US GEOLOGICAL SURVEY METALS SAMPLING
(USGS 1995)

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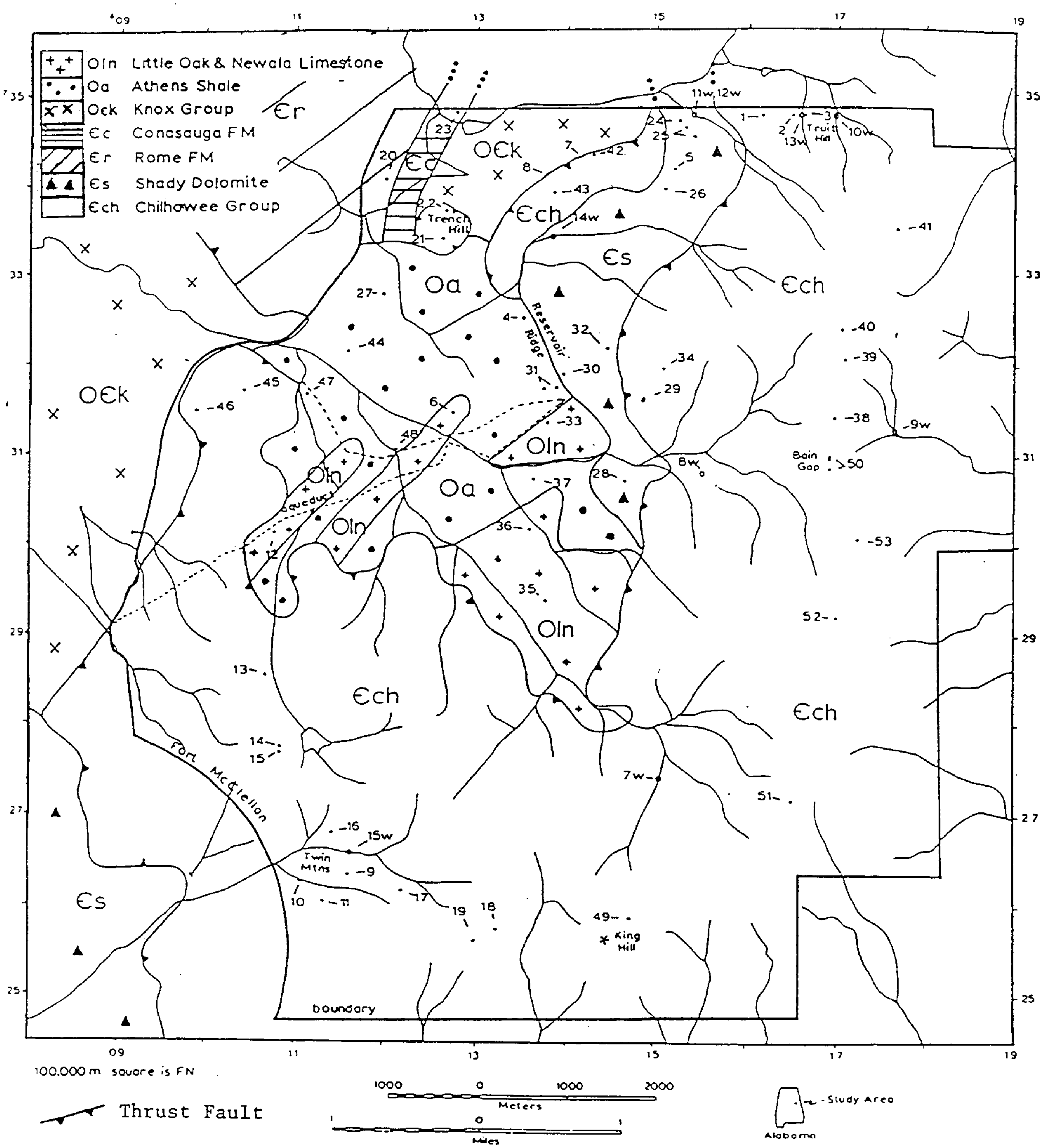

Figure 1. Geologic map and the rock, soil, and water sample locations on Fort McClellan, AL.

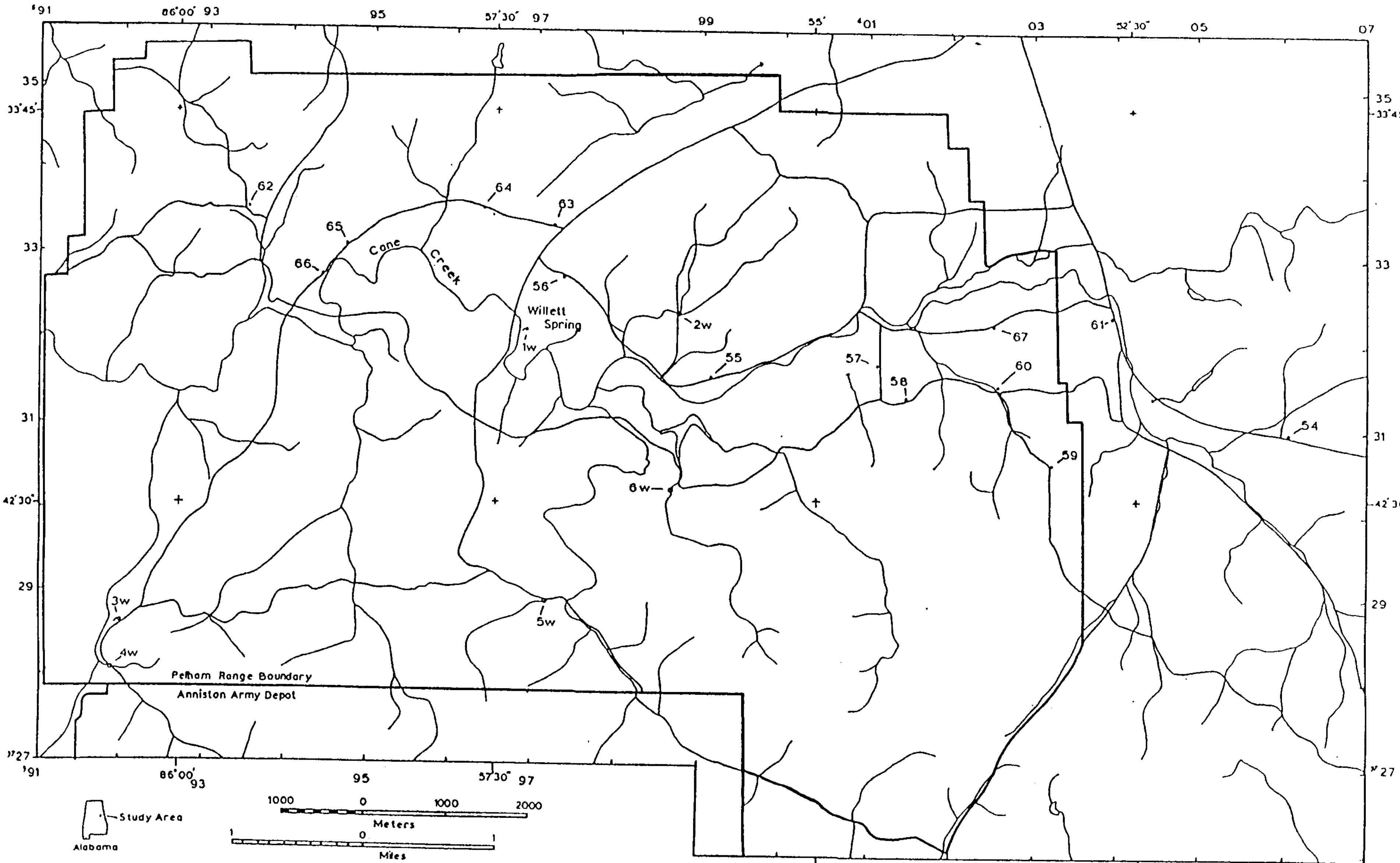

Figure 2. Rock and soil and water sample locations on Pelham Range, Fort McClellan, AL.

ANALYTICAL PROCEDURES

a. Rock and soils.

The rock and soil samples were analyzed by the six-step D.C.-arc semiquantitative emission spectrographic method (Grimes and Maranzino, 1968) for 35 elements. All of the analytical values are reported as six steps per order of magnitude (1, 1.5, 2, 3, 5, 7 or multiples of 10). These values approximate the geometric midpoints of successive concentration ranges (Grimes and Maranzino, 1968).

This analytical method compares a series of elemental standards against the elemental concentrations in the sample. The elemental concentration in the sample is visually compared with the standards. The largest source of error is interpolating a sample concentration that lies between two standards. The six-step D.C.-arc emission spectrographic method provides reproducibility within one geometric interval of the reported value approximately 86 percent of the time and within two geometric intervals of the reported value approximately 96 percent of the time (Motooka and Grimes, 1976).

If a sample contains elemental concentrations above the highest standard used, the elemental concentration is represented by a "G" in front of the upper standard. If a sample contains elemental concentrations below the lowest standard, the concentrations can have two code designations. If the sample concentration is slightly below the lowest standard, the elemental concentration is represented by an "L" in front of the lowest standard. If the sample concentration is not detected, an "N" is used. The gold analysis was done using the flameless atomic absorption method described in the USGS standard methods manual (O'Leary and Meier, 1986).

Table 1 lists the analytical results for the rock samples. Table 2 lists the analytical results for the soil samples. Duplicate samples have a "D" after the sample number. The duplicate sample analyses are within the precision of this analytical method. The variations for some elements in sample 37R probably reflects the mineralized nature of the rock and not heterogeneity in the sample or the analytical method.

b. Waters.

Water temperature and pH were measured at the sample site. The following constituents were analyzed from the untreated sample: sulfate, fluoride, chloride, nitrate, alkalinity, and specific conductance. Alkalinity measures the total acid-neutralizable constituents in water and is generally due to the presence of carbonate and bicarbonate ions. Table 3 gives the specific methods used for each analysis.

The concentrations of calcium, magnesium, sodium, potassium, silica, and iron were measured from the filtered and acidified sample using flame atomic absorption spectrophotomety. The concentrations of all other metal ions were measured using the Inductively Coupled Plasma-Atomic Emission Spectrometer (ICP-AES). Table 4 lists the concentrations of the species determined for this study.

The results of charge balance calculations are listed in Table 4. For the three samples with detectable HCO3, the charge balance is under 5%, indicating the analyses are very good. A value of 7 ppm for HCO3 was used for the other samples. The charge balance for all but three samples is still under the acceptable range of 10%. Adjusting the HCO3 value a few ppm for the three samples brings their charge balance under 10% also.

Table 3. Analytical methods used for water analysis, Fort McClellan study area, Fort McClellan, AL

Constituent	Method	Reference
Alkalinity	Gran's plot potentiometric titration	Orion Research Inc (1975)
Sulfate	Ion chromatography	Smee and Hall (1978)
Chloride	Ion chromatography	Smee and Hall (1978)
Fluoride	Ion chromatography	Smee and Hall (1978)
Calcium	Flame atomic absorption spectrophotometry	Perkin-Elmer Corp. (1976)
Magnesium	Flame atomic absorption spectrophotometry	Perkin-Elmer Corp. (1976)
Sodium	Flame atomic absorption spectrophotometry	Perkin-Elmer Corp. (1976)
Potassium	Flame atomic absorption spectrophotometry	Perkin-Elmer Corp. (1976)
Aluminum	Flame atomic absorption spectrophotometry	Perkin-Elmer Corp. (1976)
Iron	Flame atomic absorption spectrophotometry	Perkin-Elmer Corp. (1976)
Silica	Flame atomic absorption spectrophotometry	Perkin-Elmer Corp. (1976)
Specific Conductance	Conductivity bridge	Brown and others (1970)
All other cations	ICP-AES	Environmental Protection Agency, SW 846 methods 620

Table 4. Summary of inorganic constituents from stream and spring waters collected from Fort McClellan and Pelham Range, Fort McClellan, AL.

			Cond		Temp	Charge	PPM							
Sample	place	UTM FN	M/S	pH	C	Balance	Ca	Na	K	Mg	Cl	SO4	NO3	Alkalinity
FMW 01	Willet Spring, PR	9692 3203	225	7.6	16	-1.4	25	0.92	0.33	14	1.6	0.99	1.1	140
dup ICP	Willet Spring, PR	9692 3203												
FMW 02	brook, north PR	9874 3232	17	8.3	19	-2.9*	2.2	0.57	0.40	0.7	1.0	2.3	<0.2	<10
FMW 03	spring, central PR	9201 2861	254	6.3	14	1.9	28	0.68	0.40	16	1.1	1.8	<0.2	170
FMW 04	stream, south PR	9195 2808	180	7.0	17	3.8	19	0.71	0.41	11	1.2	2.0	<0.2	120
FMW 05	brook, south PR	9726 2891	19	6.7	19	-5.8*	2.2	0.66	0.45	1.0	0.97	3.1	<0.2	<10
FMW 06	brook, central PR	9867 3025	18	6.4	20	-4.9*	2.2	0.57	0.32	0.9	0.76	2.9	<0.2	<10
FMW 07	brook, Range 24A	1506 2752	18	7.3	18	1.2*	1.4	0.87	1.9	0.6	1.1	3.1	<0.2	<10
FMW 08	spring, Range 21	1550 3083	14	6.7	19	0.98*	1.3	0.83	1.5	0.4	0.98	1.6	<0.2	<10
FMW 09	brook, Bain Gap	1774 3126	17	6.6	19	1.2*	1.5	0.72	1.6	0.6	0.99	2.8	<0.2	<10
FMW 10	brook, Truitt Hill	1690 3476	15	7.0	18	15*	1.1	0.60	0.77	0.7	1.0	3.4	<0.2	<10
FMW 11	stream, north FM	1532 3475	20	7.4	18	-11*	2.2	0.66	0.85	1.1	1.1	2.6	<0.2	<10
dup ICP	stream, north FM	1532 3475												
FMW 12D	duplicate of W11	1532 3475	20	7.4	18	-11*	2.2	0.65	0.85	1.1	1.1	2.6	<0.2	<10
FMW 13	brook, French Hill	1647 3476	15	6.3	18	10*	1.3	0.63	0.30	0.6	1.1	1.8	<0.2	<10
FMW 14	stream, Res Ridge	1360 3335	13	6.7	20	7.0*	1.4	0.62	0.55	0.7	1.1	2.3	<0.2	<10
FMW 15	brook, Twin Peaks	1160 2660	15	6.7	18	2.6*	1.4	0.64	1.1	0.7	1.0	2.4	<0.2	<10

* Assumed a HCO3 concentration of 7 ppm. For samples 10 and 13, decreasing the HCO3 to 5 ppm reduced the charge balance to 6.7% and 0.39% respectively. For sample 11, increasing the HCO3 to 8 ppm decreased the charge balance to -7.3%.

$$\text{charge balance} = \frac{A - C}{A + C} \times 100 \qquad A = \frac{(Cl)}{35.5} + \frac{(SO4)}{48} + \frac{(HCO3)}{61} + \frac{(NO3)}{62} \qquad C = \frac{(Na)}{23} + \frac{(K)}{39.1} + \frac{(Ca)}{20} + \frac{(Mg)}{12.2}$$

The following elements were not detected at the 0.1 ppb level unless noted, number in parentheses is the detection limit or the sample where the element was detected and the value: Ag, As (0.6), Au, Be (1), Bi (1), Cd (3), Cr (0.9), Cs (W2 and W6 at 0.2), Dy, Er, Eu, Ga, (0.3), Ge (0.4), Hf, Ho, Li (2), Nb (1), Nd (0.2) and W2 at 0.6), Pr (W2 at 0.2), Re, Sm, Sn (1), Ta, Tb, Te (2), Ti (1), Th (0.8), Tl (0.6), Tm, U (0.2), V (0.2, W1 and W3 at 0.2, W2 and W4 at 0.3), W, Yb, Zr (W2 at 0.3).

Table 4. Summary of inorganic constituents from stream and spring waters collected from Fort McClellan and Pelham Range, Fort McClellan, AL.

		PPB					PPM		PPB										
Sample	place	Cu	Pb	Zn	Mo	Mn	Fe	SiO2	Co	Ni	Y	Ba	Rb	Sr	Sb	La	Ce	Al
FMW 01	Willet Spring, PR	0.6	<0.5	6	0.5	7.9	<.01	8	<0.1	0.8	<0.1	12	0.4	17	<0.1	0.3	<.01	<.1
dup ICP	Willet Spring, PR	<0.6	<0.5	<3	0.3	<0.4			<0.1	0.8	<0.1	11	0.4	16	<0.1	0.2	<.01	
FMW 02	brook, north PR	0.9	<0.5	6	<0.2	27	0.08	7	<0.1	0.6	0.6	22	1.0	10	<0.1	0.5	1.7	<.1
FMW 03	spring, central PR	<0.6	<0.5	<3	0.3	2.4	<.01	7	<0.1	0.8	0.2	13	0.4	18	<0.1	0.2	<.01	<.1
FMW 04	stream, south PR	2.5	<0.5	7	0.5	75	0.05	7	0.2	1.0	<0.1	26	0.3	22	<0.1	0.2	<.01	<.1
FMW 05	brook, south PR	0.8	0.6	8	<0.2	24	<.01	8	0.1	0.5	<0.1	25	0.8	9.7	<0.1	0.1	0.3	<.1
FMW 06	brook, central PR	4.2	<0.5	9	<0.2	7.4	<.01	8	<0.1	0.9	0.2	17	0.6	8.3	<0.1	0.2	0.5	<.1
FMW 07	brook, Range 24A	<0.7	<0.5	3	<0.2	7.6	0.07	11	<0.1	0.4	<0.1	19	2.0	6.0	<0.1	0.2	0.2	<.1
FMW 08	spring, Range 21	6.1	16	4	<0.2	5.5	0.08	13	0.2	<0.3	<0.1	13	2.3	4.6	0.5	0.1	0.2	<.1
FMW 09	brook, Bain Gap	<0.6	<0.5	<3	<0.2	2.3	<.01	11	<0.1	<0.3	0.1	22	2.1	8.9	<0.1	0.2	0.2	<.1
FMW 10	brook, Truitt Hill	<0.6	<0.5	3	<0.2	10	<.01	6	<0.1	0.3	0.2	24	1.2	7.6	<0.1	<.1	0.2	<.1
FMW 11	stream, north FM	<0.6	<0.5	<3	<0.2	29	0.03	7	0.3	0.5	0.2	28	1.7	6.7	<0.1	0.2	0.3	<.1
dup ICP	stream, north FM	<0.6	<0.5	<3	<0.2	26			0.2	1.1	0.2	27	1.6	6.6	<0.1	0.2	0.2	
FMW 12D	duplicate of W11	<0.6	<0.5	<3	<0.2	27	0.02	7	0.2	0.5	0.2	29	1.4	5.9	<0.1	0.1	0.2	<.1
FMW 13	brook, French Hill	<0.6	<0.5	3	<0.2	54	0.05	6	0.1	2.4	0.7	20	0.6	6.0	<0.1	0.2	0.6	<.1
FMW 14	stream, Res Ridge	2.4	2	4	<0.2	15	0.03	7	0.2	0.4	0.3	20	0.9	8.9	0.3	0.2	0.4	<.1
FMW 15	brook, Twin Mtns	<0.6	<0.5	<3	<0.2	10	0.02	8	0.1	<0.3	0.1	19	1.7	6.3	0.2	0.1	0.2	<.1

The following elements were not detected at the 0.1 ppb level unless noted, number in parentheses is the detection limit or the sample where the element was detected and the value: Ag, As (0.6), Au, Be (1), Bi (1), Cd (3), Cr (0.9), Cs (W2 and W6 at 0.2), Dy, Er, Eu, Ga (0.3), Ge (0.4), Hf, Ho, Li (2), Nb (1), Nd (0.2 and W2 at 0.6), Pr (W2 at 0.2), Re, Sm, Sn (1), Ta, Tb, Te (2), Ti (1), Th (0.8), Tl (0.6), Tm, U (0.2), V (0.2, W1 and W3 at 0.2, W2 and W4 at 0.3), W, Yb, Zr (W2 at 0.3).

Table 1. Analytical results from the rock samples collected in the Fort McClellan-Pelham Range study area, Fort McClellan, AL.

Sample	UTM-FN	Au ppb	Ag	Cu	Pb	Zn	Fe %	Ba	Mn	Mo	Be	Ca %	Mg %	Na %	Ti %	B	Co	Cr	Ga	La	Ni	Sc	V	Y	Zr
FM 1R1	1616 3475	L1	N0.5	N5	N10	N200	0.3	20	50	N5	N1	L0.05	0.03	N0.2	0.1	L10	N10	L10	L5	N50	L5	N5	10	20	500
FM 3R1	1660 3477	50	1	20	100	700	G20	30	100	N5	3	N0.05	0.15	N0.2	0.1	L10	15	70	15	N50	30	30	200	70	20
FM 3R2	1660 3477	240	0.7	20	70	N200	20	70	30	20	1.5	N0.05	0.1	N0.2	0.1	10	N10	50	70	N50	20	20	100	15	20
FM 4R1	1355 3251	2	N0.5	100	70	200	7	700	3000	10	3	N0.05	0.3	L0.2	0.3	30	100	100	70	L50	150	20	150	30	70
FM 4R2	1355 3251	4	N0.5	15	150	N200	5	70	300	N5	3	L0.05	0.07	N0.2	0	L10	10	15	5	N50	20	5	70	10	15
FM 5R1	1520 3413	2	N0.5	10	N10	N200	1.5	30	150	N5	1	N0.05	0.03	N0.2	0.1	20	15	N10	5	N50	20	N5	30	L10	70
FM 5R2	1520 3413	L1	0.5	20	70	N200	10	70	150	7	2	L0.05	0.03	N0.2	0	L10	50	50	15	N50	70	N5	20	15	30
FM 6R1	1278 3145	1	N0.5	30	50	L200	3	500	150	L5	2	L0.05	1	1.5	0.3	30	50	100	70	L50	50	10	70	20	50
FM 7R1	1384 3415	1	N0.5	15	50	N200	5	70	15	L5	N1	N0.05	0.07	N0.2	0.3	15	N10	100	50	L50	20	7	70	15	150
FM 7R2	1384 3415	1	1.5	30	150	N200	15	L20	150	10	1	N0.05	0.07	N0.2	0	N10	30	30	50	N50	30	7	30	20	50
FM 7R3	1384 3415	L1	N0.5	N5	N10	N200	0.15	L20	L10	N5	N1	N0.05	L0.02	N0.2	0.2	L10	N10	L10	N5	N50	L5	N5	L10	N10	150
FM 7R4	1384 3415	L1	N0.5	7	N10	N200	0.7	20	L10	N5	1	N0.05	0.07	N0.2	0.2	L10	N10	15	L5	N50	5	L5	20	L10	300
FM 8R1	1376 3405	3	N0.5	15	100	N200	5	1000	5000	N5	1.5	N0.05	0.07	N0.2	0.1	10	70	30	15	L50	30	10	50	20	50
FM 8R2	1376 3405	L1	N0.5	7	N10	N200	1	30	30	N5	N1	N0.05	0.03	N0.2	0.5	10	N10	30	5	N50	7	L5	50	15	500
FM 8R3	1376 3405	2	N0.5	30	150	N200	7	200	500	N5	1	L0.05	0.1	N0.2	0.3	30	L10	70	30	50	30	15	100	30	200
FM 8R4	1376 3405	1	N0.5	20	50	N200	3	200	700	N5	L1	L0.05	0.07	N0.2	0.3	20	N10	70	20	L50	15	7	100	20	200
FM 9R1	1162 636	15	N0.5	30	50	N200	20	1000	3000	N5	3	N0.05	0.05	N0.2	0	N10	200	50	50	N50	50	10	70	50	10
FM 10R1	1109 2626	L1	N0.5	20	15	N200	2	50	30	N5	1	N0.05	0.05	N0.2	0.2	15	L10	30	30	N50	15	5	50	15	100
FM 12R1	1079 3013	1	N0.5	30	50	L200	7	150	100	L5	1.5	L0.05	0.5	N0.2	0.3	50	15	70	30	N50	30	15	100	30	150
FM 12R2	1079 3013	1	N0.5	L5	L10	N200	0.3	50	20	N5	N1	L0.05	0.03	N0.2	0.03	N10	N10	10	N5	N50	7	N5	10	N10	10
FM 12R3	1079 3013	1	N0.5	30	10	N200	3	70	70	N5	L1	L0.05	0.3	N0.2	0.2	20	L10	70	10	N50	20	10	50	L10	100
FM 13R1	1068 2836	L1	N0.5	10	30	N200	3	70	50	N5	1	L0.05	L0.02	N0.2	0.7	20	N10	100	50	N50	N5	15	150	50	700
FM 13R2	1068 2836	L1	N0.5	N5	N10	N200	0.2	70	10	N5	N1	L0.05	L0.02	N0.2	0.1	N10	N10	15	N5	N50	L5	N5	L10	N10	100
FM 14R1	1084 2776	2	N0.5	20	50	N200	7	150	50	N5	2	N0.05	0.2	N0.2	0.3	30	N10	100	50	L50	15	20	150	30	300
FM 14R2	1084 2776	L1	N0.5	15	30	N200	20	L20	500	N5	1.5	L0.05	0.05	N0.2	0.2	N10	L10	50	30	N50	15	15	50	50	500
FM 15R1	1085 2770	L1	N0.5	N5	N10	N200	0.7	100	10	N5	N1	L0.05	0.02	N0.2	0.05	N10	N10	15	N5	N50	7	N5	L10	10	70
FM 16R1	1144 2681	L1	N0.5	20	70	N200	3	1000	50	N5	1	L0.05	0.05	N0.2	0.5	20	N10	70	50	100	5	20	150	70	700
FM 16R2	1144 2681	L1	N0.5	N5	N10	N200	0.2	70	L10	N5	N1	L0.05	L0.02	N0.2	0.07	N10	N10	10	N5	N50	5	N5	L10	L10	150
FM 17R1	1222 2618	1	N0.5	20	20	N200	5	200	50	N5	2	L0.05	0.3	N0.2	0.5	50	L10	100	30	L50	20	15	100	50	500
FM 17R2	1222 2618	1	N0.5	10	10	N200	15	70	70	N5	5	N0.05	0.2	N0.2	0.03	N10	N10	10	30	N50	20	L5	10	10	100
FM 18R1	1327 2574	1	N0.5	10	30	N200	10	150	70	N5	7	N0.05	0.2	N0.2	0.7	50	N10	70	30	100	10	20	100	150	G1000
FM 18R2	1327 2574	2	N0.5	10	30	N200	1.5	200	L10	N5	1.5	N0.05	0.1	N0.2	0.7	20	N10	20	30	L50	7	7	50	50	700
FM 18R3	1327 2574	1	N0.5	30	50	N200	20	200	500	N5	5	N0.05	0.2	N0.2	0.2	50	30	70	50	N50	20	10	50	20	70
FM 18R4	1327 2574	L1	N0.5	5	N10	N200	1.5	70	50	N5	L1	N0.05	0.03	N0.2	0.03	10	N10	L10	5	N50	15	N5	15	10	100
FM 19R1	1301 2561	L1	N0.5	5	10	N200	0.2	100	15	N5	N1	L0.05	0.02	N0.2	0.15	L10	N10	L10	N5	N50	5	N5	15	L10	300
FM 22R1	1266 3370	1	N0.5	70	100	N200	G20	50	700	15	2	L0.05	0.1	N0.2	0.03	N10	30	200	30	N50	50	7	100	20	N10
FM 22R2	1266 3370	1	N0.5	50	100	L200	7	700	5000	N5	7	L0.05	0.2	N0.2	0.2	50	50	70	30	70	50	20	100	70	100
FM 22R3	1266 3370	35	3	100	70	N200	>20	50	70	30	N1	N0.05	L0.02	N0.2	.005	N10	N10	15	30	N50	50	N5	100	N10	N10
FM 22R4	1266 3370	2	N0.5	70	100	L200	5	1500	300	N5	2	0.3	1.5	L0.2	0.5	100	20	150	50	50	70	20	150	30	100

Table 1. (continued) Analytical results from the rock samples collected in the Fort McClellan-Pelham Range study area, Fort McClellan, AL.

Sample	UTM-FN	Au ppb	Ag	Cu	Pb	Zn	Fe %	Ba	Mn	Mo	Be	Ca %	Mg %	Na %	Ti %	B	Co	Cr	Ga	La	Ni	Sc	V	Y	Zr
FM 22R5	1266 3370	3	N0.5	70	150	L200	5	300	G5000	N5	3	L0.05	0.2	N0.2	0.15	20	200	70	20	50	70	15	100	50	70
FM 23R1	1280 3480	1	N0.5	50	70	N200	7	150	100	N5	2	L0.05	0.7	N0.2	0.5	150	L10	100	50	L50	30	15	150	20	150
FM 24R1	1527 3471	L1	N0.5	30	70	N200	3	300	700	N5	L1	L0.05	0.07	N0.2	1	30	20	70	15	L50	20	7	150	50	G1000
FM 25R1	1544 3451	L1	1.5	5	N10	N200	0.3	70	30	N5	L1	L0.05	0.07	N0.2	0.07	10	N10	10	L5	N50	L5	L5	30	N10	30
FM 25R2	1544 3451	L1	0.5	50	150	200	5	200	70	L5	3	L0.05	0.5	N0.2	0.5	30	50	100	20	50	70	20	300	30	150
FM 26R1	1510 3392	L1	N0.5	L5	N10	N200	0.3	100	20	N5	N1	L0.05	0.02	N0.2	0.5	N10	N10	10	L5	L50	L5	N5	15	15	700
FM 27R1	1202 3277	1	N0.5	50	50	L200	5	700	50	L5	2	0.05	0.7	N0.2	0.5	50	10	100	50	50	30	15	150	30	150
FM 28R1	1468 3072	L1	N0.5	7	15	N200	0.3	200	200	N5	N1	0.05	0.07	N0.2	0.02	N10	N10	L10	N5	N50	15	N5	15	N10	10
FM 28R1	1468 3072	1	N0.5	30	30	N200	5	300	70	N5	2	L0.05	0.7	N0.2	0.5	70	L10	100	30	50	30	15	150	30	300
FM 28R2	1468 3072	1	N0.5	30	30	N200	5	200	70	N5	2	L0.05	1	N0.2	0.5	70	L10	100	30	50	30	15	150	30	200
FM 28R3	1468 3071	L1	N0.5	10	L10	N200	0.7	150	200	N5	L1	0.05	0.1	N0.2	0.05	L10	N10	L10	N5	N50	15	N5	15	N10	15
FM 29R1	1486 3159	1	N0.5	20	30	N200	5	500	70	N5	1.5	N0.05	0.15	N0.2	0.7	50	10	150	50	70	20	15	100	50	300
FM 29R2	1486 3159	L1	N0.5	10	20	N200	15	1000	150	N5	2	L0.05	0.07	N0.2	0.5	15	10	20	20	70	15	20	150	100	700
FM 30R1	1395 3190	L1	N0.5	20	N10	N200	1	700	500	L5	2	L0.05	0.07	N0.2	0.02	N10	10	15	5	N50	30	N5	15	L10	20
FM 30R2	1395 3190	L1	N0.5	10	L10	N200	1	200	700	N5	2	0.05	0.07	N0.2	0.03	N10	N10	15	L5	N50	20	N5	20	N10	15
FM 31R1	1393 3171	1	N0.5	70	30	N200	7	1000	50	7	1.5	0.07	0.5	N0.2	0.7	70	L10	100	50	50	20	20	200	30	150
FM 32R1	1448 3215	1	N0.5	50	30	N200	3	700	70	N5	2	L0.05	1	L0.2	0.5	50	15	100	50	50	50	10	100	20	150
FM 32R2	1448 3215	1	N0.5	10	20	N200	5	300	70	N5	2	L0.05	0.7	N0.2	0.5	100	15	150	30	L50	30	15	150	30	150
FM 33R1	1380 3135	1	N0.5	50	50	N200	7	700	70	10	2	L0.05	0.7	N0.2	0.5	70	15	100	50	50	50	20	150	30	150
FM 33R1	1380 3135	1	N0.5	70	70	N200	5	700	50	10	2	L0.05	0.5	L0.2	0.5	50	N10	100	50	50	20	15	150	30	150
FM 34R1	1510 3196	L1	L0.5	N5	N10	N200	0.2	70	10	N5	N1	L0.05	L0.02	N0.2	0.2	N10	N10	L10	N5	N50	L5	N5	15	15	150
FM 34R1	1510 3196	1	N0.5	N5	N10	N200	0.2	70	15	N5	N1	L0.05	L0.02	N0.2	0.15	N10	N10	15	N5	N50	L5	N5	10	L10	200
FM 35R1	1378 2940	L1	N0.5	L5	N10	N200	0.7	70	300	N5	L1	L0.05	0.02	N0.2	0.15	N10	N10	L10	N5	N50	L5	L5	15	L10	200
FM 37R1	1376 3072	2	N0.5	50	50	N200	2	1000	50	15	1	L0.05	0.5	N0.2	0.5	30	N10	100	30	50	7	15	300	30	150
FM 37R1	1376 3072	3	N0.5	150	50	N200	7	1000	30	7	1	L0.05	0.5	N0.2	0.3	30	N10	150	50	50	7	15	200	20	100
FM 38R1	1700 3143	L1	N0.5	20	15	N200	5	1000	700	N5	1.5	L0.05	0.3	N0.2	0.7	30	20	70	30	50	30	15	70	50	700
FM 39R1	1710 3210	1	N0.5	15	15	N200	7	700	70	N5	3	L0.05	0.07	N0.2	0.2	15	L10	50	15	L50	10	7	50	30	700
FM 39R2	1710 3210	1	N0.5	100	30	N200	20	3000	G5000	N5	5	L0.05	0.02	N0.2	0.2	N10	100	70	30	200	30	20	50	100	700
FM 40R1	1710 3236	L1	N0.5	N5	N10	N200	0.7	100	100	N5	N1	L0.05	L0.02	N0.2	0.15	N10	N10	15	N5	N50	L5	N5	15	10	300
FM 41R1	1766 3350	1	N0.5	30	20	N200	7	300	300	N5	3	N0.05	0.7	N0.2	0.5	70	20	100	50	70	50	20	100	50	150
FM 41R2	1766 3350	2	N0.5	30	30	N200	3	150	50	N5	3	L0.05	0.2	N0.2	0.5	50	L10	100	30	50	20	15	150	50	300
FM 41R3	1766 3350	L1	N0.5	L5	N10	N200	0.7	70	20	N5	N1	L0.05	L0.02	N0.2	0.07	N10	N10	10	N5	N50	7	N5	10	L10	100
FM 42R1	1416 3426	L1	N0.5	20	30	N200	7	150	100	N5	1	L0.05	0.15	N0.2	0.3	30	15	70	15	L50	30	15	100	20	500
FM 42R2	1416 3426	L1	N0.5	30	70	N200	7	200	700	N5	3	L0.05	0.15	N0.2	0.2	20	30	50	15	50	50	15	70	50	500
FM 42R3	1416 3426	1	N0.5	15	30	L200	15	500	G5000	N5	3	L0.05	0.03	N0.2	0.03	N10	150	L10	20	N50	50	7	15	50	15
FM 43R1	1386 3389	L1	N0.5	N5	N10	N200	0.5	70	500	N5	N1	L0.05	L0.02	N0.2	0.1	N10	N10	10	N5	N50	7	N5	10	15	300
FM 44R1	1161 3217	2	N0.5	50	30	L200	5	700	300	7	1.5	L0.05	1	1	0.3	50	30	150	50	70	70	15	150	50	150
FM 44R1	1161 3217	1	N0.5	50	30	L200	5	700	500	N5	1.5	L0.05	1	0.7	0.3	30	30	100	30	50	70	15	150	30	100

Table 1. (continued) Analytical results from the rock samples collected in the Fort McClellan-Pelham Range study area, Fort McClellan, AL.

Sample	UTM-FN	Au ppb	Ag	Cu	Pb	Zn	Fe %	Ba	Mn	Mo	Be	Ca %	Mg %	Na %	Ti %	B	Co	Cr	Ga	La	Ni	Sc	V	Y	Zr
FM 48R1	1212 3104	1	N0.5	70	50	L200	5	1000	300	7	2	0.2	1	1	0.3	50	30	100	50	70	70	15	200	30	100
FM 48R2	1212 3104	L1	N0.5	N5	L10	N200	0.15	20	70	N5	N1	20	0.5	N0.2	.015	L10	N10	L10	N5	N50	L5	N5	15	N10	L10
FM 48R3	1212 3104	2	N0.5	30	70	N200	1.5	150	100	7	L1	15	2	0.3	0.15	30	15	70	20	N50	70	5	70	L10	50
FM 49R1	1478 2588	1	N0.5	10	20	N200	1	1000	10	N5	L1	0.15	0.1	L0.2	0.5	10	L10	50	20	L50	7	7	50	30	700
FM 49R2	1478 2588	1	N0.5	30	15	N200	3	500	70	N5	5	L0.05	0.7	N0.2	0.7	50	20	100	50	70	50	15	100	50	200
FM 50R1	1693 3098	1	N0.5	70	30	N200	G20	700	1000	N5	5	L0.05	L0.02	N0.2	0.01	N10	50	10	50	N50	30	10	15	15	15
FM 50R2	1693 3098	2	N0.5	30	50	N200	20	200	50	N5	3	N0.05	0.15	N0.2	0.5	50	L10	100	50	L50	20	10	50	30	200
FM 50R3	1693 3098	4	L0.5	50	50	N200	15	150	150	N5	3	L0.05	L0.02	N0.2	0.03	L10	15	15	30	N50	20	7	20	20	100
FM 50R4	1693 3098	3	N0.5	150	15	300	2	5000	G5000	N5	2	L0.05	0.05	N0.2	0.1	L10	500	15	10	L50	200	7	30	70	100
FM 50R5	1693 3098	3	N0.5	50	100	N200	15	1000	5000	N5	5	L0.05	0.1	N0.2	0.3	20	50	20	30	100	50	10	70	150	200
FM 51R1	1652 2718	1	N0.5	30	50	N200	5	700	100	N5	1.5	L0.05	0.5	N0.2	1	30	10	150	30	70	20	15	100	100	700
FM 51R1	1652 2718	L1	N0.5	20	20	N200	5	1000	70	N5	2	L0.05	0.7	N0.2	1	50	N10	100	50	70	15	15	150	50	300
FM 52R1	1704 2920	1	N0.5	5	N10	N200	1	70	30	N5	N1	L0.05	0.05	N0.2	0.7	10	N10	20	5	N50	N5	L5	20	15	1000
FM 53R1	1723 3006	L1	N0.5	5	30	N200	15	500	100	N5	1.5	N0.05	0.07	N0.2	0.15	10	N10	15	30	N50	L5	7	70	20	700
FM 53R2	1726 3006	1	N0.5	10	N10	N200	5	100	70	N5	2	L0.05	L0.02	N0.2	0.1	L10	N10	10	7	N50	10	N5	10	10	100
FM 54R1	0606 3096	8	N0.5	50	20	700	G20	N20	1000	N5	5	L0.05	0.07	N0.2	0.02	L10	200	50	30	N50	300	10	70	70	N10
FM 55R1	9914 3156	L1	N0.5	7	N10	N200	1	100	70	N5	N1	L0.05	0.03	N0.2	.007	20	N10	15	N5	N50	7	N5	15	N10	10
FM 55R2	9914 3156	1	N0.5	30	20	N200	10	70	300	L5	L1	L0.05	0.05	N0.2	0.03	10	20	50	20	N50	30	L5	20	20	10
FM 57R1	0112 3173	L1	N0.5	70	70	500	G20	100	1500	5	1.5	N0.05	0.07	N0.2	0.03	N10	100	2000	100	N50	200	15	150	70	150
FM 57R2	0112 3173	4	N0.5	5	N10	N200	1	50	50	N5	N1	L0.05	0.05	N0.2	0.05	20	N10	20	5	N50	10	N5	20	N10	30
FM 58R1	0146 3134	1	N0.5	30	50	N200	5	70	100	7	1	L0.05	0.15	N0.2	0.2	20	L10	50	20	50	30	10	100	10	70
FM 60R1	0257 3150	L1	N0.5	50	50	L200	7	100	300	N5	2	L0.05	0.7	N0.2	0.3	50	20	100	30	50	70	15	150	150	150
FM 60R2	0257 3150	1	N0.5	L5	N10	N200	0.3	50	70	N5	N1	L0.05	0.03	N0.2	0.01	15	N10	10	N5	N50	5	N5	10	L10	L10
FM 61R1	0396 3230	12	N0.5	50	L10	N200	3	50	100	N5	L1	L0.05	0.1	N0.2	0.1	20	10	15	5	N50	15	10	70	L10	30
FM 62R1	9350 3350	1	0.5	30	100	200	2	150	70	N5	1.5	0.05	0.3	N0.2	0.3	20	20	150	15	70	150	10	100	100	1000
FM 62R2	9350 3350	1	N0.5	5	L10	N200	0.3	20	10	N5	N1	L0.05	0.07	N0.2	0.3	15	N10	20	5	N50	20	7	15	30	G1000
FM 64R1	9637 3354	3	N0.5	20	30	N200	1.5	500	15	7	1	L0.05	0.3	N0.2	0.5	30	N10	100	30	50	7	15	150	20	100
FM 64R2	9637 3352	3	N0.5	70	100	300	20	300	200	N5	1.5	L0.05	0.15	N0.2	0.2	30	70	100	70	N50	20	15	100	10	30
FM 64R3	9637 3354	1	N0.5	5	L10	N200	0.7	50	20	N5	N1	L0.05	0.05	N0.2	0	10	N10	20	5	N50	7	N5	15	N10	20
FM 65R1	9470 3310	14	1	7	150	N200	0.7	1000	15	100	1	L0.05	0.15	N0.2	0.7	50	20	70	15	50	100	7	70	20	300
FM 65R2	9470 3310	1	N0.5	7	L10	N200	3	200	15	5	1	L0.05	0.05	N0.2	0.1	10	20	20	7	N50	50	5	30	20	300
FM 67R1	0252 3220	L1	N0.5	L5	L10	N200	0.3	20	20	N5	N1	0.05	0.02	N0.2	0	10	N10	15	N5	N50	5	N5	10	N10	10
FM 67R2	0252 3220	5	N0.5	700	500	200	1.5	5000	G5000	15	2	0.15	0.07	N0.2	0.1	10	200	20	N5	N50	500	70	100	20	30

Table 2. Analytical results from the soil samples collected in the Fort McClellan-Pelham Range study area, Fort McClellan, AL.

Sample	Fe %	Cu	Pb	Au ppb	Mn	Ba	Ni	Co	V	Ca%	Mg %	P%	Ti%	B	Be	Cr	Ga	La	Nb	Sc	Y	Zr
FM 01S	0.7	15	20	3	150	100	7	N10	30	L0.05	0.07	L0.2	0.3	15	L1	30	7	N50	L20	L5	15	300
FM 02S	3	20	30	2	200	100	30	10	100	N.05	0.1	N0.2	0.3	20	1.5	70	15	L50	L20	10	20	150
FM 03S1	3	15	15	5	10	15	15	L10	100	N.05	0.03	N0.2	0.1	15	1.5	20	7	N50	N20	30	7	30
FM 03S2	1.5	15	50	2	300	300	5	N10	70	L0.05	0.07	L0.2	1	30	L1	50	10	50	20	7	30	1500
FM 04S	15	50	70	2	1500	500	100	70	70	N.05	0.3	L0.2	0.1	50	5	50	50	N50	N20	15	30	30
FM 05S	3	30	70	2	300	150	30	15	50	L0.05	0.1	L0.2	0.2	20	1.5	30	15	L50	L20	5	20	300
FM 08S	3	50	100	2	3000	500	50	15	100	L0.05	0.1	L0.2	0.7	30	1.5	70	20	100	20	7	50	500
FM 11S	1	15	15	L1	30	100	10	L10	30	L0.05	0.05	L0.2	1	15	N1	30	7	L50	L20	5	20	700
FM 12S	0.7	15	20	2	300	300	10	10	70	L0.05	0.1	L0.2	1	30	L1	30	7	L50	20	7	30	1000
FM 13S	1	10	30	2	70	150	5	N10	70	L0.05	0.05	L0.2	1	20	L1	15	10	50	30	7	50	1500
FM 15S	1.5	15	30	2	70	200	5	N10	70	L0.05	0.07	L0.2	0.7	30	L1	50	20	50	20	7	50	1500
FM 18S	1.5	5	10	L1	100	300	5	N10	70	L0.05	0.07	L0.2	1	20	1	20	10	70	30	7	50	1500
FM 20S	3	20	30	1	300	200	50	L10	100	L0.05	0.3	L0.2	0.7	30	1.5	30	20	50	L20	7	30	300
FM 21S	3	20	30	2	700	150	50	L10	150	L0.05	0.15	L0.2	0.7	50	2	50	30	50	20	10	30	300
FM 22S	3	20	20	1	700	300	30	10	100	0.05	0.15	L0.2	0.7	30	1.5	50	15	50	20	7	30	700
FM 23S	2	20	30	1	300	150	20	N10	70	L0.05	0.15	L0.2	0.7	30	1	30	30	L50	L20	7	30	500
FM 24S	3	20	150	1	1000	300	30	20	100	L0.05	0.2	L0.2	1	50	1	100	30	50	20	10	70	1000
FM 25S	1.5	7	7	1	100	200	10	N10	70	L0.05	0.1	L0.2	1	50	L1	30	10	L50	30	7	30	1000
FM 26S	2	10	10	5	70	300	10	N10	100	L0.05	0.07	L0.2	1	30	L1	70	10	50	20	7	70	1500
FM 28S	1.5	10	15	L1	70	500	15	N10	70	L0.05	0.15	L0.2	1	70	L1	70	15	L50	20	7	30	1000
FM 28SD	1.5	10	15	L1	70	500	15	N10	70	L0.05	0.15	L0.2	1	70	L1	70	15	50	20	7	50	700
FM 30S	1.5	15	15	L1	300	300	10	N10	70	L0.05	0.1	L0.2	1	50	1	70	15	L50	30	7	30	1000
FM 30SD	2	20	15	1	500	500	30	L10	100	L0.05	0.15	L0.2	1	50	1	70	15	50	30	7	50	700
FM 31S	3	30	20	1	70	500	30	15	150	L0.05	0.2	L0.2	1	50	1.5	50	20	70	30	10	30	500
FM 32S	1.5	7	15	L1	300	300	10	L10	70	L0.05	0.1	L0.2	G1	30	L1	70	10	L50	30	7	70	1500
FM 34S	1.5	15	30	L1	100	300	10	N10	70	L0.05	0.1	0.2	G1	30	1.5	70	20	100	30	10	70	1000
FM 35S	2	20	20	1	700	300	30	10	100	0.05	0.15	L0.2	1	30	1	70	15	L50	30	7	70	1500
FM 36S	2	20	10	L1	300	500	20	L10	100	0.05	0.15	L0.2	G1	30	L1	70	10	L50	30	7	70	1500
FM 37S	2	30	30	12	500	300	L5	10	100	L0.05	0.1	L0.2	1	30	1	50	15	L50	L20	5	30	700
FM 37SD	5	50	30	1	100	700	20	L10	200	0.05	0.3	L0.2	1	50	1	100	30	50	20	10	30	700

Table 2. (continued) Analytical results form the soil samples collected in the Fort McClellan-Pelham Range study area, Fort McClellan, AL.

Sample	Fe %	Cu	Pb	Au ppb	Mn	Ba	Ni	Co	V	Ca%	Mg %	P%	Ti %	B	Be	Cr	Ga	La	Nb	Sc	Y	Zr
FM 40S	2	20	50	1	70	300	10	N10	100	L0.05	0.15	L0.2	1	20	L1	100	30	50	L20	7	50	1000
FM 41S	2	20	30	1	70	150	15	N10	70	L0.05	0.15	L0.2	1	30	L1	70	20	50	20	7	50	1500
FM 42S	3	30	30	1	300	500	50	15	100	L0.05	0.15	L0.2	1	30	L1	70	30	70	20	10	70	1000
FM 43S	0.7	50	500	L1	300	300	15	N10	50	0.05	0.1	L0.2	0.7	15	1	30	10	L50	L20	5	20	500
FM 44S	5	50	100	1	100	500	30	10	150	L0.05	0.7	L0.2	1	50	2	150	70	70	20	15	30	300
FM 45S	0.7	10	10	L1	200	200	L5	N10	70	L0.05	0.07	L0.2	1	20	L1	30	5	L50	30	7	30	1500
FM 46S	3	50	50	2	500	200	50	15	150	L0.05	0.15	L0.2	0.7	30	1	70	30	L50	20	10	30	500
FM 47S	1.5	15	15	L1	500	200	15	30	100	0.07	0.1	L0.2	G1	20	L1	50	5	50	30	7	50	1500
FM 49S	2	10	50	1	200	700	15	10	100	L0.05	0.2	L0.2	0.7	20	2	70	30	50	20	10	50	700
FM 50S	2	20	50	1	70	200	5	N10	100	L0.05	0.07	L0.2	0.7	15	1	50	20	50	20	7	50	700
FM 51S	2	20	70	L1	300	1000	15	L10	100	L0.05	0.3	L0.2	0.7	30	1.5	70	50	70	20	10	70	700
FM 51SD	3	20	50	L1	500	1000	20	L10	100	L0.05	0.5	L0.2	1	30	2	70	30	70	20	15	70	700
FM 52S	1.5	5	20	L1	150	500	15	N10	70	L0.05	0.1	L0.2	1	20	L1	70	7	50	20	7	30	1000
FM 53S	3	15	50	2	700	1000	15	L10	100	L0.05	0.2	L0.2	1	30	1.5	100	50	50	30	10	50	1000
FM 55S	1.5	20	150	L1	700	300	15	L10	70	0.07	0.1	L0.2	0.7	.20	1	70	7	70	20	5	50	700
FM 56S	2	30	150	1	3000	700	50	20	100	0.05	0.15	L0.2	1	30	1.5	70	30	100	20	10	100	500
FM 57S	3	30	50	2	500	150	50	15	100	L0.05	0.15	L0.2	0.7	30	1	50	20	L50	L20	7	100	300
FM 59S	2	30	30	2	2000	200	30	30	70	0.05	0.15	L0.2	1	30	1.5	50	20	L50	20	7	70	700
FM 63S	7	50	100	1	100	100	50	10	150	L0.05	0.15	L0.2	0.5	15	1	100	30	50	20	10	10	150
FM 64S	2	30	70	2	300	150	20	15	70	0.05	0.1	L0.2	0.3	15	L1	70	10	L50	L20	5	15	300
FM 65S	1.5	30	30	4	5000	500	30	15	50	0.05	0.05	0.3	0.2	15	1.5	30	L5	50	L20	5	30	200
FM 66S	1.5	15	L10	1	70	300	15	10	50	L0.05	0.07	L0.2	0.7	20	L1	30	5	L50	20	5	20	500
FM 67S	1.5	20	L10	3	100	100	15	10	70	0.05	0.1	L0.2	0.7	20	L1	50	7	L50	20	5	15	300

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