No		
Outlier	NA		
Tn[1]			
Critical Value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting li nondetects (qualifier "U"), except where they cause the exceed the maximum detected concentration.

[1] $T_n = (X_n - X)/sd$ Source: EPA 1989c

[2] Source: Table 8, EPA 1989c

TABLE B.1-3

SHAPIRO-WILK TEST OF NORMALITY - ZINC IN SURFACE SOIL

i	Zinc Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	3.3673	2.3224	-1.0449	0.5251	-0.5487
2	3.0634	2.4159	-0.6475	0.3318	-0.2148
3	3.0106	2.4510	-0.5596	0.246	-0.1377
4	2.9232	2.4596	-0.4636	0.1802	-0.0835
5	2.7081	2.4849	-0.2231	0.124	-0.0277
6	2.7014	2.5337	-0.1677	0.0727	-0.0122
7	2.6391	2.5416	-0.0975	0.024	-0.0023
8	2.5416	2.6391	0.0975		-1.0269
9	2.5337	2.7014	0.1677		
10	2.4849	2.7081	0.2231		
11	2.4596	2.9232	0.4636		
12	2.4510	3.0106	0.5596		
13	2.4159	3.0634	0.6475		
14	2.3224	3.3673	1.0449		
				N	14
				StdDev	0.2996
				W	0.9035
				Wcritical	0.8740
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.1-4

SUMMARY STATISTICS FOR ZINC IN SURFACE SOIL

ZINC (mg/kg)	log-transformed
11.6	2.4510
14	2.6391
12	2.4849
11.2	2.4159
15	2.7081
11.7	2.4596
12.7	2.5416
20.3	3.0106
12.6	2.5337
14.9	2.7014
29	3.3673
10.2	2.3224
18.6	2.9232
21.4	3.0634

ZINC (mg/kg)	
Mean	15.371429
Standard Error	1.4006838
Median	13.35
Mode	#N/A
Standard Deviation	5.240879
Sample Variance	27.466813
Kurtosis	2.3496062
Skewness	1.5638152
Range	18.8
Minimum	10.2
Maximum	29
Sum	215.2
Count	14
Confidence Level(95.0%)	3.0259929

log-transformed	
Mean	2.6872885
Standard Error	0.0800839
Median	2.5903297
Mode	#N/A
Standard Deviation	0.2996466
Sample Variance	0.0897881
Kurtosis	0.4019062
Skewness	1.0203411
Range	1.0449081
Minimum	2.3223877
Maximum	3.3672958
Sum	37.622039
Count	14
Confidence Level(95.0%)	0.1730108

APPENDIX B.2
STATISTICAL RESULTS FOR SUBSURFACE SOIL

B.2.1 Aluminum

A nonlinear regression line fit plot and coefficient of determination (R^2) of -3.4 (Table B.2-1) indicates that aluminum concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No potential outliers were identified in the data set for aluminum (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plot (Figure B.2-1) indicate that the aluminum data set in subsurface soil has a lognormal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR ALUMINUM IN SUBSURFACE SOIL

ALUMINUM (mg/kg)	CALCIUM (mg/kg)
7950	4100
4990	171000
6610	1750
7080	66600
4560	190000
4910	150000
5050	158000
6160	19900
3370	136000
5110	135000
3960	42500
3730	34900
5800	95300
12200	23700
9290	167000
4400	55000
7330	38300
3730	253000
9530	52500
8160	81900
5040	71800
4250	89500
5680	87900
3380	43700
6030	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-3.388553925
Adjusted R Square	-3.430220592
Standard Error	4572.165107
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-387389650.4	-387389650	-18.5312282	#NUM!
Residual	24	501712650.4	20904693.77		
Total	25	114323000			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR ALUMINUM IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.04050738	0.008346986	4.852934824	6.03677E-05	0.023280051	0.05773471	0.023280051	0.05773471

RESIDUAL OUTPUT

Observation	*Predicted ALUMINUM (mg/kg)*	*Residuals*
1	166.0802588	7783.919741
2	6926.762015	-1936.762015
3	70.88791536	6539.112085
4	2697.791522	4382.208478
5	7696.402239	-3136.402239
6	6076.107031	-1166.107031
7	6400.166073	-1350.166073
8	806.0968661	5353.903134
9	5509.003708	-2139.003708
10	5468.496328	-358.4963278
11	1721.563659	2238.436341
12	1413.707569	2316.292431
13	3860.353334	1939.646666
14	960.0249109	11239.97509
15	6764.732494	2525.267506
16	2227.905911	2172.094089
17	1551.432662	5778.567338
18	10248.36719	-6518.367192
19	2126.637461	7403.362539
20	3317.554439	4842.445561
21	2908.429899	2131.570101
22	3625.410528	624.5894716
23	3560.59872	2119.40128
24	1770.172515	1609.827485
25	2669.436356	3360.563644

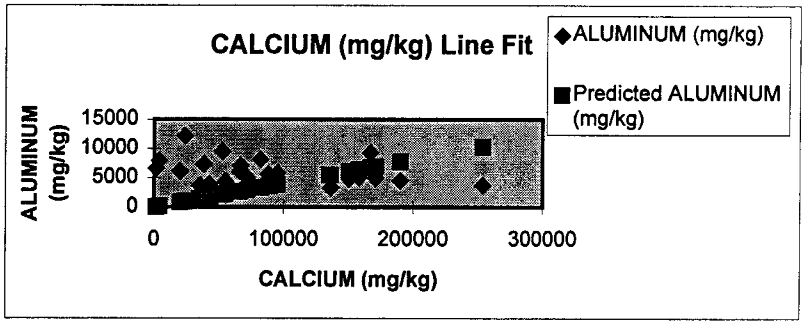


TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - ALUMINUM
CANNON AIR FORCE BASE

SAMPLE	Metals ALUMINUM mg/kg Result	RL	Qual
CBSB010005	7950	10.8	
CBSB010010	4990	21.3	
CBSB020005	6610	10.7	
CBSB020010	7080	10.8	
CBSB020020	4560	22.1	
CBSB020029	4910	22.8	
CBSB020039	5050	22.3	
CBSB030005	6160	10.6	
CBSB030010	3370	22.3	
CBSB040010	5110	21.7	
CBSB040020	3960	10.8	
CBSB040030	3730	10.9	
CBSB040041	5800	10.8	
CBSB050005	12200	10.9	
CBSB050010	9290	21.5	
CBSB060005	4400	11.4	
CBSB060010	7330	10.6	
CBSB070005	3730	52.8	
CBSB070010	9530	11.1	
CBSB080005	8160	10.8	
CBSB080010	5040	10.7	
CBSB080020	4250	10.8	
CBSB080030	5680	10.9	
CBSB080040	3380	10.4	
CBSB100005	6030	11	
Number of detects	25		
Count (N)	25		
Minimum (detected)	3370		
Maximum (detected)	12200		
Mean (x)	5932		
Standard deviation (sd)	2183		
Max > Min*5	No		
Outlier	NA		
T_n[1]			
Critical value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - ALUMINUM IN SUBSURFACE SOIL

i	Aluminum Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	9.4092	8.1227	-1.2865	0.445	-0.5725
2	9.1622	8.1256	-1.0366	0.3069	-0.3181
3	9.1367	8.2242	-0.9125	0.2543	-0.2321
4	9.0070	8.2242	-0.7828	0.2148	-0.1682
5	8.9809	8.2840	-0.6969	0.1822	-0.1270
6	8.8997	8.3547	-0.5451	0.1539	-0.0839
7	8.8650	8.3894	-0.4757	0.1283	-0.0610
8	8.7963	8.4251	-0.3713	0.1046	-0.0388
9	8.7258	8.4990	-0.2268	0.0823	-0.0187
10	8.7045	8.5152	-0.1893	0.061	-0.0115
11	8.6656	8.5252	-0.1405	0.0403	-0.0057
12	8.6447	8.5271	-0.1176	0.02	-0.0024
13	8.5390	8.5390	0.0000	0	0.0000
14	8.5271	8.6447	0.1176		-1.6398
15	8.5252	8.6656	0.1405		
16	8.5152	8.7045	0.1893		
17	8.4990	8.7258	0.2268		
18	8.4251	8.7963	0.3713		
19	8.3894	8.8650	0.4757		
20	8.3547	8.8997	0.5451		
21	8.2840	8.9809	0.6969		
22	8.2242	9.0070	0.7828		
23	8.2242	9.1367	0.9125		
24	8.1256	9.1622	1.0366		
25	8.1227	9.4092	1.2865		
				N	25
				StdDev	0.3404
				W	0.9669
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

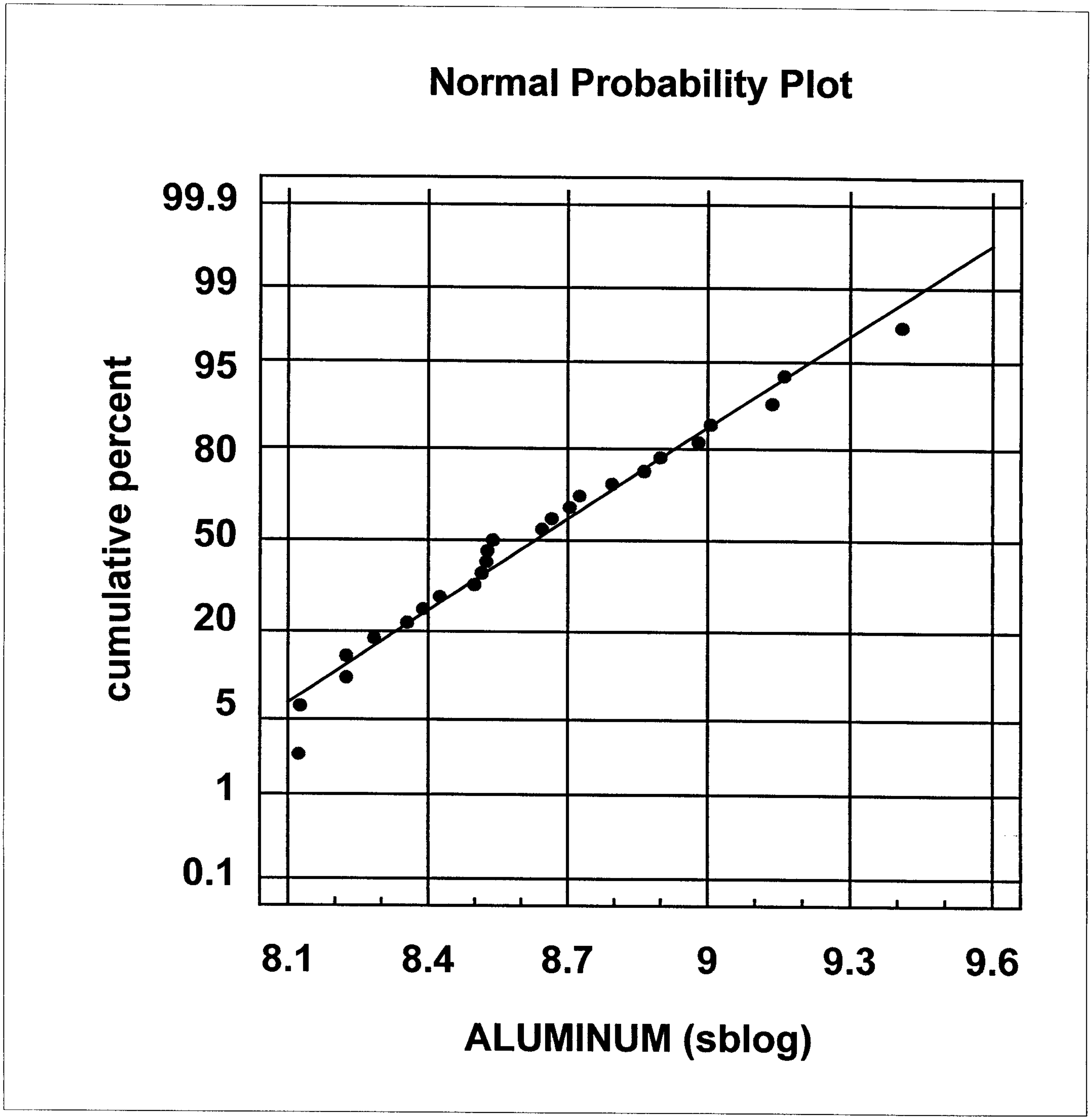
SUMMARY STATISTICS FOR ALUMINUM IN SUBSURFACE SOIL

ALUMINUM (mg/kg)	log-transformed
7950	8.9809
4990	8.5152
6610	8.7963
7080	8.8650
4560	8.4251
4910	8.4990
5050	8.5271
6160	8.7258
3370	8.1227
5110	8.5390
3960	8.2840
3730	8.2242
5800	8.6656
12200	9.4092
9290	9.1367
4400	8.3894
7330	8.8997
3730	8.2242
9530	9.1622
8160	9.0070
5040	8.5252
4250	8.3547
5680	8.6447
3380	8.1256
6030	8.7045

ALUMINUM (mg/kg)		*log-transformed*	
Mean	5932	Mean	8.630119
Standard Error	436.506968	Standard Error	0.068082
Median	5110	Median	8.538955
Mode	3730	Mode	8.224164
Standard Deviation	2182.53484	Standard Deviation	0.340408
Sample Variance	4763458.33	Sample Variance	0.115878
Kurtosis	1.42906105	Kurtosis	-0.34437
Skewness	1.20790285	Skewness	0.463969
Range	8830	Range	1.286523
Minimum	3370	Minimum	8.122668
Maximum	12200	Maximum	9.409191
Sum	148300	Sum	215.753
Count	25	Count	25
Confidence Level(95.0%)	900.905918	Confidence Level(95.0%)	0.140514

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.2 Antimony

The antimony results for all subsurface samples were nondetect. Therefore, no linear regression, outlier, or distribution analyses were conducted.

B.2.3 Arsenic

A nonlinear regression line fit plot and coefficient of determination (R^2) of -1.6 (Table B.2-1) indicates that arsenic concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No potential outliers were identified in the data set for arsenic (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plots (Figures B.2-1 and B.2-2) indicate that the arsenic data set in subsurface soil has a normal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR ARSENIC IN SUBSURFACE SOIL

ARSENIC (mg/kg)	CALCIUM (mg/kg)
3	4100
3.5	171000
2.7	1750
3.5	66600
1.6	190000
1.15	150000
1.1	158000
2.6	19900
1.1	136000
3.1	135000
1.7	42500
1.2	34900
1.2	95300
2.2	23700
2	167000
2.5	55000
2.1	38300
3.6	253000
1.8	52500
3.3	81900
2.6	71800
1.5	89500
0.55	87900
0.5	43700
3.3	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0
R Square	-1.626727875
Adjusted R Square	-1.668394541
Standard Error	1.559199255
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-36.13385559	-36.1338556	-14.8631571	#NUM!
Residual	24	58.34645559	2.431102316		
Total	25	22.2126			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR ARSENIC IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	1.6116E-05	2.84649E-06	5.661697526	7.87194E-06	1.02411E-05	2.19908E-05	1.02411E-05	2.1991E-05

RESIDUAL OUTPUT

Observation	*Predicted ARSENIC (mg/kg)*	*Residuals*
1	0.06607542	2.93392458
2	2.755828488	0.744171512
3	0.028202923	2.671797077
4	1.073322674	2.426677326
5	3.062031653	-1.462031653
6	2.41739341	-1.26739341
7	2.546321059	-1.446321059
8	0.320707526	2.279292474
9	2.191770025	-1.091770025
10	2.175654069	0.924345931
11	0.684928133	1.015071867
12	0.562446867	0.637553133
13	1.535850613	-0.335850613
14	0.381948159	1.818051841
15	2.691364663	-0.691364663
16	0.886377584	1.613622416
17	0.617241117	1.482758883
18	4.077336885	-0.477336885
19	0.846087694	0.953912306
20	1.319896802	1.980103198
21	1.157125646	1.442874354
22	1.442378068	0.057621932
23	1.416592538	-0.866592538
24	0.70426728	-0.20426728
25	1.062041505	2.237958495

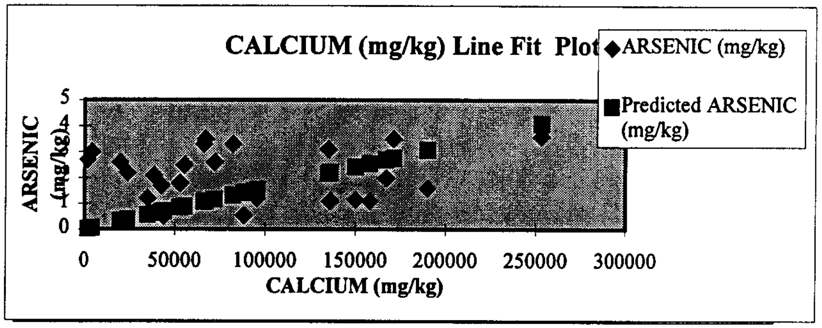


TABLE B.2-2

OUTLIER ANALYSIS RESULTS FOR SUBSURFACE SOIL - ARSENIC CANNON AIR FORCE BASE

SAMPLE	Metals ARSENIC mg/kg		
	Result	RL	Qual
CBSB010005	3	1.1	
CBSB010010	3.5	2.1	
CBSB020005	2.7	1.1	
CBSB020010	3.5	1.1	
CBSB020020	1.6	2.2	J
CBSB020029	1.15	2.3	U
CBSB020039	1.1	2.2	U
CBSB030005	2.6	1.1	
CBSB030010	1.1	2.2	U
CBSB040010	3.1	2.2	
CBSB040020	1.7	1.1	
CBSB040030	1.2	1.1	
CBSB040041	1.2	1.1	
CBSB050005	2.2	1.1	
CBSB050010	2	2.1	J
CBSB060005	2.5	1.1	
CBSB060010	2.1	1.1	
CBSB070005	3.6	5.3	J
CBSB070010	1.8	1.1	
CBSB080005	3.3	1.1	
CBSB080010	2.6	1.1	
CBSB080020	1.5	1.1	
CBSB080030	0.55	1.1	U
CBSB080040	0.5	1	U
CBSB100005	3.3	1.1	
Number of detects	20		
Count (N)	25		
Minimum (detected)	1.2		
Maximum (detected)	3.6		
Mean (x)	2.1		
Standard deviation (sd)	1		
Max > Min*5	No		
Outlier	NA		
T_n [1]			
Critical value [2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

1 $T_n = (X_n - X)/sd$ Source: EPA 1989

2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - ARSENIC IN SUBSURFACE SOIL

i	Arsenic Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	1.2809	-0.6931	-1.9741	0.445	-0.8785
2	1.2528	-0.5978	-1.8506	0.3069	-0.5679
3	1.2528	0.0953	-1.1575	0.2543	-0.2943
4	1.1939	0.0953	-1.0986	0.2148	-0.2360
5	1.1939	0.1398	-1.0542	0.1822	-0.1921
6	1.1314	0.1823	-0.9491	0.1539	-0.1461
7	1.0986	0.1823	-0.9163	0.1283	-0.1176
8	0.9933	0.4055	-0.5878	0.1046	-0.0615
9	0.9555	0.4700	-0.4855	0.0823	-0.0400
10	0.9555	0.5306	-0.4249	0.061	-0.0259
11	0.9163	0.5878	-0.3285	0.0403	-0.0132
12	0.7885	0.6931	-0.0953	0.02	-0.0019
13	0.7419	0.7419	0.0000	0	0.0000
14	0.6931	0.7885	0.0953		-2.5749
15	0.5878	0.9163	0.3285		
16	0.5306	0.9555	0.4249		
17	0.4700	0.9555	0.4855		
18	0.4055	0.9933	0.5878		
19	0.1823	1.0986	0.9163		
20	0.1823	1.1314	0.9491		
21	0.1398	1.1939	1.0542		
22	0.0953	1.1939	1.0986		
23	0.0953	1.2528	1.1575		
24	-0.5978	1.2528	1.8506		
25	-0.6931	1.2809	1.9741		
				N	25
				StdDev	0.5527
				W	0.9042
				Wcritical	0.9180
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - ARSENIC IN SUBSURFACE SOIL

i	Arsenic Result, cont. X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	3.6	0.5	-3.1000	0.445	-1.3795
2	3.5	0.55	-2.9500	0.3069	-0.9054
3	3.5	1.1	-2.4000	0.2543	-0.6103
4	3.3	1.1	-2.2000	0.2148	-0.4726
5	3.3	1.15	-2.1500	0.1822	-0.3917
6	3.1	1.2	-1.9000	0.1539	-0.2924
7	3	1.2	-1.8000	0.1283	-0.2309
8	2.7	1.5	-1.2000	0.1046	-0.1255
9	2.6	1.6	-1.0000	0.0823	-0.0823
10	2.6	1.7	-0.9000	0.061	-0.0549
11	2.5	1.8	-0.7000	0.0403	-0.0282
12	2.2	2	-0.2000	0.02	-0.0040
13	2.1	2.1	0.0000	0	0.0000
14	2	2.2	0.2000		-4.5777
15	1.8	2.5	0.7000		
16	1.7	2.6	0.9000		
17	1.6	2.6	1.0000		
18	1.5	2.7	1.2000		
19	1.2	3	1.8000		
20	1.2	3.1	1.9000		
21	1.15	3.3	2.1500		
22	1.1	3.3	2.2000		
23	1.1	3.5	2.4000		
24	0.55	3.5	2.9500		
25	0.5	3.6	3.1000		
				N	25
				StdDev	0.9620
				W	0.9434
				Wcritical	0.9180
					Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR ARSENIC IN SUBSURFACE SOIL

ARSENIC (mg/kg)	log-transformed
3	1.0986
3.5	1.2528
2.7	0.9933
3.5	1.2528
1.6	0.4700
1.15	0.1398
1.1	0.0953
2.6	0.9555
1.1	0.0953
3.1	1.1314
1.7	0.5306
1.2	0.1823
1.2	0.1823
2.2	0.7885
2	0.6931
2.5	0.9163
2.1	0.7419
3.6	1.2809
1.8	0.5878
3.3	1.1939
2.6	0.9555
1.5	0.4055
0.55	-0.5978
0.5	-0.6931
3.3	1.1939

ARSENIC (mg/kg)	
Mean	2.136
Standard Error	0.19240842
Median	2.1
Mode	3.5
Standard Deviation	0.9620421
Sample Variance	0.925525
Kurtosis	-1.20362711
Skewness	-0.01980566
Range	3.1
Minimum	0.5
Maximum	3.6
Sum	53.4
Count	25
Confidence Level(95.0%)	0.39711138

log-transformed	
Mean	0.63385405
Standard Error	0.11054721
Median	0.74193734
Mode	1.25276297
Standard Deviation	0.55273603
Sample Variance	0.30551712
Kurtosis	0.33266906
Skewness	-0.90629617
Range	1.97408103
Minimum	-0.69314718
Maximum	1.28093385
Sum	15.8463513
Count	25
Confidence Level(95.0%)	0.22815817

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

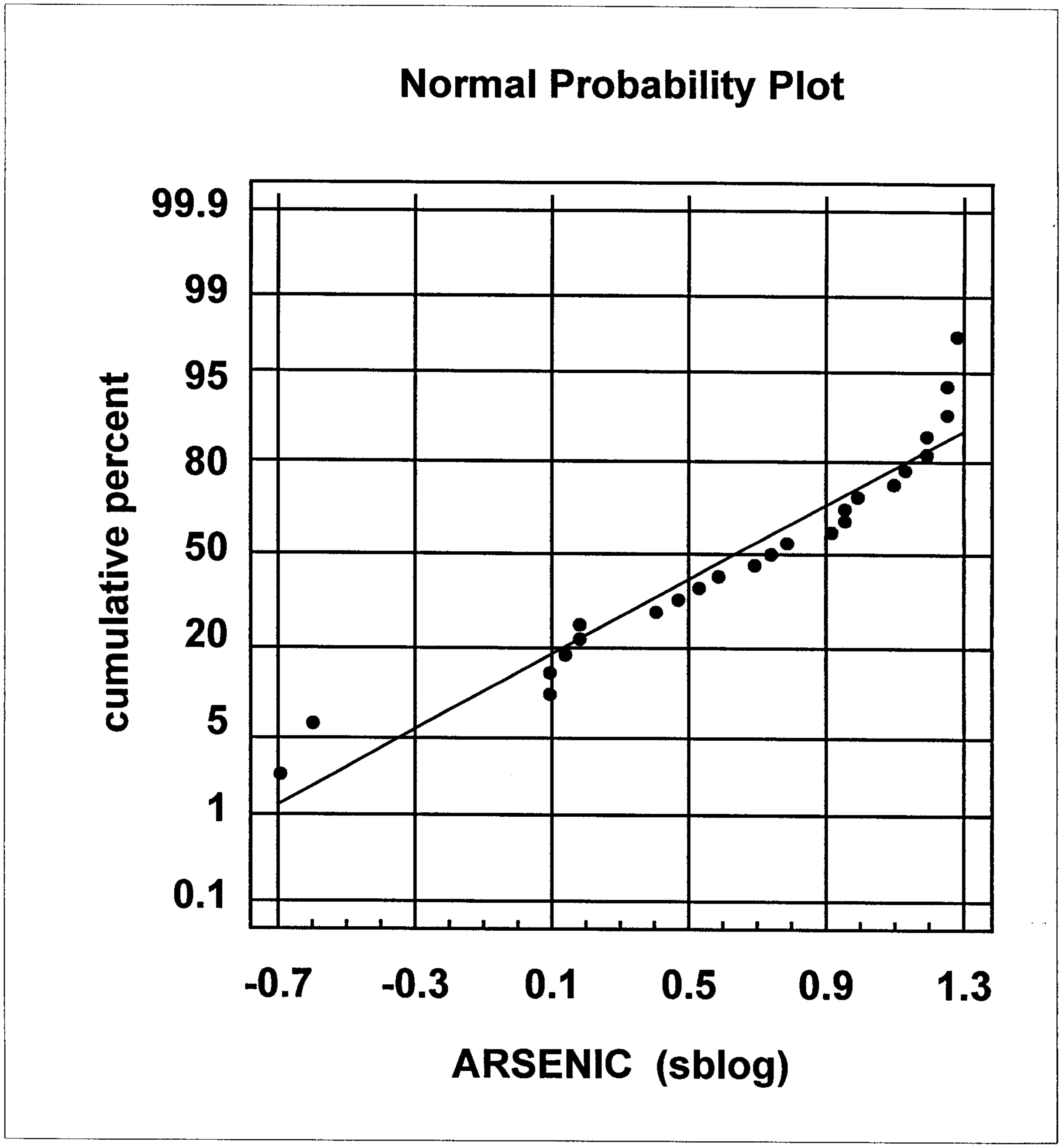
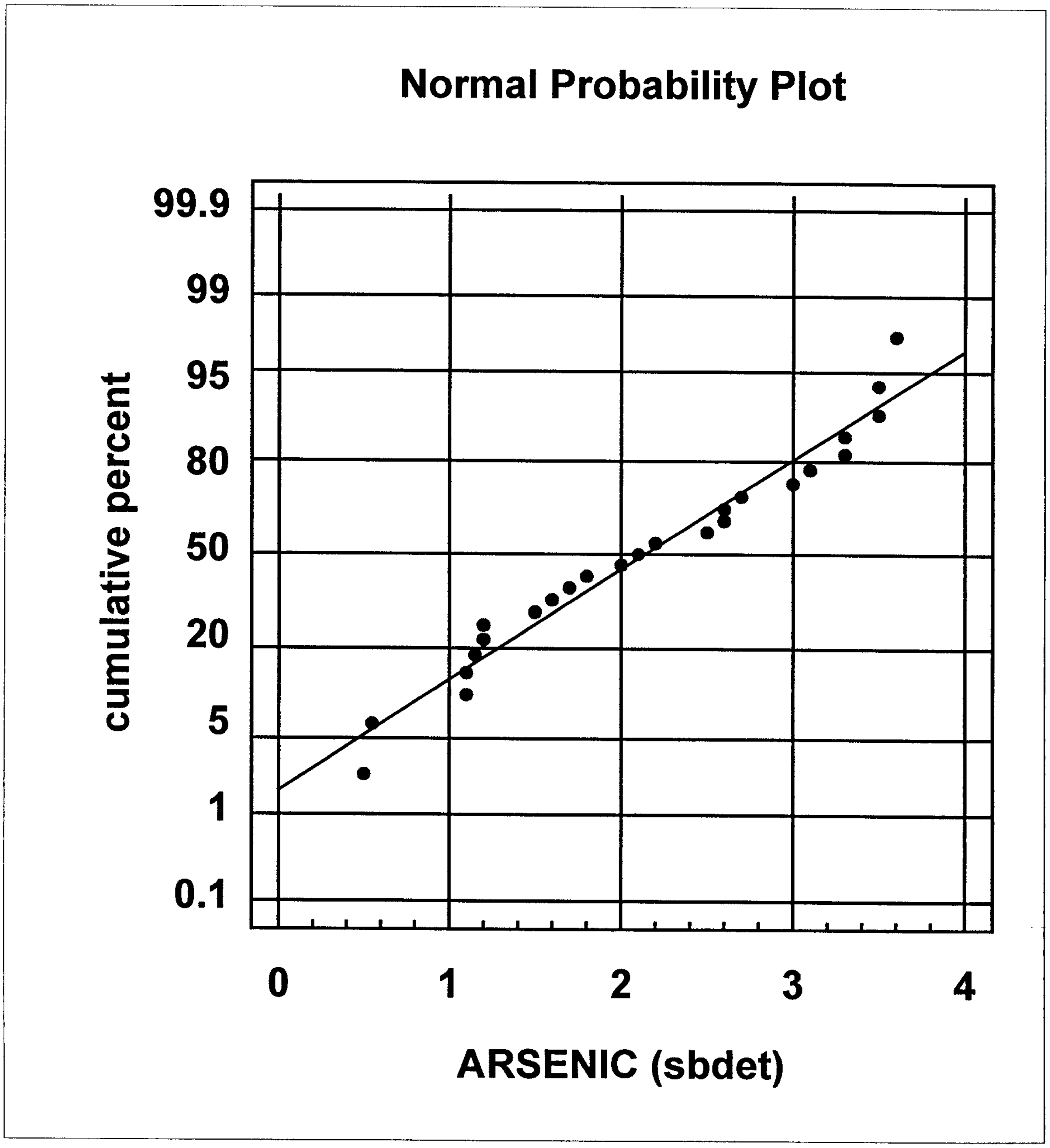


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.4 Barium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -0.16 (Table B.2-1 indicates that barium concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No "true" outliers were identified in the barium subsurface soil data set (see Table B.2-2). Although several concentrations exceeded the minimum detected concentration by a factor of 5 or more, none of these concentrations were determined to be "true" outliers by the methodology described in Section 5.0.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plot (Figure B.2-1) indicate that the barium data set in subsurface soil has a lognormal distribution.

TABLE C.2-1

LINEAR REGRESSION ANALYSIS FOR BARIUM IN SUBSURFACE SOIL

BARIUM (mg/kg)	CALCIUM (mg/kg)
73.5	4100
170	171000
66.3	1750
285	66600
117	190000
339	150000
317	158000
91.2	19900
805	136000
137	135000
723	42500
47.9	34900
57.2	95300
82.3	23700
264	167000
103	55000
79.4	38300
167	253000
162	52500
100	81900
168	71800
74.3	89500
508	87900
134	43700
185	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-0.161598581
Adjusted R Square	-0.203265248
Standard Error	214.3018095
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-153336.0914	-153336.091	-3.33881774	#NUM!
Residual	24	1102206.373	45925.26554		
Total	25	948870.2816			

TABLE C.2-1

LINEAR REGRESSION ANALYSIS FOR BARIUM IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.001781001	0.000391231	4.552295524	0.000129657	0.000973539	0.002588462	0.000973539	0.002588462

RESIDUAL OUTPUT

Observation	*Predicted BARIUM (mg/kg)*	*Residuals*
1	7.302102672	66.19789733
2	304.5511114	-134.5511114
3	3.11675114	63.18324886
4	118.6146434	166.3853566
5	338.3901238	-221.3901238
6	267.1500977	71.84990226
7	281.398103	35.60189704
8	35.44191297	55.75808703
9	242.2160886	562.7839114
10	240.435088	-103.435088
11	75.69252769	647.3074723
12	62.15692274	-14.25692274
13	169.7293621	-112.5293621
14	42.20971544	40.09028456
15	297.4271088	-33.42710882
16	97.95503584	5.04496416
17	68.21232496	11.18767504
18	450.5931649	-283.5931649
19	93.50253421	68.49746579
20	145.8639534	-45.86395337
21	127.8758468	40.12415321
22	159.3995583	-85.09955832
23	156.5499573	351.4500427
24	77.82972848	56.17027152
25	117.3679429	67.63205706

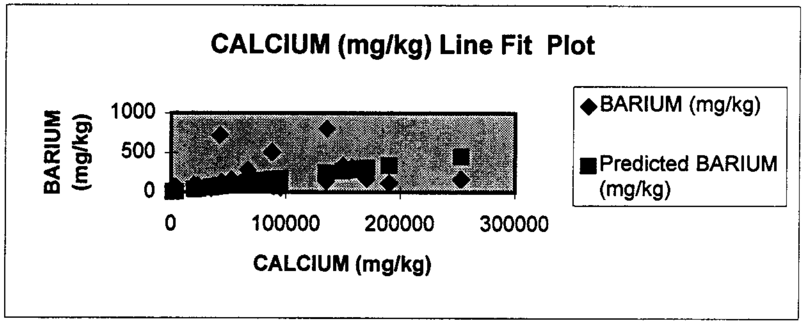


TABLE B.2-2

OUTLIER ANALYSIS RESULTS FOR SUBSURFACE SOIL - BARIUM CANNON AIR FORCE BASE

SAMPLE	Metals BARIUM mg/kg			
	Result	Log Result	RL	Qual
CBSB010005	73.5	4.2973	1.1	
CBSB010010	170	5.1358	2.1	
CBSB020005	66.3	4.1942	1.1	
CBSB020010	285	5.6525	1.1	
CBSB020020	117	4.7622	2.2	
CBSB020029	339	5.8260	2.3	
CBSB020039	317	5.7589	2.2	
CBSB030005	91.2	4.5131	1.1	
CBSB030010	805	6.6908	2.2	
CBSB040010	137	4.9200	2.2	
CBSB040020	723	6.5834	1.1	
CBSB040030	47.9	3.8691	1.1	
CBSB040041	57.2	4.0466	1.1	
CBSB050005	82.3	4.4104	1.1	
CBSB050010	264	5.5759	2.1	
CBSB060005	103	4.6347	1.1	
CBSB060010	79.4	4.3745	1.1	
CBSB070005	167	5.1180	5.3	
CBSB070010	162	5.0876	1.1	
CBSB080005	100	4.6052	1.1	
CBSB080010	168	5.1240	1.1	
CBSB080020	74.3	4.3081	1.1	
CBSB080030	508	6.2305	1.1	
CBSB080040	134	4.8978	1	
CBSB100005	185	5.2204	1.1	
Number of detects	25			
Count (N)	25			
Minimum (detected)	47.9			
Maximum (detected)	805			
Mean (x)	210	5.0335		
Standard deviation (sd)	199	0.7670		
Max > Min*5	Yes			
Outlier		No		
T_n[1]		2.161		
Critical value[2]		2.663		

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - BARIUM IN SUBSURFACE SOIL

i	Barium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	6.6908	3.8691	-2.8217	0.445	-1.2557
2	6.5834	4.0466	-2.5369	0.3069	-0.7786
3	6.2305	4.1942	-2.0363	0.2543	-0.5178
4	5.8260	4.2973	-1.5287	0.2148	-0.3284
5	5.7589	4.3081	-1.4508	0.1822	-0.2643
6	5.6525	4.3745	-1.2780	0.1539	-0.1967
7	5.5759	4.4104	-1.1656	0.1283	-0.1495
8	5.2204	4.5131	-0.7073	0.1046	-0.0740
9	5.1358	4.6052	-0.5306	0.0823	-0.0437
10	5.1240	4.6347	-0.4892	0.061	-0.0298
11	5.1180	4.7622	-0.3558	0.0403	-0.0143
12	5.0876	4.8978	-0.1898	0.02	-0.0038
13	4.9200	4.9200	0.0000	0	0.0000
14	4.8978	5.0876	0.1898		-3.6566
15	4.7622	5.1180	0.3558		
16	4.6347	5.1240	0.4892		
17	4.6052	5.1358	0.5306		
18	4.5131	5.2204	0.7073		
19	4.4104	5.5759	1.1656		
20	4.3745	5.6525	1.2780		
21	4.3081	5.7589	1.4508		
22	4.2973	5.8260	1.5287		
23	4.1942	6.2305	2.0363		
24	4.0466	6.5834	2.5369		
25	3.8691	6.6908	2.8217		
				N	25
				StdDev	0.7670
				W	0.9469
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR BARIUM IN SUBSURFACE SOIL

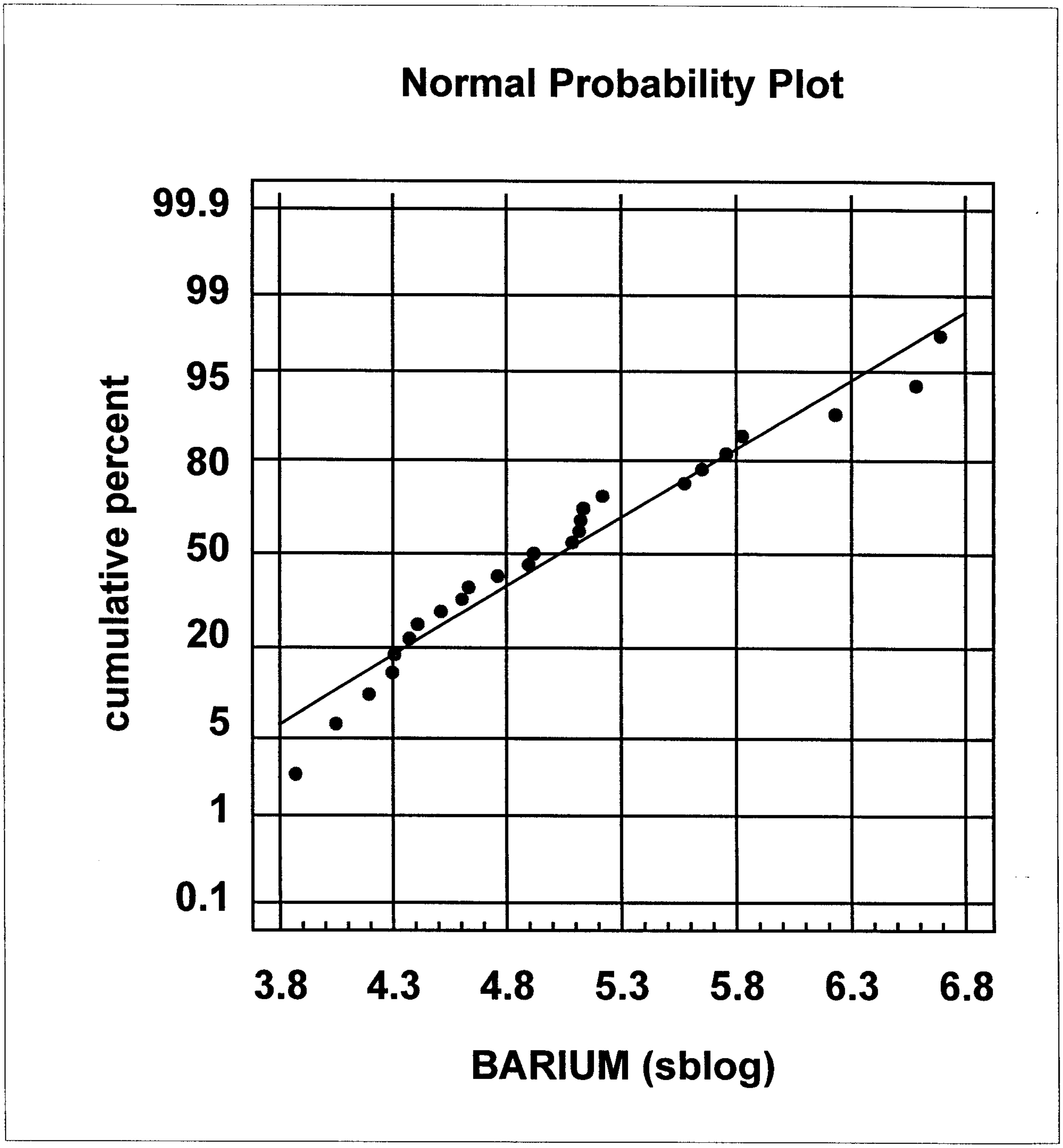
BARIUM (mg/kg)	log-transformed
73.5	4.2973
170	5.1358
66.3	4.1942
285	5.6525
117	4.7622
339	5.8260
317	5.7589
91.2	4.5131
805	6.6908
137	4.9200
723	6.5834
47.9	3.8691
57.2	4.0466
82.3	4.4104
264	5.5759
103	4.6347
79.4	4.3745
167	5.1180
162	5.0876
100	4.6052
168	5.1240
74.3	4.3081
508	6.2305
134	4.8978
185	5.2204

BARIUM (mg/kg)	
Mean	210.244
Standard Error	39.7674549
Median	137
Mode	#N/A
Standard Deviation	198.837275
Sample Variance	39536.2617
Kurtosis	3.64289541
Skewness	2.0107219
Range	757.1
Minimum	47.9
Maximum	805
Sum	5256.1
Count	25
Confidence Level(95.0%)	82.0759761

log-transformed	
Mean	5.033474
Standard Error	0.153408
Median	4.919981
Mode	#N/A
Standard Deviation	0.767039
Sample Variance	0.588349
Kurtosis	-0.22871
Skewness	0.655328
Range	2.821727
Minimum	3.869116
Maximum	6.690842
Sum	125.8369
Count	25
Confidence Level(95.0%)	0.316618

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.5 Beryllium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -1.7 (Table B.2-1) indicates that beryllium concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No outliers were identified in the beryllium subsurface soil data set (see Table B.2-2). Although several concentrations exceeded the minimum detected concentration by a factor of 5 or more, none of these concentrations were determined to be statistical outliers by the methodology described in Section 5.3.

The Shapiro-Wilk test (Table B.2-3) and probability plots (Figures B.2-1 and B.2-2) indicate that the beryllium data set in subsurface soil has a normal distribution. The coefficient of skewness (Table B.2-4) was inclusive, probably due to a small data set. However, since two of three tests indicated the same result and the Shapiro-Wilk test is considered one of the best tests for normality, it was concluded that the beryllium data set is normally distributed.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR BERYLLIUM IN SUBSURFACE SOIL

BERYLLIUM (mg/kg)	CALCIUM (mg/kg)
0.5	4100
0.26	171000
0.46	1750
0.45	66600
0.2	190000
0.25	150000
0.25	158000
0.31	19900
0.25	136000
0.31	135000
0.17	42500
0.12	34900
0.1	95300
0.66	23700
0.39	167000
0.43	55000
0.4	38300
0.55	253000
0.58	52500
0.57	81900
0.54	71800
0.23	89500
0.1	87900
0.11	43700
0.45	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0
R Square	-1.740640376
Adjusted R Square	-1.782307042
Standard Error	0.279522658
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-1.190973995	-1.190974	-15.2429226	#NUM!
Residual	24	1.875189995	0.078132916		
Total	25	0.684216			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR BERYLLIUM IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	2.44591E-06	5.10299E-07	4.793099217	7.02782E-05	1.39271E-06	3.49912E-06	1.39271E-06	3.49912E-06

RESIDUAL OUTPUT

Observation	*Predicted BERYLLIUM (mg/kg)*	*Residuals*
1	0.010028248	0.489971752
2	0.418251339	-0.158251339
3	0.00428035	0.45571965
4	0.16289789	0.28710211
5	0.46472371	-0.26472371
6	0.366887139	-0.116887139
7	0.386454453	-0.136454453
8	0.048673694	0.261326306
9	0.33264434	-0.08264434
10	0.330198425	-0.020198425
11	0.103951356	0.066048644
12	0.085362408	0.034637592
13	0.233095629	-0.133095629
14	0.057968168	0.602031832
15	0.408467682	-0.018467682
16	0.134525284	0.295474716
17	0.093678516	0.306321484
18	0.618816308	-0.068816308
19	0.128410499	0.451589501
20	0.200320378	0.369679622
21	0.175616644	0.364383356
22	0.218909326	0.011090674
23	0.214995864	-0.114995864
24	0.106886453	0.003113547
25	0.16118575	0.28881425

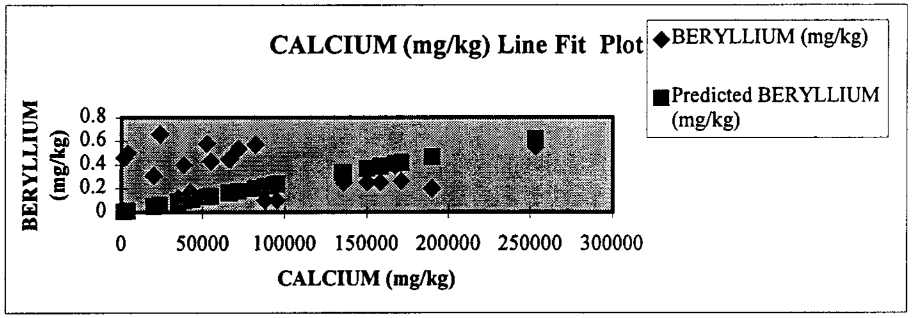


TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - BERYLLIUM
CANNON AIR FORCE BASE

SAMPLE	Metals BERYLLIUM mg/kg			
	Result	Log Result	RL	Qual
CBSB010005	0.5	-0.6931	0.22	
CBSB010010	0.26	-1.3471	0.43	J
CBSB020005	0.46	-0.7765	0.21	
CBSB020010	0.45	-0.7985	0.22	
CBSB020020	0.2	-1.6094	0.44	U
CBSB020029	0.25	-1.3863	0.46	U
CBSB020039	0.25	-1.3863	0.45	U
CBSB030005	0.31	-1.1712	0.21	
CBSB030010	0.25	-1.3863	0.45	U
CBSB040010	0.31	-1.1712	0.43	J
CBSB040020	0.17	-1.7720	0.22	J
CBSB040030	0.12	-2.1203	0.22	J
CBSB040041	0.1	-2.3026	0.22	U
CBSB050005	0.66	-0.4155	0.22	
CBSB050010	0.39	-0.9416	0.43	J
CBSB060005	0.43	-0.8440	0.23	
CBSB060010	0.4	-0.9163	0.21	
CBSB070005	0.55	-0.5978	1.1	U
CBSB070010	0.58	-0.5447	0.22	
CBSB080005	0.57	-0.5621	0.22	
CBSB080010	0.54	-0.6162	0.21	
CBSB080020	0.23	-1.4697	0.22	
CBSB080030	0.1	-2.3026	0.22	J
CBSB080040	0.11	-2.2073	0.21	J
CBSB100005	0.45	-0.7985	0.22	
Number of detects	19			
Count (N)	25			
Minimum (detected)	0.1			
Maximum (detected)	0.66			
Mean (x)	0.35	-1.2055		
Standard deviation (sd)	0.17	0.5836		
Max > Min*5	Yes			
Outlier		No		
T_n[1]		0.759		
Critical value[2]		2.663		

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - BERYLLIUM IN SUBSURFACE SOIL

i	Beryllium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	-0.4155	-2.3026	-1.8871	0.445	-0.8397
2	-0.5447	-2.3026	-1.7579	0.3069	-0.5395
3	-0.5621	-2.2073	-1.6452	0.2543	-0.4184
4	-0.5978	-2.1203	-1.5224	0.2148	-0.3270
5	-0.6162	-1.7720	-1.1558	0.1822	-0.2106
6	-0.6931	-1.6094	-0.9163	0.1539	-0.1410
7	-0.7765	-1.4697	-0.6931	0.1283	-0.0889
8	-0.7985	-1.3863	-0.5878	0.1046	-0.0615
9	-0.7985	-1.3863	-0.5878	0.0823	-0.0484
10	-0.8440	-1.3863	-0.5423	0.061	-0.0331
11	-0.9163	-1.3471	-0.4308	0.0403	-0.0174
12	-0.9416	-1.1712	-0.2296	0.02	-0.0046
13	-1.1712	-1.1712	0.0000	0	0.0000
14	-1.1712	-0.9416	0.2296		-2.7300
15	-1.3471	-0.9163	0.4308		
16	-1.3863	-0.8440	0.5423		
17	-1.3863	-0.7985	0.5878		
18	-1.3863	-0.7985	0.5878		
19	-1.4697	-0.7765	0.6931		
20	-1.6094	-0.6931	0.9163		
21	-1.7720	-0.6162	1.1558		
22	-2.1203	-0.5978	1.5224		
23	-2.2073	-0.5621	1.6452		
24	-2.3026	-0.5447	1.7579		
25	-2.3026	-0.4155	1.8871		
				N	25
				StdDev	0.5836
				W	0.9117
				Wcritical	0.9180
					Not Lognormal

X(i) = Log-transformed values; descending order
X(n-i+1) = Log-transformed values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - BERYLLIUM IN SUBSURFACE SOIL

	Beryllium Result, cont.				
i	X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	0.66	0.1	-0.5600	0.445	-0.2492
2	0.58	0.1	-0.4800	0.3069	-0.1473
3	0.57	0.11	-0.4600	0.2543	-0.1170
4	0.55	0.12	-0.4300	0.2148	-0.0924
5	0.54	0.17	-0.3700	0.1822	-0.0674
6	0.5	0.2	-0.3000	0.1539	-0.0462
7	0.46	0.23	-0.2300	0.1283	-0.0295
8	0.45	0.25	-0.2000	0.1046	-0.0209
9	0.45	0.25	-0.2000	0.0823	-0.0165
10	0.43	0.25	-0.1800	0.061	-0.0110
11	0.4	0.26	-0.1400	0.0403	-0.0056
12	0.39	0.31	-0.0800	0.02	-0.0016
13	0.31	0.31	0.0000	0	0.0000
14	0.31	0.39	0.0800		-0.8045
15	0.26	0.4	0.1400		
16	0.25	0.43	0.1800		
17	0.25	0.45	0.2000		
18	0.25	0.45	0.2000		
19	0.23	0.46	0.2300		
20	0.2	0.5	0.3000		
21	0.17	0.54	0.3700		
22	0.12	0.55	0.4300		
23	0.11	0.57	0.4600		
24	0.1	0.58	0.4800		
25	0.1	0.66	0.5600		
				N	25
				StdDev	0.1688
				W	0.9460
				Wcritical	0.9180
					Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR BERYLLIUM IN SUBSURFACE SOIL

BERYLLIUM (mg/kg)	log-transformed
0.5	-0.6931
0.26	-1.3471
0.46	-0.7765
0.45	-0.7985
0.2	-1.6094
0.25	-1.3863
0.25	-1.3863
0.31	-1.1712
0.25	-1.3863
0.31	-1.1712
0.17	-1.7720
0.12	-2.1203
0.1	-2.3026
0.66	-0.4155
0.39	-0.9416
0.43	-0.8440
0.4	-0.9163
0.55	-0.5978
0.58	-0.5447
0.57	-0.5621
0.54	-0.6162
0.23	-1.4697
0.1	-2.3026
0.11	-2.2073
0.45	-0.7985

BERYLLIUM (mg/kg)	
Mean	0.3456
Standard Error	0.03376922
Median	0.31
Mode	0.25
Standard Deviation	0.16884608
Sample Variance	0.028509
Kurtosis	-1.1513217
Skewness	0.111707
Range	0.56
Minimum	0.1
Maximum	0.66
Sum	8.64
Count	25
Confidence Level(95.0%)	0.06969622

log-transformed	
Mean	-1.2054819
Standard Error	0.11672472
Median	-1.17118298
Mode	-1.38629436
Standard Deviation	0.58362358
Sample Variance	0.34061648
Kurtosis	-0.67564419
Skewness	-0.63421243
Range	1.88706965
Minimum	-2.30258509
Maximum	-0.41551544
Sum	-30.1370474
Count	25
Confidence Level(95.0%)	0.24090792

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

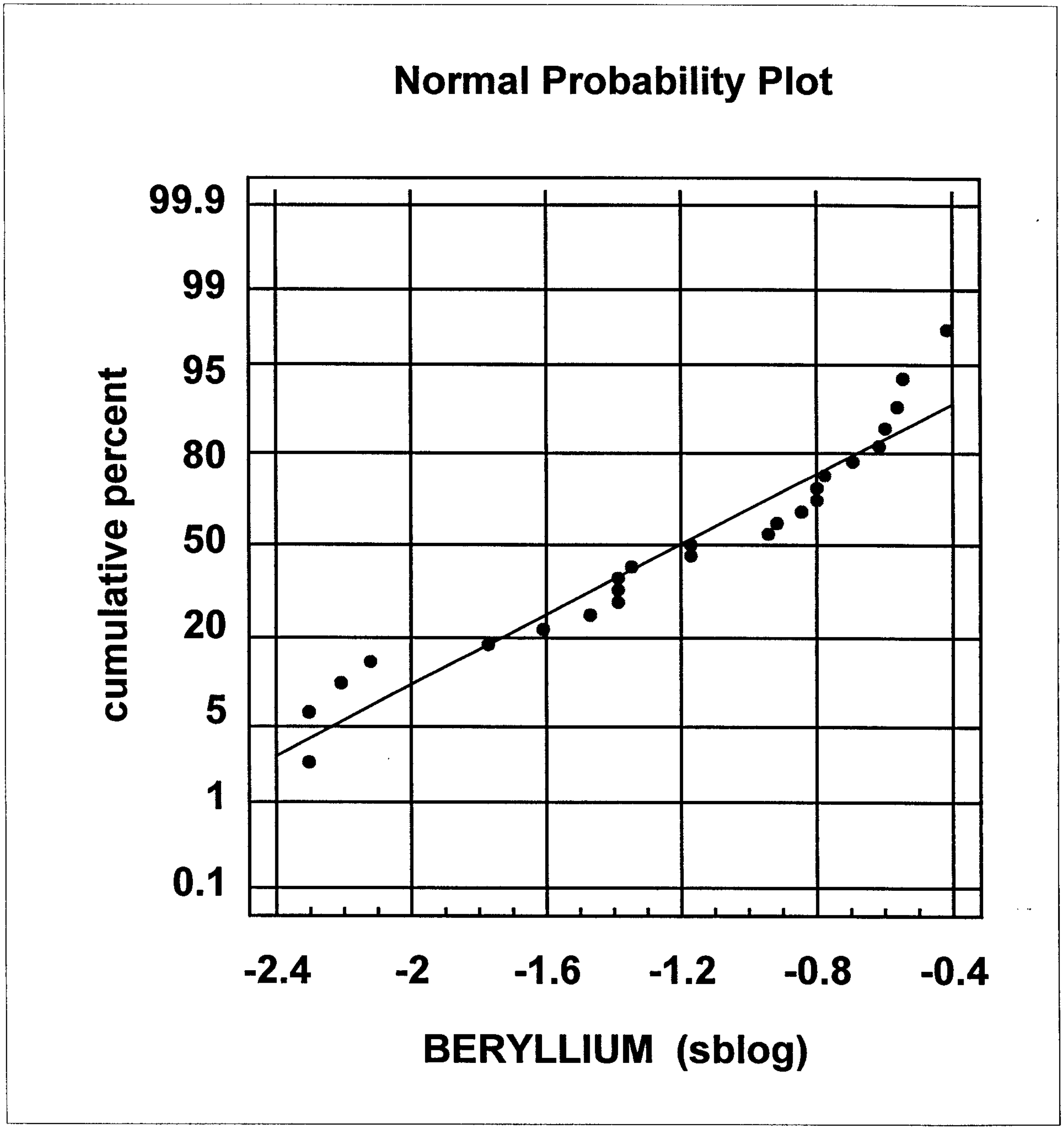
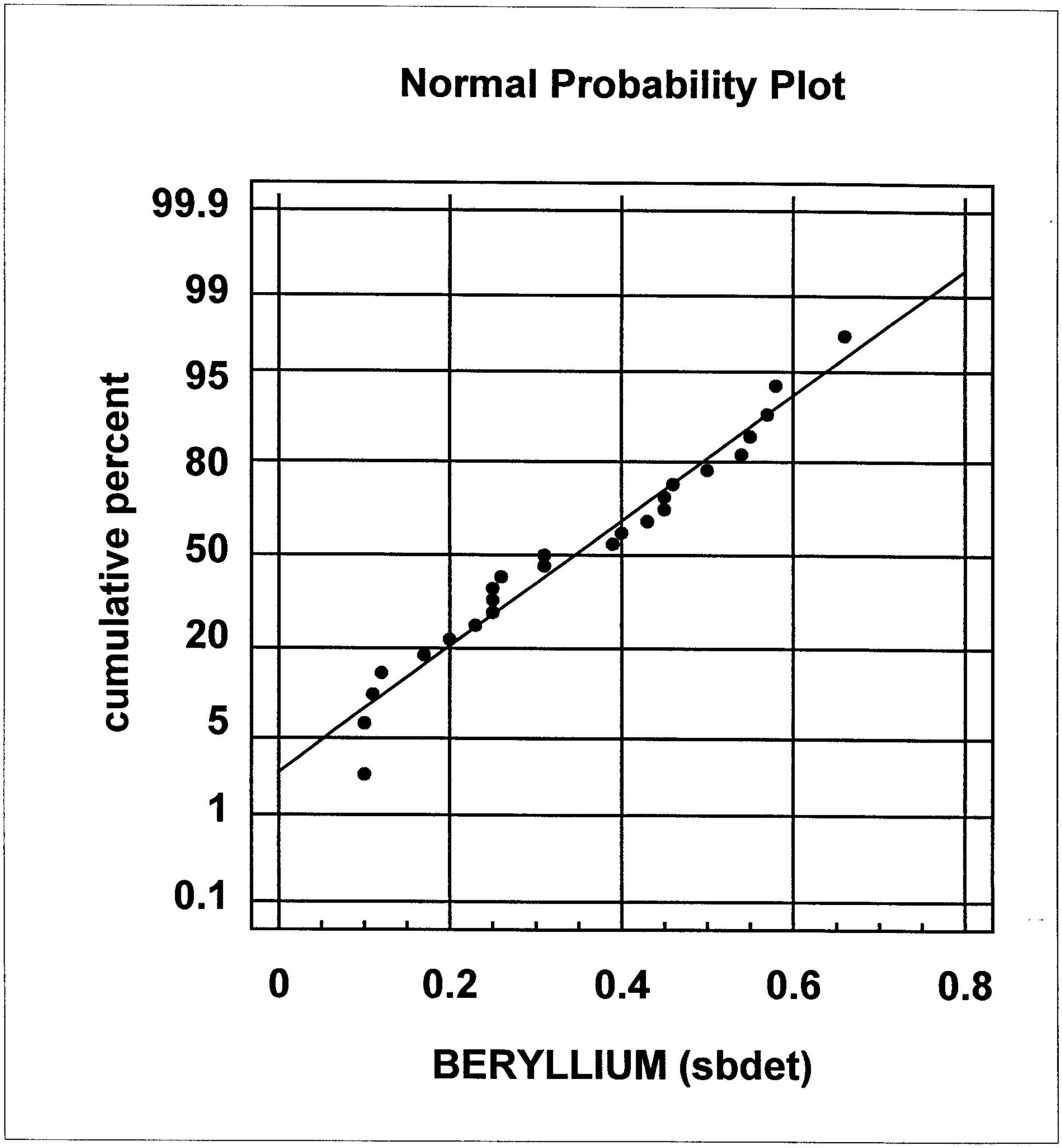


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.6 Cadmium

The cadmium results for all subsurface samples were nondetect. Therefore, no linear regression, outlier, or distribution analyses were conducted.

B.2.7 Calcium

No statistical outliers were identified in the calcium subsurface soil data set (see Table B.2-2). Although several concentrations exceeded the minimum detected concentration by a factor of 5 or more, none of these concentrations were determined to be statistical outliers by the methodology described in Section 5.3.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plots (Figures B.2-1 and B.2-2) indicate that the calcium data set in subsurface soil has a normal distribution.

TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - CALCIUM
CANNON AIR FORCE BASE

SAMPLE	Metals CALCIUM mg/kg Result	Log Result	RL	Qual
CBSB010005	4100	8.3187	21.5	
CBSB010010	171000	12.0494	42.6	
CBSB020005	1750	7.4674	21.4	
CBSB020010	66600	11.1065	21.7	
CBSB020020	190000	12.1548	44.2	
CBSB020029	150000	11.9184	45.6	
CBSB020039	158000	11.9704	44.6	
CBSB030005	19900	9.8985	21.2	
CBSB030010	136000	11.8204	44.5	
CBSB040010	135000	11.8130	43.3	
CBSB040020	42500	10.6573	21.7	
CBSB040030	34900	10.4602	21.9	
CBSB040041	95300	11.4648	21.6	
CBSB050005	23700	10.0732	21.7	
CBSB050010	167000	12.0257	42.9	
CBSB060005	55000	10.9151	22.8	
CBSB060010	38300	10.5532	21.1	
CBSB070005	253000	12.4411	106	
CBSB070010	52500	10.8686	22.1	
CBSB080005	81900	11.3133	21.7	
CBSB080010	71800	11.1816	21.4	
CBSB080020	89500	11.4020	21.6	
CBSB080030	87900	11.3840	21.7	
CBSB080040	43700	10.6851	20.8	
CBSB100005	65900	11.0959	22	
Number of detects	25			
Count (N)	25			
Minimum (detected)	1750			
Maximum (detected)	253000			
Mean (x)	89410	11.0015		
Standard deviation (sd)	64611	1.1517		
Max > Min*5	Yes			
Outlier		No		
T_n[1]		1.250		
Critical value[2]		2.663		

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - CALCIUM IN SUBSURFACE SOIL

i	Calcium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	12.4411	7.4674	-4.9738	0.445	-2.2133
2	12.1548	8.3187	-3.8360	0.3069	-1.1773
3	12.0494	9.8985	-2.1509	0.2543	-0.5470
4	12.0257	10.0732	-1.9525	0.2148	-0.4194
5	11.9704	10.4602	-1.5101	0.1822	-0.2751
6	11.9184	10.5532	-1.3652	0.1539	-0.2101
7	11.8204	10.6573	-1.1632	0.1283	-0.1492
8	11.8130	10.6851	-1.1279	0.1046	-0.1180
9	11.4648	10.8686	-0.5962	0.0823	-0.0491
10	11.4020	10.9151	-0.4869	0.061	-0.0297
11	11.3840	11.0959	-0.2881	0.0403	-0.0116
12	11.3133	11.1065	-0.2068	0.02	-0.0041
13	11.1816	11.1816	0.0000	0	0.0000
14	11.1065	11.3133	0.2068		-5.2040
15	11.0959	11.3840	0.2881		
16	10.9151	11.4020	0.4869		
17	10.8686	11.4648	0.5962		
18	10.6851	11.8130	1.1279		
19	10.6573	11.8204	1.1632		
20	10.5532	11.9184	1.3652		
21	10.4602	11.9704	1.5101		
22	10.0732	12.0257	1.9525		
23	9.8985	12.0494	2.1509		
24	8.3187	12.1548	3.8360		
25	7.4674	12.4411	4.9738		
				N	25
				StdDev	1.1517
				W	0.8507
				Wcritical	0.9180
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - CALCIUM IN SUBSURFACE SOIL

i	X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
	Calcium Result, cont.				
1	253000	1750	-251250.0000	0.445	-111806.2500
2	190000	4100	-185900.0000	0.3069	-57052.7100
3	171000	19900	-151100.0000	0.2543	-38424.7300
4	167000	23700	-143300.0000	0.2148	-30780.8400
5	158000	34900	-123100.0000	0.1822	-22428.8200
6	150000	38300	-111700.0000	0.1539	-17190.6300
7	136000	42500	-93500.0000	0.1283	-11996.0500
8	135000	43700	-91300.0000	0.1046	-9549.9800
9	95300	52500	-42800.0000	0.0823	-3522.4400
10	89500	55000	-34500.0000	0.061	-2104.5000
11	87900	65900	-22000.0000	0.0403	-886.6000
12	81900	66600	-15300.0000	0.02	-306.0000
13	71800	71800	0.0000	0	0.0000
14	66600	81900	15300.0000		-306049.5500
15	65900	87900	22000.0000		
16	55000	89500	34500.0000		
17	52500	95300	42800.0000		
18	43700	135000	91300.0000		
19	42500	136000	93500.0000		
20	38300	150000	111700.0000		
21	34900	158000	123100.0000		
22	23700	167000	143300.0000		
23	19900	171000	151100.0000		
24	4100	190000	185900.0000		
25	1750	253000	251250.0000		
				N	25
				StdDev	64610.9930
				W	0.9349
				Wcritical	0.9180
					Normal

X(i) = Detected values; descending order
X(n-i+1) = Detected values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR CALCIUM IN SUBSURFACE SOIL

CALCIUM (mg/kg)	log-transformed
4100	8.3187
171000	12.0494
1750	7.4674
66600	11.1065
190000	12.1548
150000	11.9184
158000	11.9704
19900	9.8985
136000	11.8204
135000	11.8130
42500	10.6573
34900	10.4602
95300	11.4648
23700	10.0732
167000	12.0257
55000	10.9151
38300	10.5532
253000	12.4411
52500	10.8686
81900	11.3133
71800	11.1816
89500	11.4020
87900	11.3840
43700	10.6851
65900	11.0959

CALCIUM (mg/kg)	
Mean	89410
Standard Error	12922.1986
Median	71800
Mode	#N/A
Standard Deviation	64610.993
Sample Variance	4174580417
Kurtosis	0.04503343
Skewness	0.77527901
Range	251250
Minimum	1750
Maximum	253000
Sum	2235250
Count	25
Confidence Level(95.0%)	26670.1016

log-transformed	
Mean	11.00154
Standard Error	0.230335
Median	11.18164
Mode	#N/A
Standard Deviation	1.151675
Sample Variance	1.326356
Kurtosis	3.312881
Skewness	-1.66495
Range	4.973774
Minimum	7.467371
Maximum	12.44114
Sum	275.0385
Count	25
Confidence Level(95.0%)	0.475388

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

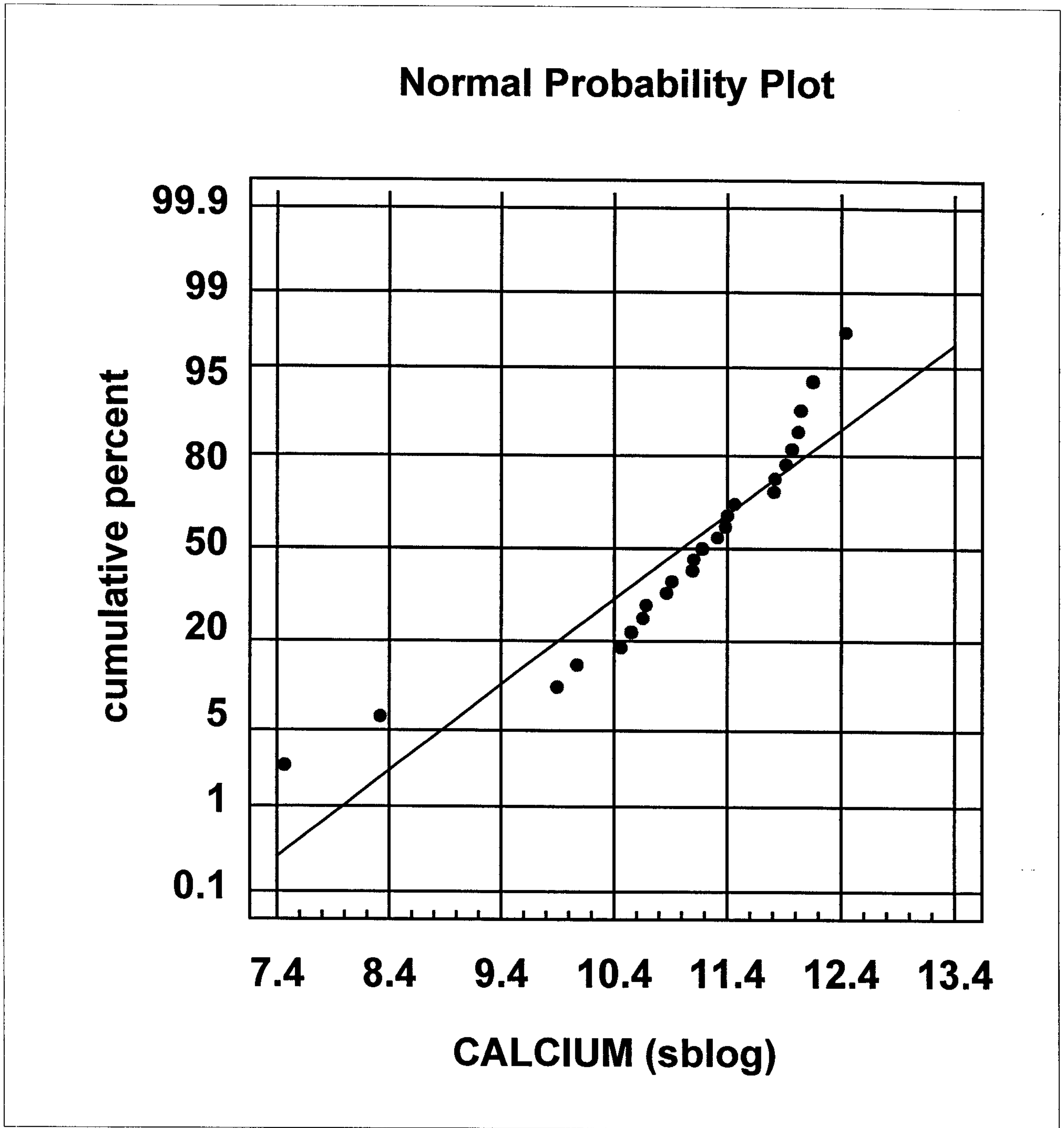
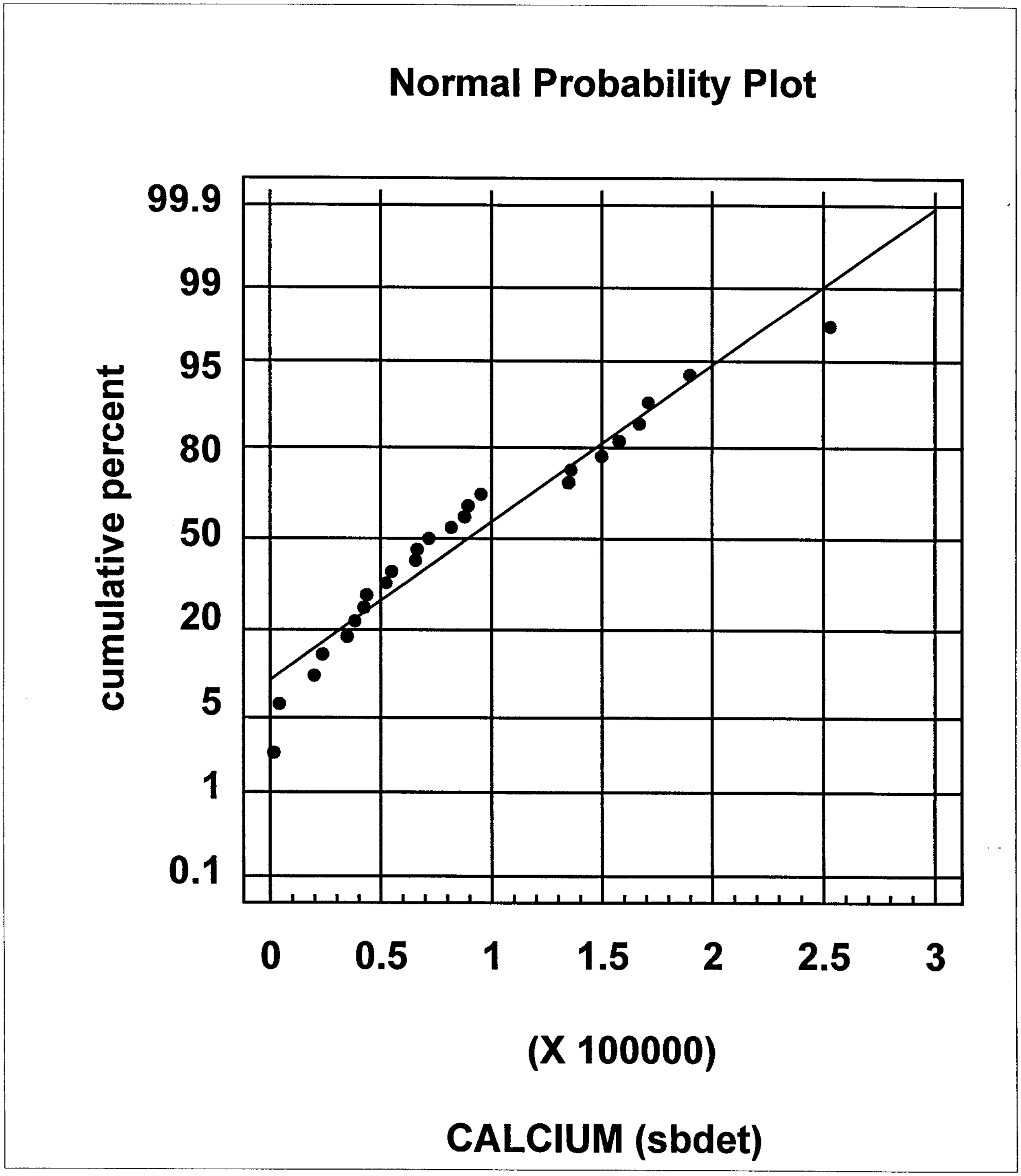


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.8 Chromium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -3.0 (Table B.2-1) indicates that chromium concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No potential outliers were identified in the data set for chromium (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plot (Figure B.2-1) indicate that the chromium data set in subsurface soil has a lognormal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR CHROMIUM IN SUBSURFACE SOIL

CHROMIUM, TOTAL (mg/kg)	CALCIUM (mg/kg)
10	4100
4.5	171000
8.9	1750
6.5	66600
3	190000
4.4	150000
3.6	158000
7.7	19900
2.7	136000
4.9	135000
4	42500
2.8	34900
3	95300
11.1	23700
7.5	167000
4.6	55000
7.1	38300
4.5	253000
6.9	52500
8	81900
5.9	71800
3.9	89500
5.3	87900
3	43700
5.9	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0
R Square	-3.028625632
Adjusted R Square	-3.070292298
Standard Error	4.682613512
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-395.6184632	-395.618463	-18.0426333	#NUM!
Residual	24	526.2448632	21.9268693		
Total	25	130.6264			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR CHROMIUM IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	3.58222E-05	8.54862E-06	4.190407207	0.000325328	1.81787E-05	5.34657E-05	1.81787E-05	5.34657E-05

RESIDUAL OUTPUT

Observation	*Predicted CHROMIUM, TOTAL (mg/kg)*	*Residuals*
1	0.146871047	9.853128953
2	6.125597333	-1.625597333
3	0.062688862	8.837311138
4	2.385758961	4.114241039
5	6.806219259	-3.806219259
6	5.373330994	-0.973330994
7	5.659908647	-2.059908647
8	0.712861912	6.987138088
9	4.871820101	-2.171820101
10	4.835997894	0.064002106
11	1.522443782	2.477556218
12	1.250195011	1.549804989
13	3.413856291	-0.413856291
14	0.848986297	10.2510137
15	5.982308506	1.517691494
16	1.970221364	2.629778636
17	1.371990514	5.728009486
18	9.063018276	-4.563018276
19	1.880665848	5.019334152
20	2.933838723	5.066161277
21	2.572034436	3.327965564
22	3.206087493	0.693912507
23	3.148771962	2.151228038
24	1.56543043	1.43456957
25	2.360683417	3.539316583

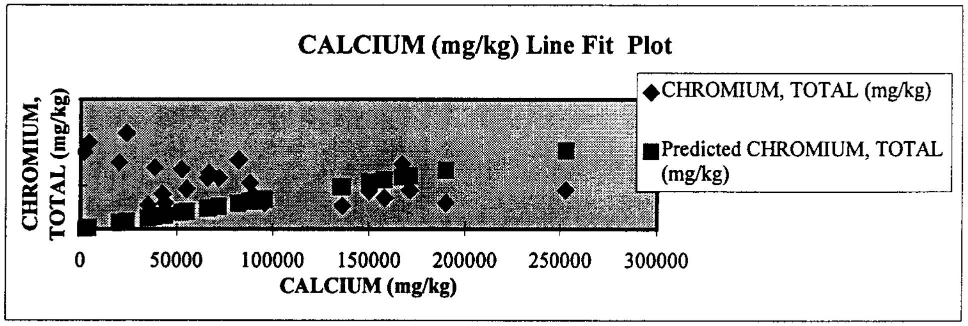


TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - CHROMIUM (TOTAL)
CANNON AIR FORCE BASE

SAMPLE	Metals CHROMIUM, TOTAL mg/kg		
	Result	RL	Qual
CBSB010005	10	1.1	
CBSB010010	4.5	2.1	
CBSB020005	8.9	1.1	
CBSB020010	6.5	1.1	
CBSB020020	3	2.2	
CBSB020029	4.4	2.3	
CBSB020039	3.6	2.2	
CBSB030005	7.7	1.1	
CBSB030010	2.7	2.2	
CBSB040010	4.9	2.2	
CBSB040020	4	1.1	
CBSB040030	2.8	1.1	
CBSB040041	3	1.1	
CBSB050005	11.1	1.1	
CBSB050010	7.5	2.1	
CBSB060005	4.6	1.1	
CBSB060010	7.1	1.1	
CBSB070005	4.5	5.3	J
CBSB070010	6.9	1.1	
CBSB080005	8	1.1	
CBSB080010	5.9	1.1	
CBSB080020	3.9	1.1	
CBSB080030	5.3	1.1	
CBSB080040	3	1	
CBSB100005	5.9	1.1	
Number of detects	25		
Count (N)	25		
Minimum (detected)	2.7		
Maximum (detected)	11.1		
Mean (x)	5.59		
Standard deviation (sd)	2.33		
Max > Min*5	No		
Outlier	NA		
T_n[1]			
Critical value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - CHROMIUM IN SUBSURFACE SOIL

	Chromium Log Result				
i	X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	2.4069	0.9933	-1.4137	0.445	-0.6291
2	2.3026	1.0296	-1.2730	0.3069	-0.3907
3	2.1861	1.0986	-1.0874	0.2543	-0.2765
4	2.0794	1.0986	-0.9808	0.2148	-0.2107
5	2.0412	1.0986	-0.9426	0.1822	-0.1717
6	2.0149	1.2809	-0.7340	0.1539	-0.1130
7	1.9601	1.3610	-0.5991	0.1283	-0.0769
8	1.9315	1.3863	-0.5452	0.1046	-0.0570
9	1.8718	1.4816	-0.3902	0.0823	-0.0321
10	1.7750	1.5041	-0.2709	0.061	-0.0165
11	1.7750	1.5041	-0.2709	0.0403	-0.0109
12	1.6677	1.5261	-0.1417	0.02	-0.0028
13	1.5892	1.5892	0.0000	0	0.0000
14	1.5261	1.6677	0.1417		-1.9880
15	1.5041	1.7750	0.2709		
16	1.5041	1.7750	0.2709		
17	1.4816	1.8718	0.3902		
18	1.3863	1.9315	0.5452		
19	1.3610	1.9601	0.5991		
20	1.2809	2.0149	0.7340		
21	1.0986	2.0412	0.9426		
22	1.0986	2.0794	0.9808		
23	1.0986	2.1861	1.0874		
24	1.0296	2.3026	1.2730		
25	0.9933	2.4069	1.4137		
				N	25
				StdDev	0.4142
				W	0.9599
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR CHROMIUM IN SUBSURFACE SOIL

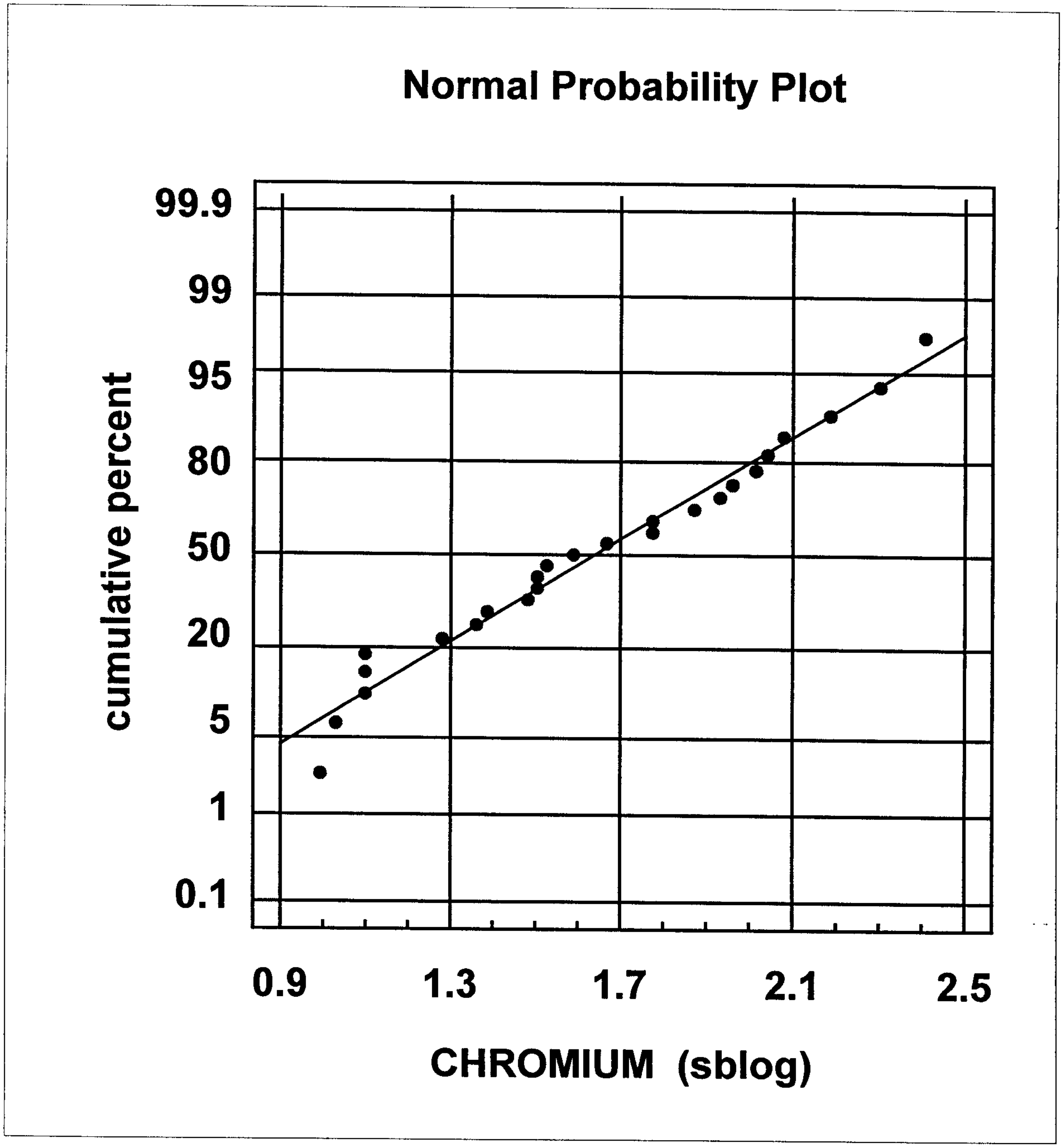
CHROMIUM, TOTAL (mg/kg)	log-transformed
10	2.3026
4.5	1.5041
8.9	2.1861
6.5	1.8718
3	1.0986
4.4	1.4816
3.6	1.2809
7.7	2.0412
2.7	0.9933
4.9	1.5892
4	1.3863
2.8	1.0296
3	1.0986
11.1	2.4069
7.5	2.0149
4.6	1.5261
7.1	1.9601
4.5	1.5041
6.9	1.9315
8	2.0794
5.9	1.7750
3.9	1.3610
5.3	1.6677
3	1.0986
5.9	1.7750

CHROMIUM, TOTAL(mg/kg)	
Mean	5.588
Standard Error	0.46659476
Median	4.9
Mode	3
Standard Deviation	2.33297378
Sample Variance	5.44276667
Kurtosis	-0.16463981
Skewness	0.73710088
Range	8.4
Minimum	2.7
Maximum	11.1
Sum	139.7
Count	25
Confidence Level(95.0%)	0.96300405

log-transformed	
Mean	1.6385656
Standard Error	0.0828377
Median	1.58923521
Mode	1.09861229
Standard Deviation	0.41418851
Sample Variance	0.17155212
Kurtosis	-0.99186015
Skewness	0.08332059
Range	1.41369334
Minimum	0.99325177
Maximum	2.40694511
Sum	40.9641399
Count	25
Confidence Level(95.0%)	0.17096858

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.9 Cobalt

A nonlinear regression line fit plot and coefficient of determination (R^2) of -1.5 (Table B.2-1) indicates that cobalt concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No statistical outliers were identified in the cobalt subsurface soil data set (see Table B.2-2). Although several concentrations exceeded the minimum detected concentration by a factor of 5 or more, none of these concentrations were determined to be statistical outliers by the methodology described in Section 5.3.

The Shapiro-Wilk test (Table B.2-3) and probability plots (Figures B.2-1 and B.2-2) indicate that the cobalt data set in subsurface soil has neither a lognormal nor normal distribution. The coefficient of skewness was inconclusive, probably due to a small data set. However, since two of three tests indicated the same results, it was concluded that the cobalt data set has neither a lognormal nor normal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR COBALT IN SUBSURFACE SOIL

COBALT (mg/kg)	CALCIUM (mg/kg)
3.5	4100
1.05	171000
3.1	1750
2.7	66600
1.1	190000
1.15	150000
1.1	158000
3.5	19900
1.1	136000
4.1	135000
1.9	42500
0.55	34900
0.55	95300
4.7	23700
4	167000
3.3	55000
3	38300
4.5	253000
3.2	52500
4.7	81900
4.3	71800
2.9	89500
1	87900
1.8	43700
3.4	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0
R Square	-1.535517845
Adjusted R Square	-1.577184511
Standard Error	2.215057692
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-71.31313394	-71.3131339	-14.534478	#NUM!
Residual	24	117.7555339	4.906480581		
Total	25	46.4424			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR COBALT IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	1.86162E-05	4.04383E-06	4.603617061	0.000113785	1.02702E-05	2.69623E-05	1.02702E-05	2.69623E-05

RESIDUAL OUTPUT

Observation	*Predicted COBALT (mg/kg)*	*Residuals*
1	0.076326594	3.423673406
2	3.183377454	-2.133377454
3	0.032578424	3.067421576
4	1.239841745	1.460158255
5	3.53708606	-2.43708606
6	2.792436363	-1.642436363
7	2.941366303	-1.841366303
8	0.370463224	3.129536776
9	2.531808969	-1.431808969
10	2.513192727	1.586807273
11	0.791190303	1.108809697
12	0.649706861	-0.099706861
13	1.774127903	-1.224127903
14	0.441204945	4.258795055
15	3.108912485	0.891087515
16	1.023893333	2.276106667
17	0.713002085	2.286997915
18	4.709909333	-0.209909333
19	0.977352727	2.222647273
20	1.524670254	3.175329746
21	1.336646206	2.963353794
22	1.666153697	1.233846303
23	1.636367709	-0.636367709
24	0.813529794	0.986470206
25	1.226810376	2.173189624

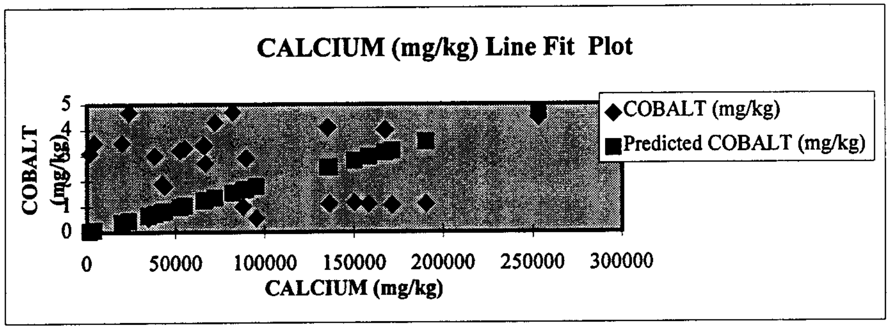


TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - COBALT
CANNON AIR FORCE BASE

SAMPLE	Metals COBALT mg/kg			
	Result	Log Result	RL	Qual
CBSB010005	3.5	1.2528	1.1	
CBSB010010	1.05	0.0488	2.1	U
CBSB020005	3.1	1.1314	1.1	
CBSB020010	2.7	0.9933	1.1	
CBSB020020	1.1	0.0953	2.2	U
CBSB020029	1.15	0.1398	2.3	U
CBSB020039	1.1	0.0953	2.2	U
CBSB030005	3.5	1.2528	1.1	
CBSB030010	1.1	0.0953	2.2	U
CBSB040010	4.1	1.4110	2.2	
CBSB040020	1.9	0.6419	1.1	
CBSB040030	0.55	-0.5978	1.1	U
CBSB040041	0.55	3.8959	1.1	U
CBSB050005	4.7	1.5476	1.1	
CBSB050010	4	1.3863	2.1	
CBSB060005	3.3	1.1939	1.1	
CBSB060010	3	1.0986	1.1	
CBSB070005	4.5	1.5041	5.3	J
CBSB070010	3.2	1.1632	1.1	
CBSB080005	4.7	1.5476	1.1	
CBSB080010	4.3	1.4586	1.1	
CBSB080020	2.9	1.0647	1.1	
CBSB080030	1	0.0000	1.1	J
CBSB080040	1.8	0.5878	1	
CBSB100005	3.4	1.2238	1.1	
Number of detects	18			
Count (N)	25			
Minimum (detected)	0.55			
Maximum (detected)	4.7			
Mean (x)	2.6	0.9693		
Standard deviation (sd)	1.4	0.8653		
Max > Min*5	Yes			
Outlier		No		
T_n[1]		0.668		
Critical value[2]		2.663		

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

1 $T_n = (X_n - X)/sd$ Source: EPA 1989

2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - COBALT IN SUBSURFACE SOIL

i	Cobalt Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	1.5476	-0.5978	-2.1454	0.445	-0.9547
2	1.5476	-0.5978	-2.1454	0.3069	-0.6584
3	1.5041	0.0000	-1.5041	0.2543	-0.3825
4	1.4586	0.0488	-1.4098	0.2148	-0.3028
5	1.4110	0.0953	-1.3157	0.1822	-0.2397
6	1.3863	0.0953	-1.2910	0.1539	-0.1987
7	1.2528	0.0953	-1.1575	0.1283	-0.1485
8	1.2528	0.1398	-1.1130	0.1046	-0.1164
9	1.2238	0.5878	-0.6360	0.0823	-0.0523
10	1.1939	0.6419	-0.5521	0.061	-0.0337
11	1.1632	0.9933	-0.1699	0.0403	-0.0068
12	1.1314	1.0647	-0.0667	0.02	-0.0013
13	1.0986	1.0986	0.0000	0	0.0000
14	1.0647	1.1314	0.0667		-3.0960
15	0.9933	1.1632	0.1699		
16	0.6419	1.1939	0.5521		
17	0.5878	1.2238	0.6360		
18	0.1398	1.2528	1.1130		
19	0.0953	1.2528	1.1575		
20	0.0953	1.3863	1.2910		
21	0.0953	1.4110	1.3157		
22	0.0488	1.4586	1.4098		
23	0.0000	1.5041	1.5041		
24	-0.5978	1.5476	2.1454		
25	-0.5978	1.5476	2.1454		
				N	25
				StdDev	0.6786
				W	0.8672
				Wcritical	0.9180
					Not Lognormal

X(i) = Log-transformed values; descending order
X(n-i+1) = Log-transformed values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - COBALT IN SUBSURFACE SOIL

i	Cobalt Result, cont. X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	4.7	0.55	-4.1500	0.445	-1.8468
2	4.7	0.55	-4.1500	0.3069	-1.2736
3	4.5	1	-3.5000	0.2543	-0.8901
4	4.3	1.05	-3.2500	0.2148	-0.6981
5	4.1	1.1	-3.0000	0.1822	-0.5466
6	4	1.1	-2.9000	0.1539	-0.4463
7	3.5	1.1	-2.4000	0.1283	-0.3079
8	3.5	1.15	-2.3500	0.1046	-0.2458
9	3.4	1.8	-1.6000	0.0823	-0.1317
10	3.3	1.9	-1.4000	0.061	-0.0854
11	3.2	2.7	-0.5000	0.0403	-0.0202
12	3.1	2.9	-0.2000	0.02	-0.0040
13	3	3	0.0000	0	0.0000
14	2.9	3.1	0.2000		-6.4964
15	2.7	3.2	0.5000		
16	1.9	3.3	1.4000		
17	1.8	3.4	1.6000		
18	1.15	3.5	2.3500		
19	1.1	3.5	2.4000		
20	1.1	4	2.9000		
21	1.1	4.1	3.0000		
22	1.05	4.3	3.2500		
23	1	4.5	3.5000		
24	0.55	4.7	4.1500		
25	0.55	4.7	4.1500		
				N	25
				StdDev	1.3911
				W	0.9087
				Wcritical	0.9180
					Not Normal

X(i) = Detected values; descending order
X(n-i+1) = Detected values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR COBALT IN SUBSURFACE SOIL

COBALT (mg/kg)	log-transformed
3.5	1.2528
1.05	0.0488
3.1	1.1314
2.7	0.9933
1.1	0.0953
1.15	0.1398
1.1	0.0953
3.5	1.2528
1.1	0.0953
4.1	1.4110
1.9	0.6419
0.55	-0.5978
0.55	-0.5978
4.7	1.5476
4	1.3863
3.3	1.1939
3	1.0986
4.5	1.5041
3.2	1.1632
4.7	1.5476
4.3	1.4586
2.9	1.0647
1	0.0000
1.8	0.5878
3.4	1.2238

COBALT (mg/kg)	
Mean	2.648
Standard Error	0.27821574
Median	3
Mode	1.1
Standard Deviation	1.39107872
Sample Variance	1.9351
Kurtosis	-1.41526438
Skewness	-0.11121459
Range	4.15
Minimum	0.55
Maximum	4.7
Sum	66.2
Count	25
Confidence Level(95.0%)	0.57420895

log-transformed	
Mean	0.78951598
Standard Error	0.13572321
Median	1.09861229
Mode	0.09531018
Standard Deviation	0.67861605
Sample Variance	0.46051974
Kurtosis	-0.74541198
Skewness	-0.73077161
Range	2.14539951
Minimum	-0.597837
Maximum	1.54756251
Sum	19.7378995
Count	25
Confidence Level(95.0%)	0.28011888

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

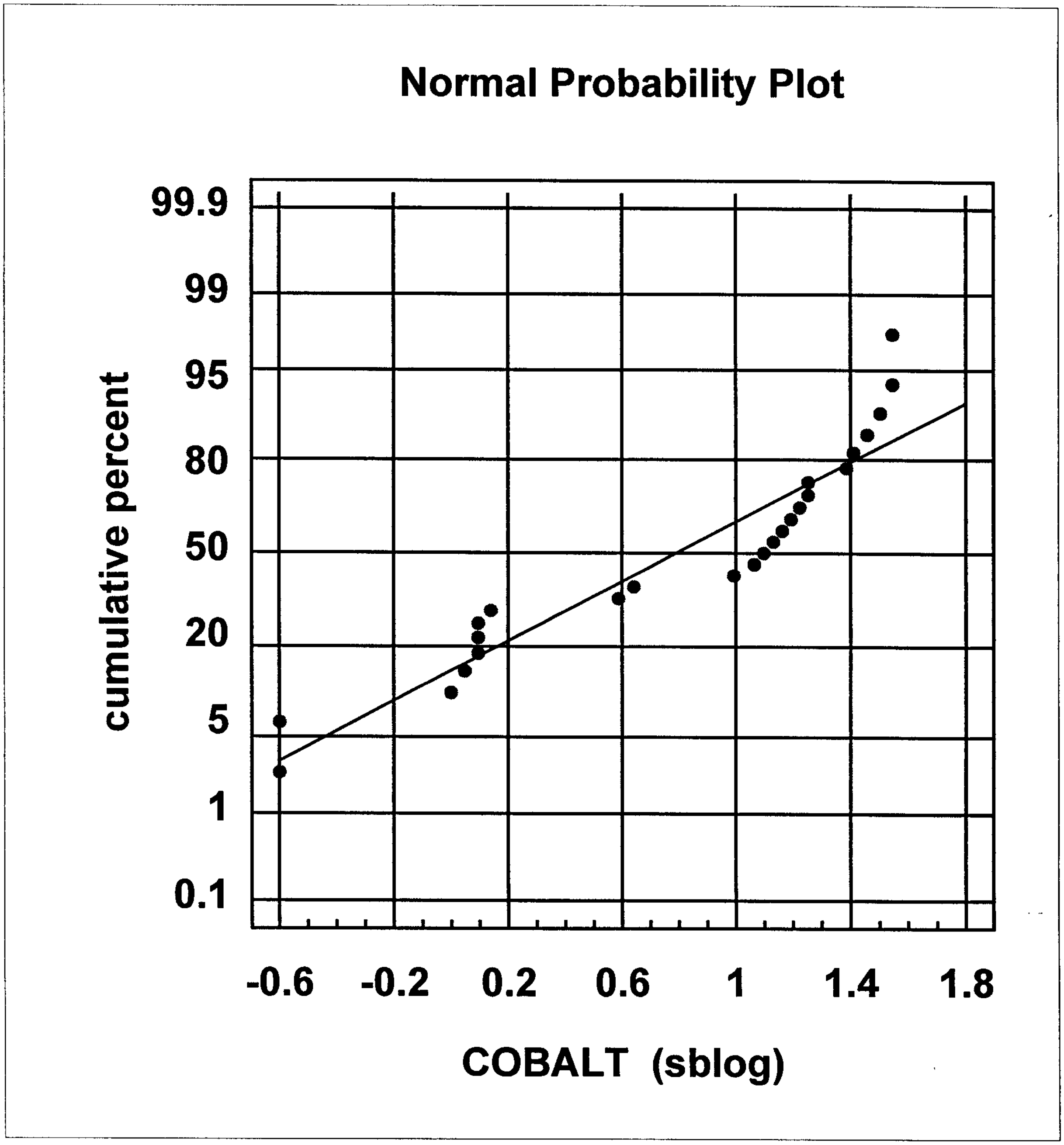
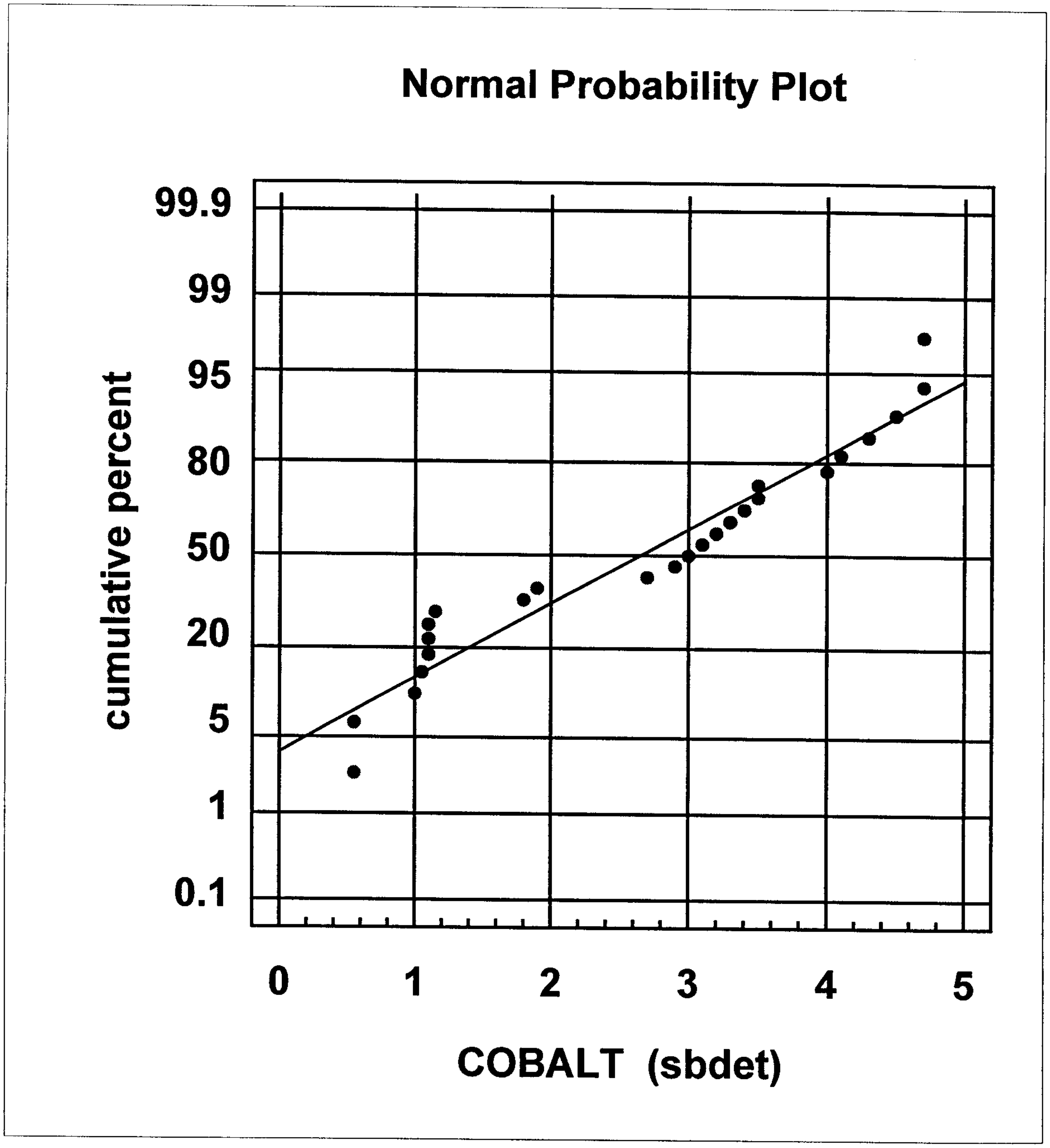


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.10 Copper

A nonlinear regression line fit plot and coefficient of determination (R^2) of -1.8 (Table B.2-1) indicates that copper concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No statistical outliers were identified in the copper subsurface soil data set (see Table B.2-2). Although several concentrations exceeded the minimum detected concentration by a factor of 5 or more, none of these concentrations were determined to be statistical outliers by the methodology described in Section 5.3.

The Shapiro-Wilk test (Table B.2-3) and probability plots (Figures B.2-1 and B.2-2) indicate that the copper data set in subsurface soil has a normal distribution. The coefficient of skewness was inconclusive, probably due to a small data set. However, since two of three tests indicated the same result, and the Shapiro-Wilk test is considered to be one of the best tests for normality, it was concluded that the copper data set has a normal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR COPPER IN SUBSURFACE SOIL

COPPER (mg/kg)	CALCIUM (mg/kg)
6.2	4100
3.2	171000
5.2	1750
4.5	66600
2.2	190000
2.3	150000
2.25	158000
6.6	19900
2.25	136000
4.1	135000
2.7	42500
1.1	34900
1.1	95300
7.4	23700
4	167000
4.3	55000
5.3	38300
5.3	253000
3.4	52500
7.3	81900
5	71800
1.8	89500
1.3	87900
1.1	43700
5.1	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0
R Square	-1.779965363
Adjusted R Square	-1.821632029
Standard Error	3.277448753
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-165.0650879	-165.065088	-15.3667989	#NUM!
Residual	24	257.8000879	10.74167033		
Total	25	92.735			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR COPPER IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	2.55543E-05	5.98334E-06	4.270905907	0.000265196	1.32053E-05	3.79033E-05	1.32053E-05	3.79033E-05

RESIDUAL OUTPUT

Observation	*Predicted COPPER (mg/kg)*	*Residuals*
1	0.104772562	6.095227438
2	4.369782452	-1.169782452
3	0.044719996	5.155280004
4	1.701915271	2.798084729
5	4.855313835	-2.655313835
6	3.833142501	-1.533142501
7	4.037576768	-1.787576768
8	0.508530239	6.091469761
9	3.475382535	-1.225382535
10	3.449828251	0.650171749
11	1.086057042	1.613942958
12	0.891844489	0.208155511
13	2.435323203	-1.335323203
14	0.605636515	6.794363485
15	4.267565318	-0.267565318
16	1.405485584	2.894514416
17	0.978729052	4.321270948
18	6.465233686	-1.165233686
19	1.341599875	2.058400125
20	2.092895806	5.207104194
21	1.834797544	3.165202456
22	2.287108359	-0.487108359
23	2.246221506	-0.946221506
24	1.116722182	-0.016722182
25	1.684027272	3.415972728

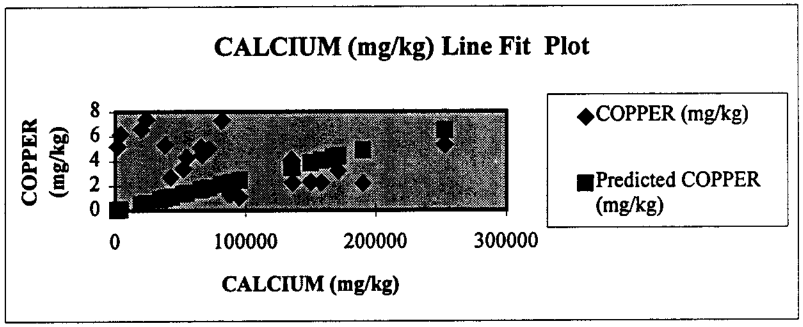


TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - COPPER
CANNON AIR FORCE BASE

SAMPLE	Metals COPPER mg/kg Result	Log Result	RL	Qual
CBSB010005	6.2	1.8245	2.2	
CBSB010010	3.2	1.1632	4.3	J
CBSB020005	5.2	1.6487	2.1	
CBSB020010	4.5	1.5041	2.2	
CBSB020020	2.2	0.7885	4.4	U
CBSB020029	2.3	0.8329	4.6	J
CBSB020039	2.25	0.8109	4.5	U
CBSB030005	6.6	1.8871	2.1	
CBSB030010	2.25	0.8109	4.5	U
CBSB040010	4.1	1.4110	4.3	J
CBSB040020	2.7	0.9933	2.2	
CBSB040030	1.1	0.0953	2.2	U
CBSB040041	1.1	0.0953	2.2	U
CBSB050005	7.4	2.0015	2.2	
CBSB050010	4	1.3863	4.3	J
CBSB060005	4.3	1.4586	2.3	
CBSB060010	5.3	1.6677	2.1	
CBSB070005	5.3	1.6677	10.6	U
CBSB070010	3.4	1.2238	2.2	
CBSB080005	7.3	1.9879	2.2	
CBSB080010	5	1.6094	2.1	
CBSB080020	1.8	0.5878	2.2	J
CBSB080030	1.3	0.2624	2.2	J
CBSB080040	1.1	0.0953	2.1	J
CBSB100005	5.1	1.6292	2.2	
Number of detects	19			
Count (N)	25			
Minimum (detected)	1.1			
Maximum (detected)	7.4			
Mean (x)	3.80	1.1777		
Standard deviation (sd)	1.97	0.6093		
Max > Min*5	Yes			
Outlier		No		
T_n[1]		1.352		
Critical value[2]		2.663		

RL = reporting limit

Qual = qualifier

J = estimated value below reporting limit

U = nondetect

NA = not applicable

Shading indicates actual detection

Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

1 $T_n = (X_n - X)/sd$ Source: EPA 1989

2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - COPPER IN SUBSURFACE SOIL

i	Copper Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	2.0015	0.0953	-1.9062	0.445	-0.8482
2	1.9879	0.0953	-1.8926	0.3069	-0.5808
3	1.8871	0.0953	-1.7918	0.2543	-0.4556
4	1.8245	0.2624	-1.5622	0.2148	-0.3356
5	1.6677	0.5878	-1.0799	0.1822	-0.1968
6	1.6677	0.7885	-0.8792	0.1539	-0.1353
7	1.6487	0.8109	-0.8377	0.1283	-0.1075
8	1.6292	0.8109	-0.8183	0.1046	-0.0856
9	1.6094	0.8329	-0.7765	0.0823	-0.0639
10	1.5041	0.9933	-0.5108	0.061	-0.0312
11	1.4586	1.1632	-0.2955	0.0403	-0.0119
12	1.4110	1.2238	-0.1872	0.02	-0.0037
13	1.3863	1.3863	0.0000	0	0.0000
14	1.2238	1.4110	0.1872		-2.8561
15	1.1632	1.4586	0.2955		
16	0.9933	1.5041	0.5108		
17	0.8329	1.6094	0.7765		
18	0.8109	1.6292	0.8183		
19	0.8109	1.6487	0.8377		
20	0.7885	1.6677	0.8792		
21	0.5878	1.6677	1.0799		
22	0.2624	1.8245	1.5622		
23	0.0953	1.8871	1.7918		
24	0.0953	1.9879	1.8926		
25	0.0953	2.0015	1.9062		
				N	25
				StdDev	0.6093
				W	0.9157
				Wcritical	0.9180
					Not Lognormal

X(i) = Log-transformed values; descending order
X(n-i+1) = Log-transformed values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - COPPER IN SUBSURFACE SOIL

Copper Result, cont.

i	X(i)	X(n-i+1)	X(n-i+1)-X(i	a(n-i+1)	b(i)
1	7.4	1.1	-6.3000	0.445	-2.8035
2	7.3	1.1	-6.2000	0.3069	-1.9028
3	6.6	1.1	-5.5000	0.2543	-1.3987
4	6.2	1.3	-4.9000	0.2148	-1.0525
5	5.3	1.8	-3.5000	0.1822	-0.6377
6	5.3	2.2	-3.1000	0.1539	-0.4771
7	5.2	2.25	-2.9500	0.1283	-0.3785
8	5.1	2.25	-2.8500	0.1046	-0.2981
9	5	2.3	-2.7000	0.0823	-0.2222
10	4.5	2.7	-1.8000	0.061	-0.1098
11	4.3	3.2	-1.1000	0.0403	-0.0443
12	4.1	3.4	-0.7000	0.02	-0.0140
13	4	4	0.0000	0	0.0000
14	3.4	4.1	0.7000		-9.3392
15	3.2	4.3	1.1000		
16	2.7	4.5	1.8000		
17	2.3	5	2.7000		
18	2.25	5.1	2.8500		
19	2.25	5.2	2.9500		
20	2.2	5.3	3.1000		
21	1.8	5.3	3.5000		
22	1.3	6.2	4.9000		
23	1.1	6.6	5.5000		
24	1.1	7.3	6.2000		
25	1.1	7.4	6.3000		
				N	25
				StdDev	1.9657
				W	0.9405
				Wcritical	0.9180
					Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed da

TABLE B.2-4

SUMMARY STATISTICS FOR COPPER IN SUBSURFACE SOIL

COPPER (mg/kg)	log-transformed
6.2	1.8245
3.2	1.1632
5.2	1.6487
4.5	1.5041
2.2	0.7885
2.3	0.8329
2.25	0.8109
6.6	1.8871
2.25	0.8109
4.1	1.4110
2.7	0.9933
1.1	0.0953
1.1	0.0953
7.4	2.0015
4	1.3863
4.3	1.4586
5.3	1.6677
5.3	1.6677
3.4	1.2238
7.3	1.9879
5	1.6094
1.8	0.5878
1.3	0.2624
1.1	0.0953
5.1	1.6292

COPPER (mg/kg)		*log-transformed*	
Mean	3.8	Mean	1.17772737
Standard Error	0.39313908	Standard Error	0.1218511
Median	4	Median	1.38629436
Mode	1.1	Mode	0.09531018
Standard Deviation	1.96569538	Standard Deviation	0.60925549
Sample Variance	3.86395833	Sample Variance	0.37119225
Kurtosis	-1.00896008	Kurtosis	-0.85175843
Skewness	0.23866368	Skewness	-0.5352227
Range	6.3	Range	1.90616982
Minimum	1.1	Minimum	0.09531018
Maximum	7.4	Maximum	2.00148
Sum	95	Sum	29.4431842
Count	25	Count	25
Confidence Level(95.0%)	0.81139901	Confidence Level(95.0%)	0.25148825

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

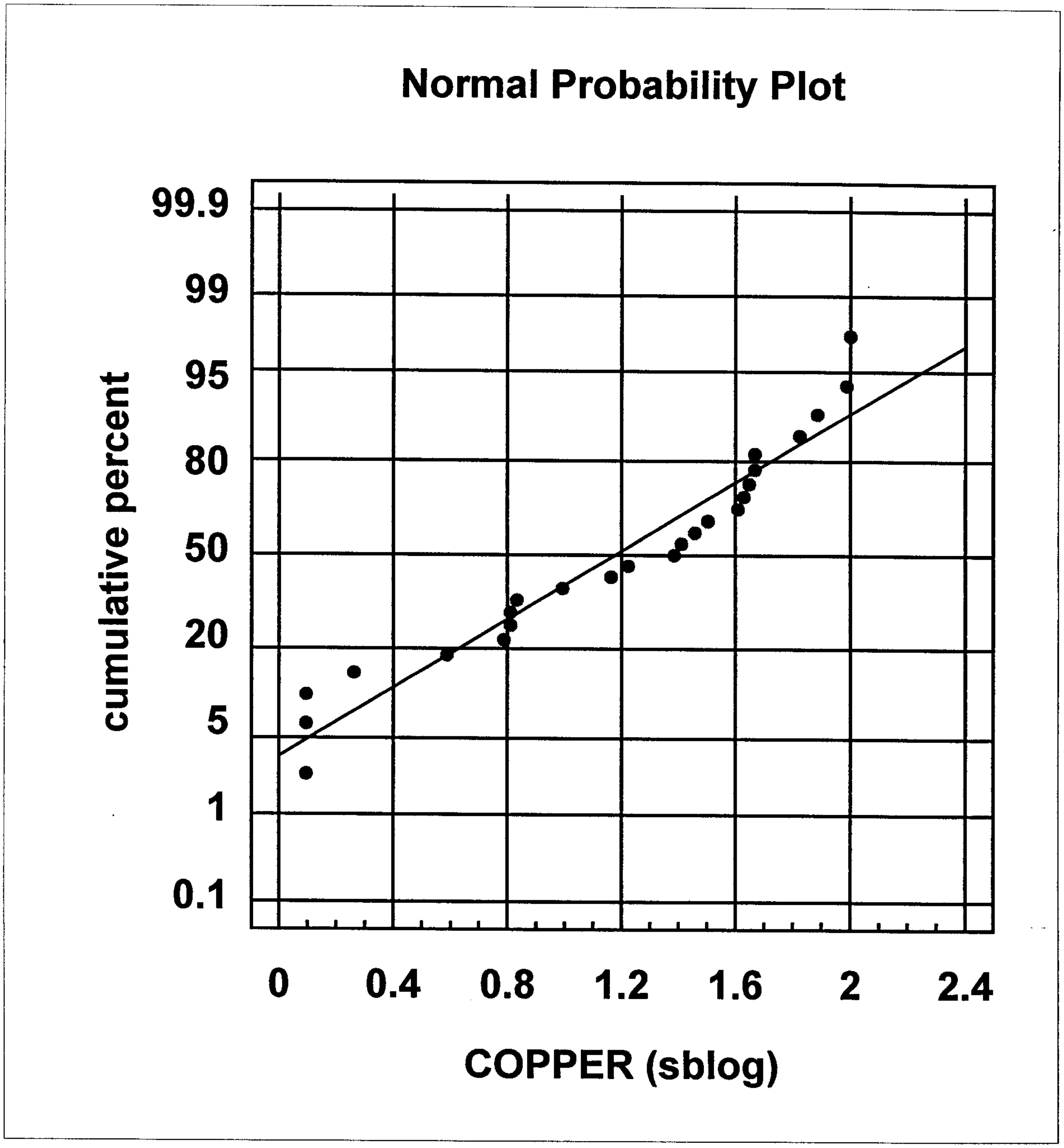
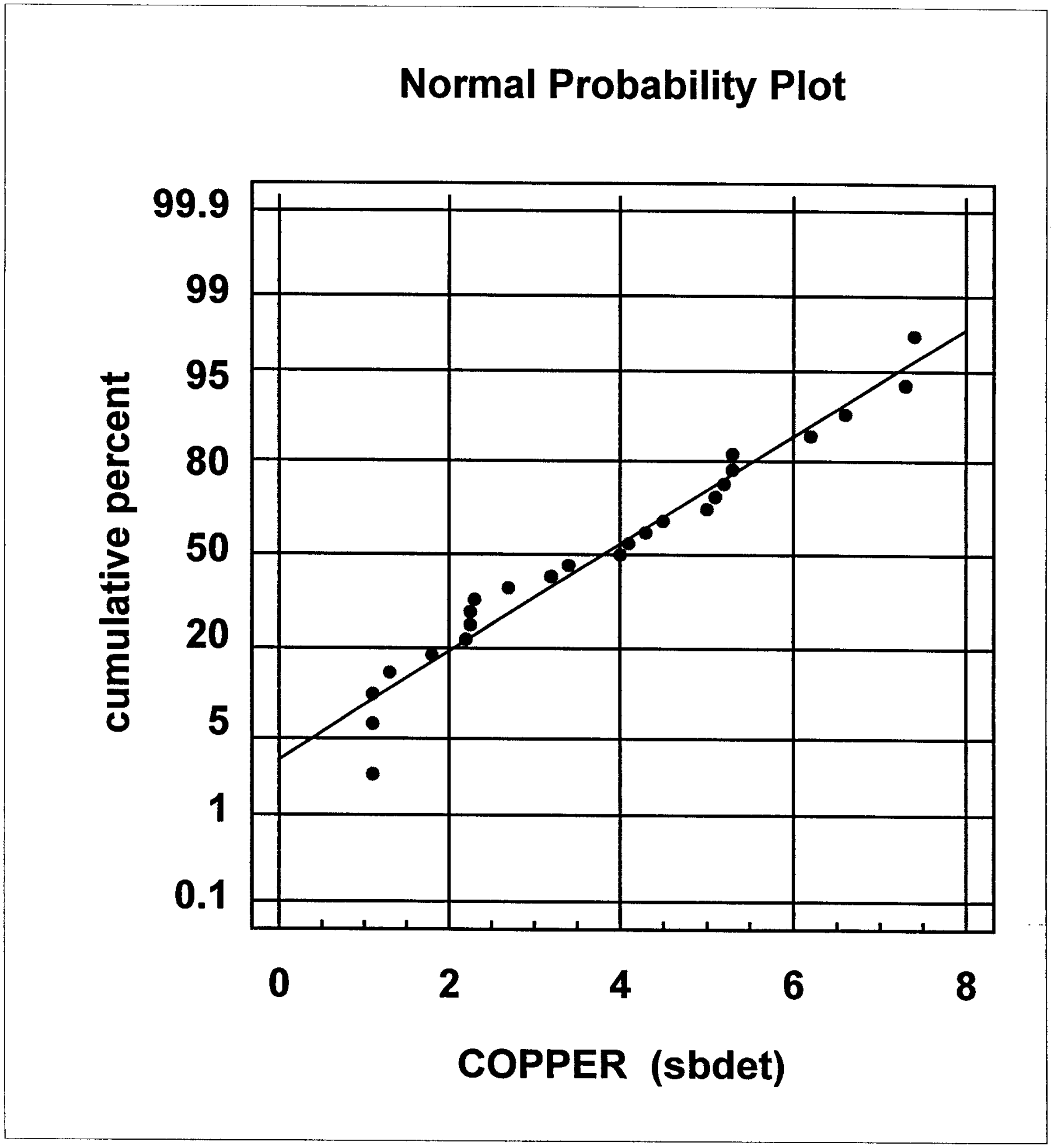


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.11 Iron

A nonlinear regression line fit plot and coefficient of determination (R^2) of -2.9 (Table B.2-1) indicates that iron concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No potential outliers were identified in the data set for iron (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plot (Figure B.2-1) indicate that the iron data set in subsurface soil has a lognormal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR IRON IN SUBSURFACE SOIL

IRON (mg/kg)	CALCIUM (mg/kg)
9700	4100
5200	171000
7840	1750
6930	66600
3720	190000
2590	150000
3020	158000
7390	19900
3110	136000
4550	135000
4220	42500
2620	34900
2430	95300
9620	23700
6240	167000
4490	55000
6400	38300
2720	253000
6560	52500
7680	81900
5600	71800
3170	89500
3500	87900
2500	43700
6890	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-2.870267297
Adjusted R Square	-2.911933963
Standard Error	4450.125672
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-352482188	-352482188	-17.7988779	#NUM!
Residual	24	475286844	19803618.5		
Total	25	122804656			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR IRON IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.032141219	0.00812419	3.956236733	0.000588479	0.015373718	0.048908719	0.015373718	0.048908719

RESIDUAL OUTPUT

Observation	*Predicted IRON (mg/kg)*	*Residuals*
1	131.7789965	9568.221003
2	5496.148391	-296.148391
3	56.24713266	7783.752867
4	2140.605163	4789.394837
5	6106.831546	-2386.831546
6	4821.182799	-2231.182799
7	5078.312548	-2058.312548
8	639.6102514	6750.389749
9	4371.205738	-1261.205738
10	4339.064519	210.9354808
11	1366.001793	2853.998207
12	1121.728531	1498.271469
13	3063.058138	-633.0581384
14	761.7468823	8858.253118
15	5367.583516	872.4164836
16	1767.767026	2722.232974
17	1231.008675	5168.991325
18	8131.728321	-5411.728321
19	1687.41398	4872.58602
20	2632.365808	5047.634192
21	2307.7395	3292.2605
22	2876.63907	293.3609298
23	2825.21312	674.7868797
24	1404.571255	1095.428745
25	2118.10631	4771.89369

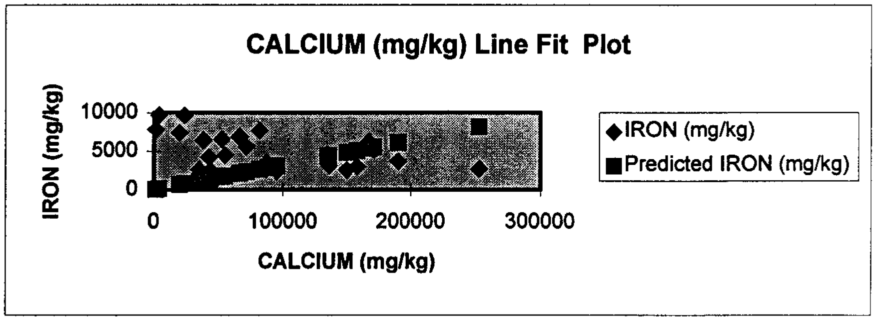


TABLE B.2-2

OUTLIER ANALYSIS RESULTS FOR SUBSURFACE SOIL - IRON CANNON AIR FORCE BASE

SAMPLE	Metals IRON mg/kg Result	RL	Qual
CBSB010005	9700	10.8	
CBSB010010	5200	21.3	
CBSB020005	7840	10.7	
CBSB020010	6930	10.8	
CBSB020020	3720	22.1	
CBSB020029	2590	22.8	
CBSB020039	3020	22.3	
CBSB030005	7390	10.6	
CBSB030010	3110	22.3	
CBSB040010	4550	21.7	
CBSB040020	4220	10.8	
CBSB040030	2620	10.9	
CBSB040041	2430	10.8	
CBSB050005	9620	10.9	
CBSB050010	6240	21.5	
CBSB060005	4490	11.4	
CBSB060010	6400	10.6	
CBSB070005	2720	52.8	
CBSB070010	6560	11.1	
CBSB080005	7680	10.8	
CBSB080010	5600	10.7	
CBSB080020	3170	10.8	
CBSB080030	3500	10.9	
CBSB080040	2500	10.4	
CBSB100005	6890	11	
Number of detects	25		
Count (N)	25		
Minimum (detected)	2430		
Maximum (detected)	9700		
Mean (x)	5148		
Standard deviation (sd)	2262		
Max > Min*5	No		
Outlier	NA		
T_n[1]			
Critical value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - IRON IN SUBSURFACE SOIL

i	Iron Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	9.1799	7.7956	-1.3842	0.445	-0.6160
2	9.1716	7.8240	-1.3476	0.3069	-0.4136
3	8.9670	7.8594	-1.1076	0.2543	-0.2817
4	8.9464	7.8709	-1.0754	0.2148	-0.2310
5	8.9079	7.9084	-0.9995	0.1822	-0.1821
6	8.8436	8.0130	-0.8306	0.1539	-0.1278
7	8.8378	8.0424	-0.7954	0.1283	-0.1021
8	8.7887	8.0615	-0.7273	0.1046	-0.0761
9	8.7641	8.1605	-0.6035	0.0823	-0.0497
10	8.7387	8.2215	-0.5173	0.061	-0.0316
11	8.6305	8.3476	-0.2829	0.0403	-0.0114
12	8.5564	8.4096	-0.1468	0.02	-0.0029
13	8.4229	8.4229	0.0000	0	0.0000
14	8.4096	8.5564	0.1468		-2.1258
15	8.3476	8.6305	0.2829		
16	8.2215	8.7387	0.5173		
17	8.1605	8.7641	0.6035		
18	8.0615	8.7887	0.7273		
19	8.0424	8.8378	0.7954		
20	8.0130	8.8436	0.8306		
21	7.9084	8.9079	0.9995		
22	7.8709	8.9464	1.0754		
23	7.8594	8.9670	1.1076		
24	7.8240	9.1716	1.3476		
25	7.7956	9.1799	1.3842		
				N	25
				StdDev	0.4508
				W	0.9266
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR IRON IN SUBSURFACE SOIL

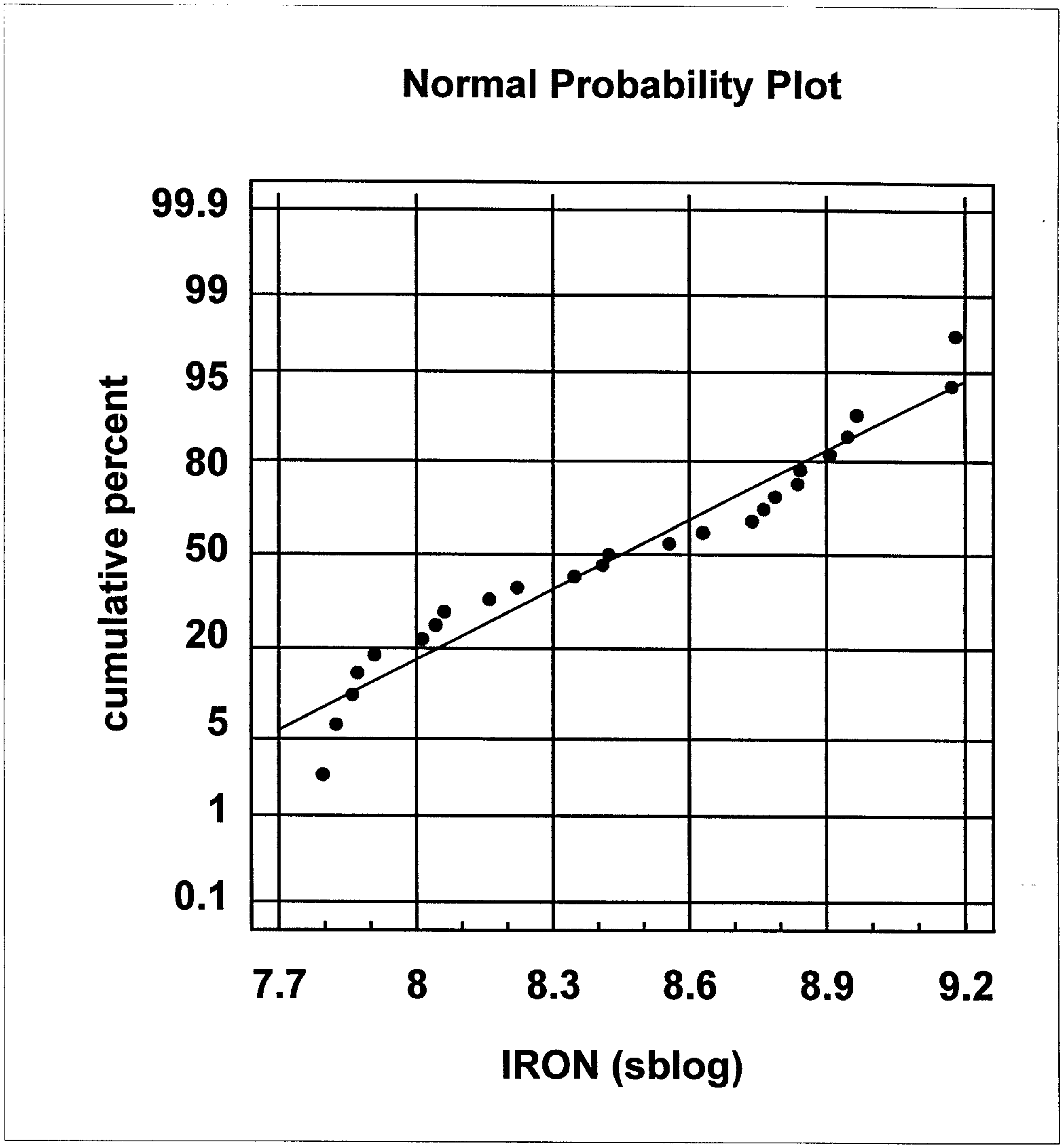
IRON (mg/kg)	log-transformed
9700	9.1799
5200	8.5564
7840	8.9670
6930	8.8436
3720	8.2215
2590	7.8594
3020	8.0130
7390	8.9079
3110	8.0424
4550	8.4229
4220	8.3476
2620	7.8709
2430	7.7956
9620	9.1716
6240	8.7387
4490	8.4096
6400	8.7641
2720	7.9084
6560	8.7887
7680	8.9464
5600	8.6305
3170	8.0615
3500	8.1605
2500	7.8240
6890	8.8378

IRON (mg/kg)	
Mean	5147.6
Standard Error	452.409578
Median	4550
Mode	#N/A
Standard Deviation	2262.04789
Sample Variance	5116860.67
Kurtosis	-0.83228203
Skewness	0.49948149
Range	7270
Minimum	2430
Maximum	9700
Sum	128690
Count	25
Confidence Level(95.0%)	933.727286

log-transformed	
Mean	8.450801
Standard Error	0.090159
Median	8.422883
Mode	#N/A
Standard Deviation	0.450793
Sample Variance	0.203214
Kurtosis	-1.38995
Skewness	-0.00099
Range	1.384235
Minimum	7.795647
Maximum	9.179881
Sum	211.27
Count	25
Confidence Level(95.0%)	0.186078

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.12 Lead

A nonlinear regression line fit plot and coefficient of determination (R^2) of -3.6 (Table B.2-1) indicates that lead concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No potential outliers were identified in the data set for lead (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plots (Figures B.2-1 and B.2-2) indicate that the lead data set in subsurface soil has a normal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR LEAD IN SUBSURFACE SOIL

LEAD (mg/kg)	CALCIUM (mg/kg)
7	4100
6.1	171000
6.2	1750
6.7	66600
4.3	190000
2.2	150000
1.5	158000
6.6	19900
4.3	136000
5.2	135000
4.8	42500
2.7	34900
2.2	95300
6.3	23700
4.6	167000
5.2	55000
5.1	38300
3.1	253000
5.8	52500
7.1	81900
5.3	71800
3.8	89500
3	87900
2.3	43700
7	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0
R Square	-3.64976517
Adjusted R Square	-3.691431837
Standard Error	3.735332025
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-262.8473281	-262.847328	-18.838449	#NUM!
Residual	24	334.8649281	13.95270534		
Total	25	72.0176			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR LEAD IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	3.15094E-05	6.81926E-06	4.620643348	0.000108962	1.74351E-05	4.55836E-05	1.74351E-05	4.55836E-05

RESIDUAL OUTPUT

Observation	*Predicted LEAD (mg/kg)*	*Residuals*
1	0.129188337	6.870811663
2	5.388098946	0.711901054
3	0.055141363	6.144858637
4	2.098522747	4.601477253
5	5.986776607	-1.686776607
6	4.726402584	-2.526402584
7	4.978477389	-3.478477389
8	0.627036076	5.972963924
9	4.285271676	0.014728324
10	4.253762326	0.946237674
11	1.339147399	3.460852601
12	1.099676335	1.600323665
13	3.002841108	-0.802841108
14	0.746771608	5.553228392
15	5.262061544	-0.662061544
16	1.733014281	3.466985719
17	1.206808126	3.893191874
18	7.971865692	-4.871865692
19	1.654240904	4.145759096
20	2.580615811	4.519384189
21	2.26237137	3.03762863
22	2.820086875	0.979913125
23	2.769671914	0.230328086
24	1.37695862	0.92304138
25	2.076466202	4.923533798

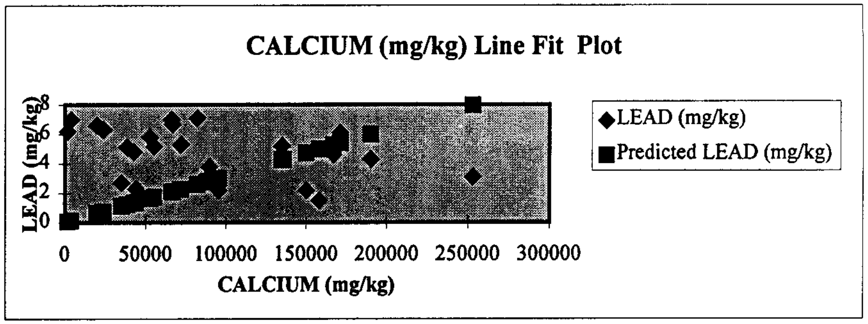


TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - LEAD
CANNON AIR FORCE BASE

SAMPLE	Metals LEAD mg/kg Result	RL	Qual
CBSB010005	7	0.32	
CBSB010010	6.1	0.64	
CBSB020005	6.2	0.32	
CBSB020010	6.7	0.33	
CBSB020020	4.3	0.66	
CBSB020029	2.2	0.68	
CBSB020039	1.5	0.67	
CBSB030005	6.6	0.32	
CBSB030010	4.3	0.67	
CBSB040010	5.2	0.65	
CBSB040020	4.8	0.33	
CBSB040030	2.7	0.33	
CBSB040041	2.2	0.32	
CBSB050005	6.3	0.33	
CBSB050010	4.6	0.64	
CBSB060005	5.2	0.34	
CBSB060010	5.1	0.32	
CBSB070005	3.1	1.6	
CBSB070010	5.8	0.33	
CBSB080005	7.1	0.33	
CBSB080010	5.3	0.32	
CBSB080020	3.8	0.32	
CBSB080030	3	0.33	
CBSB080040	2.3	0.31	
CBSB100005	7	0.33	
Number of detects	25		
Count (N)	25		
Minimum (detected)	1.5		
Maximum (detected)	7.1		
Mean (x)	4.7		
Standard deviation (sd)	1.7		
Max > Min*5	No		
Outlier	NA		
T_n[1]			
Critical value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - LEAD IN SUBSURFACE SOIL

i	Lead Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	1.9601	0.4055	-1.5546	0.445	-0.6918
2	1.9459	0.7885	-1.1575	0.3069	-0.3552
3	1.9459	0.7885	-1.1575	0.2543	-0.2943
4	1.9021	0.8329	-1.0692	0.2148	-0.2297
5	1.8871	0.9933	-0.8938	0.1822	-0.1629
6	1.8405	1.0986	-0.7419	0.1539	-0.1142
7	1.8245	1.1314	-0.6931	0.1283	-0.0889
8	1.8083	1.3350	-0.4733	0.1046	-0.0495
9	1.7579	1.4586	-0.2992	0.0823	-0.0246
10	1.6677	1.4586	-0.2091	0.061	-0.0128
11	1.6487	1.5261	-0.1226	0.0403	-0.0049
12	1.6487	1.5686	-0.0800	0.02	-0.0016
13	1.6292	1.6292	0.0000	0	0.0000
14	1.5686	1.6487	0.0800		-2.0304
15	1.5261	1.6487	0.1226		
16	1.4586	1.6677	0.2091		
17	1.4586	1.7579	0.2992		
18	1.3350	1.8083	0.4733		
19	1.1314	1.8245	0.6931		
20	1.0986	1.8405	0.7419		
21	0.9933	1.8871	0.8938		
22	0.8329	1.9021	1.0692		
23	0.7885	1.9459	1.1575		
24	0.7885	1.9459	1.1575		
25	0.4055	1.9601	1.5546		
				N	25
				StdDev	0.4388
				W	0.8921
				Wcritical	0.9180
					Not Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - LEAD IN SUBSURFACE SOIL

i	Lead Result, cont. X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	7.1	1.5	-5.6000	0.445	-2.4920
2	7	2.2	-4.8000	0.3069	-1.4731
3	7	2.2	-4.8000	0.2543	-1.2206
4	6.7	2.3	-4.4000	0.2148	-0.9451
5	6.6	2.7	-3.9000	0.1822	-0.7106
6	6.3	3	-3.3000	0.1539	-0.5079
7	6.2	3.1	-3.1000	0.1283	-0.3977
8	6.1	3.8	-2.3000	0.1046	-0.2406
9	5.8	4.3	-1.5000	0.0823	-0.1235
10	5.3	4.3	-1.0000	0.061	-0.0610
11	5.2	4.6	-0.6000	0.0403	-0.0242
12	5.2	4.8	-0.4000	0.02	-0.0080
13	5.1	5.1	0.0000	0	0.0000
14	4.8	5.2	0.4000		-8.2043
15	4.6	5.2	0.6000		
16	4.3	5.3	1.0000		
17	4.3	5.8	1.5000		
18	3.8	6.1	2.3000		
19	3.1	6.2	3.1000		
20	3	6.3	3.3000		
21	2.7	6.6	3.9000		
22	2.3	6.7	4.4000		
23	2.2	7	4.8000		
24	2.2	7	4.8000		
25	1.5	7.1	5.6000		
				N	25
				StdDev	1.7323
				W	0.9346
				Wcritical	0.9180
					Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR LEAD IN SUBSURFACE SOIL

LEAD (mg/kg)	log-transformed
7	1.9459
6.1	1.8083
6.2	1.8245
6.7	1.9021
4.3	1.4586
2.2	0.7885
1.5	0.4055
6.6	1.8871
4.3	1.4586
5.2	1.6487
4.8	1.5686
2.7	0.9933
2.2	0.7885
6.3	1.8405
4.6	1.5261
5.2	1.6487
5.1	1.6292
3.1	1.1314
5.8	1.7579
7.1	1.9601
5.3	1.6677
3.8	1.3350
3	1.0986
2.3	0.8329
7	1.9459

LEAD (mg/kg)	
Mean	4.736
Standard Error	0.3464525
Median	5.1
Mode	7
Standard Deviation	1.73226249
Sample Variance	3.00073333
Kurtosis	-1.10792705
Skewness	-0.33452143
Range	5.6
Minimum	1.5
Maximum	7.1
Sum	118.4
Count	25
Confidence Level(95.0%)	0.71504267

log-transformed	
Mean	1.47408244
Standard Error	0.08776252
Median	1.62924054
Mode	1.94591015
Standard Deviation	0.4388126
Sample Variance	0.1925565
Kurtosis	-0.12937776
Skewness	-0.90408491
Range	1.55462968
Minimum	0.40546511
Maximum	1.96009478
Sum	36.8520609
Count	25
Confidence Level(95.0%)	0.1811329

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

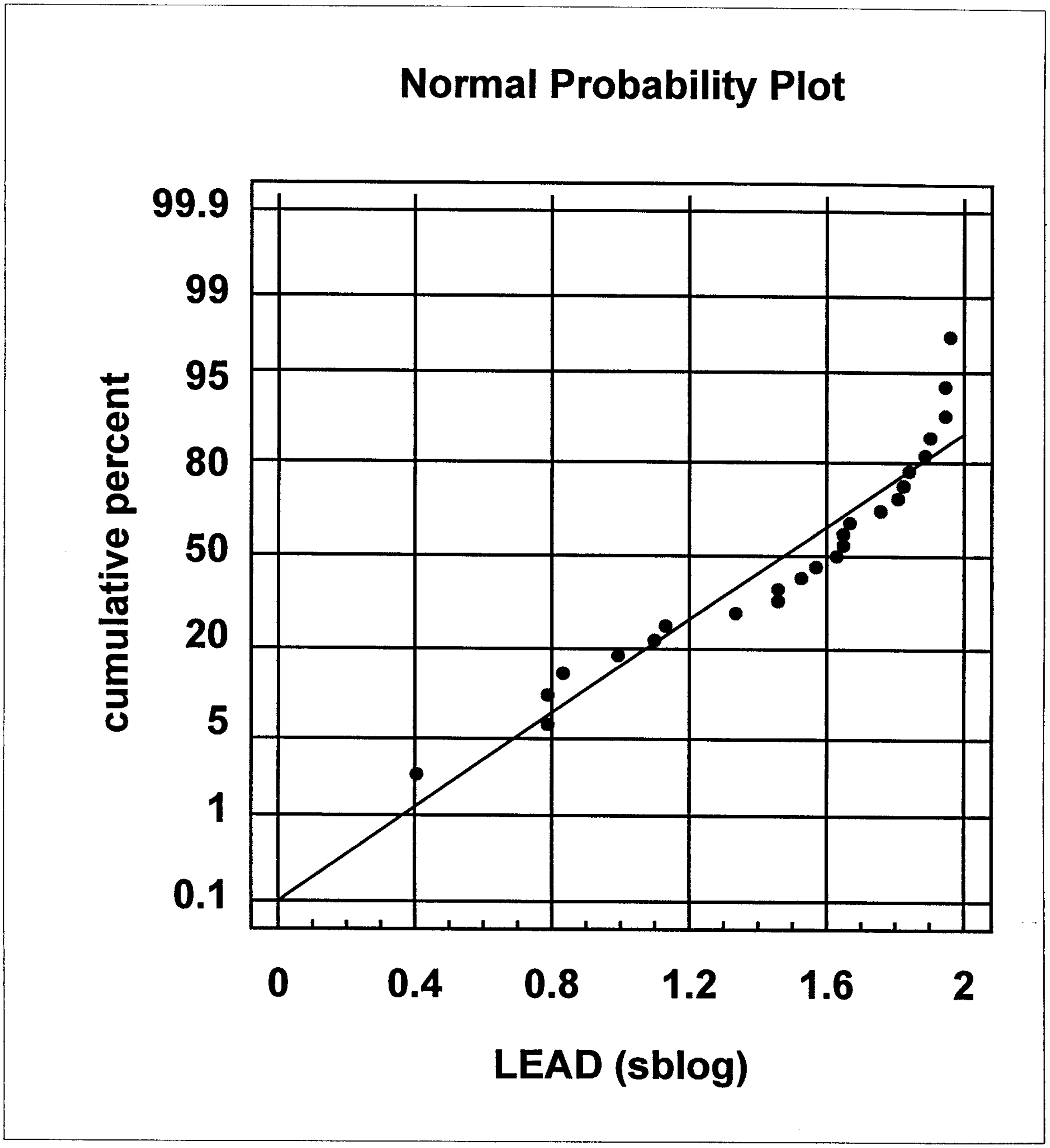
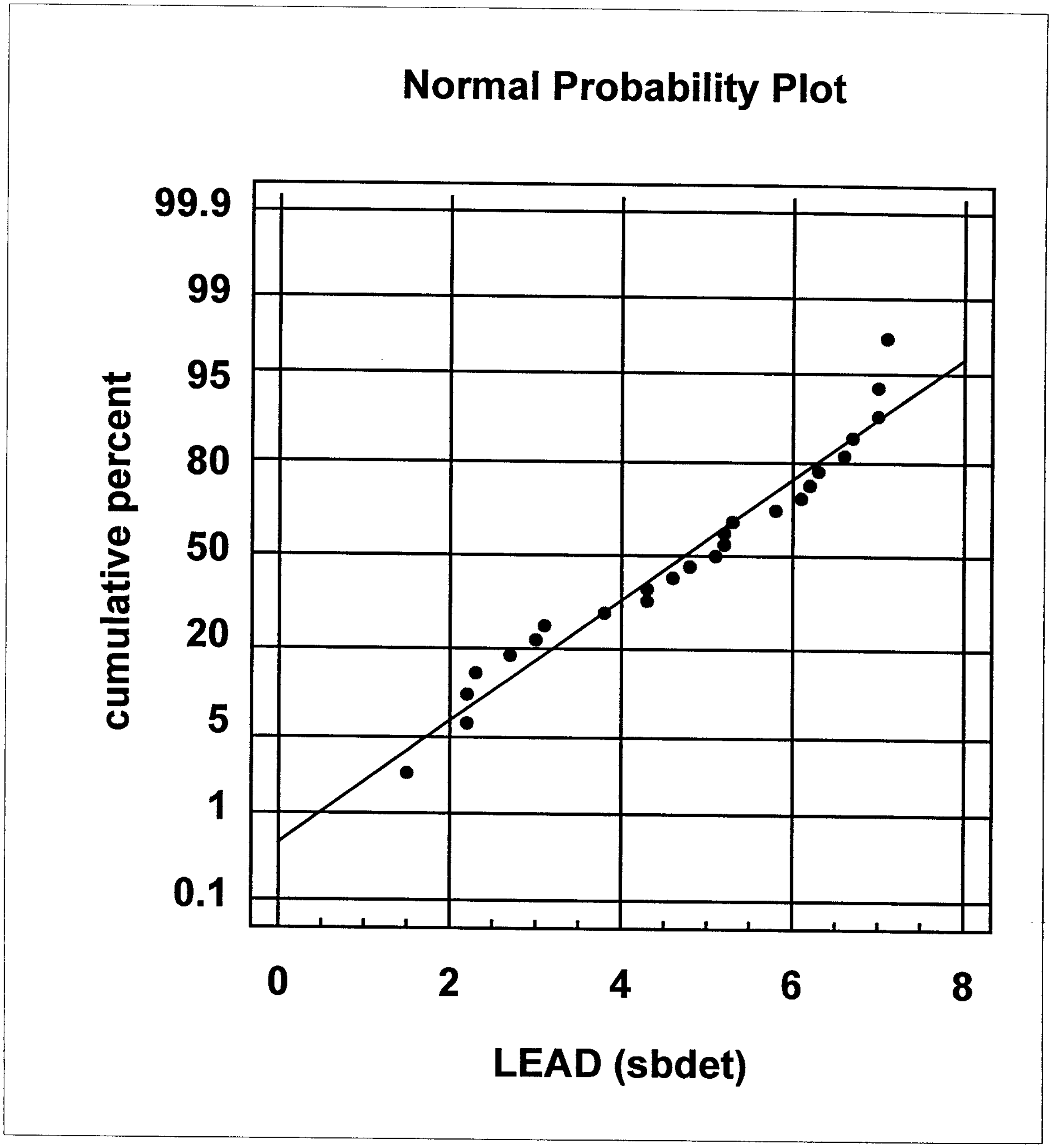


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.13 Magnesium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -0.02 (Table B.2-1) indicates that magnesium concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

The maximum detected concentration of magnesium was determined to be a statistical outlier (see Table B.2-2). Evaluation of the data set did not indicate any errors from sampling or analysis (i.e., incorrect decimal placement, etc.). As indicated in EPA guidance (EPA 1992a), the maximum detected concentration was considered to be a naturally occurring anomaly and was retained for further statistical analysis.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plots (Figures B.2-1 and B.2-2) indicate that the magnesium data set in subsurface soil has neither a lognormal nor normal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR MAGNESIUM IN SUBSURFACE SOIL

MAGNESIUM (mg/kg)	CALCIUM (mg/kg)
1570	4100
3250	171000
1510	1750
3140	66600
3900	190000
19300	150000
11600	158000
1400	19900
2450	136000
2780	135000
2480	42500
5310	34900
6390	95300
3030	23700
4390	167000
2390	55000
2050	38300
2860	253000
3200	52500
2640	81900
3010	71800
3070	89500
8280	87900
3660	43700
2840	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0
R Square	-0.021708826
Adjusted R Square	-0.063375492
Standard Error	3897.730029
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-7747185.167	-7747185.17	-0.50994158	#NUM!
Residual	24	364615185.2	15192299.38		
Total	25	356868000			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR MAGNESIUM IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.038552041	0.007115731	5.417860647	1.44839E-05	0.023865896	0.053238186	0.023865896	0.053238186

RESIDUAL OUTPUT

Observation	*Predicted MAGNESIUM (mg/kg)*	*Residuals*
1	158.0633692	1411.936631
2	6592.399055	-3342.399055
3	67.46607221	1442.533928
4	2567.565948	572.4340521
5	7324.887839	-3424.887839
6	5782.806189	13517.19381
7	6091.222519	5508.777481
8	767.1856211	632.8143789
9	5243.077611	-2793.077611
10	5204.52557	-2424.52557
11	1638.461754	841.5382464
12	1345.46624	3964.53376
13	3674.009532	2715.990468
14	913.6833779	2116.316622
15	6438.19089	-2048.19089
16	2120.362269	269.6377307
17	1476.54318	573.4568197
18	9753.666439	-6893.666439
19	2023.982166	1176.017834
20	3157.412179	-517.4121792
21	2768.036562	241.9634375
22	3450.407693	-380.4076928
23	3388.724427	4891.275573
24	1684.724203	1975.275797
25	2540.579519	299.420481

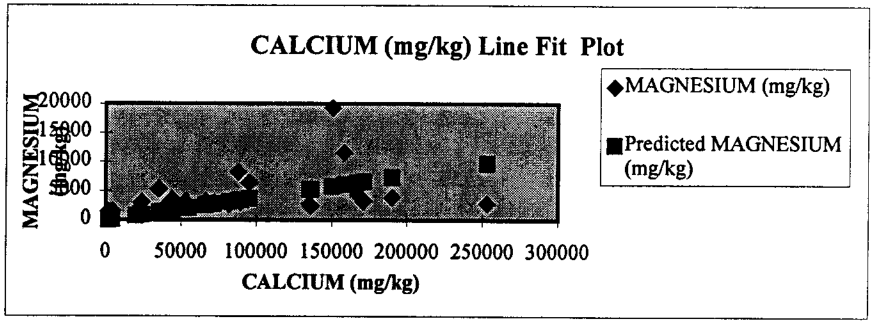


TABLE B.2-2

OUTLIER ANALYSIS RESULTS FOR SUBSURFACE SOIL - MAGNESIUM CANNON AIR FORCE BASE

SAMPLE	Metals MAGNESIUM mg/kg			
	Result	Log Result	RL	Qual
CBSB010005	1570	7.3588	21.5	
CBSB010010	3250	8.0864	42.6	
CBSB020005	1510	7.3199	21.4	
CBSB020010	3140	8.0520	21.7	
CBSB020020	3900	8.2687	44.2	
CBSB020029	19300	9.8679	45.6	
CBSB020039	11600	9.3588	44.6	
CBSB030005	1400	7.2442	21.2	
CBSB030010	2450	7.8038	44.5	
CBSB040010	2780	7.9302	43.3	
CBSB040020	2480	7.8160	21.7	
CBSB040030	5310	8.5773	21.9	
CBSB040041	6390	8.7625	21.6	
CBSB050005	3030	8.0163	21.7	
CBSB050010	4390	8.3871	42.9	
CBSB060005	2390	7.7790	22.8	
CBSB060010	2050	7.6256	21.1	
CBSB070005	2860	7.9586	106	
CBSB070010	3200	8.0709	22.1	
CBSB080005	2640	7.8785	21.7	
CBSB080010	3010	8.0097	21.4	
CBSB080020	3070	8.0294	21.6	
CBSB080030	8280	9.0216	21.7	
CBSB080040	3660	8.2052	20.8	
CBSB100005	2840	7.9516	22	
Number of detects	25			
Count (N)	25			
Minimum (detected)	1400			
Maximum (detected)	19300			
Mean (x)	4260	8.1352		
Standard deviation (sd)	3856	0.6071		
Max > Min*5	Yes			
Outlier		Yes		
T_n[1]		2.854		
Critical value[2]		2.663		

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - MAGNESIUM IN SUBSURFACE SOIL

i	Magnesium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	9.8679	7.2442	-2.6236	0.445	-1.1675
2	9.3588	7.3199	-2.0389	0.3069	-0.6257
3	9.0216	7.3588	-1.6628	0.2543	-0.4228
4	8.7625	7.6256	-1.1369	0.2148	-0.2442
5	8.5773	7.7790	-0.7983	0.1822	-0.1454
6	8.3871	7.8038	-0.5832	0.1539	-0.0898
7	8.2687	7.8160	-0.4527	0.1283	-0.0581
8	8.2052	7.8785	-0.3267	0.1046	-0.0342
9	8.0864	7.9302	-0.1562	0.0823	-0.0129
10	8.0709	7.9516	-0.1193	0.061	-0.0073
11	8.0520	7.9586	-0.0934	0.0403	-0.0038
12	8.0294	8.0097	-0.0197	0.02	-0.0004
13	8.0163	8.0163	0.0000	0	0.0000
14	8.0097	8.0294	0.0197		-2.8121
15	7.9586	8.0520	0.0934		
16	7.9516	8.0709	0.1193		
17	7.9302	8.0864	0.1562		
18	7.8785	8.2052	0.3267		
19	7.8160	8.2687	0.4527		
20	7.8038	8.3871	0.5832		
21	7.7790	8.5773	0.7983		
22	7.6256	8.7625	1.1369		
23	7.3588	9.0216	1.6628		
24	7.3199	9.3588	2.0389		
25	7.2442	9.8679	2.6236		
				N	25
				StdDev	0.6071
				W	0.8938
				Wcritical	0.9180
					Not Lognormal

X(i) = Log-transformed values; descending order
X(n-i+1) = Log-transformed values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - MAGNESIUM IN SUBSURFACE SOIL

i	Magnesium Result, cont. X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	19300	1400	-17900.0000	0.445	-7965.5000
2	11600	1510	-10090.0000	0.3069	-3096.6210
3	8280	1570	-6710.0000	0.2543	-1706.3530
4	6390	2050	-4340.0000	0.2148	-932.2320
5	5310	2390	-2920.0000	0.1822	-532.0240
6	4390	2450	-1940.0000	0.1539	-298.5660
7	3900	2480	-1420.0000	0.1283	-182.1860
8	3660	2640	-1020.0000	0.1046	-106.6920
9	3250	2780	-470.0000	0.0823	-38.6810
10	3200	2840	-360.0000	0.061	-21.9600
11	3140	2860	-280.0000	0.0403	-11.2840
12	3070	3010	-60.0000	0.02	-1.2000
13	3030	3030	0.0000	0	0.0000
14	3010	3070	60.0000		-14893.2990
15	2860	3140	280.0000		
16	2840	3200	360.0000		
17	2780	3250	470.0000		
18	2640	3660	1020.0000		
19	2480	3900	1420.0000		
20	2450	4390	1940.0000		
21	2390	5310	2920.0000		
22	2050	6390	4340.0000		
23	1570	8280	6710.0000		
24	1510	11600	10090.0000		
25	1400	19300	17900.0000		
				N	25
				StdDev	3856.0991
				W	0.6215
				Wcritical	0.9180
					Not Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR MAGNESIUM IN SUBSURFACE SOIL

MAGNESIUM (mg/kg)	log-transformed
1570	7.3588
3250	8.0864
1510	7.3199
3140	8.0520
3900	8.2687
19300	9.8679
11600	9.3588
1400	7.2442
2450	7.8038
2780	7.9302
2480	7.8160
5310	8.5773
6390	8.7625
3030	8.0163
4390	8.3871
2390	7.7790
2050	7.6256
2860	7.9586
3200	8.0709
2640	7.8785
3010	8.0097
3070	8.0294
8280	9.0216
3660	8.2052
2840	7.9516

MAGNESIUM (mg/kg)		*log-transformed*	
Mean	4260	Mean	8.13520527
Standard Error	771.219813	Standard Error	0.12142885
Median	3030	Median	8.0163179
Mode	#N/A	Mode	#N/A
Standard Deviation	3856.09907	Standard Deviation	0.60714427
Sample Variance	14869500	Sample Variance	0.36862417
Kurtosis	9.80650882	Kurtosis	1.94941226
Skewness	2.96854231	Skewness	1.22934272
Range	17900	Range	2.62363286
Minimum	1400	Minimum	7.24422752
Maximum	19300	Maximum	9.86786037
Sum	106500	Sum	203.380132
Count	25	Count	25
Confidence Level(95.0%)	1591.71914	Confidence Level(95.0%)	0.25061679

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

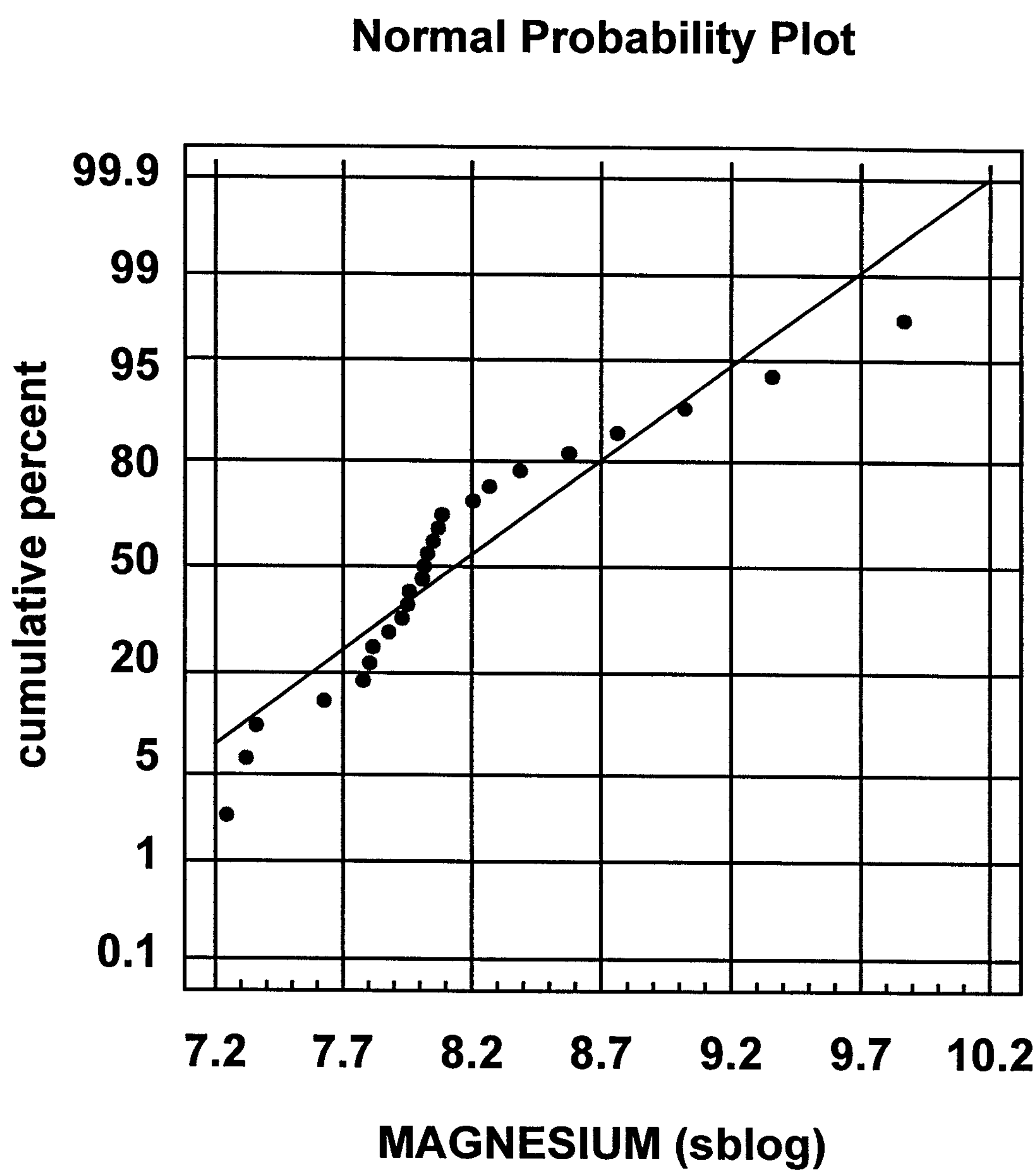
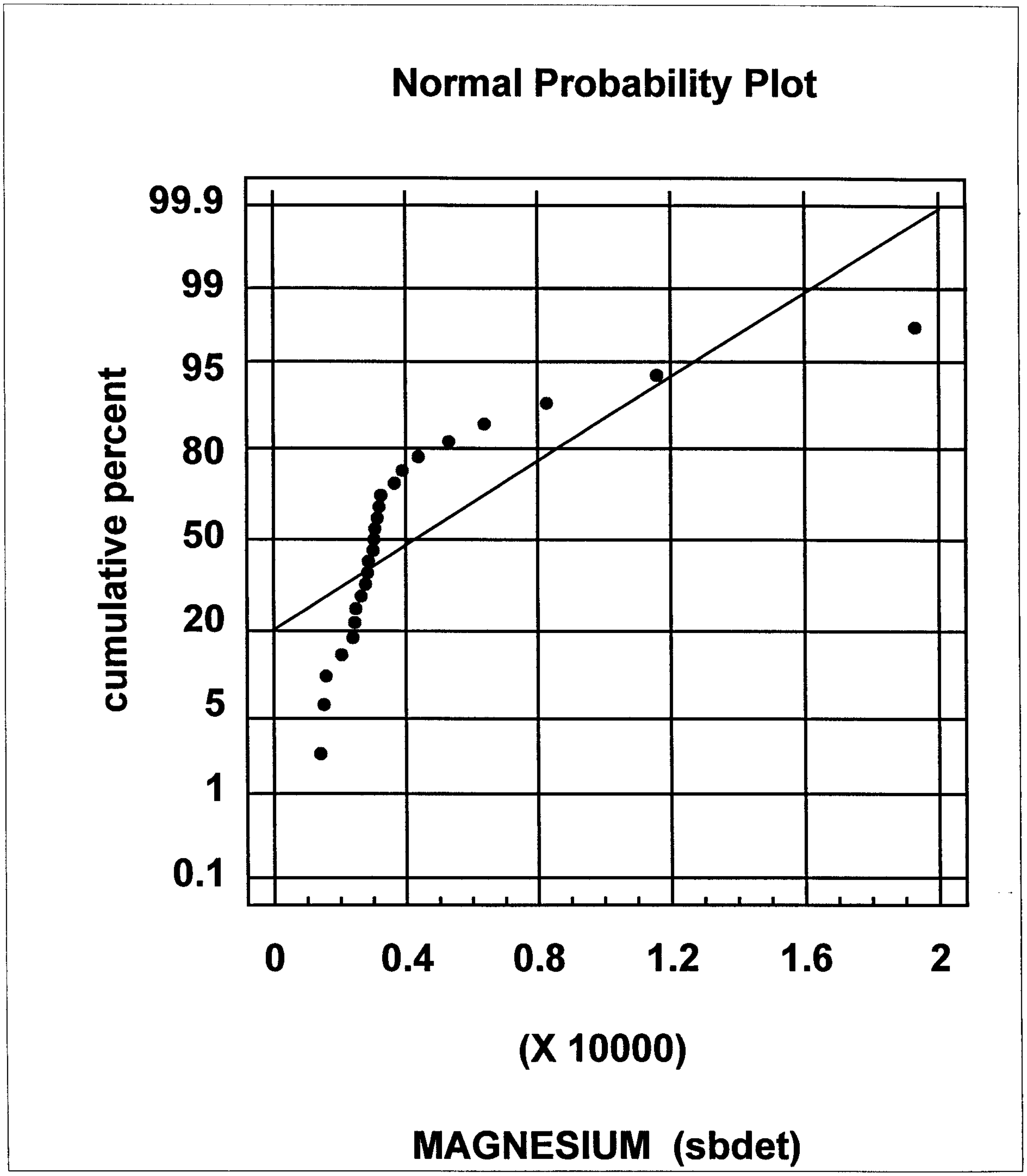


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.14 Manganese

A nonlinear regression line fit plot and coefficient of determination (R^2) of -1.7 (Table B.2-1) indicates that manganese concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No statistical outliers were identified in the manganese subsurface soil data set (see Table B.2-2). Although several concentrations exceeded the minimum detected concentration by a factor of 5 or more, none of these concentrations were determined to be statistical outliers by the methodology described in Section 5.3.

The Shapiro-Wilk test (Table B.2-3) and probability plot (Figure B.2-1) indicate that the manganese data set in subsurface soil has a lognormal distribution. The coefficient of skewness (Table B.2-4) was inconclusive, probably due to a small data set. However, since two of three tests indicated the same result and the Shapiro-Wilk test is considered to be one of the best tests for normality, it was concluded that the manganese data set is lognormally distributed.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR MANGANESE IN SUBSURFACE SOIL

MANGANESE (mg/kg)	CALCIUM (mg/kg)
131	4100
63.7	171000
83.2	1750
102	66600
48.3	190000
17.6	150000
23.1	158000
179	19900
42	136000
94.9	135000
87.3	42500
23.3	34900
27.5	95300
115	23700
71.9	167000
115	55000
95	38300
32.8	253000
99.9	52500
184	81900
152	71800
68.5	89500
30.2	87900
37.2	43700
148	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0
R Square	-1.67755411
Adjusted R Square	-1.719220776
Standard Error	81.27682326
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-99330.57837	-99330.5784	-15.0365957	#NUM!
Residual	24	158542.128	6605.921999		
Total	25	59211.5496			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR MANGANESE IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.000491435	0.00014838	3.31201054	0.002924864	0.000185195	0.000797676	0.000185195	0.000797676

RESIDUAL OUTPUT

Observation	*Predicted MANGANESE (mg/kg)*	*Residuals*
1	2.014884149	128.9851159
2	84.03541205	-20.33541205
3	0.860011527	82.33998847
4	32.72958154	69.27041846
5	93.37268006	-45.07268006
6	73.71527373	-56.11527373
7	77.64675499	-54.54675499
8	9.779559648	169.2204404
9	66.83518151	-24.83518151
10	66.34374635	28.55625365
11	20.88599422	66.41400578
12	17.15108702	6.148912979
13	46.83377058	-19.33377058
14	11.64701325	103.3529868
15	82.06967142	-10.16967142
16	27.0289337	87.9710663
17	18.82196656	76.17803344
18	124.333095	-91.53309502
19	25.8003458	74.0996542
20	40.24853946	143.7514605
21	35.28504436	116.7149556
22	43.98344666	24.51655334
23	43.1971504	-12.9971504
24	21.47571641	15.72428359
25	32.38557692	115.6144231

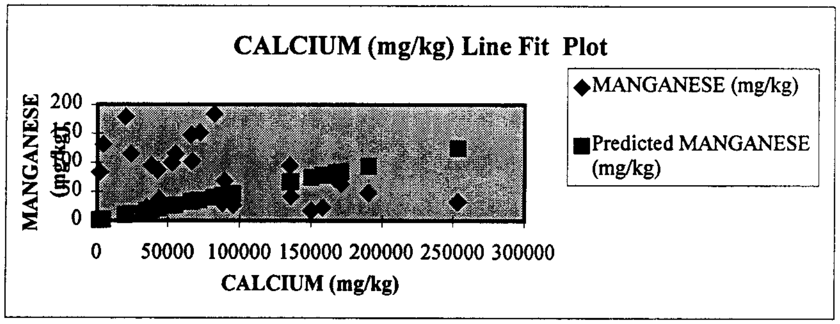


TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - MANGANESE
CANNON AIR FORCE BASE

SAMPLE	Metals MANGANESE mg/kg Result	Log Result	RL	Qual
CBSB010005	131	4.8752	1.1	
CBSB010010	63.7	4.1542	2.1	
CBSB020005	83.2	4.4212	1.1	
CBSB020010	102	4.6250	1.1	
CBSB020020	48.3	3.8774	2.2	
CBSB020029	17.6	2.8679	2.3	
CBSB020039	23.1	3.1398	2.2	
CBSB030005	179	5.1874	1.1	
CBSB030010	42	3.7377	2.2	
CBSB040010	94.9	4.5528	2.2	
CBSB040020	87.3	4.4694	1.1	
CBSB040030	23.3	3.1485	1.1	
CBSB040041	27.5	3.3142	1.1	
CBSB050005	115	4.7449	1.1	
CBSB050010	71.9	4.2753	2.1	
CBSB060005	115	4.7449	1.1	
CBSB060010	95	4.5539	1.1	
CBSB070005	32.8	3.4904	5.3	
CBSB070010	99.9	4.6042	1.1	
CBSB080005	184	5.2149	1.1	
CBSB080010	152	5.0239	1.1	
CBSB080020	68.5	4.2268	1.1	
CBSB080030	30.2	3.4078	1.1	
CBSB080040	37.2	3.6163	1	
CBSB100005	148	4.9972	1.1	
Number of detects	25			
Count (N)	25			
Minimum (detected)	17.6			
Maximum (detected)	184			
Mean (x)	83	4.2109		
Standard deviation (sd)	50	0.6973		
Max > Min*5	Yes			
Outlier		No		
T_n[1]		1.440		
Critical value[2]		2.663		

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

1 $T_n = (X_n - X)/sd$ Source: EPA 1989

2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - MANGANESE IN SUBSURFACE SOIL

	Manganese Log Result				
i	X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	5.2149	2.8679	-2.3470	0.445	-1.0444
2	5.1874	3.1398	-2.0476	0.3069	-0.6284
3	5.0239	3.1485	-1.8754	0.2543	-0.4769
4	4.9972	3.3142	-1.6830	0.2148	-0.3615
5	4.8752	3.4078	-1.4674	0.1822	-0.2674
6	4.7449	3.4904	-1.2545	0.1539	-0.1931
7	4.7449	3.6163	-1.1286	0.1283	-0.1448
8	4.6250	3.7377	-0.8873	0.1046	-0.0928
9	4.6042	3.8774	-0.7267	0.0823	-0.0598
10	4.5539	4.1542	-0.3997	0.061	-0.0244
11	4.5528	4.2268	-0.3260	0.0403	-0.0131
12	4.4694	4.2753	-0.1941	0.02	-0.0039
13	4.4212	4.4212	0.0000	0	0.0000
14	4.2753	4.4694	0.1941		-3.3105
15	4.2268	4.5528	0.3260		
16	4.1542	4.5539	0.3997		
17	3.8774	4.6042	0.7267		
18	3.7377	4.6250	0.8873		
19	3.6163	4.7449	1.1286		
20	3.4904	4.7449	1.2545		
21	3.4078	4.8752	1.4674		
22	3.3142	4.9972	1.6830		
23	3.1485	5.0239	1.8754		
24	3.1398	5.1874	2.0476		
25	2.8679	5.2149	2.3470		
				N	25
				StdDev	0.6973
				W	0.9393
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR MANGANESE IN SUBSURFACE SOIL

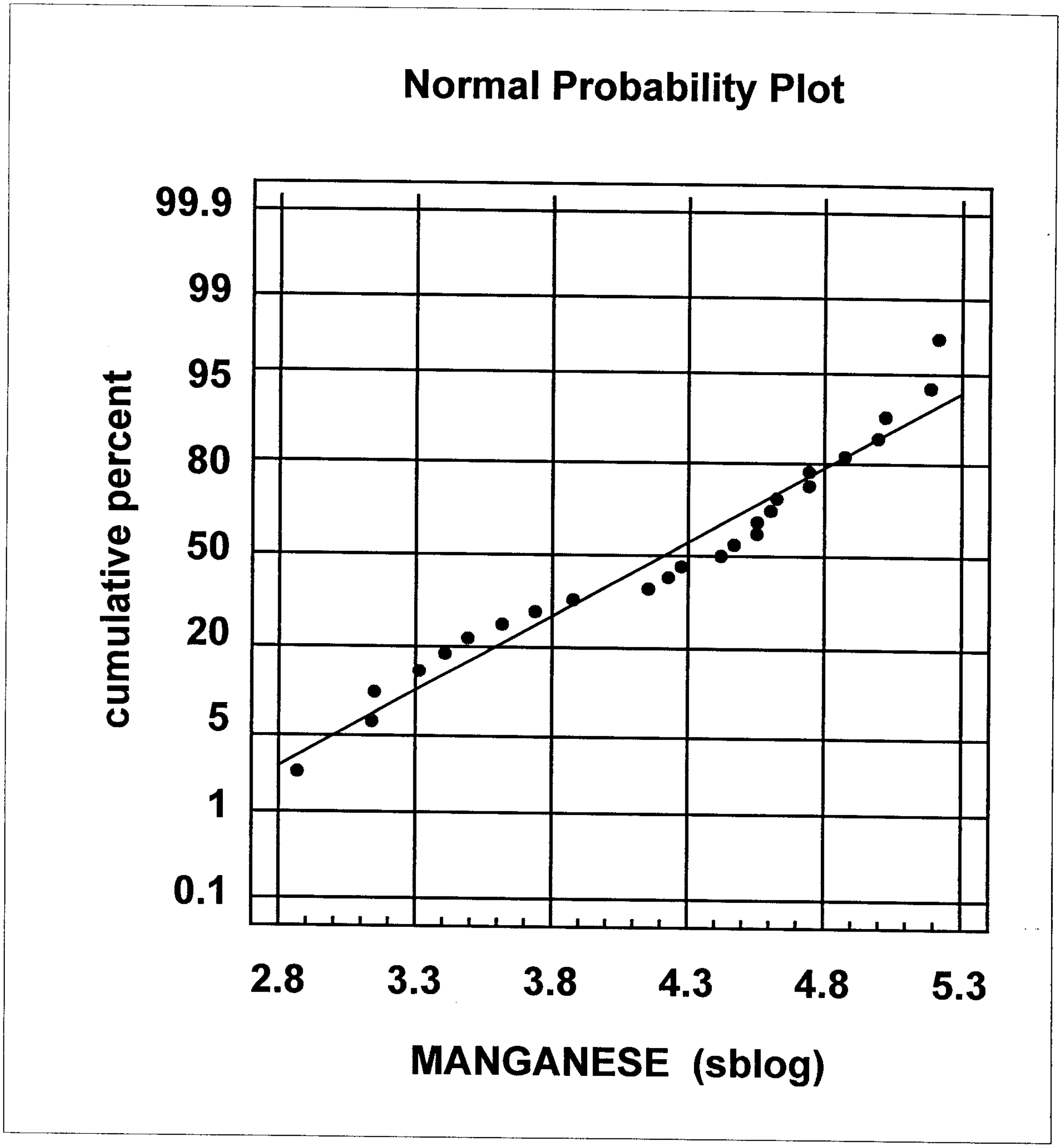
MANGANESE (mg/kg)	log-transformed
131	4.8752
63.7	4.1542
83.2	4.4212
102	4.6250
48.3	3.8774
17.6	2.8679
23.1	3.1398
179	5.1874
42	3.7377
94.9	4.5528
87.3	4.4694
23.3	3.1485
27.5	3.3142
115	4.7449
71.9	4.2753
115	4.7449
95	4.5539
32.8	3.4904
99.9	4.6042
184	5.2149
152	5.0239
68.5	4.2268
30.2	3.4078
37.2	3.6163
148	4.9972

MANGANESE (mg/kg)	
Mean	82.896
Standard Error	9.93407852
Median	83.2
Mode	115
Standard Deviation	49.6703926
Sample Variance	2467.1479
Kurtosis	-0.65309621
Skewness	0.50170054
Range	166.4
Minimum	17.6
Maximum	184
Sum	2072.4
Count	25
Confidence Level(95.0%)	20.5029261

log-transformed	
Mean	4.21085051
Standard Error	0.13945263
Median	4.42124735
Mode	4.74493213
Standard Deviation	0.69726317
Sample Variance	0.48617594
Kurtosis	-1.02568967
Skewness	-0.40233463
Range	2.34703686
Minimum	2.8678989
Maximum	5.21493576
Sum	105.271263
Count	25
Confidence Level(95.0%)	0.28781603

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.15 Mercury

The mercury results for all subsurface samples were nondetect. Therefore, no linear regression, outlier, or distribution analyses were conducted.

B.2.16 Nickel

A nonlinear regression line fit plot and coefficient of determination (R^2) of -2.1 (Table B.2-1) indicates that nickel concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No potential outliers were identified in the data set for nickel (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3) indicated that the nickel data set in subsurface soil has a lognormal distribution. The coefficient of skewness (Table B.2-4) and probability plots (Figure B.2-1 and B.2-2) were inconclusive. However, since the Shapiro-Wilk test is considered to be one of the best tests for normality, it was concluded that the nickel data set is lognormally distributed.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR NICKEL IN SUBSURFACE SOIL

NICKEL (mg/kg)	CALCIUM (mg/kg)
8	4100
4.3	171000
7	1750
6.7	66600
4.4	190000
4.55	150000
4.45	158000
6.5	19900
4.45	136000
5.8	135000
4.5	42500
2.5	34900
2.15	95300
11.4	23700
7.3	167000
5.5	55000
7	38300
10.55	253000
5.8	52500
8.8	81900
8.5	71800
4.6	89500
2.5	87900
2.8	43700
7.1	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0
R Square	-2.145637638
Adjusted R Square	-2.187304304
Standard Error	4.279468413
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-299.8047976	-299.804798	-16.3703863	#NUM!
Residual	24	439.5323976	18.3138499		
Total	25	139.7276			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR NICKEL IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	4.34449E-05	7.81264E-06	5.560849786	1.0124E-05	2.73204E-05	5.95694E-05	2.73204E-05	5.95694E-05

RESIDUAL OUTPUT

Observation	*Predicted NICKEL (mg/kg)*	*Residuals*
1	0.178124082	7.821875918
2	7.429077553	-3.129077553
3	0.076028571	6.923971429
4	2.893430205	3.806569795
5	8.254530614	-3.854530614
6	6.516734695	-1.966734695
7	6.864293879	-2.414293879
8	0.86455347	5.63544653
9	5.908506124	-1.458506124
10	5.865061226	-0.065061226
11	1.846408164	2.653591836
12	1.516226939	0.983773061
13	4.140298776	-1.990298776
14	1.029644082	10.37035592
15	7.255297961	0.044702039
16	2.389469388	3.110530612
17	1.663939592	5.336060408
18	10.99155919	-0.441559186
19	2.280857143	3.519142857
20	3.558137144	5.241862856
21	3.119343674	5.380656326
22	3.888318368	0.711681632
23	3.818806531	-1.318806531
24	1.898542041	0.901457959
25	2.863018776	4.236981224

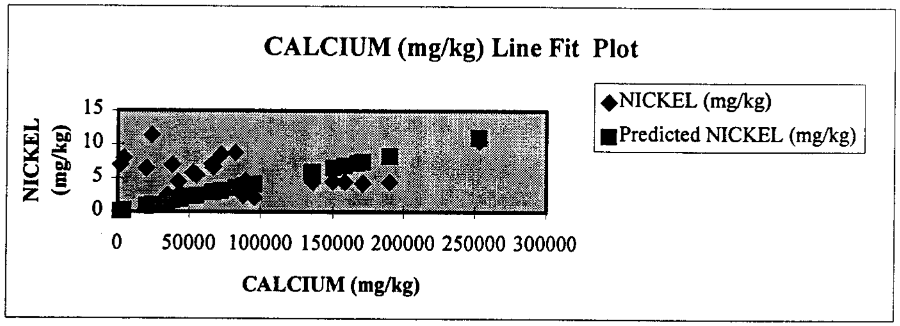


TABLE B.2-2

OUTLIER ANALYSIS RESULTS FOR SUBSURFACE SOIL - NICKEL CANNON AIR FORCE BASE

SAMPLE	Metals NICKEL mg/kg		
	Result	RL	Qual
CBSB010005	8	4.3	
CBSB010010	4.3	8.5	J
CBSB020005	7	4.3	
CBSB020010	6.7	4.3	
CBSB020020	4.4	8.8	U
CBSB020029	4.55	9.1	U
CBSB020039	4.45	8.9	U
CBSB030005	6.5	4.2	
CBSB030010	4.45	8.9	U
CBSB040010	5.8	8.7	J
CBSB040020	4.5	4.3	
CBSB040030	2.5	4.4	J
CBSB040041	2.15	4.3	U
CBSB050005	11.4	4.3	
CBSB050010	7.3	8.6	J
CBSB060005	5.5	4.6	
CBSB060010	7	4.2	
CBSB070005	10.55	21.1	U
CBSB070010	5.8	4.4	
CBSB080005	8.8	4.3	
CBSB080010	8.5	4.3	
CBSB080020	4.6	4.3	
CBSB080030	2.5	4.3	J
CBSB080040	2.8	4.2	J
CBSB100005	7.1	4.4	
Number of detects	19		
Count (N)	25		
Minimum (detected)	2.5		
Maximum (detected)	11.4		
Mean (x)	5.89		
Standard deviation (sd)	2.41		
Max > Min*5	No		
Outlier	NA		
T_n[1]			
Critical value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

1 $T_n = (X_n - X)/sd$ Source: EPA 1989

2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - NICKEL IN SUBSURFACE SOIL

i	Nickel Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	2.4336	0.7655	-1.6681	0.445	-0.7423
2	2.3561	0.9163	-1.4398	0.3069	-0.4419
3	2.1748	0.9163	-1.2585	0.2543	-0.3200
4	2.1401	1.0296	-1.1104	0.2148	-0.2385
5	2.0794	1.4586	-0.6208	0.1822	-0.1131
6	1.9879	1.4816	-0.5063	0.1539	-0.0779
7	1.9601	1.4929	-0.4672	0.1283	-0.0599
8	1.9459	1.4929	-0.4530	0.1046	-0.0474
9	1.9459	1.5041	-0.4418	0.0823	-0.0364
10	1.9021	1.5151	-0.3870	0.061	-0.0236
11	1.8718	1.5261	-0.3457	0.0403	-0.0139
12	1.7579	1.7047	-0.0531	0.02	-0.0011
13	1.7579	1.7579	0.0000	0	0.0000
14	1.7047	1.7579	0.0531		-2.1161
15	1.5261	1.8718	0.3457		
16	1.5151	1.9021	0.3870		
17	1.5041	1.9459	0.4418		
18	1.4929	1.9459	0.4530		
19	1.4929	1.9601	0.4672		
20	1.4816	1.9879	0.5063		
21	1.4586	2.0794	0.6208		
22	1.0296	2.1401	1.1104		
23	0.9163	2.1748	1.2585		
24	0.9163	2.3561	1.4398		
25	0.7655	2.4336	1.6681		
				N	25
				StdDev	0.4435
				W	0.9487
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992a)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992a)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR NICKEL IN SUBSURFACE SOIL

NICKEL (mg/kg)	log-transformed
8	2.0794
4.3	1.4586
7	1.9459
6.7	1.9021
4.4	1.4816
4.55	1.5151
4.45	1.4929
6.5	1.8718
4.45	1.4929
5.8	1.7579
4.5	1.5041
2.5	0.9163
2.15	0.7655
11.4	2.4336
7.3	1.9879
5.5	1.7047
7	1.9459
10.55	2.3561
5.8	1.7579
8.8	2.1748
8.5	2.1401
4.6	1.5261
2.5	0.9163
2.8	1.0296
7.1	1.9601

NICKEL (mg/kg)	
Mean	5.886
Standard Error	0.48257573
Median	5.8
Mode	7
Standard Deviation	2.41287864
Sample Variance	5.82198333
Kurtosis	-0.06109623
Skewness	0.48265558
Range	9.25
Minimum	2.15
Maximum	11.4
Sum	147.15
Count	25
Confidence Level(95.0%)	0.99598715

log-transformed	
Mean	1.68468476
Standard Error	0.08869532
Median	1.75785792
Mode	1.94591015
Standard Deviation	0.44347662
Sample Variance	0.19667151
Kurtosis	-0.26732017
Skewness	-0.4753859
Range	1.66814551
Minimum	0.76546784
Maximum	2.43361336
Sum	42.1171191
Count	25
Confidence Level(95.0%)	0.18305811

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

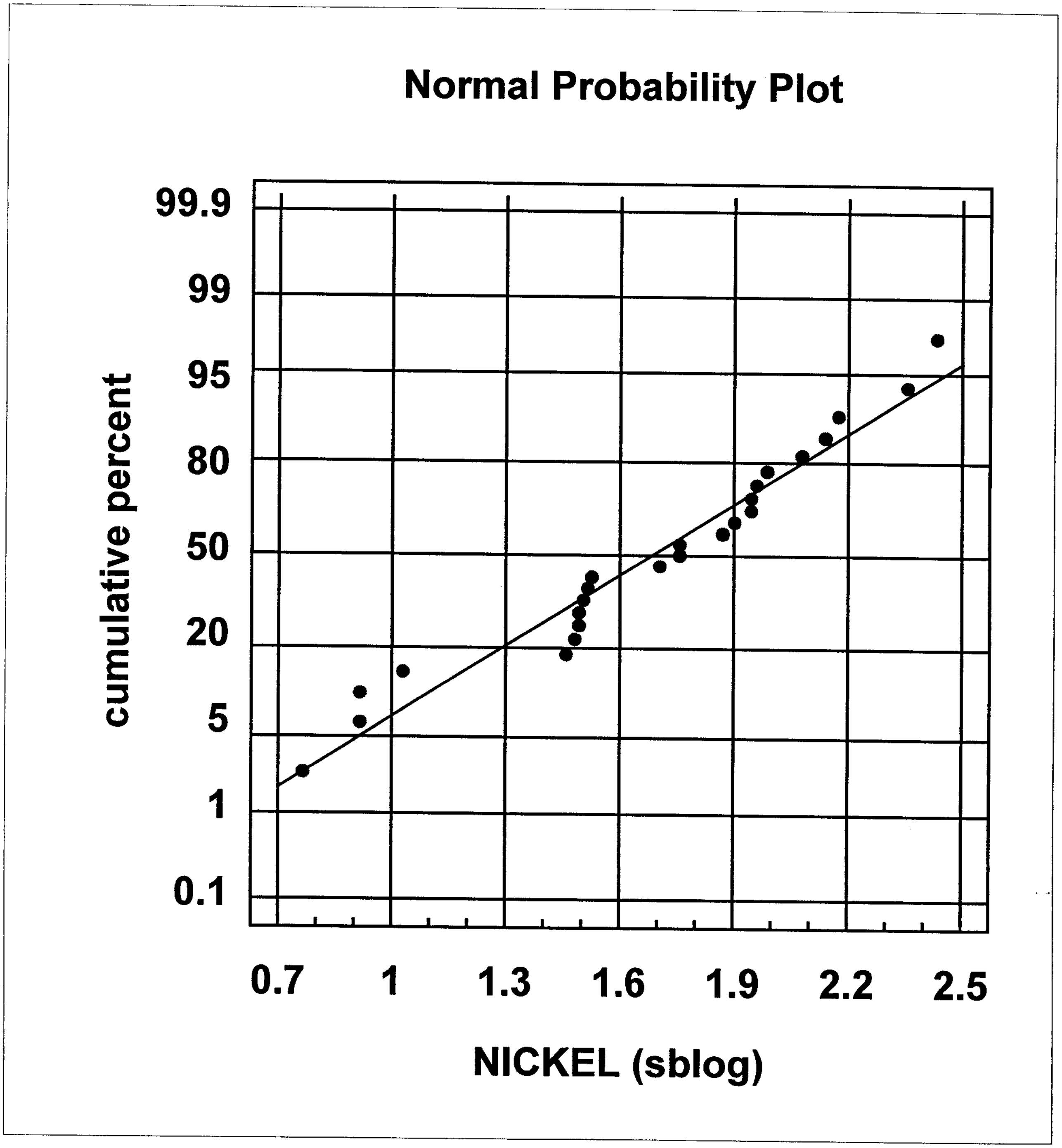
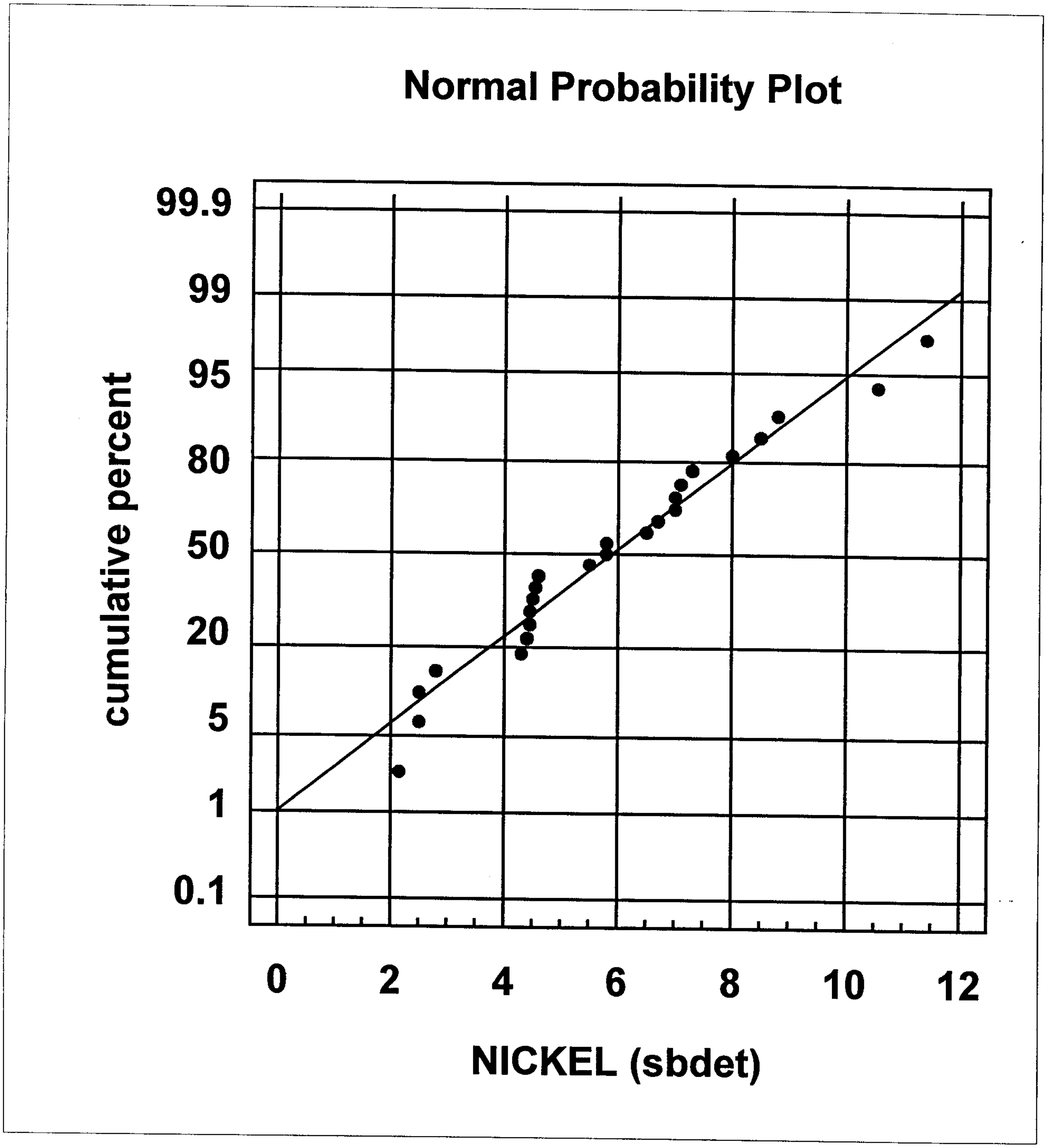


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.17 Potassium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -4 (Table B.2-1) indicates that potassium concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No potential outliers were identified in the data set for potassium (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plot (Figure B.2-1) indicate that the potassium data set in subsurface soil has a lognormal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR POTASSIUM IN SUBSURFACE SOIL

POTASSIUM (mg/kg)	CALCIUM (mg/kg)
1460	4100
1010	171000
1220	1750
1310	66600
1200	190000
642	150000
886	158000
1300	19900
777	136000
1300	135000
1220	42500
660	34900
725	95300
2370	23700
1690	167000
1120	55000
1460	38300
754	253000
1800	52500
1900	81900
1310	71800
1230	89500
1030	87900
817	43700
1350	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-3.950107439
Adjusted R Square	-3.991774106
Standard Error	927.8516105
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-16487794.91	-16487794.9	-19.1516204	#NUM!
Residual	24	20661806.67	860908.611		
Total	25	4174011.76			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR POTASSIUM IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.008330523	0.001693894	4.917970875	5.11805E-05	0.004834498	0.011826548	0.004834498	0.011826548

RESIDUAL OUTPUT

Observation	*Predicted POTASSIUM (mg/kg)*	*Residuals*
1	34.15514455	1425.844855
2	1424.519444	-414.5194435
3	14.57841536	1205.421585
4	554.8128359	755.1871641
5	1582.799382	-382.7993817
6	1249.578459	-607.5784592
7	1316.222644	-430.2226437
8	165.7774089	1134.222591
9	1132.951136	-355.9511364
10	1124.620613	175.3793867
11	354.0472301	865.9527699
12	290.7352548	369.2647452
13	793.8988478	-68.89884776
14	197.4333966	2172.566603
15	1391.197351	298.8026487
16	458.1787684	661.8212316
17	319.0590333	1140.940967
18	2107.622335	-1353.622335
19	437.3524607	1362.647539
20	682.2698387	1217.730161
21	598.1315558	711.8684442
22	745.581814	484.418186
23	732.2529771	297.7470229
24	364.0438578	452.9561422
25	548.9814698	801.0185302

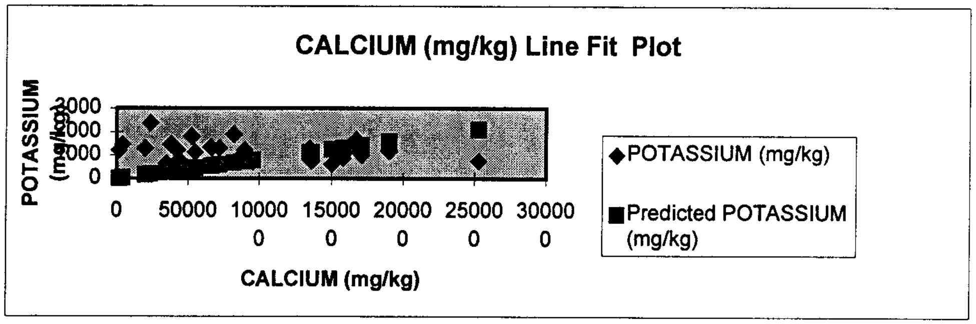


TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - POTASSIUM
CANNON AIR FORCE BASE

SAMPLE	Metals POTASSIUM mg/kg		
	Result	RL	Qual
CBSB010005	1460	538	
CBSB010010	1010	1070	J
CBSB020005	1220	535	
CBSB020010	1310	542	
CBSB020020	1200	1110	
CBSB020029	642	1140	J
CBSB020039	886	1110	J
CBSB030005	1300	529	
CBSB030010	777	1110	J
CBSB040010	1300	1080	
CBSB040020	1220	542	
CBSB040030	660	546	
CBSB040041	725	540	
CBSB050005	2370	543	
CBSB050010	1690	1070	
CBSB060005	1120	570	
CBSB060010	1460	528	
CBSB070005	754	2640	J
CBSB070010	1800	553	
CBSB080005	1900	542	
CBSB080010	1310	536	
CBSB080020	1230	540	
CBSB080030	1030	543	
CBSB080040	817	521	
CBSB100005	1350	550	
Number of detects	25		
Count (N)	25		
Minimum (detected)	642		
Maximum (detected)	2370		
Mean (x)	1222		
Standard deviation (sd)	417		
Max > Min*5	No		
Outlier	NA		
T_n[1]			
Critical value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - POTASSIUM IN SUBSURFACE SOIL

i	Potassium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	7.7706	6.4646	-1.3061	0.445	-0.5812
2	7.5496	6.4922	-1.0574	0.3069	-0.3245
3	7.4955	6.5862	-0.9094	0.2543	-0.2313
4	7.4325	6.6254	-0.8071	0.2148	-0.1734
5	7.2862	6.6554	-0.6308	0.1822	-0.1149
6	7.2862	6.7056	-0.5806	0.1539	-0.0893
7	7.2079	6.7867	-0.4211	0.1283	-0.0540
8	7.1778	6.9177	-0.2601	0.1046	-0.0272
9	7.1778	6.9373	-0.2405	0.0823	-0.0198
10	7.1701	7.0211	-0.1490	0.061	-0.0091
11	7.1701	7.0901	-0.0800	0.0403	-0.0032
12	7.1148	7.1066	-0.0082	0.02	-0.0002
13	7.1066	7.1066	0.0000	0	0.0000
14	7.1066	7.1148	0.0082		-1.6281
15	7.0901	7.1701	0.0800		
16	7.0211	7.1701	0.1490		
17	6.9373	7.1778	0.2405		
18	6.9177	7.1778	0.2601		
19	6.7867	7.2079	0.4211		
20	6.7056	7.2862	0.5806		
21	6.6554	7.2862	0.6308		
22	6.6254	7.4325	0.8071		
23	6.5862	7.4955	0.9094		
24	6.4922	7.5496	1.0574		
25	6.4646	7.7706	1.3061		
				N	25
				StdDev	0.3383
				W	0.9648
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR POTASSIUM IN SUBSURFACE SOIL

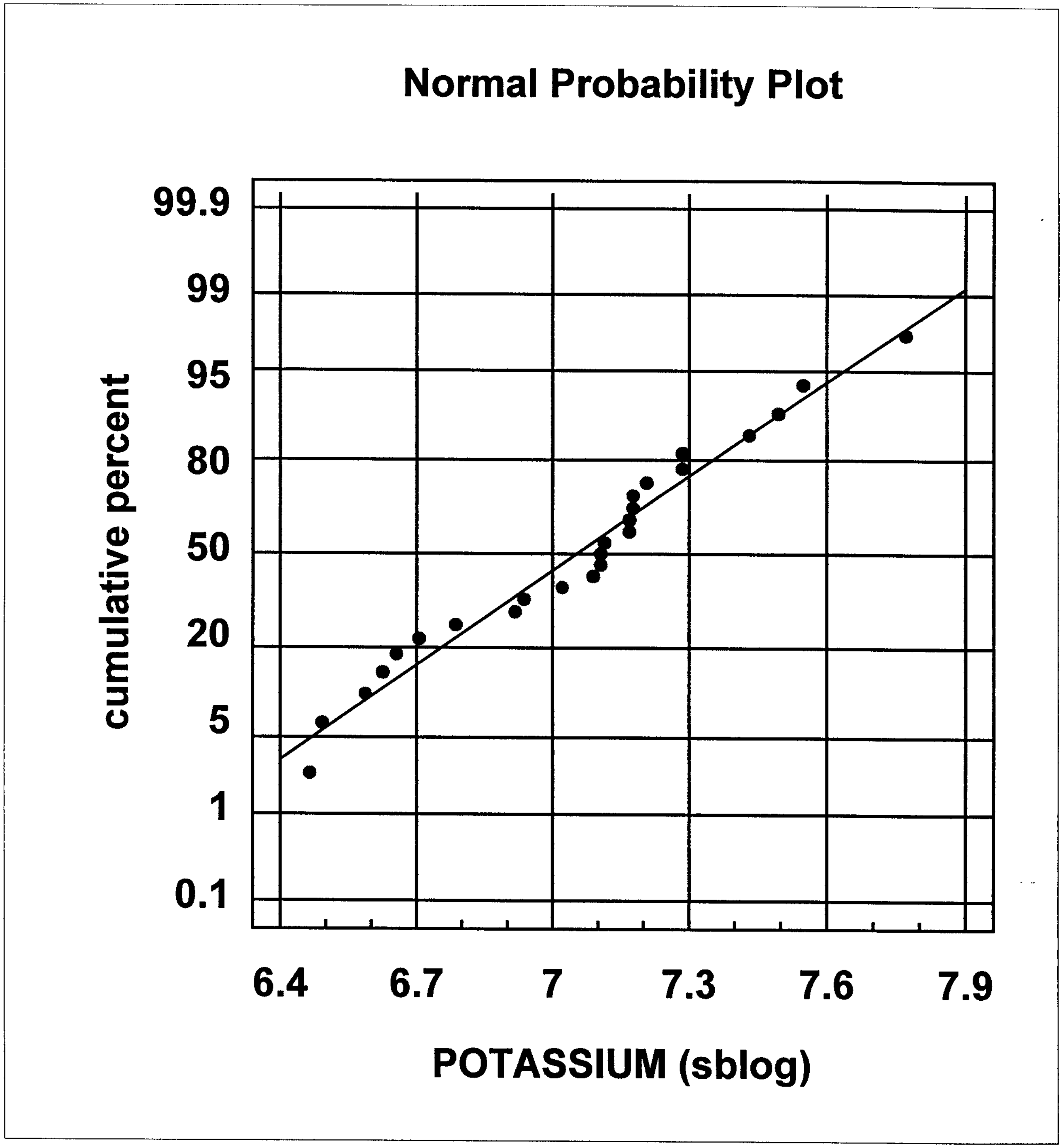
POTASSIUM (mg/kg)	log-transformed
1460	7.2862
1010	6.9177
1220	7.1066
1310	7.1778
1200	7.0901
642	6.4646
886	6.7867
1300	7.1701
777	6.6554
1300	7.1701
1220	7.1066
660	6.4922
725	6.5862
2370	7.7706
1690	7.4325
1120	7.0211
1460	7.2862
754	6.6254
1800	7.4955
1900	7.5496
1310	7.1778
1230	7.1148
1030	6.9373
817	6.7056
1350	7.2079

POTASSIUM (mg/kg)	
Mean	1221.64
Standard Error	83.4067519
Median	1220
Mode	1460
Standard Deviation	417.03376
Sample Variance	173917.157
Kurtosis	1.04577238
Skewness	0.84177488
Range	1728
Minimum	642
Maximum	2370
Sum	30541
Count	25
Confidence Level(95.0%)	172.14304

log-transformed	
Mean	7.053387
Standard Error	0.06767
Median	7.106606
Mode	7.286192
Standard Deviation	0.338349
Sample Variance	0.11448
Kurtosis	-0.40371
Skewness	-0.0242
Range	1.306057
Minimum	6.464588
Maximum	7.770645
Sum	176.3347
Count	25
Confidence Level(95.0%)	0.139663

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.18 Selenium

Due to the large number of nondetects (i.e., greater than 30 percent) in the selenium subsurface soil data set, regression analysis was not conducted.

No potential outliers were identified in the data set for selenium (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plot (Figure B.2-1) indicate that the selenium data set in subsurface soil has neither a lognormal nor normal distribution.

TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - SELENIUM
CANNON AIR FORCE BASE

SAMPLE	Metals SELENIUM mg/kg Result	RL	Qual
CBSB010005	0.27	0.54	U
CBSB010010	0.99	1.1	J
CBSB020005	0.265	0.53	U
CBSB020010	0.27	0.54	U
CBSB020020	0.55	1.1	U
CBSB020029	0.55	1.1	U
CBSB020039	1.1	1.1	
CBSB030005	0.265	0.53	U
CBSB030010	1	1.1	J
CBSB040010	0.55	1.1	U
CBSB040020	0.27	0.54	U
CBSB040030	0.275	0.55	U
CBSB040041	0.73	0.54	
CBSB050005	0.27	0.54	U
CBSB050010	0.55	1.1	U
CBSB060005	0.285	0.57	U
CBSB060010	0.265	0.53	U
CBSB070005	1.3	2.6	U
CBSB070010	0.275	0.55	U
CBSB080005	0.27	0.54	U
CBSB080010	0.27	0.54	U
CBSB080020	0.27	0.54	U
CBSB080030	0.27	0.54	U
CBSB080040	0.26	0.52	U
CBSB100005	0.275	0.55	U
Number of detects	4		
Count (N)	25		
Minimum (detected)	0.73		
Maximum (detected)	1.1		
Mean (x)	0.47		
Standard deviation (sd)	0.31		
Max > Min*5	No		
Outlier	NA		
T_n[1]			
Critical value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.

1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - SELENIUM IN SUBSURFACE SOIL

i	Selenium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	1.3471	-0.2624	-1.6094	0.445	-0.7162
2	1.3280	-0.0953	-1.4233	0.3069	-0.4368
3	1.3280	0.0000	-1.3280	0.2543	-0.3377
4	1.3280	0.0101	-1.3180	0.2148	-0.2831
5	1.3093	0.3147	-0.9946	0.1822	-0.1812
6	1.3093	0.5978	-0.7115	0.1539	-0.1095
7	1.3093	0.5978	-0.7115	0.1283	-0.0913
8	1.3093	0.5978	-0.7115	0.1046	-0.0744
9	1.3093	0.5978	-0.7115	0.0823	-0.0586
10	1.3093	1.2553	-0.0541	0.061	-0.0033
11	1.3093	1.2910	-0.0183	0.0403	-0.0007
12	1.3093	1.2910	-0.0183	0.02	-0.0004
13	1.2910	1.2910	0.0000	0	0.0000
14	1.2910	1.3093	0.0183		-2.2932
15	1.2910	1.3093	0.0183		
16	1.2553	1.3093	0.0541		
17	0.5978	1.3093	0.7115		
18	0.5978	1.3093	0.7115		
19	0.5978	1.3093	0.7115		
20	0.5978	1.3093	0.7115		
21	0.3147	1.3093	0.9946		
22	0.0101	1.3280	1.3180		
23	0.0000	1.3280	1.3280		
24	-0.0953	1.3280	1.4233		
25	-0.2624	1.3471	1.6094		
				N	25
				StdDev	0.5516
				W	0.7203
				Wcritical	0.9180
					Not Lognormal

X(i) = Log-transformed values; descending order
X(n-i+1) = Log-transformed values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - SELENIUM IN SUBSURFACE SOIL

	Selenium Result, cont.				
i	X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	1.3	0.26	-1.0400	0.445	-0.4628
2	1.1	0.265	-0.8350	0.3069	-0.2563
3	1	0.265	-0.7350	0.2543	-0.1869
4	0.99	0.265	-0.7250	0.2148	-0.1557
5	0.73	0.27	-0.4600	0.1822	-0.0838
6	0.55	0.27	-0.2800	0.1539	-0.0431
7	0.55	0.27	-0.2800	0.1283	-0.0359
8	0.55	0.27	-0.2800	0.1046	-0.0293
9	0.55	0.27	-0.2800	0.0823	-0.0230
10	0.285	0.27	-0.0150	0.061	-0.0009
11	0.275	0.27	-0.0050	0.0403	-0.0002
12	0.275	0.27	-0.0050	0.02	-0.0001
13	0.275	0.275	0.0000	0	0.0000
14	0.27	0.275	0.0050		-1.2781
15	0.27	0.275	0.0050		
16	0.27	0.285	0.0150		
17	0.27	0.55	0.2800		
18	0.27	0.55	0.2800		
19	0.27	0.55	0.2800		
20	0.27	0.55	0.2800		
21	0.27	0.73	0.4600		
22	0.265	0.99	0.7250		
23	0.265	1	0.7350		
24	0.265	1.1	0.8350		
25	0.26	1.3	1.0400		
				N	25
				StdDev	0.3141
				W	0.6897
				Wcritical	0.9180
					Not Normal

X(i) = Detected values; descending order

X(n-i+1) = Detected values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR SELENIUM IN SUBSURFACE SOIL

SELENIUM (mg/kg)	log-transformed
0.27	1.3093
0.99	0.0101
0.265	1.3280
0.27	1.3093
0.55	0.5978
0.55	0.5978
1.1	-0.0953
0.265	1.3280
1	0.0000
0.55	0.5978
0.27	1.3093
0.275	1.2910
0.73	0.3147
0.27	1.3093
0.55	0.5978
0.285	1.2553
0.265	1.3280
1.3	-0.2624
0.275	1.2910
0.27	1.3093
0.27	1.3093
0.27	1.3093
0.27	1.3093
0.26	1.3471
0.275	1.2910

SELENIUM (mg/kg)	
Mean	0.4658
Standard Error	0.06282693
Median	0.275
Mode	0.27
Standard Deviation	0.31413466
Sample Variance	0.09868058
Kurtosis	1.15547801
Skewness	1.50937478
Range	1.04
Minimum	0.26
Maximum	1.3
Sum	11.645
Count	25
Confidence Level(95.0%)	0.12966839

log-transformed	
Mean	0.93169879
Standard Error	0.11031122
Median	1.29098418
Mode	1.30933332
Standard Deviation	0.55155609
Sample Variance	0.30421412
Kurtosis	-0.44085407
Skewness	-1.05236349
Range	1.60943791
Minimum	-0.26236426
Maximum	1.34707365
Sum	23.2924698
Count	25
Confidence Level(95.0%)	0.22767112

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

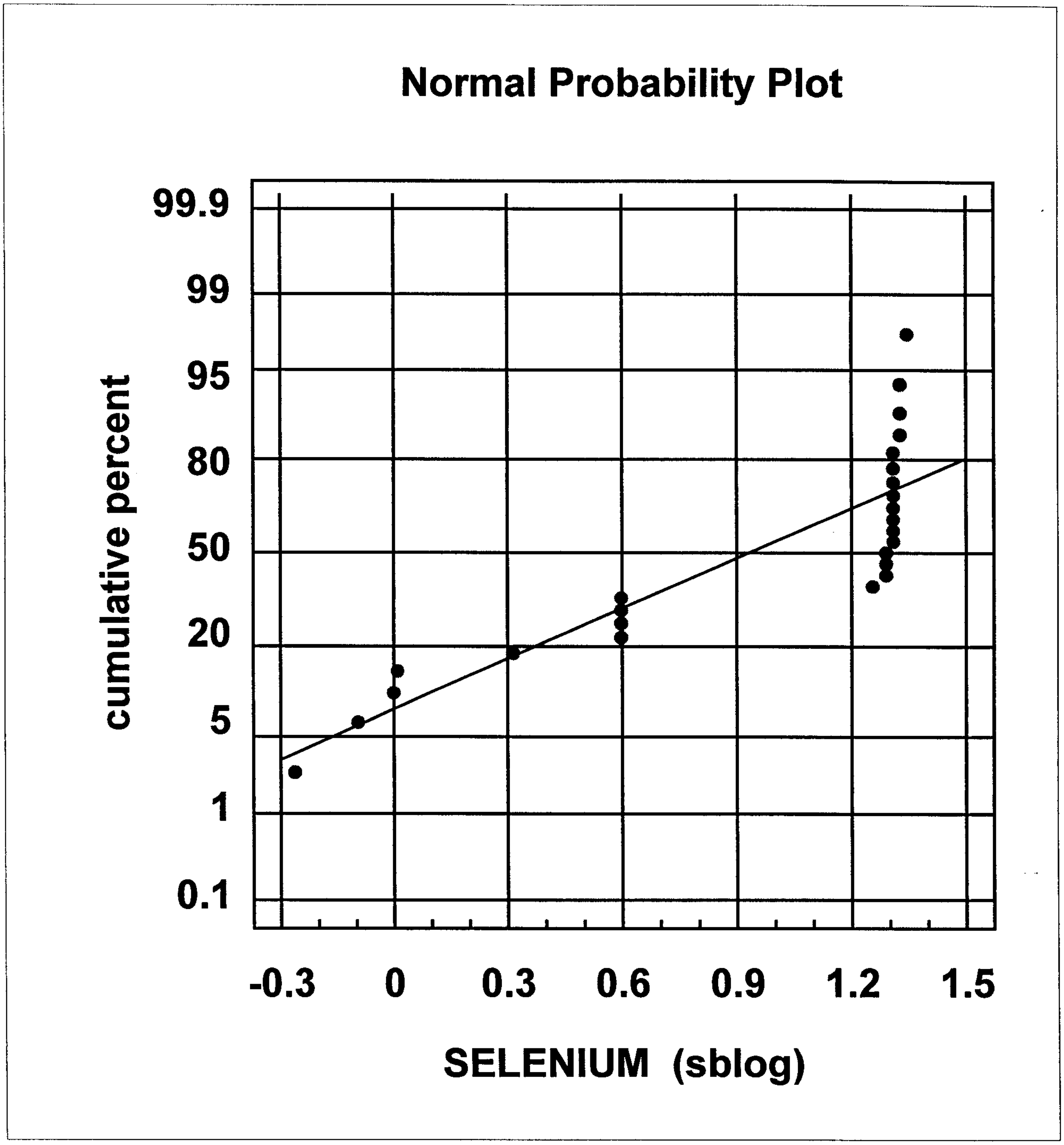
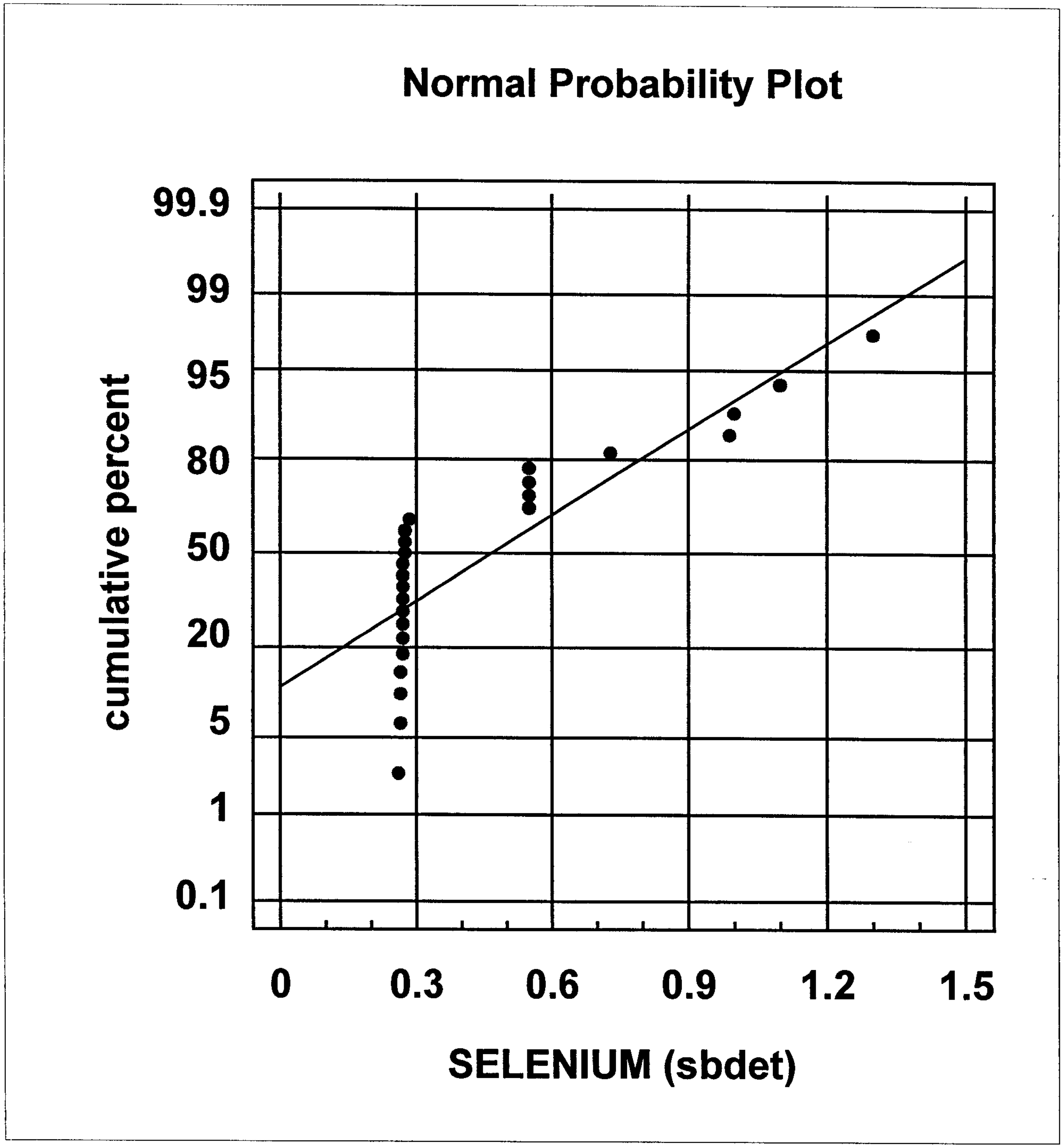


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.19 Silver

The silver results for all subsurface samples were nondetect. Therefore, no linear regression, outlier, or distribution analyses were conducted.

B.2.20 Sodium

Due to the large number of nondetects (i.e., greater than 30 percent) in the sodium subsurface soil data set, regression analysis was not conducted.

No statistical outliers were identified in the sodium subsurface soil data set (see Table B.2-2). Although several concentrations exceeded the minimum detected concentration by a factor of 5 or more, none of these concentrations were determined to be statistical outliers by the methodology described in Section 5.3.

The Shapiro-Wilk test (Table B.2-3) and coefficient of skewness (Table B.2-4) indicate that the sodium data set in subsurface soil has a lognormal distribution. The probability plots (Figures B.2-1 and B.2-2) shows that the data set is not normally distributed but is not clearly lognormally distributed. However, since two of three tests indicated the same result, and the Shapiro-Wilk test is considered to be one of the best tests for normality, it was concluded that the sodium data set has a lognormal distribution.

TABLE B.2-2

OUTLIER ANALYSIS RESULTS FOR SUBSURFACE SOIL - SODIUM CANNON AIR FORCE BASE

SAMPLE	Metals SODIUM mg/kg			
	Result	Log Result	RL	Qual
CBSB010005	269	5.5947	538	U
CBSB010010	535	6.2823	1070	U
CBSB020005	267.5	5.5891	535	U
CBSB020010	271	5.6021	542	U
CBSB020020	555	6.3190	1110	U
CBSB020029	570	6.3456	1140	U
CBSB020039	555	6.3190	1110	U
CBSB030005	264.5	5.5778	529	U
CBSB030010	555	6.3190	1110	U
CBSB040010	359	5.8833	1080	J
CBSB040020	205	5.3230	542	J
CBSB040030	133	4.8903	546	J
CBSB040041	82.6	4.4140	540	J
CBSB050005	271.5	5.6040	543	U
CBSB050010	325	5.7838	1070	J
CBSB060005	200	5.2983	570	J
CBSB060010	85.5	4.4485	528	J
CBSB070005	1320	7.1854	2640	U
CBSB070010	224	5.4116	553	J
CBSB080005	136	4.9127	542	J
CBSB080010	503	6.2206	536	J
CBSB080020	366	5.9026	540	J
CBSB080030	216	5.3753	543	J
CBSB080040	222	5.4027	521	J
CBSB100005	275	5.6168	550	U
Number of detects	13			
Count (N)	25			
Minimum (detected)	82.6			
Maximum (detected)	503			
Mean (x)	351	5.66		
Standard deviation (sd)	253	0.63		
Max > Min*5	Yes			
Outlier		No		
T_n[1]		2.408		
Critical value[2]		2.663		

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - SODIUM IN SUBSURFACE SOIL

i	Sodium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	7.1854	4.4140	-2.7714	0.445	-1.2333
2	6.3456	4.4485	-1.8971	0.3069	-0.5822
3	6.3190	4.8903	-1.4286	0.2543	-0.3633
4	6.3190	4.9127	-1.4063	0.2148	-0.3021
5	6.3190	5.2983	-1.0207	0.1822	-0.1860
6	6.2823	5.3230	-0.9593	0.1539	-0.1476
7	6.2206	5.3753	-0.8453	0.1283	-0.1085
8	5.9026	5.4027	-0.5000	0.1046	-0.0523
9	5.8833	5.4116	-0.4717	0.0823	-0.0388
10	5.7838	5.5778	-0.2060	0.061	-0.0126
11	5.6168	5.5891	-0.0277	0.0403	-0.0011
12	5.6040	5.5947	-0.0093	0.02	-0.0002
13	5.6021	5.6021	0.0000	0	0.0000
14	5.5947	5.6040	0.0093		-3.0279
15	5.5891	5.6168	0.0277		
16	5.5778	5.7838	0.2060		
17	5.4116	5.8833	0.4717		
18	5.4027	5.9026	0.5000		
19	5.3753	6.2206	0.8453		
20	5.3230	6.2823	0.9593		
21	5.2983	6.3190	1.0207		
22	4.9127	6.3190	1.4063		
23	4.8903	6.3190	1.4286		
24	4.4485	6.3456	1.8971		
25	4.4140	7.1854	2.7714		
				N	25
				StdDev	0.6316
				W	0.9577
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order
X(n-i+1) = Log-transformed values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR SODIUM IN SUBSURFACE SOIL

SODIUM (mg/kg)	log-transformed
269	5.5947
535	6.2823
267.5	5.5891
271	5.6021
555	6.3190
570	6.3456
555	6.3190
264.5	5.5778
555	6.3190
359	5.8833
205	5.3230
133	4.8903
82.6	4.4140
271.5	5.6040
325	5.7838
200	5.2983
85.5	4.4485
1320	7.1854
224	5.4116
136	4.9127
503	6.2206
366	5.9026
216	5.3753
222	5.4027
275	5.6168

SODIUM (mg/kg)	
Mean	350.624
Standard Error	50.6747147
Median	271
Mode	555
Standard Deviation	253.373573
Sample Variance	64198.1677
Kurtosis	8.38764647
Skewness	2.45714348
Range	1237.4
Minimum	82.6
Maximum	1320
Sum	8765.6
Count	25
Confidence Level(95.0%)	104.587449

log-transformed	
Mean	5.66486196
Standard Error	0.12631566
Median	5.60211882
Mode	6.31896811
Standard Deviation	0.6315783
Sample Variance	0.39889115
Kurtosis	0.52758708
Skewness	0.05507985
Range	2.77137734
Minimum	4.41400968
Maximum	7.18538702
Sum	141.621549
Count	25
Confidence Level(95.0%)	0.26070266

B.2.21 Thallium

The thallium results for all subsurface samples were nondetect. Therefore, no linear regression, outlier, or distribution analyses were conducted.

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL

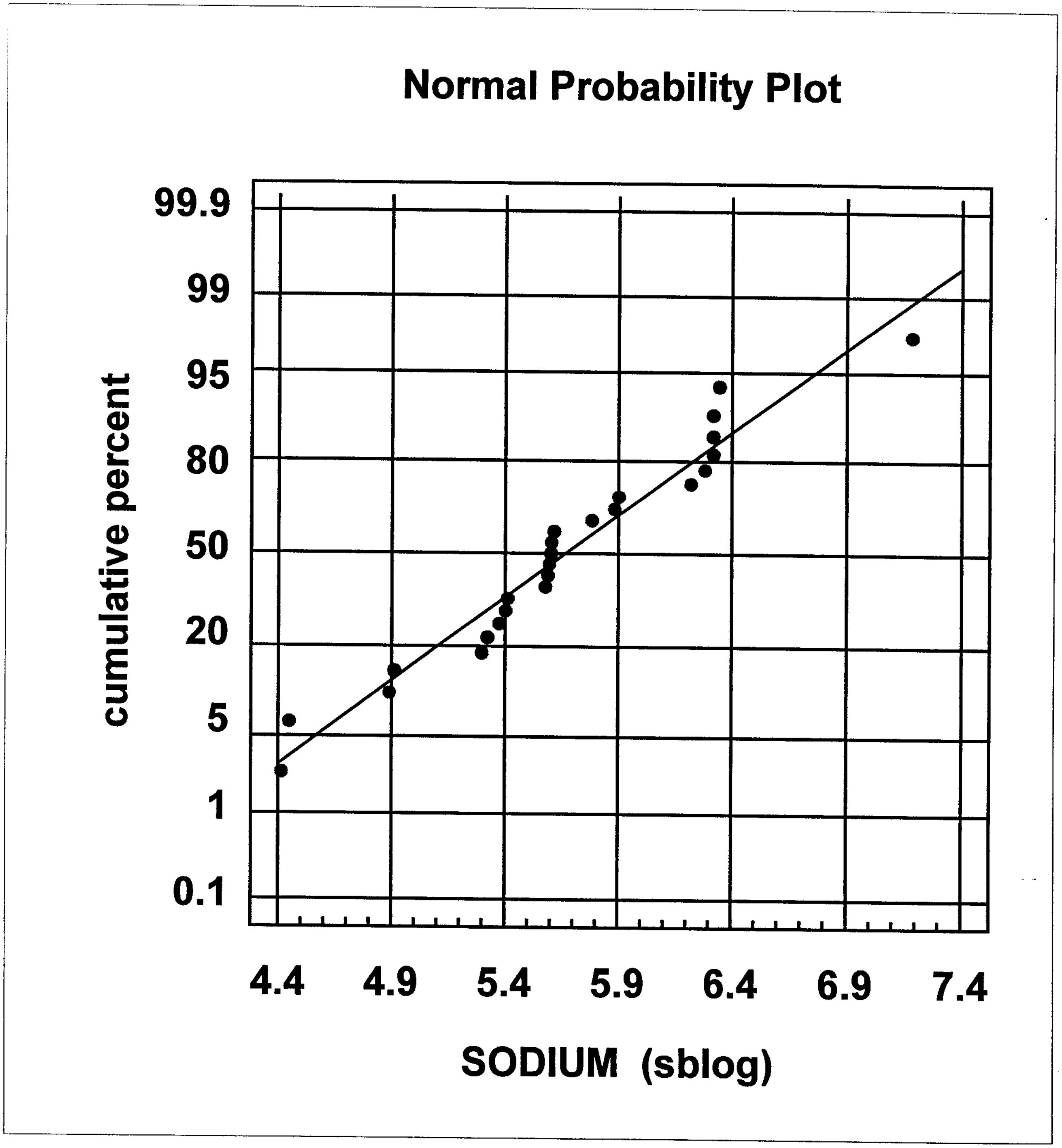
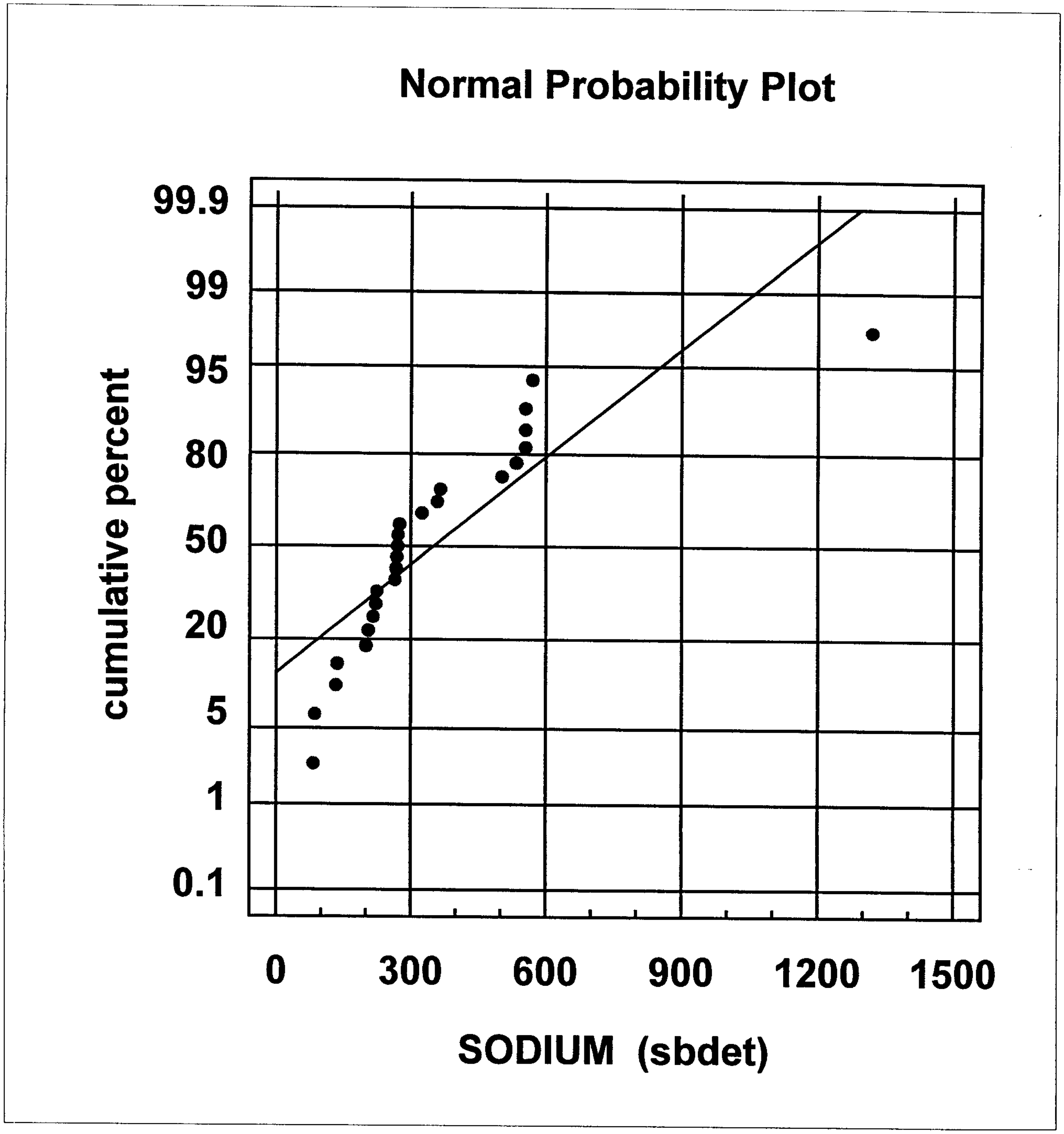


FIGURE B.2-2

PROBABILITY PLOTS (NORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.22 Vanadium

A nonlinear regression line fit plot and coefficient of determination (R^2) of -4 (Table B.1-1) indicates that vanadium concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No potential outliers were identified in the data set for vanadium (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plot (Figure B.2-1) indicate that the vanadium data set in subsurface soil has a lognormal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR VANADIUM IN SUBSURFACE SOIL

VANADIUM (mg/kg)	CALCIUM (mg/kg)
22.6	4100
17.4	171000
18.2	1750
23.2	66600
11.9	190000
23.3	150000
13.5	158000
17.3	19900
9.3	136000
15.3	135000
14.7	42500
12.4	34900
9.3	95300
18.4	23700
16.2	167000
14.1	55000
12.8	38300
11.8	253000
17.6	52500
16.1	81900
26.3	71800
12.3	89500
12.7	87900
6.5	43700
25.8	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-3.961432871
Adjusted R Square	-4.003099538
Standard Error	11.5198058
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-2543.002217	-2543.00222	-19.1626878	#NUM!
Residual	24	3184.942217	132.7059257		
Total	25	641.94			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR VANADIUM IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	0.000112908	2.10307E-05	5.368744135	1.63856E-05	6.95031E-05	0.000156313	6.95031E-05	0.000156313

RESIDUAL OUTPUT

Observation	*Predicted VANADIUM (mg/kg)*	*Residuals*
1	0.462923805	22.1370762
2	19.30730991	-1.907309913
3	0.197589429	18.00241057
4	7.519689124	15.68031088
5	21.45256657	-9.55256657
6	16.93623677	6.363763235
7	17.83950273	-4.339502726
8	2.246874078	15.05312592
9	15.35552133	-6.055521334
10	15.24261309	0.057386911
11	4.798600417	9.901399583
12	3.940497754	8.459502246
13	10.76015576	-1.460155758
14	2.675925409	15.72407459
15	18.85567693	-2.655676932
16	6.209953481	7.890046519
17	4.324385787	8.475614213
18	28.56578601	-16.76578601
19	5.927682868	11.67231713
20	9.247185274	6.852814726
21	8.106811998	18.193188
22	10.10528794	2.194712063
23	9.924634745	2.775365255
24	4.934090311	1.565909689
25	7.440653352	18.35934665

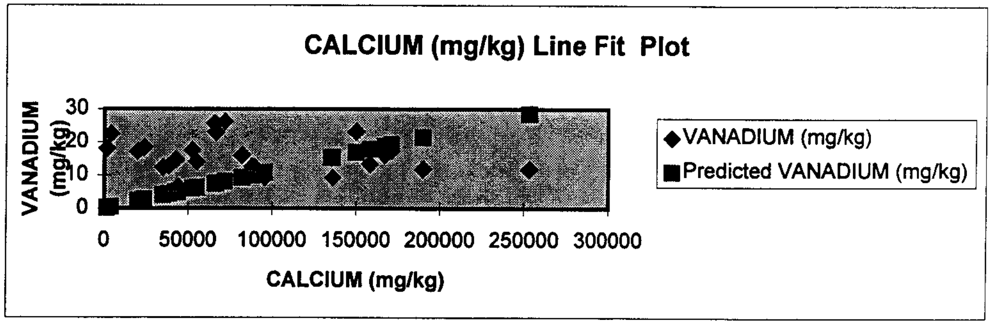


TABLE B.2-2

OUTLIER ANALYSIS RESULTS
FOR SUBSURFACE SOIL - VANADIUM
CANNON AIR FORCE BASE

SAMPLE	Metals VANADIUM mg/kg Result	RL	Qual
CBSB010005	22.6	1.1	
CBSB010010	17.4	2.1	
CBSB020005	18.2	1.1	
CBSB020010	23.2	1.1	
CBSB020020	11.9	2.2	
CBSB020029	23.3	2.3	
CBSB020039	13.5	2.2	
CBSB030005	17.3	1.1	
CBSB030010	9.3	2.2	
CBSB040010	15.3	2.2	
CBSB040020	14.7	1.1	
CBSB040030	12.4	1.1	
CBSB040041	9.3	1.1	
CBSB050005	18.4	1.1	
CBSB050010	16.2	2.1	
CBSB060005	14.1	1.1	
CBSB060010	12.8	1.1	
CBSB070005	11.8	5.3	
CBSB070010	17.6	1.1	
CBSB080005	16.1	1.1	
CBSB080010	26.3	1.1	
CBSB080020	12.3	1.1	
CBSB080030	12.7	1.1	
CBSB080040	6.5	1	
CBSB100005	25.8	1.1	
Number of detects	25		
Count (N)	25		
Minimum (detected)	6.5		
Maximum (detected)	26.3		
Mean (x)	16.0		
Standard deviation (sd)	5.2		
Max > Min*5	No		
Outlier	NA		
T_n [1]			
Critical value[2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - VANADIUM IN SUBSURFACE SOIL

i	Vanadium Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	3.2696	1.8718	-1.3978	0.445	-0.6220
2	3.2504	2.2300	-1.0204	0.3069	-0.3131
3	3.1485	2.2300	-0.9184	0.2543	-0.2336
4	3.1442	2.4681	-0.6761	0.2148	-0.1452
5	3.1179	2.4765	-0.6414	0.1822	-0.1169
6	2.9124	2.5096	-0.4028	0.1539	-0.0620
7	2.9014	2.5177	-0.3837	0.1283	-0.0492
8	2.8679	2.5416	-0.3263	0.1046	-0.0341
9	2.8565	2.5494	-0.3070	0.0823	-0.0253
10	2.8507	2.6027	-0.2480	0.061	-0.0151
11	2.7850	2.6462	-0.1388	0.0403	-0.0056
12	2.7788	2.6878	-0.0910	0.02	-0.0018
13	2.7279	2.7279	0.0000	0	0.0000
14	2.6878	2.7788	0.0910		-1.6240
15	2.6462	2.7850	0.1388		
16	2.6027	2.8507	0.2480		
17	2.5494	2.8565	0.3070		
18	2.5416	2.8679	0.3263		
19	2.5177	2.9014	0.3837		
20	2.5096	2.9124	0.4028		
21	2.4765	3.1179	0.6414		
22	2.4681	3.1442	0.6761		
23	2.2300	3.1485	0.9184		
24	2.2300	3.2504	1.0204		
25	1.8718	3.2696	1.3978		
				N	25
				StdDev	0.3372
				W	0.9664
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order
X(n-i+1) = Log-transformed values; ascending order
a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)
b(i) = a(n-i+1) * [X(n-i+1) -X(i)]
b = Sum[b(i)]
W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2
Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)
Data set is determined to be normal if W>Wcritical
Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR VANADIUM IN SUBSURFACE SOIL

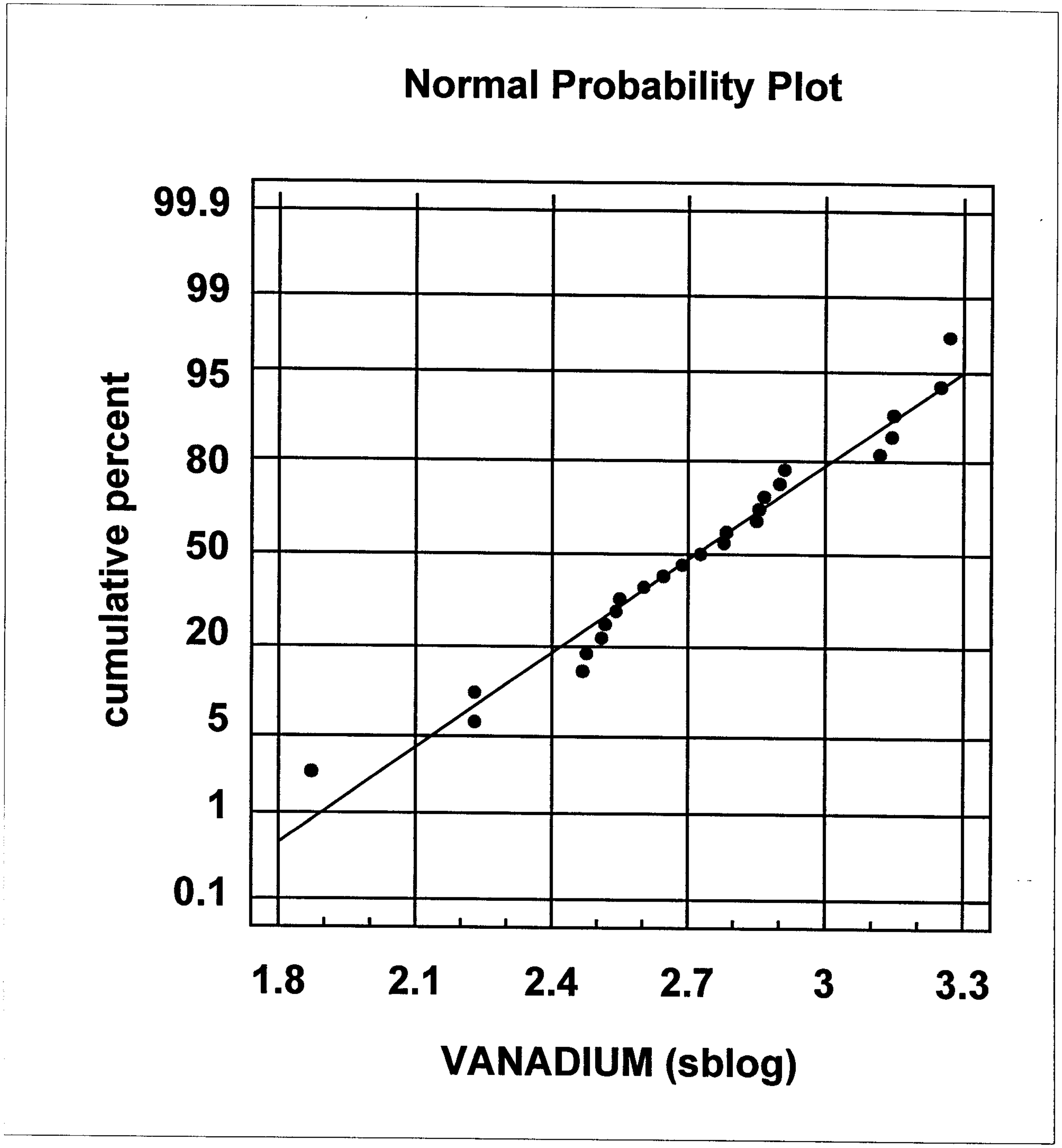
VANADIUM (mg/kg)	log-transformed
22.6	3.1179
17.4	2.8565
18.2	2.9014
23.2	3.1442
11.9	2.4765
23.3	3.1485
13.5	2.6027
17.3	2.8507
9.3	2.2300
15.3	2.7279
14.7	2.6878
12.4	2.5177
9.3	2.2300
18.4	2.9124
16.2	2.7850
14.1	2.6462
12.8	2.5494
11.8	2.4681
17.6	2.8679
16.1	2.7788
26.3	3.2696
12.3	2.5096
12.7	2.5416
6.5	1.8718
25.8	3.2504

VANADIUM (mg/kg)	
Mean	15.96
Standard Error	1.03435971
Median	15.3
Mode	9.3
Standard Deviation	5.17179853
Sample Variance	26.7475
Kurtosis	-0.30315943
Skewness	0.45877783
Range	19.8
Minimum	6.5
Maximum	26.3
Sum	399
Count	25
Confidence Level(95.0%)	2.13481307

log-transformed	
Mean	2.717702
Standard Error	0.067441
Median	2.727853
Mode	2.230014
Standard Deviation	0.337205
Sample Variance	0.113707
Kurtosis	0.34421
Skewness	-0.39293
Range	1.397767
Minimum	1.871802
Maximum	3.269569
Sum	67.94255
Count	25
Confidence Level(95.0%)	0.139191

FIGURE B.2-1

PROBABILITY PLOTS (LOGNORMAL) FOR METALS IN SUBSURFACE SOIL



B.2.23 Zinc

A nonlinear regression line fit plot and coefficient of determination (R^2) of -3 (Table B.2-1) indicates that zinc concentrations in subsurface soil do not correlate with calcium concentrations (i.e., caliche) in subsurface soil.

No potential outliers were identified in the data set for zinc (see Table B.2-2). The maximum detected concentration did not exceed the minimum detected concentration by a factor of 5. Therefore, outlier analysis was not applicable.

The Shapiro-Wilk test (Table B.2-3), coefficient of skewness (Table B.2-4), and probability plot (Figure B.2-1) indicate that the zinc data set in subsurface soil has a lognormal distribution.

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR ZINC IN SUBSURFACE SOIL

ZINC (mg/kg)	CALCIUM (mg/kg)
16.9	4100
11.2	171000
13.9	1750
14.5	66600
8.7	190000
6	150000
7.1	158000
18.9	19900
12	136000
13.5	135000
9.9	42500
4.5	34900
4.8	95300
20.5	23700
18.9	167000
11.3	55000
15.4	38300
8.9	253000
15.5	52500
18.8	81900
13.8	71800
9	89500
7.5	87900
6	43700
14.6	65900

SUMMARY OUTPUT

Regression Statistics	
Multiple R	65535
R Square	-2.993162172
Adjusted R Square	-3.034828838
Standard Error	9.503732732
Observations	25

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	-1624.84886	-1624.84886	-17.9897257	#NUM!
Residual	24	2167.70246	90.32093585		
Total	25	542.8536			

TABLE B.2-1

LINEAR REGRESSION ANALYSIS FOR ZINC IN SUBSURFACE SOIL

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
CALCIUM (mg/kg)	8.21672E-05	1.73501E-05	4.735832153	8.12904E-05	4.63583E-05	0.000117976	4.63583E-05	0.000117976

RESIDUAL OUTPUT

Observation	*Predicted ZINC (mg/kg)*	*Residuals*
1	0.336885381	16.56311462
2	14.05058541	-2.850585409
3	0.143792541	13.75620746
4	5.472333265	9.027666735
5	15.61176157	-6.911761566
6	12.32507492	-6.325074921
7	12.98241225	-5.88241225
8	1.635126606	17.26487339
9	11.17473459	0.825265405
10	11.09256743	2.407432571
11	3.492104561	6.407895439
12	2.867634098	1.632365902
13	7.830530933	-3.030530933
14	1.947361837	18.55263816
15	13.72191674	5.178083255
16	4.519194138	6.780805862
17	3.147002463	12.25299754
18	20.78829303	-11.88829303
19	4.313776222	11.18622378
20	6.729490907	12.07050909
21	5.899602529	7.900397471
22	7.353961369	1.646038631
23	7.222493903	0.277506097
24	3.59070516	2.40929484
25	5.414816248	9.185183752

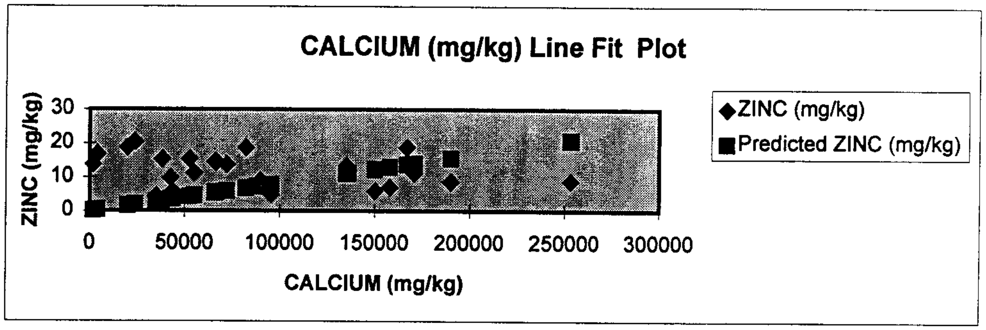


TABLE B.2-2

OUTLIER ANALYSIS RESULTS FOR SUBSURFACE SOIL - ZINC CANNON AIR FORCE BASE

SAMPLE	Metals ZINC mg/kg		
	Result	RL	Qual
CBSB010005	16.9	2.2	
CBSB010010	11.2	4.3	
CBSB020005	13.9	2.1	
CBSB020010	14.5	2.2	
CBSB020020	8.7	4.4	
CBSB020029	6	4.6	
CBSB020039	7.1	4.5	
CBSB030005	18.9	2.1	
CBSB030010	12	4.5	
CBSB040010	13.5	4.3	
CBSB040020	9.9	2.2	
CBSB040030	4.5	2.2	
CBSB040041	4.8	2.2	
CBSB050005	20.5	2.2	
CBSB050010	18.9	4.3	
CBSB060005	11.3	2.3	
CBSB060010	15.4	2.1	
CBSB070005	8.9	10.6	J
CBSB070010	15.5	2.2	
CBSB080005	18.8	2.2	
CBSB080010	13.8	2.1	
CBSB080020	9	2.2	
CBSB080030	7.5	2.2	
CBSB080040	6	2.1	
CBSB100005	14.6	2.2	
Number of detects	25		
Count (N)	25		
Minimum (detected)	4.5		
Maximum (detected)	20.5		
Mean (x)	12.1		
Standard deviation (sd)	4.8		
Max > Min*5	No		
Outlier	NA		
T_n [1]			
Critical value [2]			

RL = reporting limit
Qual = qualifier
J = estimated value below reporting limit
U = nondetect
NA = not applicable
Shading indicates actual detection
Average was calculated using one-half of the reporting limit for nondetects (qualifier "U"), except where they cause the mean to exceed the maximum detected concentration.
1 $T_n = (X_n - X)/sd$ Source: EPA 1989
2 Source: Table 8, EPA 1989

TABLE B.2-3

SHAPIRO-WILK TEST OF NORMALITY - ZINC IN SUBSURFACE SOIL

i	Zinc Log Result X(i)	X(n-i+1)	X(n-i+1)-X(i)	a(n-i+1)	b(i)
1	3.0204	1.5041	-1.5163	0.445	-0.6748
2	2.9392	1.5686	-1.3705	0.3069	-0.4206
3	2.9392	1.7918	-1.1474	0.2543	-0.2918
4	2.9339	1.7918	-1.1421	0.2148	-0.2453
5	2.8273	1.9601	-0.8672	0.1822	-0.1580
6	2.7408	2.0149	-0.7259	0.1539	-0.1117
7	2.7344	2.1633	-0.5710	0.1283	-0.0733
8	2.6810	2.1861	-0.4950	0.1046	-0.0518
9	2.6741	2.1972	-0.4769	0.0823	-0.0393
10	2.6319	2.2925	-0.3394	0.061	-0.0207
11	2.6247	2.4159	-0.2088	0.0403	-0.0084
12	2.6027	2.4248	-0.1779	0.02	-0.0036
13	2.4849	2.4849	0.0000	0	0.0000
14	2.4248	2.6027	0.1779		-2.0992
15	2.4159	2.6247	0.2088		
16	2.2925	2.6319	0.3394		
17	2.1972	2.6741	0.4769		
18	2.1861	2.6810	0.4950		
19	2.1633	2.7344	0.5710		
20	2.0149	2.7408	0.7259		
21	1.9601	2.8273	0.8672		
22	1.7918	2.9339	1.1421		
23	1.7918	2.9392	1.1474		
24	1.5686	2.9392	1.3705		
25	1.5041	3.0204	1.5163		
				N	25
				StdDev	0.4425
				W	0.9378
				Wcritical	0.9180
					Lognormal

X(i) = Log-transformed values; descending order

X(n-i+1) = Log-transformed values; ascending order

a(n-i+1) = Coefficient for the W test of Normality from Table A-1, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 1992)

b(i) = a(n-i+1) * [X(n-i+1) -X(i)]

b = Sum[b(i)]

W = Shapiro-Wilk test statistic of normality = (b/stdev((n-1)^0.5))^2

Wcritical = Critical value of the W statistic at the 95% confidence level from Table A-2 (EPA 1992)

Data set is determined to be normal if W>Wcritical

Data set is determined to be lognormal if W>Wcritical based on log-transformed data.

TABLE B.2-4

SUMMARY STATISTICS FOR ZINC IN SUBSURFACE SOIL

ZINC (mg/kg)	log-transformed
16.9	2.8273
11.2	2.4159
13.9	2.6319
14.5	2.6741
8.7	2.1633
6	1.7918
7.1	1.9601
18.9	2.9392
12	2.4849
13.5	2.6027
9.9	2.2925
4.5	1.5041
4.8	1.5686
20.5	3.0204
18.9	2.9392
11.3	2.4248
15.4	2.7344
8.9	2.1861
15.5	2.7408
18.8	2.9339
13.8	2.6247
9	2.1972
7.5	2.0149
6	1.7918
14.6	2.6810

ZINC (mg/kg)		*log-transformed*	
Mean	12.084	Mean	2.40582
Standard Error	0.95118663	Standard Error	0.088493
Median	12	Median	2.484907
Mode	6	Mode	1.791759
Standard Deviation	4.75593314	Standard Deviation	0.442467
Sample Variance	22.6189	Sample Variance	0.195777
Kurtosis	-1.05788681	Kurtosis	-0.67385
Skewness	0.06698924	Skewness	-0.5572
Range	16	Range	1.516347
Minimum	4.5	Minimum	1.504077
Maximum	20.5	Maximum	3.020425
Sum	302.1	Sum	60.14551
Count	25	Count	25
Confidence Level(95.0%)	1.96315231	Confidence Level(95.0%)	0.182641

APPENDIX B.3
METALS CONCENTRATIONS VS. DEPTH

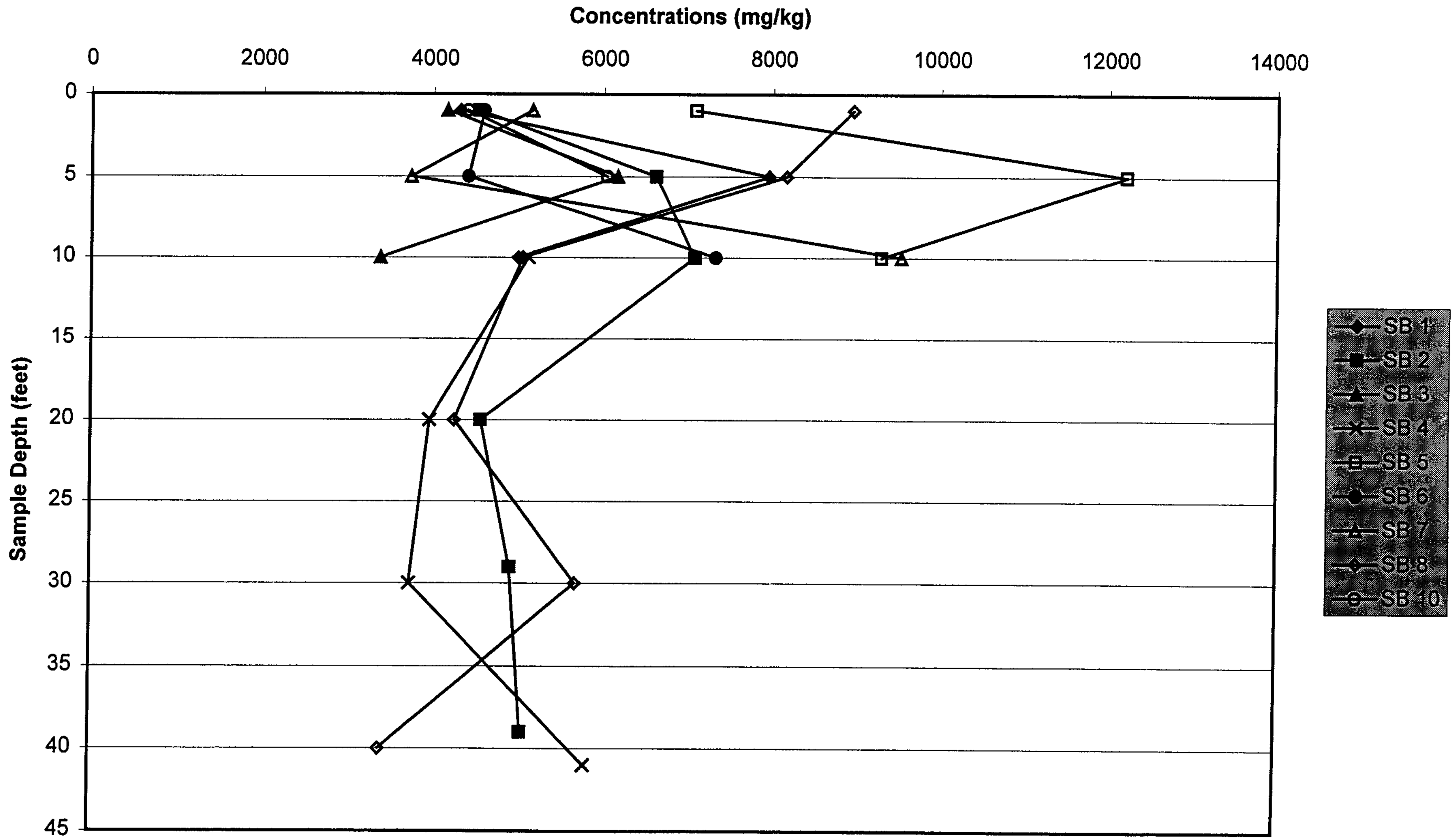
B.3
METALS CONCENTRATIONS VS. DEPTH

Appendix B.3 presents variations in background metal concentrations by depth. There is a brief summary of each metal results followed by a graph showing concentration versus depth in nine different background soil borings. Results less than the reporting limit are not shown. Three metals; antimony, cadmium, and thallium, were not detected above reporting limits in background borings. Results are not summarized or graphed for these three metals.

B.3.1 Aluminum

Figure B.3-1 shows variation in aluminum concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between 3,000 and 12,000 mg/kg aluminum. From 10 to 40 feet bgs, concentrations tend to remain near constant between 4,000 and 6,000 mg/kg.

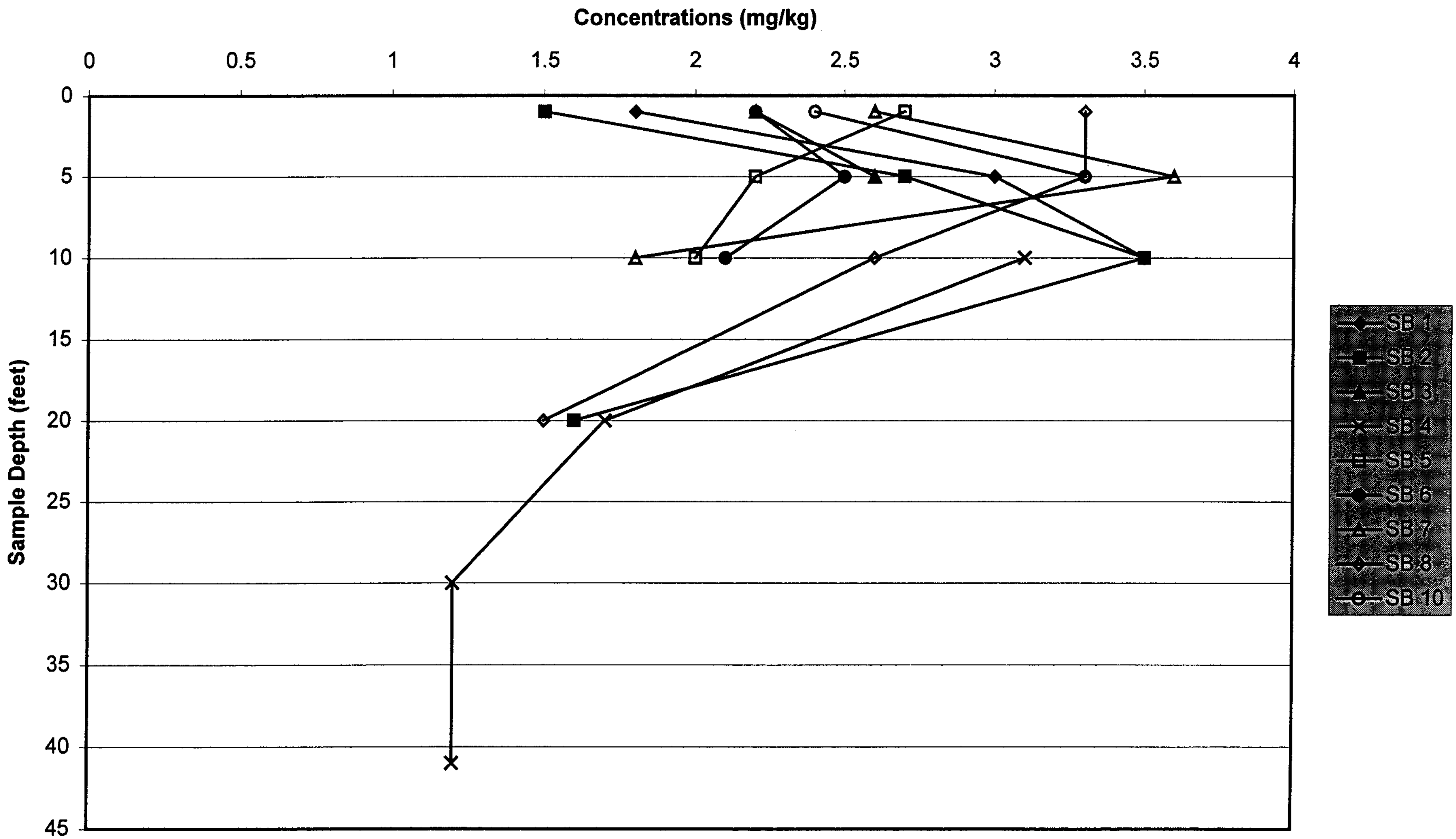
FIGURE B.3-1
ALUMINUM CONCENTRATIONS AT DEPTH



B.3.2 Arsenic

Figure B.3-2 shows variation in arsenic concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between 1 and 4 mg/kg arsenic. From 10 to 40 feet bgs, arsenic concentrations tend to decrease with depth to about 1.5 mg/kg.

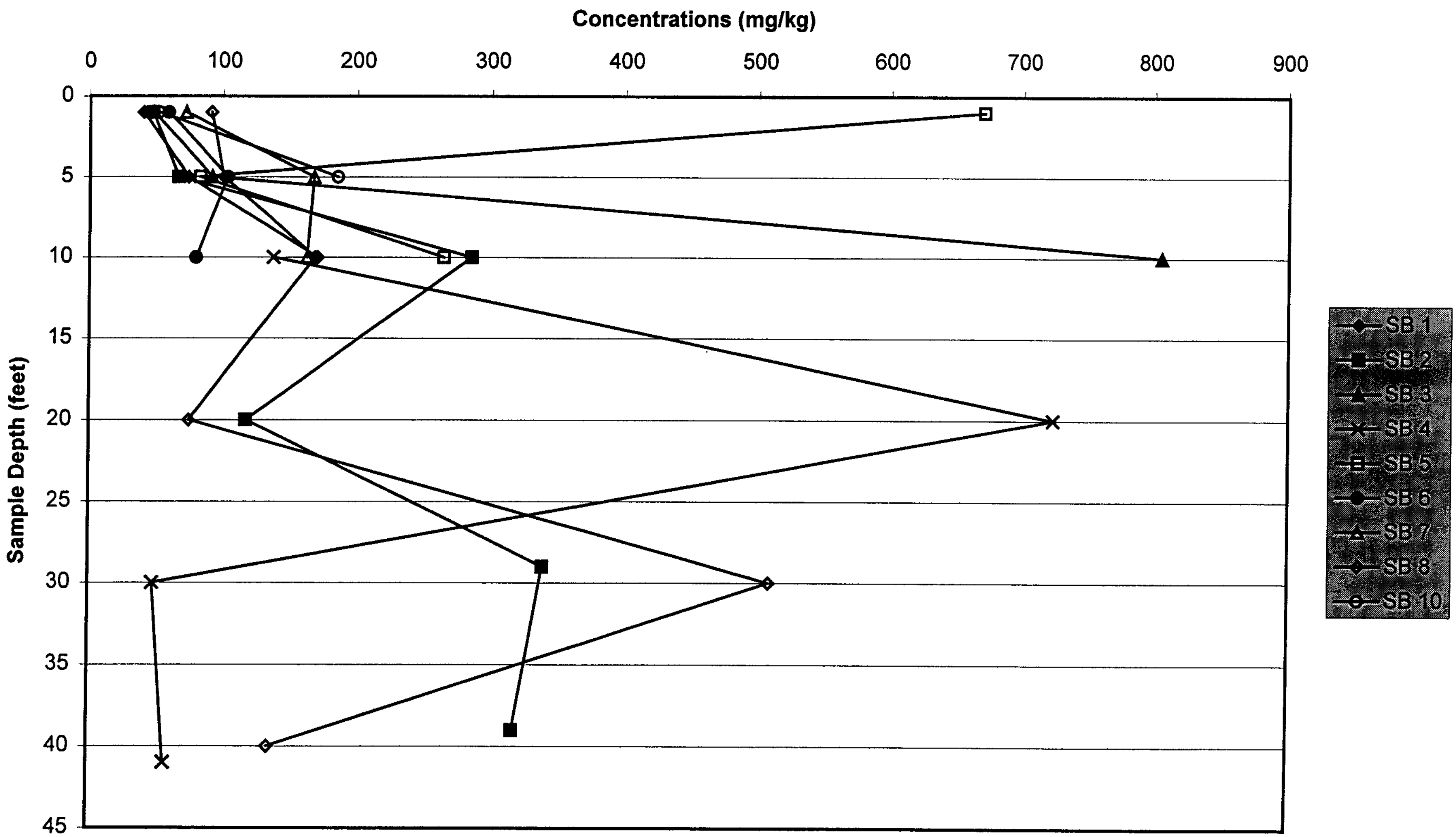
FIGURE B.3-2
ARSENIC CONCENTRATIONS AT DEPTH



B.3.3 Barium

Figure B.3-3 shows variation in barium concentrations with depth in the background soil borings. There is no consistent correlation between barium concentration and depth.

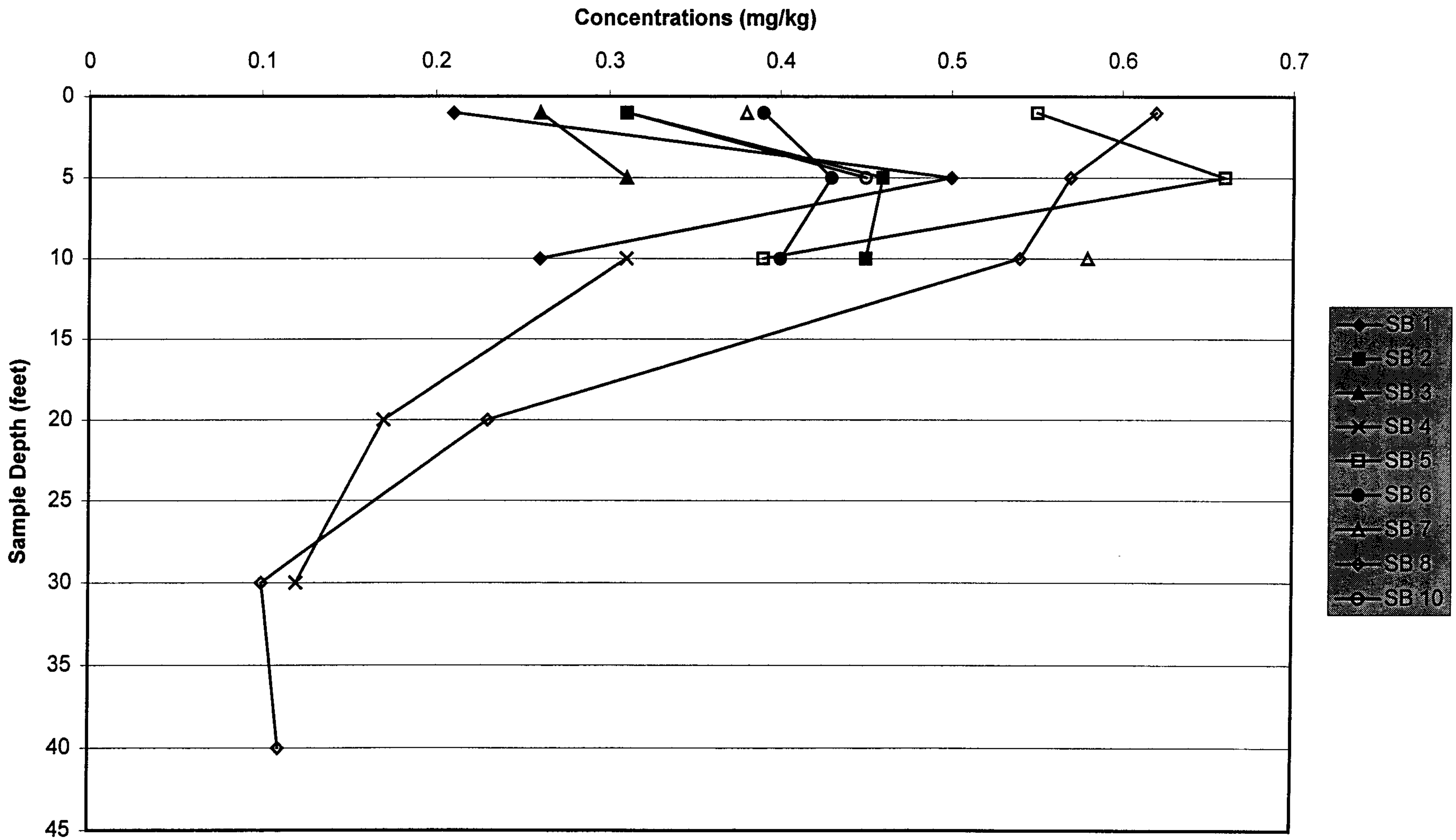
FIGURE B.3-3
BARIUM CONCENTRATIONS AT DEPTH



B.3.4 Beryllium

Figure B.3-4 shows variation in beryllium concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, all samples contain less than 0.7 mg/kg beryllium. From 10 feet to 40 feet bgs, beryllium concentrations tend to decrease with depth to below 0.2 mg/kg.

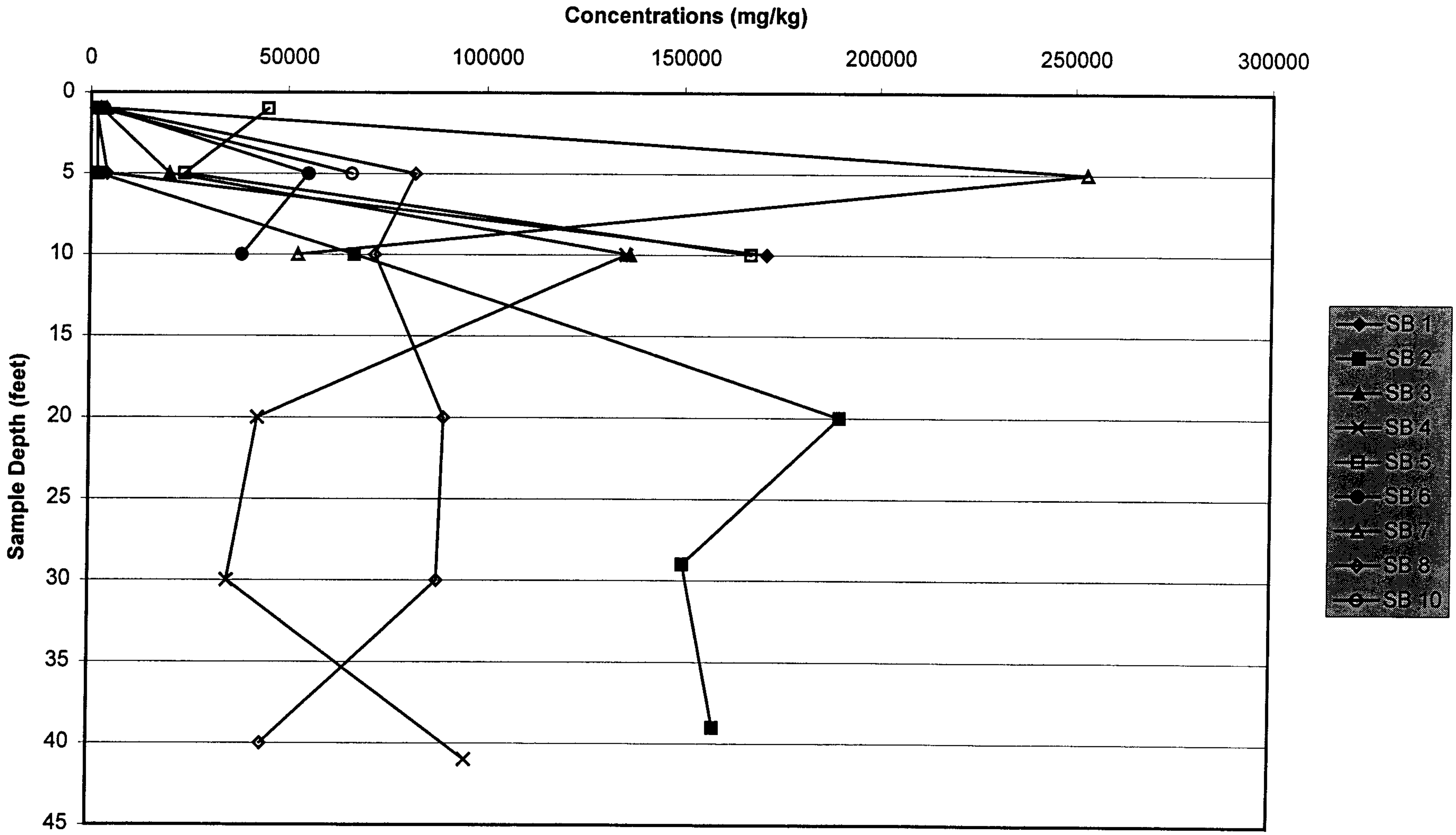
FIGURE B.3-4
BERYLLIUM CONCENTRATIONS AT DEPTH



B.3.5 Calcium

Figure B.3-5 shows variation in calcium concentrations with depth in the background soil borings. There is no consistent correlation between calcium concentration and depth.

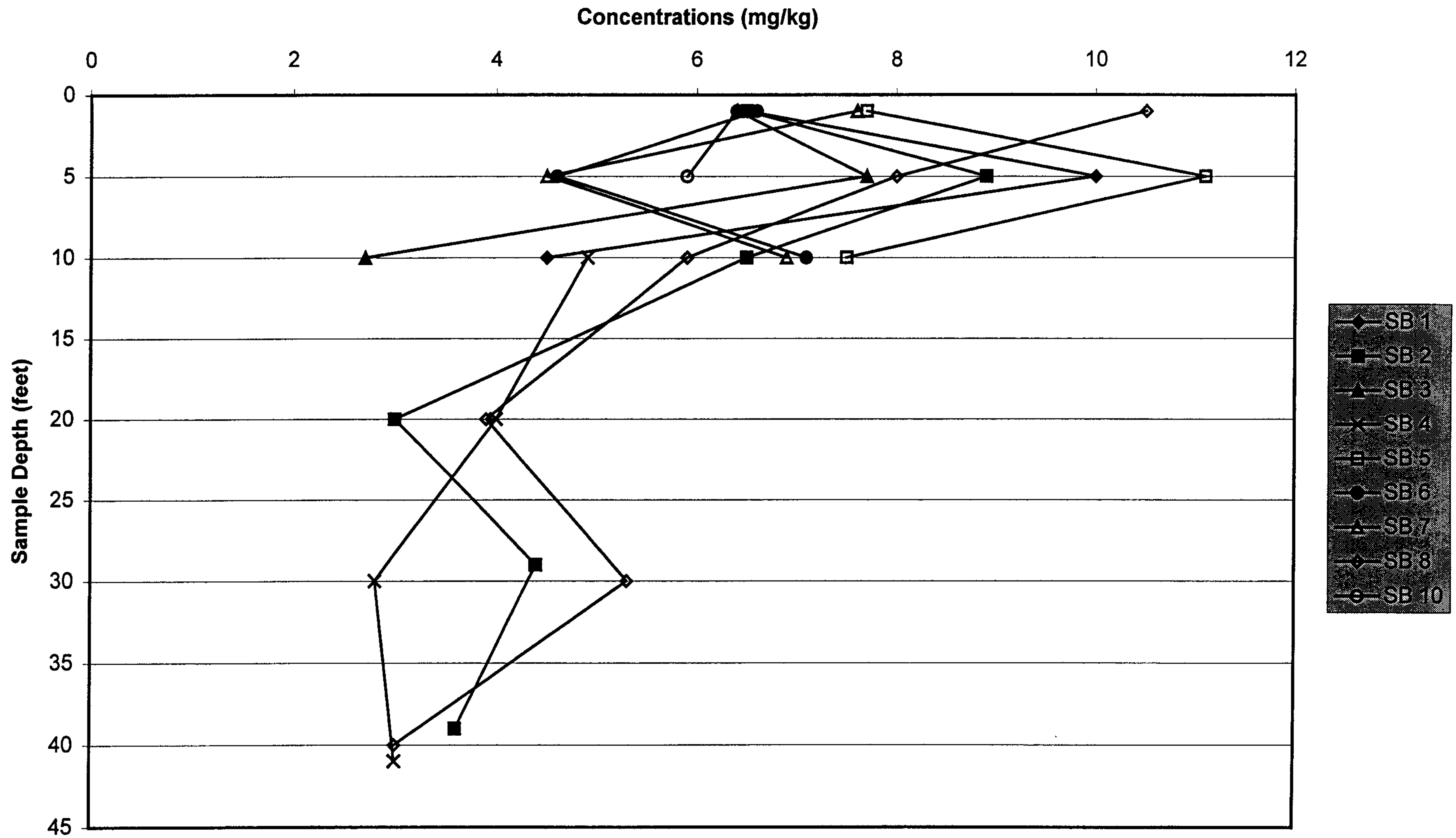
FIGURE B.3-5
CALCIUM CONCENTRATIONS AT DEPTH



B.3.6 Chromium

Figure B.3-6 shows variation in chromium concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between 3 and 11 mg/kg chromium. From 10 feet to 40 feet bgs, chromium concentrations tend to decrease with depth to about 3 mg/kg.

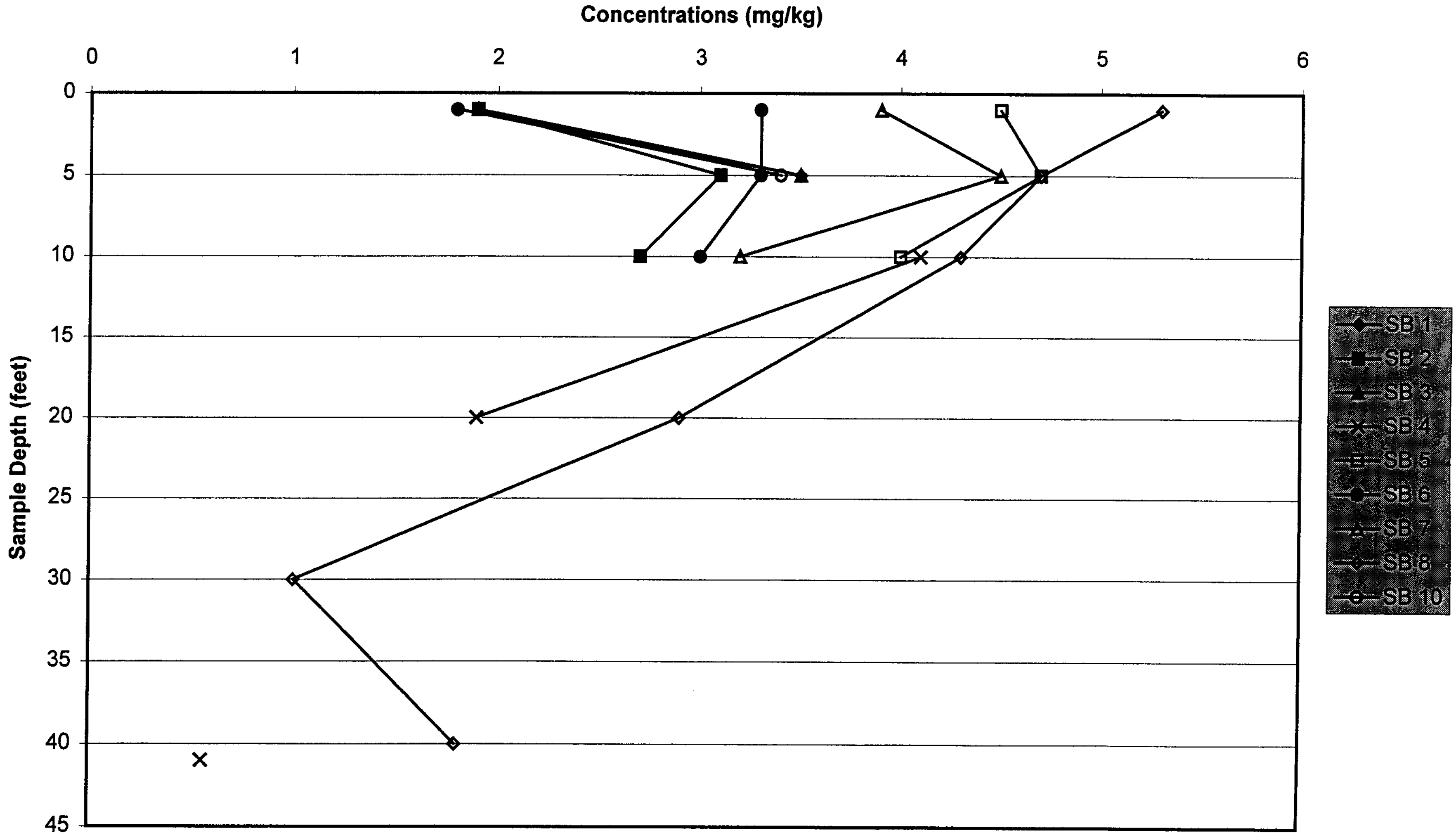
FIGURE B.3-6
CHROMIUM CONCENTRATIONS AT DEPTH



B.3.7 Cobalt

Figure B.3-7 shows variation in cobalt concentrations with depth in the background soil borings. There is no consistent correlation between cobalt concentrations and depth. However, most samples contain between 1 and 6 mg/kg cobalt.

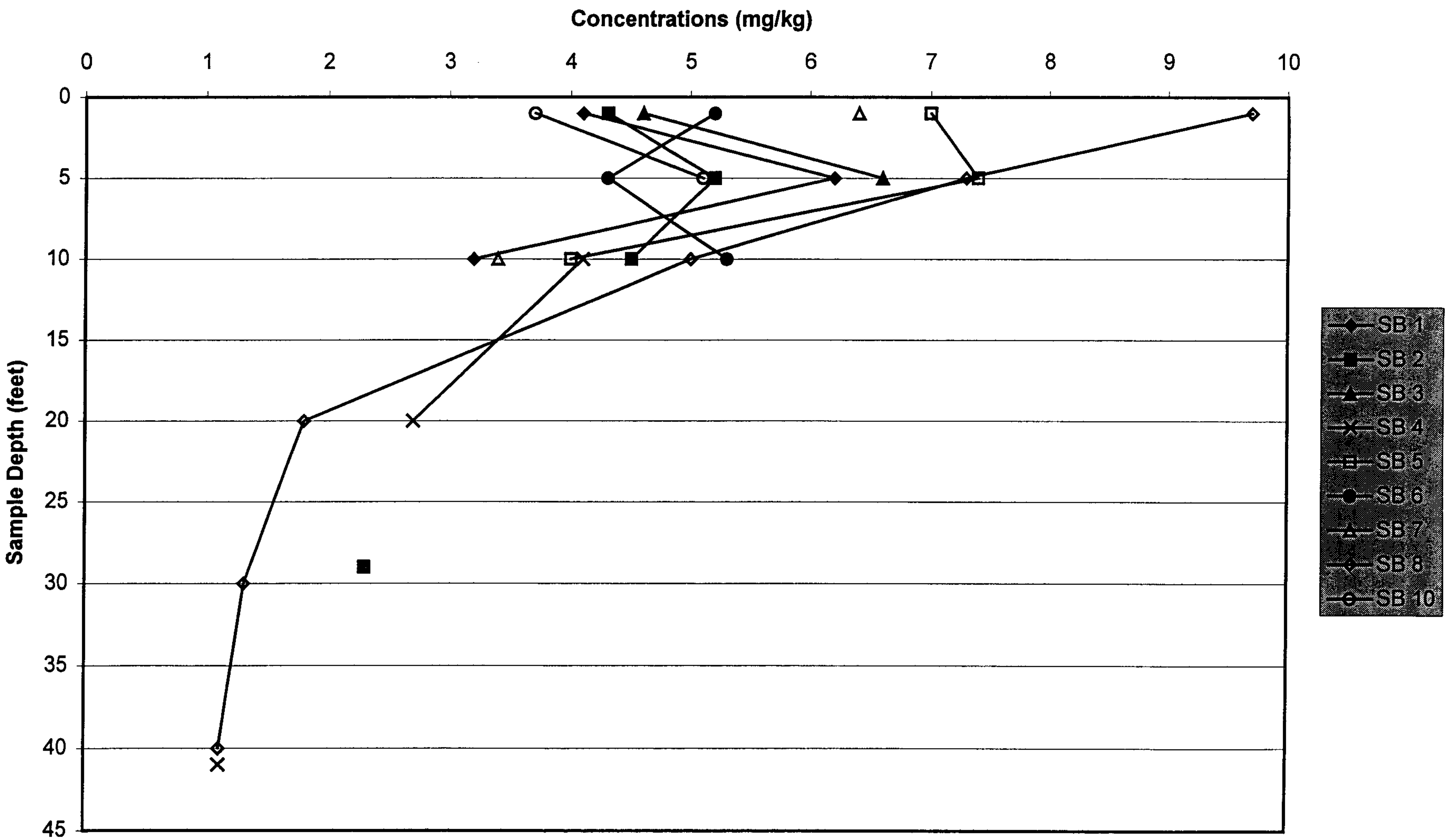
FIGURE B.3-7
COBALT CONCENTRATIONS AT DEPTH



B.3.8 Copper

Figure B.3-8 shows variation in copper concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between 2 and 10 mg/kg copper. From 10 to 40 feet bgs, copper concentrations tend to decrease with depth to about 2 mg/kg.

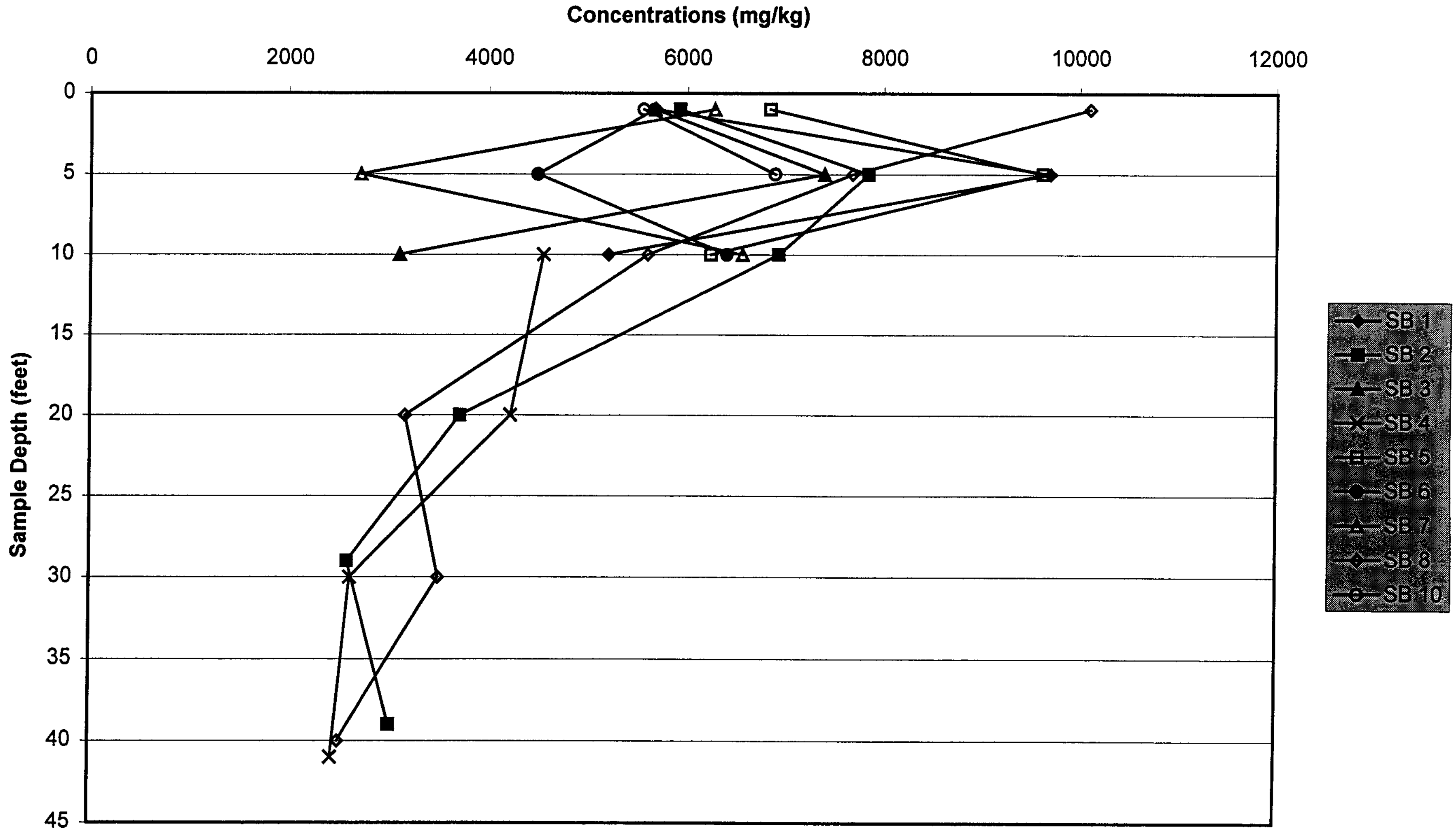
FIGURE B.3-8
COPPER CONCENTRATIONS AT DEPTH



B.3.9 Iron

Figure B.3-9 shows variation in iron concentrations with depth in the background soil borings. There is no consistent correlation between iron concentrations and depth up to 10 feet bgs. However, most samples contain between 2,500 and 10,000 mg/kg. From 10 to 40 feet bgs, iron concentrations tend to decrease with depth to about 3,000 mg/kg.

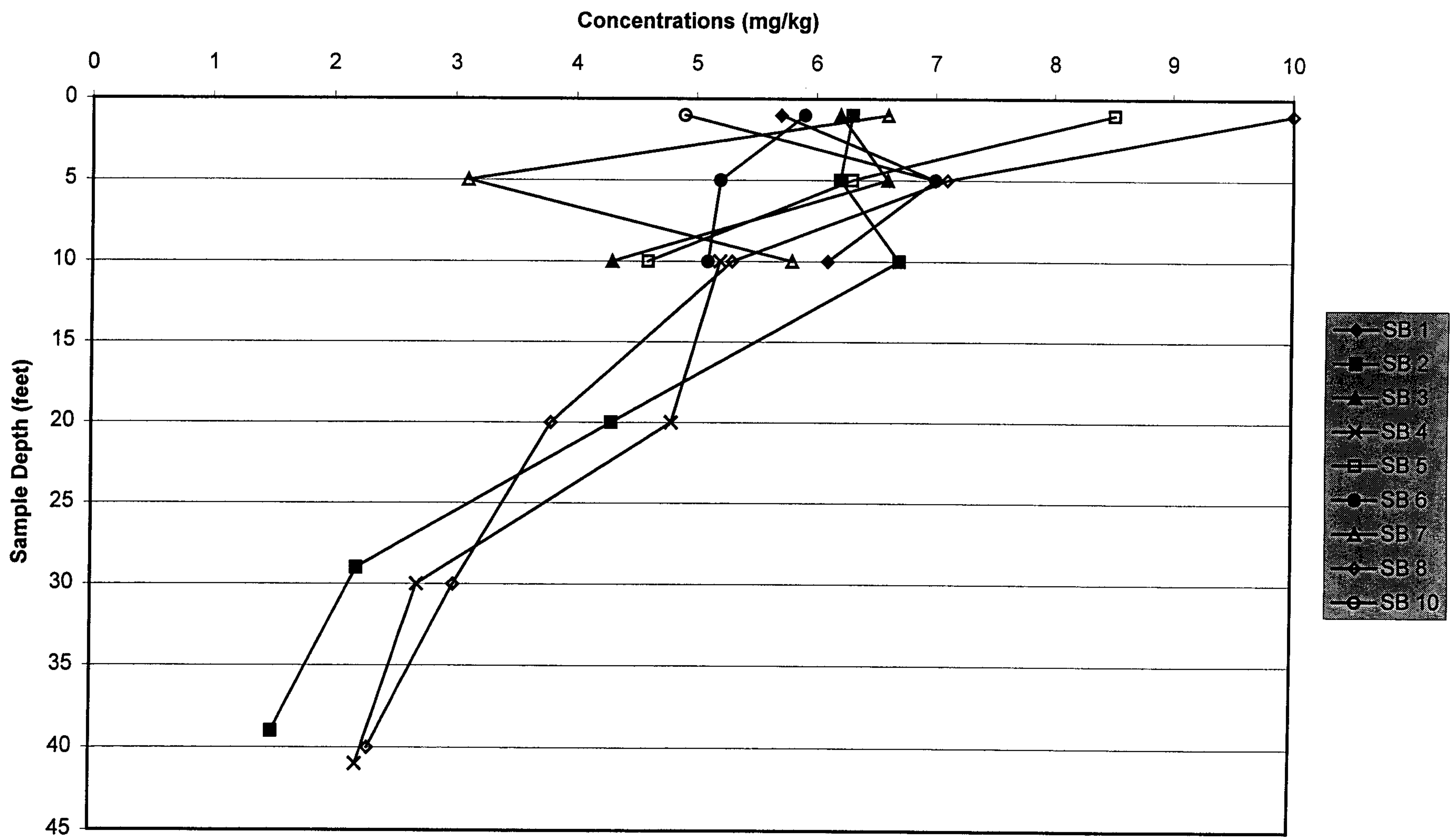
FIGURE B.3-9
IRON CONCENTRATIONS AT DEPTH



B.3.10 Lead

Figure B.3-10 shows variation in lead concentrations with depth in the background soil borings. Lead concentrations are mostly between 3 and 10 mg/kg, and tend to decrease with depth to about 2 mg/kg at 40 feet bgs.

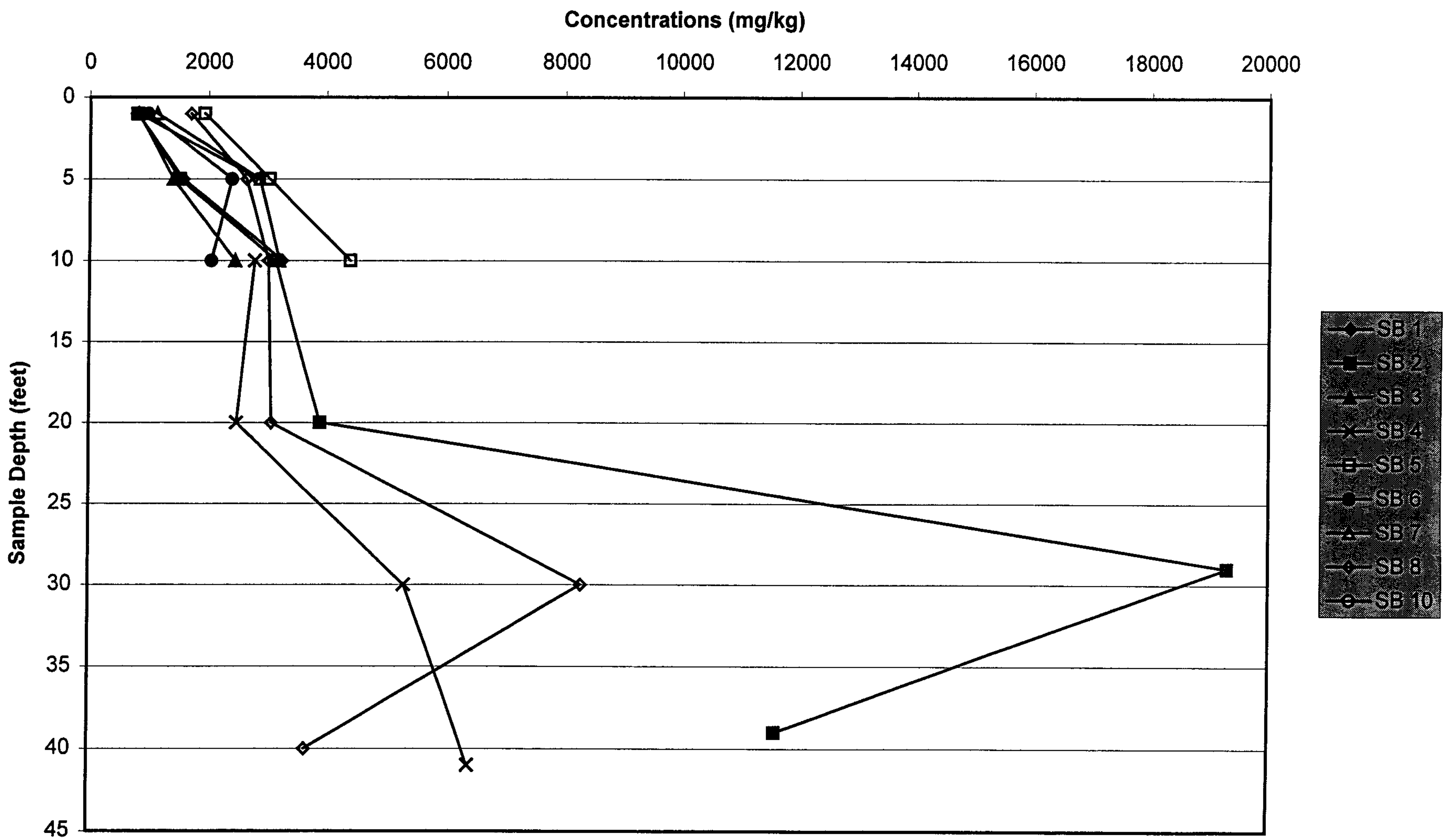
FIGURE B.3-10
LEAD CONCENTRATIONS AT DEPTH



B.3.11 Magnesium

Figure B.3-11 shows variation in magnesium concentrations with depth in the background soil borings. Magnesium concentrations tend to increase with depth up to 30 feet bgs (to between 5,000 and 20,000 mg/kg at 30 feet bgs). From 30 to 40 feet bgs, concentrations tend to decrease to a range of about 4,000 to 12,000 mg/kg.

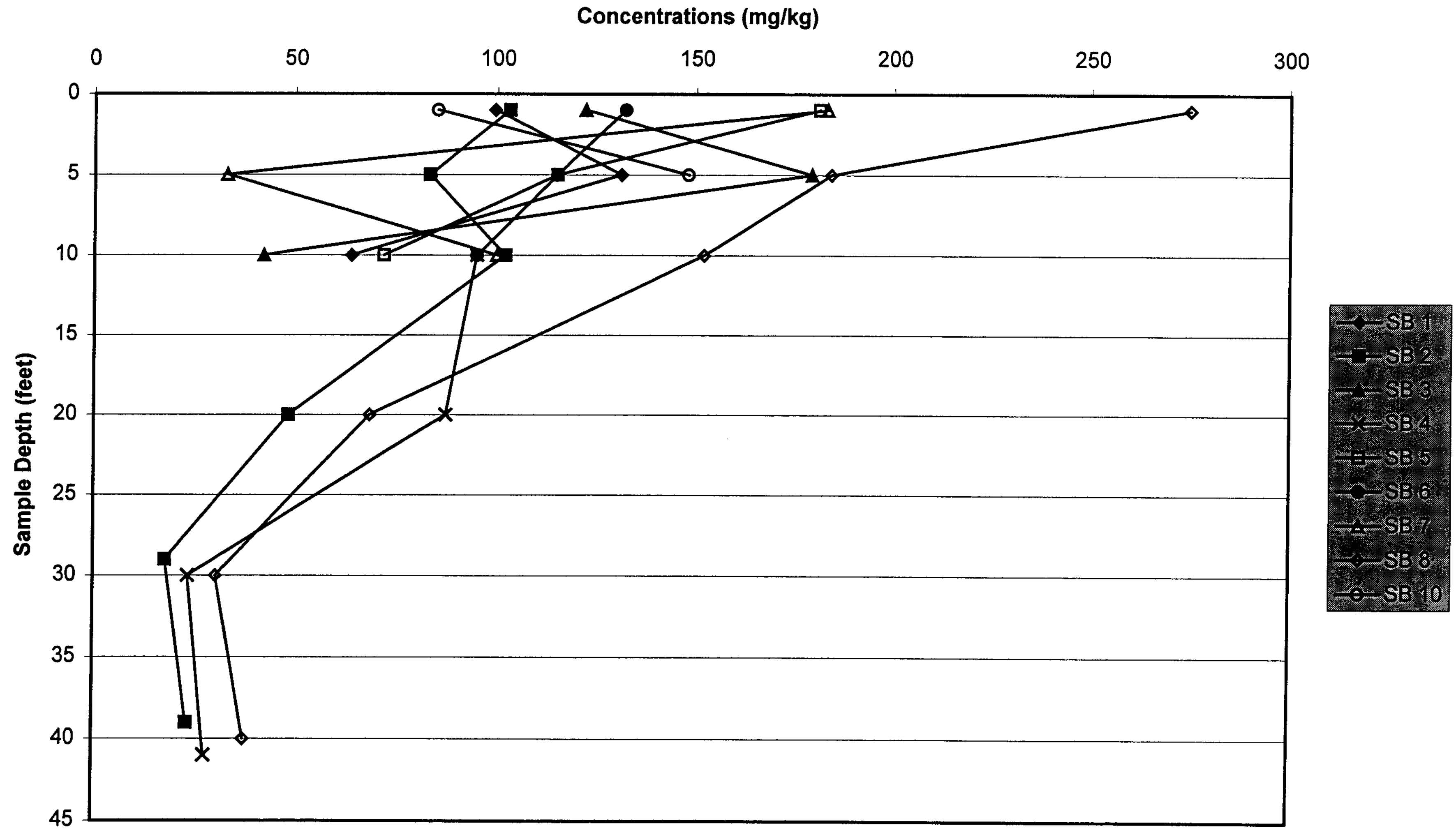
FIGURE B.3-11
MAGNESIUM CONCENTRATIONS AT DEPTH



B.3.12 Manganese

Figure B.3-12 shows variation in manganese concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between 50 and 200 mg/kg manganese. From 10 to 40 feet bgs, concentrations tend to decrease with depth to about 30 mg/kg.

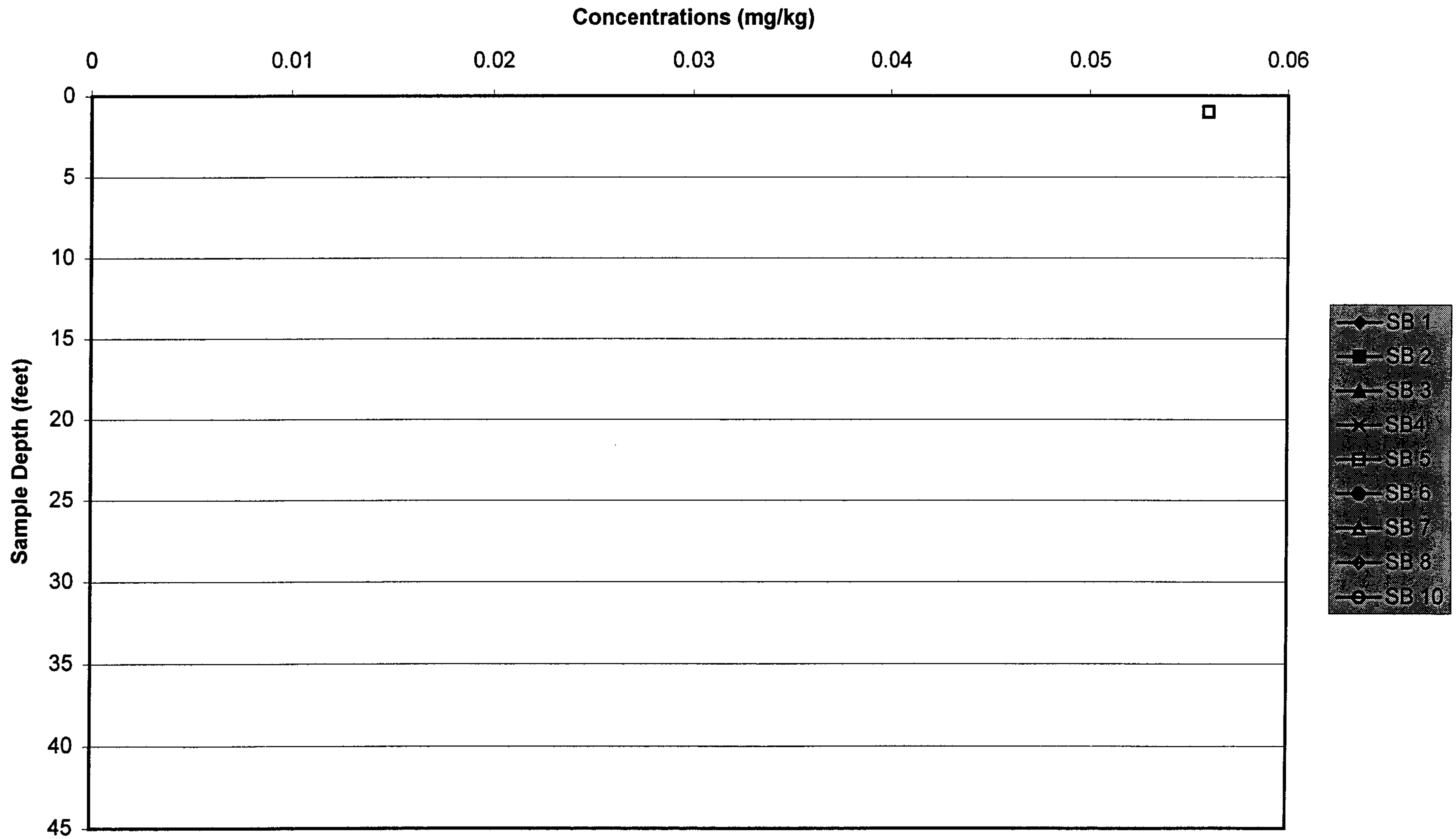
FIGURE B.3-12
MANGANESE CONCENTRATIONS AT DEPTH



B.3.13 Mercury

Figure B.3-13 shows variation in mercury concentrations with depth in the background soil borings. Mercury was only detected in soil boring 5 at 1 foot bgs (at 0.056 mg/kg). All other samples were below the reporting limit for mercury and are not included on the chart.

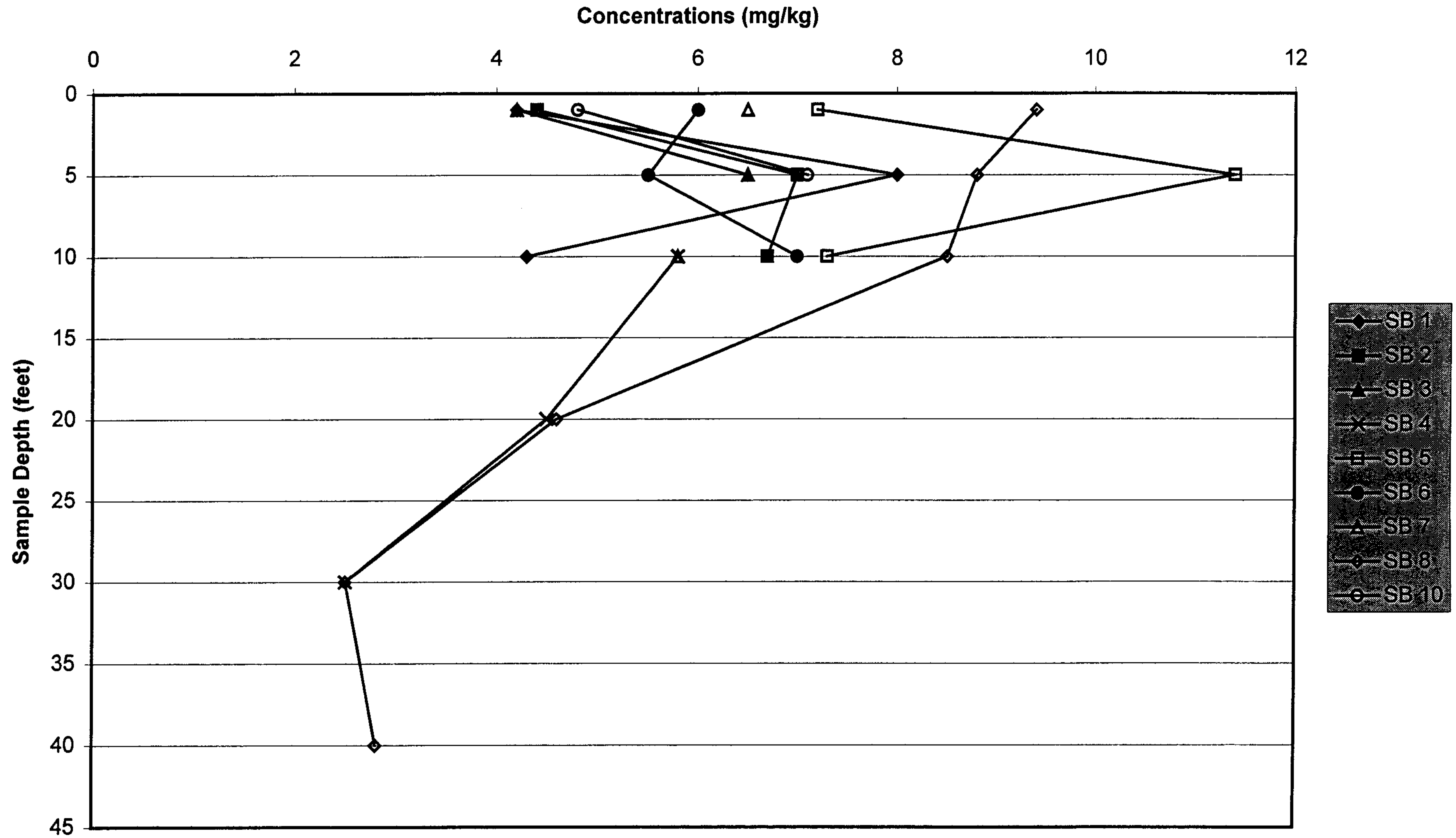
FIGURE B.3-13
MERCURY CONCENTRATIONS AT DEPTH



B.3.14 Nickel

Figure B.3-14 shows variation in nickel concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between 4 and 10 mg/kg nickel. From 10 to 40 feet bgs, concentrations tend to decrease with depth to about 3 mg/kg.

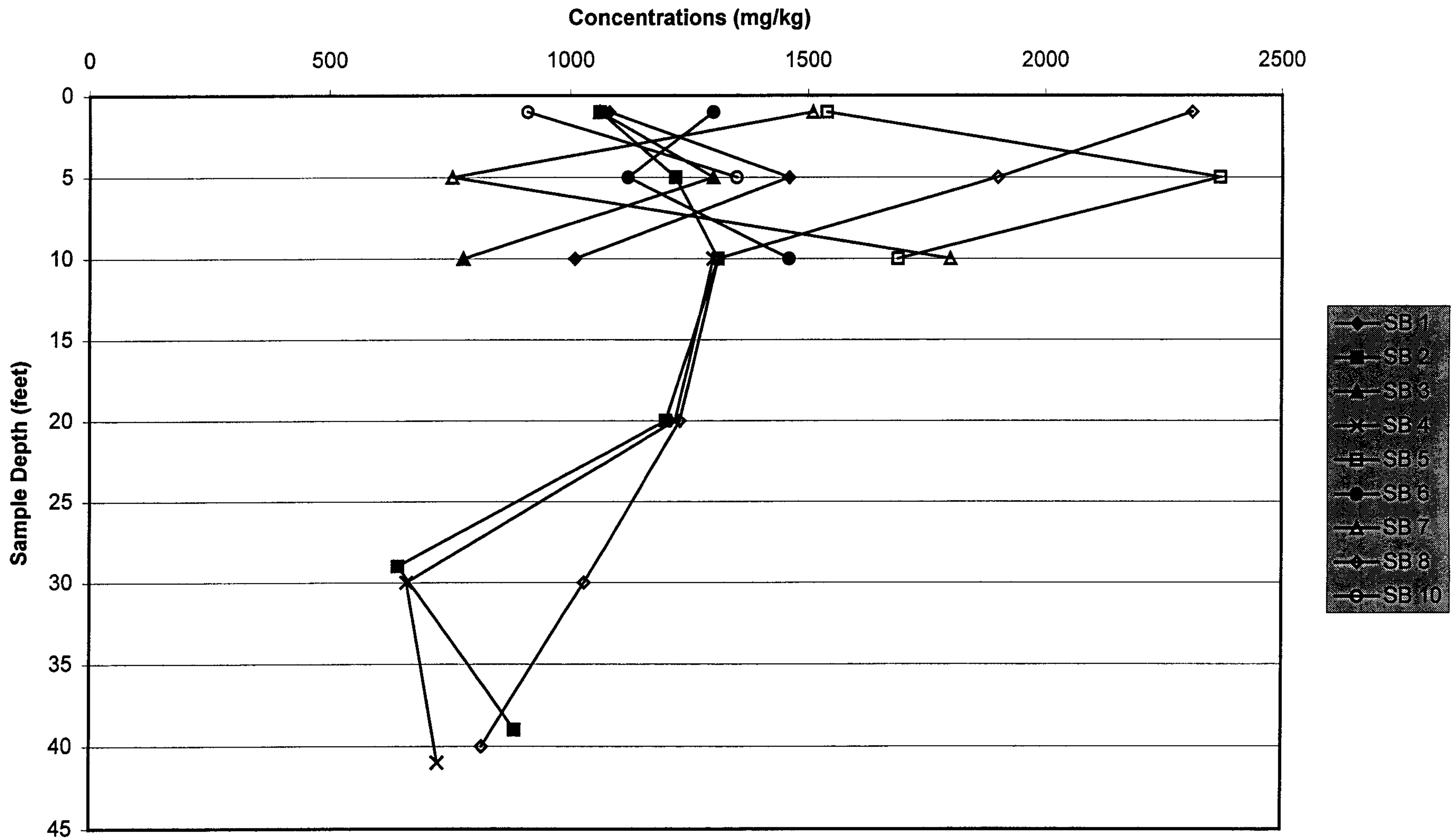
FIGURE B.3-14
NICKEL CONCENTRATIONS AT DEPTH



B.3.15 Potassium

Figure B.3-15 shows variation in potassium concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between 750 and 2,500 mg/kg potassium. From 10 to 40 feet bgs, concentrations tend to decrease with depth to about 750 mg/kg.

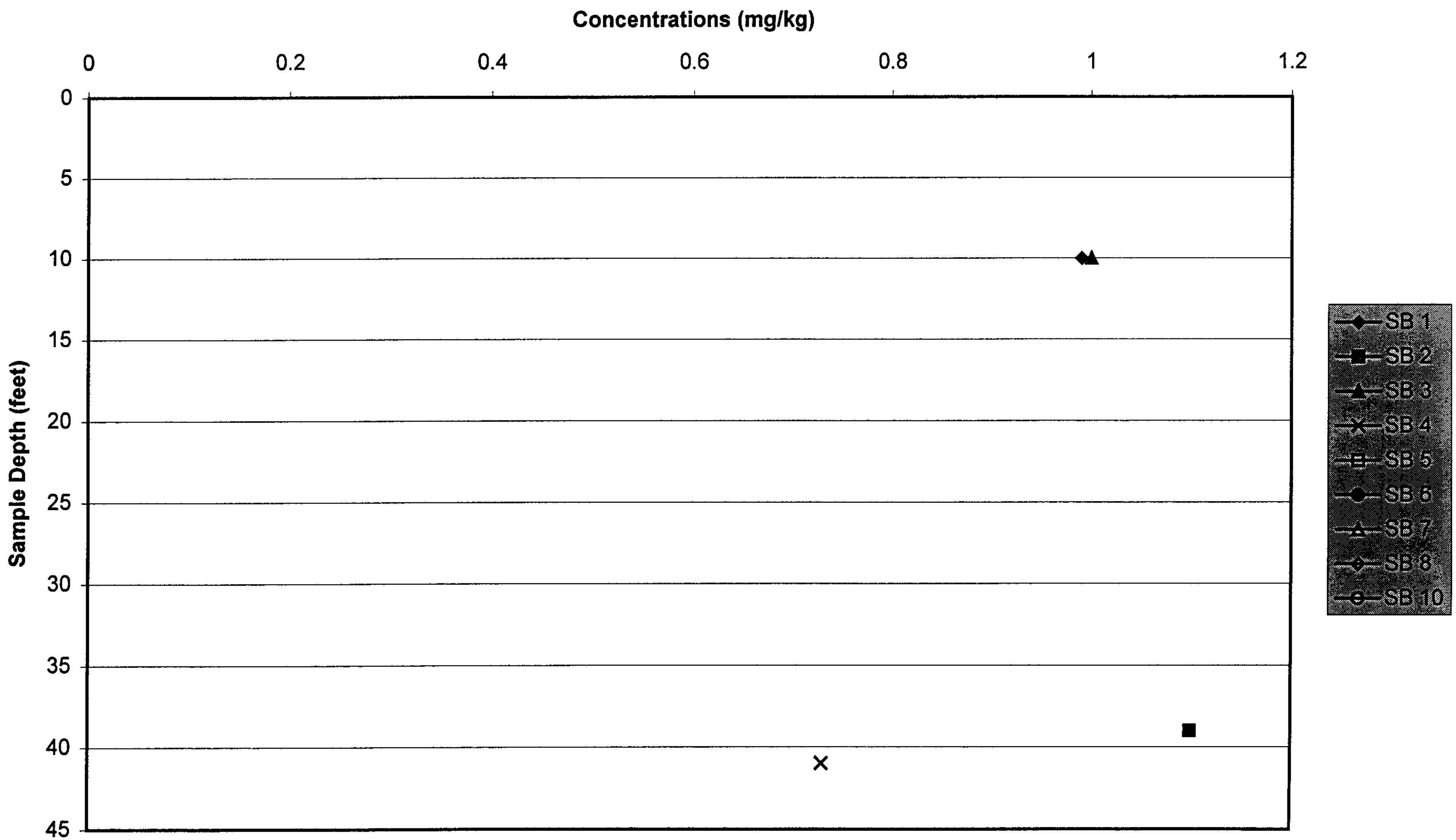
FIGURE B.3-15
POTASSIUM CONCENTRATIONS AT DEPTH



B.3.16 Selenium

Figure B.3-16 shows variation in selenium concentrations with depth in the background soil borings. There were only four detections of selenium in the background soil boring samples. All detections were between 0.73 and 1.1 mg/kg. All other samples were below the reporting limit for selenium and are not included on the chart.

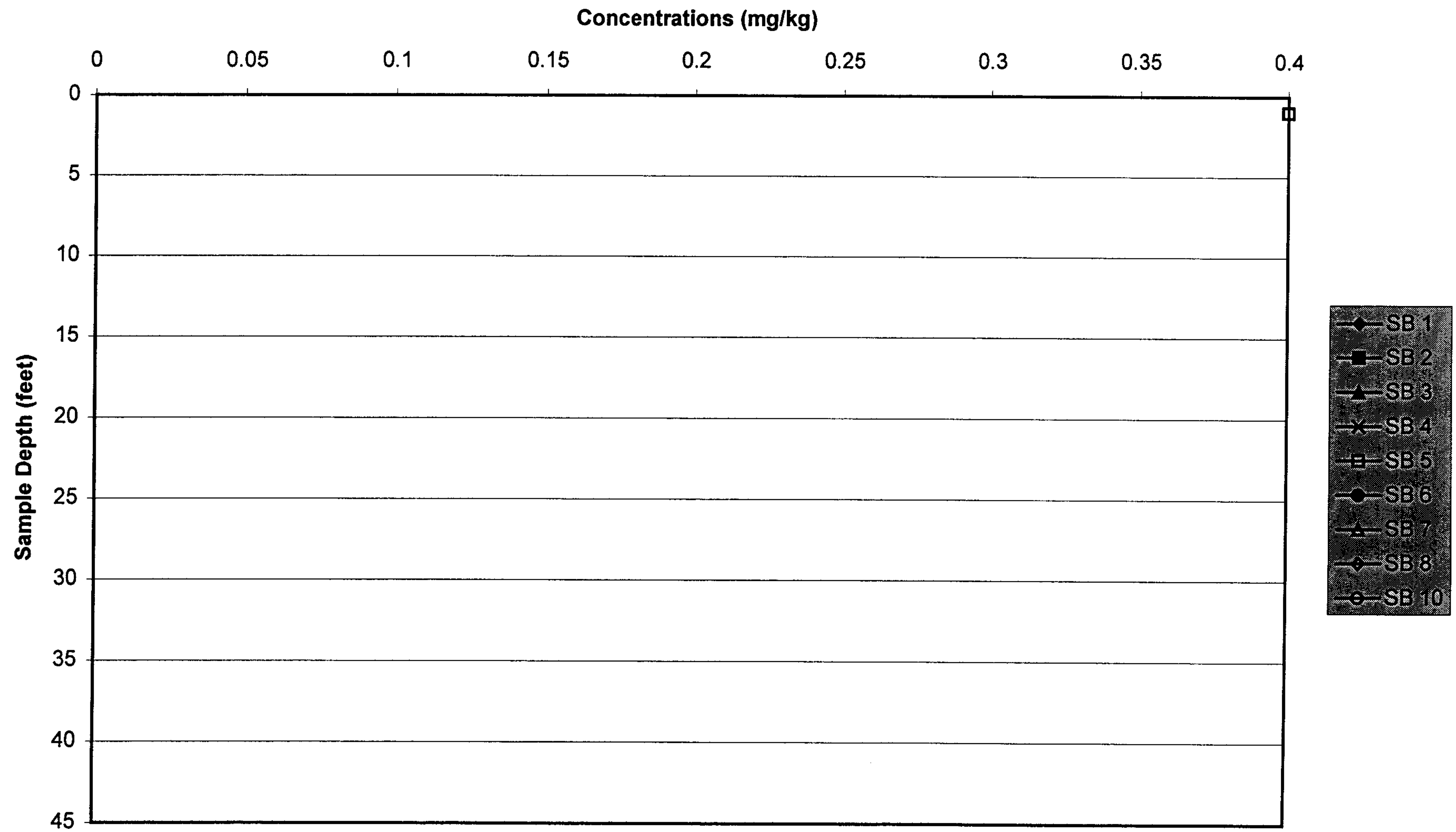
FIGURE B.3-16
SELENIUM CONCENTRATIONS AT DEPTH



B.3.17 Silver

Figure B.3-17 shows variation in silver concentrations with depth in the background soil borings. Silver was only detected in soil boring 5 at 1 foot bgs (at 0.4 mg/kg). All other samples were below the reporting limit for silver and are not included on the chart.

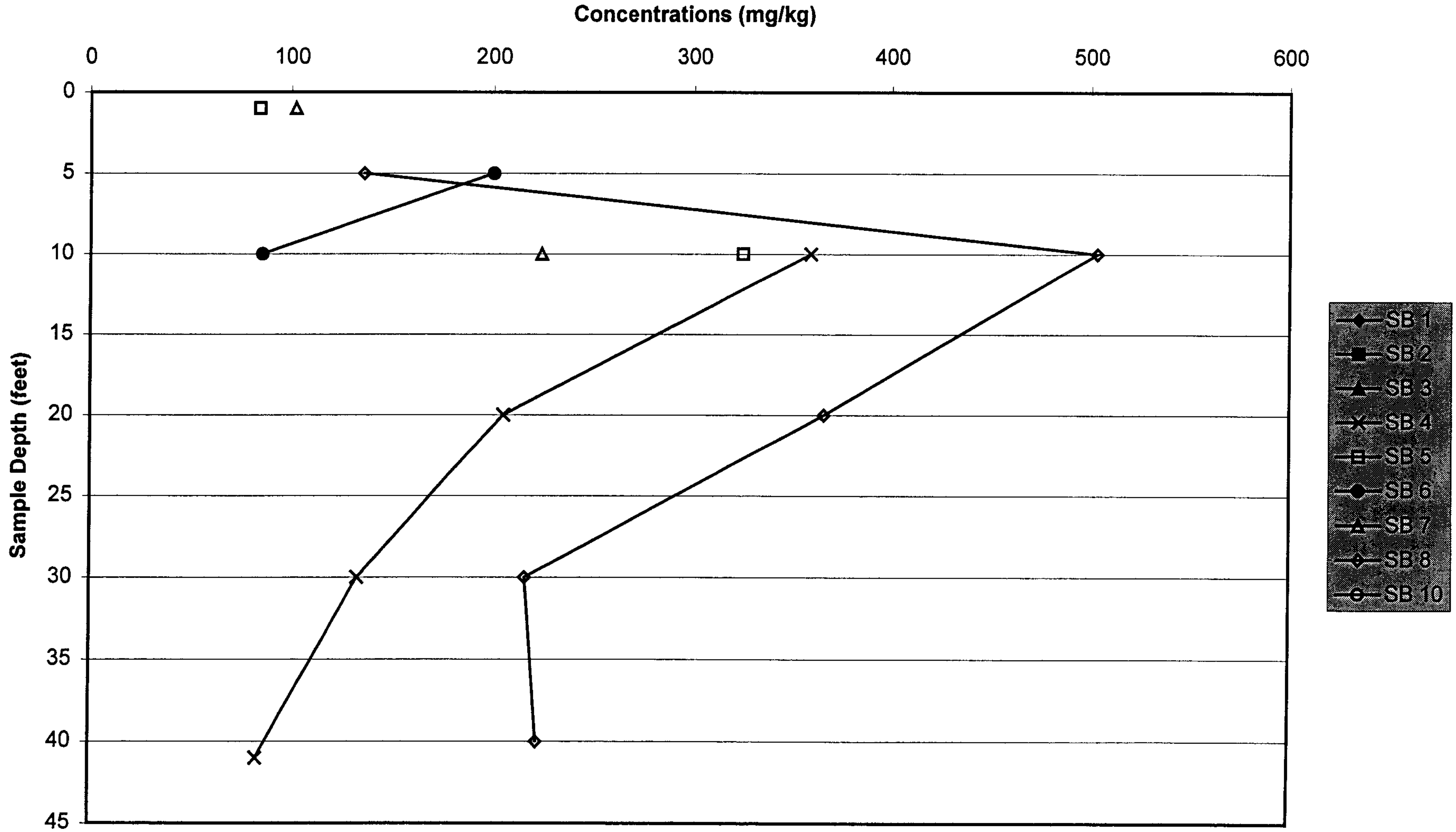
FIGURE B.3-17
SILVER CONCENTRATIONS AT DEPTH



B.3.18 Sodium

Figure B.3-18 shows variation in sodium concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between 85 and 500 mg/kg sodium. From 10 to 40 feet bgs, concentrations tend to decrease with depth to between about 100 and 200 mg/kg.

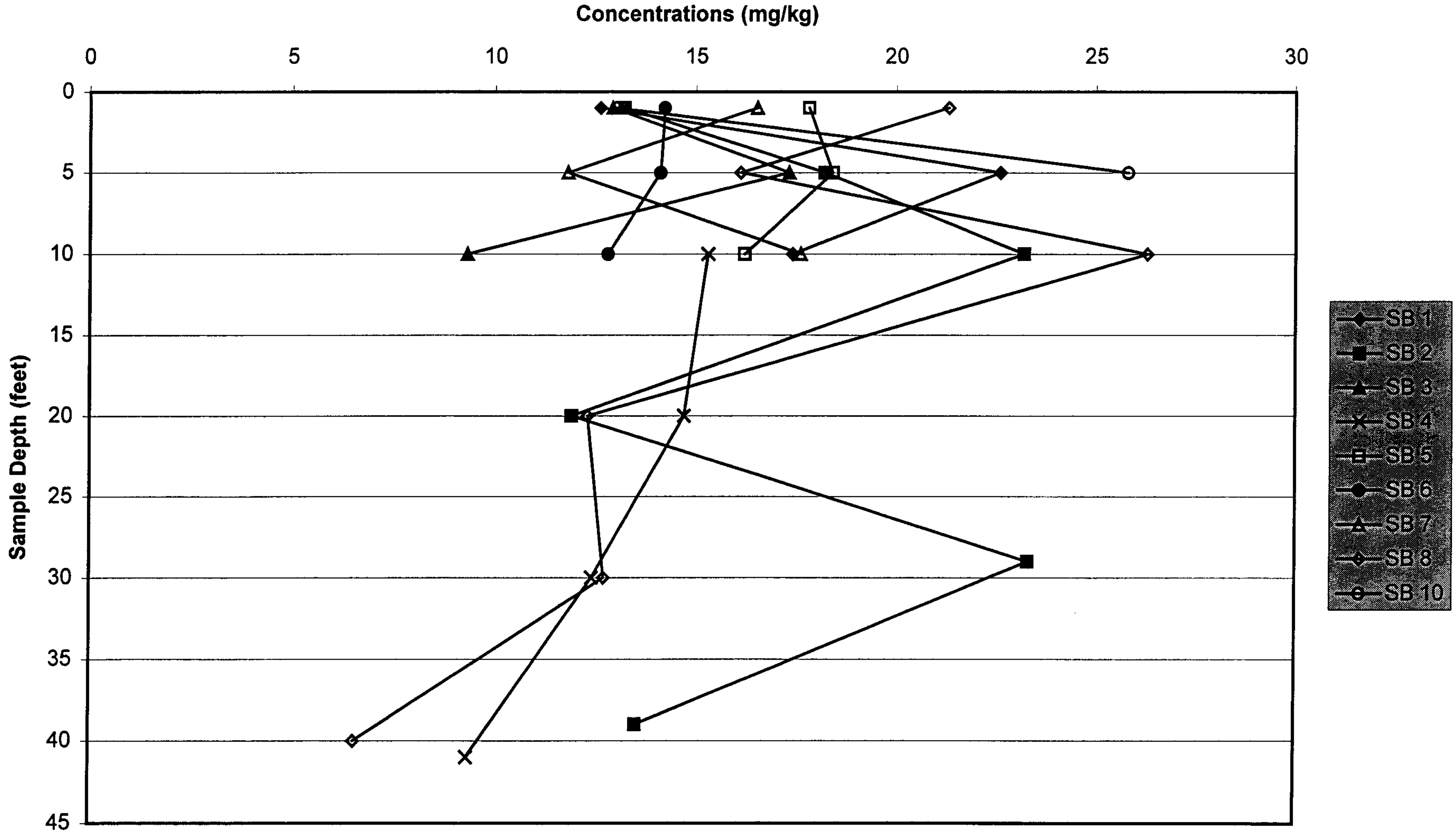
FIGURE B.3-18
SODIUM CONCENTRATIONS AT DEPTH



B.3.19 Vanadium

Figure B.3-19 shows variation in vanadium concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between about 10 and 25 mg/kg vanadium. From 10 to 40 feet bgs, concentrations tend to decrease with depth to about 7 to 15 mg/kg.

FIGURE B.3-19
VANADIUM CONCENTRATIONS AT DEPTH



B.3.20 Zinc

Figure B.3-20 shows variation in zinc concentrations with depth in the background soil borings. From the ground surface to 10 feet bgs, there is no consistent correlation between concentration and depth. However, most samples contain between about 10 and 20 mg/kg zinc. From 10 to 40 feet bgs, concentrations tend to decrease with depth to between 5 and 10 mg/kg.

FIGURE B.3-20
ZINC CONCENTRATIONS AT DEPTH