U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

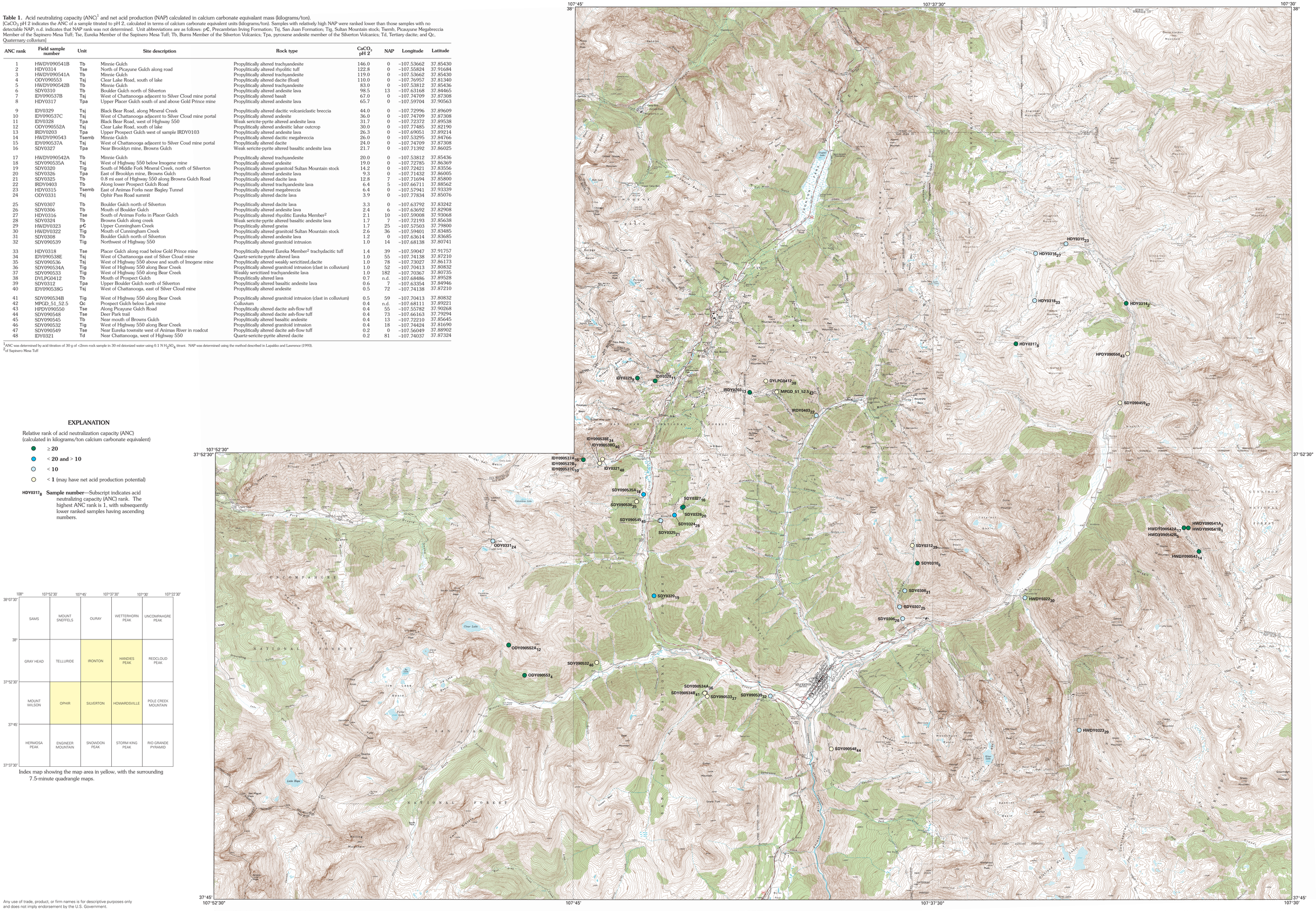
Prepared in cooperation with the
U.S. BUREAU OF LAND MANAGEMENT

SCIENTIFIC INVESTIGATIONS REPORT 2008–5063
PLATE 1

Table 1. Acid neutralizing capacity (ANC)[1] and net acid production (NAP) calculated in calcium carbonate equivalant mass (kilograms/ton).
[$CaCO_3$ pH 2 indicates the ANC of a sample titrated to pH 2, calculated in terms of calcium carbonate equivalent units (kilograms/ton). Samples with relatively high NAP were ranked lower than those samples with no detectable NAP; n.d. indicates that NAP rank was not determined. Unit abbreviations are as follows: pC, Precambrian Irving Formation; Tsj, San Juan Formation; Tig, Sultan Mountain stock; Tsemb, Picayune Megabreccia Member of the Sapinero Mesa Tuff; Tse, Eureka Member of the Sapinero Mesa Tuff; Tb, Burns Member of the Silverton Volcanics; Tpa, pyroxene andesite member of the Silverton Volcanics; Td, Tertiary dacite; and Qc, Quaternary colluvium]

ANC rank	Field sample number	Unit	Site description	Rock type	$CaCO_3$ pH 2	NAP	Longitude	Latitude
1	HWDY090541B	Tb	Minnie Gulch	Propylitically altered trachyandesite	146.0	0	−107.53662	37.85430
2	HDY0314	Tse	North of Picayune Gulch along road	Propylitically altered rhyolitic tuff	122.8	0	−107.55824	37.91684
3	HWDY090541A	Tb	Minnie Gulch	Propylitically altered trachyandesite	119.0	0	−107.53662	37.85430
4	ODY090553	Tsj	Clear Lake Road, south of lake	Propylitically altered dacite (float)	110.0	0	−107.76957	37.81340
5	HWDY090542B	Tb	Minnie Gulch	Propylitically altered trachyandesite	83.0	0	−107.53812	37.85436
6	SDY0310	Tb	Boulder Gulch north of Silverton	Propylitically altered andesite lava	98.5	13	−107.63168	37.84465
7	IDY090537B	Tsj	West of Chattanooga adjacent to Silver Cloud mine portal	Propylitically altered basalt	67.0	0	−107.74709	37.87308
8	HDY0317	Tpa	Upper Placer Gulch south of and above Gold Prince mine	Propylitically altered andesite lava	65.7	0	−107.59704	37.90563
9	IDY0329	Tsj	Black Bear Road, along Mineral Creek	Propylitically altered dacitic volcaniclastic breccia	44.0	0	−107.72996	37.89609
10	IDY090537C	Tsj	West of Chattanooga adjacent to Silver Cloud mine portal	Propylitically altered andesite	36.0	0	−107.74709	37.87308
11	IDY0328	Tpa	Black Bear Road, west of Highway 550	Weak sericite-pyrite altered andesite lava	31.7	0	−107.72372	37.89538
12	ODY090552A	Tsj	Clear Lake Road, south of lake	Propylitically altered andesitic lahar outcrop	30.0	0	−107.77485	37.82190
13	IRDY0203	Tpa	Upper Prospect Gulch west of sample IRDY0103	Propylitically altered andesite lava	26.3	0	−107.69051	37.89214
14	HWDY090543	Tsemb	Minnie Gulch	Propylitically altered dacitic megabreccia	26.0	0	−107.53295	37.84766
15	IDY090537A	Tsj	West of Chattanooga adjacent to Silver Coud mine portal	Propylitically altered dacite	24.0	0	−107.74709	37.87308
16	SDY0327	Tpa	Near Brooklyn mine, Browns Gulch	Weak sericite-pyrite altered basaltic andesite lava	21.7	0	−107.71392	37.86025
17	HWDY090542A	Tb	Minnie Gulch	Propylitically altered trachyandesite	20.0	0	−107.53812	37.85436
18	SDY090535A	Tsj	West of Highway 550 below Imogene mine	Propylitically altered andesite	19.0	0	−107.72785	37.86369
19	SDY0320	Tig	South of Middle Fork Mineral Creek, north of Silverton	Propylitically altered granitoid Sultan Mountain stock	14.2	0	−107.72421	37.83556
20	SDY0326	Tpa	East of Brooklyn mine, Browns Gulch	Propylitically altered andesite lava	9.3	0	−107.71432	37.86005
21	SDY0325	Tb	0.8 mi east of Highway 550 along Browns Gulch Road	Propylitically altered dacite lava	12.8	7	−107.71694	37.85800
22	IRDY0403	Tb	Along lower Prospect Gulch Road	Propylitically altered trachyandesite lava	6.4	5	−107.66711	37.88562
23	HDY0315	Tsemb	East of Animas Forks near Bagley Tunnel	Propylitically altered megabreccia	6.4	0	−107.57941	37.93339
24	ODY0331	Tsj	Ophir Pass Road summit	Propylitically altered dacite lava	3.9	0	−107.77834	37.85076
25	SDY0307	Tb	Boulder Gulch north of Silverton	Propylitically altered dacite lava	3.3	0	−107.63792	37.83242
26	SDY0306	Tb	Mouth of Boulder Gulch	Propylitically altered andesite lava	2.4	6	−107.63692	37.82908
27	HDY0316	Tse	South of Animas Forks in Placer Gulch	Propylitically altered rhyolitic Eureka Member[2]	2.1	10	−107.59008	37.93068
28	SDY0324	Tb	Browns Gulch along creek	Weak sericite-pyrite altered basaltic andesite lava	1.7	7	−107.72193	37.85638
29	HWDY0323	pC	Upper Cunningham Creek	Propylitically altered gneiss	1.7	25	−107.57503	37.79800
30	HWDY0322	Tig	Mouth of Cunningham Creek	Propylitically altered granitoid Sultan Mountain stock	2.6	36	−107.59401	37.83485
31	SDY0308	Tb	Boulder Gulch north of Silverton	Propylitically altered andesite lava	1.2	0	−107.63614	37.83685
32	SDY090539	Tig	Northwest of Highway 550	Propylitically altered granitoid intrusion	1.0	14	−107.68138	37.80741
33	HDY0318	Tse	Placer Gulch along road below Gold Prince mine	Propylitically altered Eureka Member[2] trachydacitic tuff	1.4	39	−107.59047	37.91757
34	IDY090538E	Tsj	West of Chattanooga east of Silver Cloud mine	Quartz-sericite-pyrite altered lava	1.0	55	−107.74138	37.87210
35	SDY090536	Tsj	West of Highway 550 above and south of Imogene mine	Propylitically altered weakly sericitized,dacite	1.0	78	−107.73027	37.86173
36	SDY090534A	Tig	West of Highway 550 along Bear Creek	Propylitically altered granitoid intrusion (clast in colluvium)	1.0	52	−107.70413	37.80832
37	SDY090533	Tig	West of Highway 550 along Bear Creek	Weakly sericitized trachyandesite lava	1.0	182	−107.70367	37.80735
38	DYLPG0412	Tb	Mouth of Prospect Gulch	Propylitically altered lava	0.7	n.d.	−107.68486	37.89528
39	SDY0312	Tpa	Upper Boulder Gulch north of Silverton	Propylitically altered basaltic andesite lava	0.6	7	−107.63354	37.84946
40	IDY090538G	Tsj	West of Chattanooga, east of Silver Cloud mine	Propylitically altered andesite	0.5	72	−107.74138	37.87210
41	SDY090534B	Tig	West of Highway 550 along Bear Creek	Propylitically altered granitoid intrusion (clast in colluvium)	0.5	59	−107.70413	37.80832
42	MPGD_51_52.5	Qc	Prospect Gulch below Lark mine	Colluvium	0.4	n.d.	−107.68111	37.89221
43	HPDY090550	Tse	Along Picayune Gulch Road	Propylitically altered dacite ash-flow tuff	0.4	55	−107.55782	37.90268
44	SDY090548	Tse	Deer Park trail	Propylitically altered dacite ash-flow tuff	0.4	73	−107.66163	37.79294
45	SDY090545	Tb	Near mouth of Browns Gulch	Propylitically altered basaltic andesite	0.4	13	−107.72210	37.85645
46	SDY090532	Tig	West of Highway 550 along Bear Creek	Propylitically altered granitoid intrusion	0.4	18	−107.74424	37.81690
47	SDY090549	Tse	Near Eureka townsite west of Animas River in roadcut	Propylitically altered dacite ash-flow tuff	0.2	0	−107.56049	37.88902
48	IDY0321	Td	Near Chattanooga, west of Highway 550	Quartz-sericite-pyrite altered dacite	0.2	81	−107.74037	37.87324

[1] ANC was determined by acid titration of 30 g of <2mm rock sample in 30 ml deionized water using 0.1 N H_2SO_4 titrant. NAP was determined using the method described in Lapakko and Lawrence (1993).
[2] of Sapinero Mesa Tuff



EXPLANATION

Relative rank of acid neutralization capacity (ANC)
(calculated in kilograms/ton calcium carbonate equivalent)

- ≥ **20**
- < **20 and** > **10**
- < **10**
- < **1** (may have net acid production potential)

HDY0317$_8$ **Sample number**—Subscript indicates acid neutralizing capacity (ANC) rank. The highest ANC rank is 1, with subsequently lower ranked samples having ascending numbers.

Index map showing the map area in yellow, with the surrounding 7.5-minute quadrangle maps.

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Base from U.S. Geological Survey, Ironton, Handies Peak, Ophir, Silverton, and Howardsville, 1955.

Polyconic Projection, North American Datum NAD 27

Colorado State Plane coordinate system, south zone
Reprojected to Universal Transverse Mercator meters, zone 13

APPROXIMATE MEAN DECLINATION, 2005

SCALE 1:50 000
1 1/2 0 1 2 3 4 MILES
1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

COLORADO
MAP LOCATION

Acid neutralizing capacity (ANC) and net acid production (NAP) determined by Douglas B. Yager, Mark R. Stanton, and Rhonda L. Driscoll. Field sampling by Douglas B. Yager, 2003–2005.

Digital raster graphics images derived from scans of U.S. Geological Survey basemaps.

Edited by L.J. Binder
Denver Publications Service Center

Manuscript approved for publication April 23, 2008.

MAP SHOWING ACID NEUTRALIZING CAPACITY AND NET ACID PRODUCTION OF ANIMAS RIVER WATERSHED ROCKS NEAR SILVERTON, COLORADO

By
Douglas B. Yager, Mark R. Stanton, and Rhonda L. Driscoll
2008

ISBN 978-1411321649

Printed on recycled paper