

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

**USGS Branch of Geochemistry  
Sample Submittal Manual, Fourth Edition**

By

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Open-File Report 93-533

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey.

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1993



USGS Branch of Geochemistry

# Sample Submittal Manual

Fourth Edition, 1993

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Shawn T. Smith

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# Introduction

This manual is a guide for submitting geologic/geochemical/environmental samples to the USGS Branch of Geochemistry (BGC). It provides information covering a variety of subjects from required paperwork to sample size limitations. **This manual supersedes Sample Submittal Manual, Third Edition, 1969, all previous sample submittal manuals, and all subsequent supplements.**

All samples submitted to BGC must be accompanied by a Request for Analysis Form (RFA), which may be obtained from BGC Sample Control personnel. The RFA consists of a cover sheet and coding sheet(s). Instructions for completing this form are discussed in more detail in later sections of this manual.

If you have questions concerning sample submittals, please contact BGC personnel (see appendix 1 for a complete list of contacts). The branch liaison officer can assist with information about types of analyses available, special requirements, and any other questions regarding BGC policies. Any of the branch contacts listed on page 34 will also be glad to provide assistance.

A Catalog of Services is available, which briefly describes routing and analytical methods used in the BGC laboratories. More detailed information on analytical methods and laboratory procedures such as sample preparation can be found in the BGC Quality Assurance Manual.\*

This manual is designed to acquaint you with the requirements for submitting samples, and to provide guidelines for efficient sample processing.

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\* Arbogast, B.F., ed., Quality assurance manual for the Branch of Geochemistry: U.S. Geological Survey Open-File Report 90-668, 184 p.

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# I

## General Flow of Samples

Samples, along with a completed Request for Analysis, are submitted to BGC's Sample Control personnel in Denver, Colorado. Unless the Request for Analysis form (RFA) is submitted electronically,\* samples should be submitted in lots of 40 or fewer. Samples are scanned by Sample Control personnel for radioactivity and checked against the RFA. Any discrepancies are reconciled prior to computer entry. After job and laboratory numbers are assigned, a computer copy (Confirmation Sheet) of the RFA is generated and sent to the submitter. You are responsible for verifying the information on the Confirmation Sheet, including the requested analyses. Sample Control should be notified as soon as possible if there are any corrections, omissions, or questions. Chain of custody procedures for evidentiary samples are available. Please make prior arrangements for these samples with branch contacts.

To establish a documented chain of custody, Sample Control routes samples to the appropriate laboratories and oversees all transfers. Sample Control becomes the hub of all future activity involving the physical sample (fig. 1). Samples are first routed to the Sample Preparation Laboratory, and then routed to various laboratories for the requested analytical work.

If the submitter has chosen to prepare the samples, they must be able to pass branch quality-control requirements, which are 100 percent at -80 mesh or 80 percent at -100 mesh. (Samples ground with tungsten carbide or steel grinding equipment must be so noted on the RFA under Preparation Instructions.)

Samples are analyzed on a first-in, first-out basis, unless a priority has been assigned by the BGC Branch Chief. Priority status may be obtained by stating your justification in a written request to the BGC Branch Chief. Laboratory personnel transmit data to the computer after completion of analyses. Computer printouts of the analyses are sent to you after each laboratory has completed its analyses and a laboratory chief has given final approval on each job. This information is available in digital format through branch computer support personnel (see section V).

When all requested work is completed, the prepared samples are placed in permanent archives. Any ground sample remaining after all analyses are complete is archived so that it will be available for future use. If necessary, you may obtain a split of the ground sample through Sample Control.

A maximum of 3 ounces (about 100 grams) of ground sample are kept in BGC archives and will not be returned to the submitter unless requested. Any unground sample (bulk) in excess of 3 ounces will be returned to the submitter, if noted on the RFA.

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\* Christie, J.H., Jackson, L.L. and Sutton, A.L., Submittal of requests for analysis to the Branch of Geochemistry using a spread sheet program: U.S. Geological Survey Open-File Report 901-231 A,B

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## General Flow of Samples

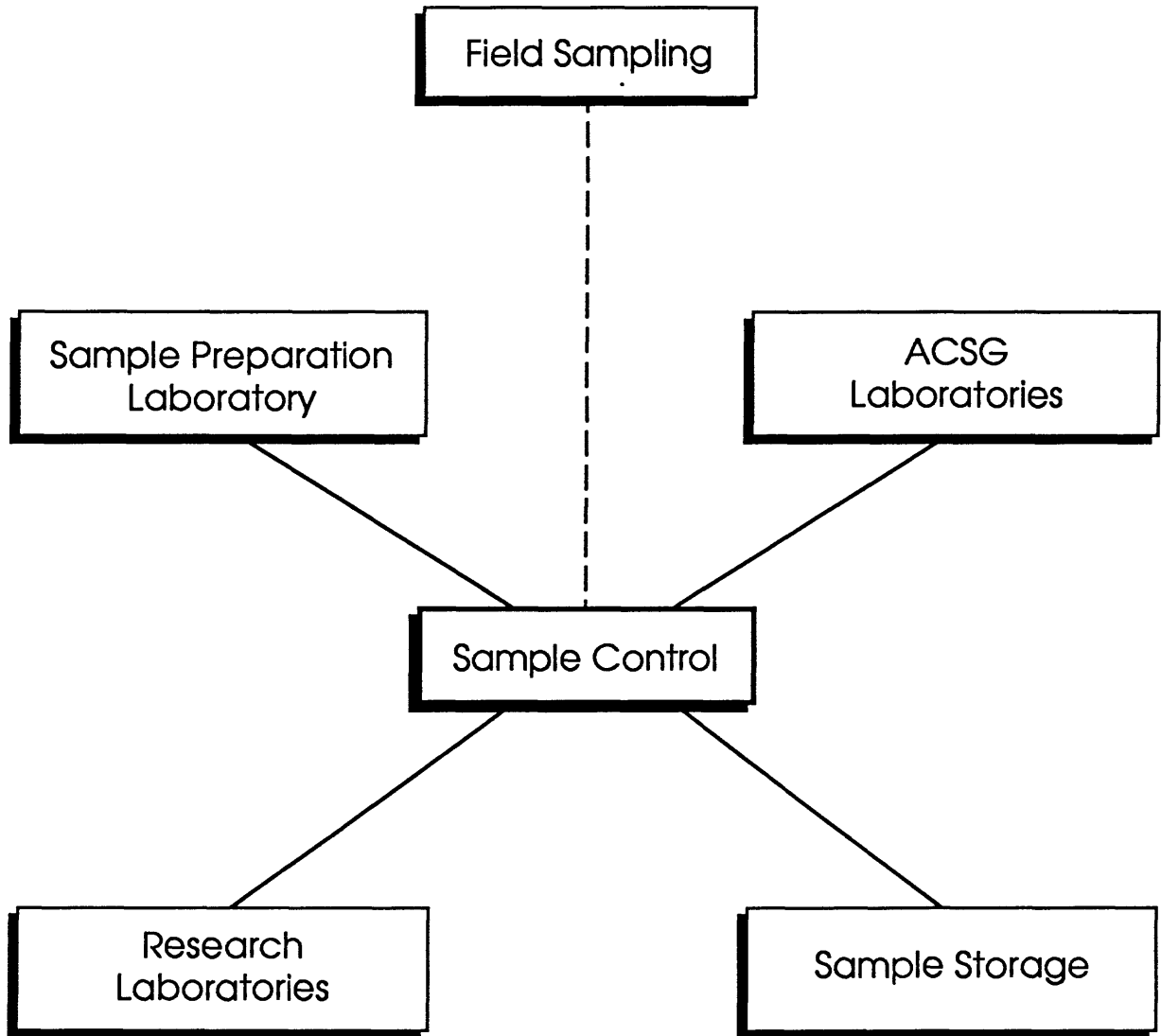


Figure 1

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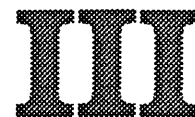
# II

## Procedures for Submitting Samples for Preparation and Analysis

- Submit samples with completed RFA in lots of 40 or fewer (unless the RFA is submitted electronically).
- Select only the analyses necessary to complete your study. Consult the Catalog of Services or speak to BGC contact personnel for additional information (see page 34).
- Samples should be limited to a 1- to 2-lb size ( $\leq 1$  kg), unless there are valid scientific reasons for submitting larger samples.
- Samples known to have a high concentration of any element, or sample materials that might cause analytical problems, should be noted on the RFA to facilitate analytical work and reduce the danger of contamination.
- Samples likely to contain  $>200$  ppm of naturally occurring radioactive elements must be noted on the RFA under "Sample Description and Comments."
- Submit only one type of sample material per sample submittal. For example, do not mix unconsolidated sediment with rock samples.
- Requests for analytical work other than those techniques shown on the RFA must be approved prior to submittal. Contact Sample Control or the branch liaison for further information.
- Analytical results are stored in the National Geochemical Database (NGD). Proprietary samples from private industry and samples from Native-American lands or foreign sources should be noted as "Confidential" on the RFA. Do not submit confidential and non-confidential samples on the same RFA (data from confidential samples will not be stored in NGD).
- Sample randomization, if desired, must be performed by the submitter prior to submittal.

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# Completing the Request for Analysis (RFA) Form



## Cover Sheet—General Information

The cover sheet is comprised of identifying information, analytical requests, QA/QC information, and Sample Control information. This form is updated periodically, and you may obtain the latest version from Sample Control personnel.

If sample identification data are incomplete or erroneous, the samples will not be analyzed. You will be notified of the problem, and processing will not continue until corrections are made. The front side of the cover sheet must contain the following information: (Mandatory items are denoted by a ✓ check mark.)

- ✓ **Submitter** *Mandatory* The submitter's name should be entered last name first (i.e., Smith, A. A.). A maximum of two names may be designated as submitters. If other people are associated with these samples, you are responsible for obtaining additional copies of reports and distributing those copies.
- **Address** Mail stop should be included where necessary.
- ✓ **Phone Number** *Mandatory* Include area code.
- **E-Mail Address** Optional.
- **Project Title** This field is not mandatory, but helpful.
- ✓ **Project Number** *Mandatory* This number is used for accounting purposes. Paperwork without this number will not be processed.
- ✓ **Program Number** *Mandatory* Samples without this number on the paperwork will not be processed.
- **List of Previous Job Numbers** Samples previously analyzed by BGC, BEG, or BAC should have former job numbers listed in this section. Do not, on the same job, submit previously analyzed samples with samples that have never been analyzed.



- 
- ✓ **Results Needed *Mandatory*** This section allows you to indicate to us the date you need completed analyses. This does not guarantee a priority handling of your samples, however we will attempt to meet your deadline, so please be honest when completing this field.
  - **Sample Type** Circle one of the material types listed or list the type of material under "Other." Do not submit more than one type of material per job. For instance, do not mix unconsolidated sediment with rock samples.
  - ✓ **Date Collected *Mandatory*** This information is very helpful in evaluating environmental samples.
  - **Number of Samples** Please complete.
  - **Preparation Instructions** Use as much detail as necessary in the space provided.
  - **Disposition of Bulk** A split of the ground sample is placed in a 3-ounce container. If this field is not completed, any sample in excess of 3 ounces will be discarded.
  - **Branch Chief Approval** If your branch requires this approval, the RFA should be signed by your Branch Chief in the space provided on the RFA.
  - **Analytical Chemistry Services Group (ACSG) Methods** Check the appropriate method box for your study (if you have any questions regarding methods or timely completion, confer with one of the branch contacts listed in Appendix 1).

All other information on the front side of the RFA cover sheet will be supplied by BGC personnel. The job number and laboratory numbers are assigned by Sample Control after our personnel have verified that the samples agree with the paperwork. You will be notified of any discrepancies.

The back side of the cover sheet is to be used to list analytical requests that do not fall under the ACSG function.

The second sheet of the RFA is referred to as the "coding sheet." This section of the RFA also includes mandatory fields that must be supplied, or processing will stop until the required information is received from the submitter.

---

## Coding Sheet—General Information

- **Lab Numbers** These numbers will be assigned by Sample Control personnel through the branch computer system.
- ✓ **Field Number** *Mandatory* This is the sample identification code assigned by you. It may contain up to 14 alpha-numeric characters.
- ✓ **Coordinates** *Mandatory* Latitude and longitude should be entered in degrees, minutes, and seconds. North latitude and west longitude are assumed. For samples collected outside of the contiguous United States and for oceanographic samples, it is recommended that the direction be recorded even if it is north latitude and (or) west longitude. If coordinates are to be digitized and submitted at a later date, prior approval must be obtained and this must be noted on the RFA Coding Sheet. Universal Transverse Mercator coordinates are not acceptable.
- ✓ **State, County, or Country** *Mandatory* If the state name is abbreviated, use the two letter U.S. Postal Service abbreviation (see appendix 2). In Alaska, use the 2 degree quadrangle name in lieu of the county name. Use the name of the ocean for oceanographic samples and the name of the country for samples outside of the United States.
- **Formation Name** This field should be completed with the name of the stratigraphic unit of formation rank or higher, represented by rock, mineral, or coal samples from the United States, Canada, or Mexico. If the sample represents a named body of igneous or metamorphic rock, this name should be entered.
- ✓ **Sample Description and Comments** *Mandatory* This column is provided for noting the sample material and (or) distinguishing characteristics of the sample. *It is very important to use this section to notify analysts of suspected or known high concentrations of an element, and (or) mineralized samples.* Please be succinct. If you have questions, please refer to the Catalog of Services.
- ✓ **Character of Sample** (column 12) *Mandatory* See page 13.
- ✓ **Source** (column 13) *Mandatory* See page 13.
- **Geologic Age** (columns 14-16) Code column 14 for known age or columns 15 & 16 for age range.
- **Economic Geology** (column 17) These codes indicate economic significance.
- ✓ **Category** (column 19) *Mandatory* See page 15.
- **Numbered columns** Coding should be as complete as possible. This system assists the analyst; it assists you when retrieving sample data from the computer; and it assists anyone who may need to use this data in the future. Columns 60-65 are for free coding. It is your responsibility to devise and maintain the scheme for these columns. Remember, use only one character per column, please.

The coding scheme for the numbered columns on the RFA has been used for many years. Do not code inapplicable sections. Likewise, if the information is unknown or uncertain, leave it blank. Do not put any marks in columns that are to remain blank. Coding is covered on pages 13 through 31 of this manual.

U.S. Geological Survey  
Branch of Geochemistry, P.O. Box 25046  
Denver Federal Center, MS 928  
Denver, CO 80225

Page 1 of \_\_\_\_\_

# REQUEST FOR ANALYSIS (RFA)<sup>1</sup>

Branch Chief approval  
(if required by Submitter's Branch)

Submitter<sup>2</sup> \_\_\_\_\_  
Address \_\_\_\_\_

Sample type<sup>3</sup>: rock, stream sediment,  
soil, water, plant, coal, concentrate,  
other: no base

Phone number \_\_\_\_\_  
E-Mail Address \_\_\_\_\_  
Project title \_\_\_\_\_  
Project number \_\_\_\_\_  
Program number \_\_\_\_\_  
If previous work was done on these samples,  
list job numbers: \_\_\_\_\_

Date Collected \_\_\_\_\_

Results needed by \_\_\_\_\_

Contact the sample control specialist (303) 236-2479 for tracking progress of your samples.

Number of samples \_\_\_\_\_

Preparation Instructions: \_\_\_\_\_

Special requirements \_\_\_\_\_

Disposition of bulk: \_\_\_\_\_

☐ Discard

☐ Return to submitter

(Submitter must supply container)

For BGC Use Only:

Job number \_\_\_\_\_

Lab number \_\_\_\_\_

Date received \_\_\_\_\_

Counted and scanned by \_\_\_\_\_

Shelf \_\_\_\_\_

Prep Lab \_\_\_\_\_

Prepared by \_\_\_\_\_

Notes \_\_\_\_\_

QC \_\_\_\_\_

Mineralogy by \_\_\_\_\_

## ACSG METHODS

Check technique(s) necessary for your study. Contact the Chief (ACSG), 236-1804, for further information. Nonroutine methods are available through arrangement with the ACSG Liaison, (303) 236-1923 (note on reverse side).

Constituent, Method	Analyst/Date
<input type="checkbox"/> 40-element, ICP-AES	<input type="checkbox"/> CO <sub>2</sub> (carbonate carbon), coulometric titration
<input type="checkbox"/> 35/37-element, dc-ARC OES	<input type="checkbox"/> Cl <sup>-</sup> , ion-selective electrode
<input type="checkbox"/> 25-element, INAA abbreviated count	<input type="checkbox"/> F <sup>-</sup> , ion-selective electrode
<input type="checkbox"/> 12-element, EDXRF	<input type="checkbox"/> FeO, potentiometric titration
<input type="checkbox"/> Rb, Sr, Y, Nb, Zr	<input type="checkbox"/> Hg, AA cold vapor
<input type="checkbox"/> Ba, La, Ce	<input type="checkbox"/> H <sub>2</sub> O, heat/weight loss
<input type="checkbox"/> Cu, Ni, Zn	<input type="checkbox"/> K <sub>2</sub> O, flame photometric
<input type="checkbox"/> Cr	<input type="checkbox"/> Na <sub>2</sub> O, flame photometric
<input type="checkbox"/> 10-element, ICP-AES	<input type="checkbox"/> Pt group, ICP-MS
<input type="checkbox"/> Major elements as oxides, WDXRF	<input type="checkbox"/> Total S, combustion
<input type="checkbox"/> As, AA hydride generation	<input type="checkbox"/> Forms of Sulfur
<input type="checkbox"/> Sb - Hydride	<input type="checkbox"/> Se, AA hydride generation
<input type="checkbox"/> Au, AA flame	<input type="checkbox"/> Te, AA flame
<input type="checkbox"/> Au, AA graphite furnace	<input type="checkbox"/> TL, AA flame
<input type="checkbox"/> Organic C, computed from the difference of total C and carbonate C determinations	<input type="checkbox"/> U & Th, DNAA
<input type="checkbox"/> Total C, combustion	<input type="checkbox"/> W, visible absorption
<input type="checkbox"/> REE ICP-MS	<input type="checkbox"/> INAA Long Count
<input type="checkbox"/> CHN	<input type="checkbox"/> INAA Short Count
<input type="checkbox"/> Coal Package	<input type="checkbox"/> Cd, AA
<input type="checkbox"/> Low level W, Nb, Mo chemical separation - ICP	<input type="checkbox"/> Ag, AA
	<input type="checkbox"/> Percent Ash
	<input type="checkbox"/> Ge, Chemical Separation

<sup>1</sup> Additional information is available in the "Sample Submittal Manual" and the "Catalog of Services."

<sup>2</sup> Use asterisk (\*) to denote contact person for multiple submitters (two-name limit). If more than one copy of final report is needed, please note quantity \_\_\_\_\_.

<sup>3</sup> Please note known or suspected mineralized samples on coding sheet (specify elements).

<sup>4</sup> Contact the Quality Assurance Coordinator for special requirements.

Sample RFA Cover Sheet, Front

Please consult with ACSG Liaison, (303) 236-1923, for availability of your request. Additional information is available in the Catalog of Services.

[illegible]

Job No.

# Request For Analysis Coding Sheet

Page \_\_\_\_\_ of \_\_\_\_\_

**Important:** Use coding as defined in the Fourth Edition of the Sample Submittal Manual. Copies of the manual are available from BGC Sample Control, and ACSG Liaisons.

**General Description of Column Entries:**

- 11 Enter "N" if sample is from NURE collection
- 12 Character of sample (grab, composite, etc.)
- 13 Source (outcrop, float, mine dump, etc.)

15 &amp; 16 Age (if uncertain, give as range—e.g. Cambrian-Silurian)

- 17 Economic geology (mineralized, alteration, etc.)
- \* 19 Category (rock type, soil, plant, etc.)
- 20 - 39 Detailed description
- 60 - 65 Free coding

[illegible]

**Required information**

• Provide previously assigned lab no. along with other information if sample is submitted from a previous lab.

11	12	13	14	15	16	17	19	20	21	22	23	24	25	26	27	28	29	30	35	36	37	38	39	60	61	62	63	64	65
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

# Sample RFA Coding Sheet

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# Coding

# IV

## ✓ **Column 12 CHARACTER OF SAMPLE** *Mandatory*

Typical of a larger body or population at the sample site.

Atypical of the larger body or population from which the sample was taken. (Sample was selected for some special attribute and is not intended to be typical.)

Typicality unknown or uncertain.

A	B	C	Single sample (e.g., hand specimen, grab sample)
D	E	F	Composite sample (e.g., chip sample)
G	H	I	Channel sample
J	K	L	Single, composite, channel, or any other type sample
			processed in the field or laboratory (e.g., panned concentrate,
			mineral separate, purified, leached, ashed, evaporated, etc.)
X	Y	Z	Other

## ✓ **Column 13 SOURCE OF SAMPLE** *Mandatory*

- A. Natural outcrop (or surface layer)
- B. Road cut
- C. Float
- D. Open pit mine or quarry
- E. Prospect pit
- F. Underground mine
- G. Mine dump
- H. Mill product (smelter, tailing)
- I. Refinery product
- J. Drill core or auger sample
- K. Drill cutting, sludge
- L. Produced from well (oil, water, etc.)
- M. Marine
- Z. Other

---

## Columns 14-16 GEOLOGIC AGE

Code known age in column 14. If uncertain, code oldest possible age in column 15, and code youngest possible age in column 16.

- |                                   |                |
|-----------------------------------|----------------|
| A. Precambrian undifferentiated   | M. Triassic    |
| B. Early Precambrian (Archeozoic) | N. Jurassic    |
| C. Late Precambrian (Proterozoic) | P. Cretaceous  |
| D. Paleozoic                      | Q. Tertiary    |
| E. Cambrian                       | R. Paleocene   |
| F. Ordovician                     | S. Eocene      |
| G. Silurian                       | T. Oligocene   |
| H. Devonian                       | U. Miocene     |
| I. Mississippian                  | V. Pliocene    |
| J. Pennsylvanian                  | W. Quaternary  |
| K. Permian                        | X. Pleistocene |
| L. Mesozoic                       | Y. Holocene    |

## Column 17 ECONOMIC GEOLOGY

This section is used to identify samples of ores and (or) related protore, altered material, or other samples of possible economic significance. This column is not mandatory, but may be useful for retrievals when used in conjunction with column 19 and other columns.

- A. Sample of mineralized rock—contains epigenetic ore minerals.
- B. Sample of altered rock—may contain epigenetic gangue minerals.
- C. Sample of vein, cavity, or fracture filling, or material that has completely replaced a pre-existing rock, AND CONTAINS ORE MINERALS.\*
- D. Sample of vein, cavity, or fracture filling, or material that has completely replaced a pre-existing rock, BUT CONTAINS ONLY GANGUE MINERALS.\*
- E. Sample from a residual concentration that is, or may be, of economic value (e.g., lateritic iron deposits, certain bauxite deposits, etc.).\*
- F. Sample has not been mineralized or altered but may contain economic concentrations of metals (e.g., magmatic segregation, sedimentary iron ore, placer, etc.).
- G. Sample has not been mineralized but is from material that is, or may be, of economic value as a nonmetallic ore or product (e.g., phosphorite, oil shale, coal, building stone).
- Z. Other materials from or related to deposits of existing or potential economic significance.

---

\* Samples in this category, unless they are of single minerals or of one of the substances itemized for column 20, are generally coded as Z in column 19, and no further coding is required.

---

✓ **Column 19 CATEGORY OF SAMPLE MATERIAL** *Mandatory*

This column is used in conjunction with the coding in columns 20-39.  
Additional coding is presented on pages noted on the right.

Code	Go To Page
A. Igneous Rock .....	16-17
B. Metamorphic Rock (including migmatite).....	18-19
C. Sedimentary Rock .....	20
D. Unconsolidated Sediment .....	21
E. Mineral .....	22-23
F. Soil .....	24
G. Water .....	25
H. Plant .....	26-28
I. Organic Fuel or Related Substance .....	29
J. Miscellaneous .....	30
K. Heavy-Mineral Concentrate .....	31
Z. Other*	

---

\* No further coding required. Describe sample briefly under "Sample Description and Comments."

---



## IGNEOUS ROCK Use if column 19 contains an A

### Column 20 FORM

A. Lava flow	L. Stock
B. Volcanic breccia or agglomerate	M. Pluton
C. Pyroclastic, unsorted, indurated	N. Pipe or plug
D. Pyroclastic, unsorted, loose	P. Intrusive breccia
E. Pyroclastic, bedded, indurated	R. Intrusive rock
F. Pyroclastic, bedded, loose	S. Flow or sill(?)
G. Pyroclastic	T. Inclusion (uncertain origin)
H. Extrusive rock	U. Xenolith
J. Dike	V. Autolith
K. Sill, laccolith, etc.	W. Segregation

### Column 21 TEXTURE AND STRUCTURE

Porphyritic (code matrix texture)

			Nonmassive (layered, laminated)
			Massive
A	B	C	Glassy
D	E	F	Aphanitic
G	H	J	Fine grained, <1 mm
K	L	M	Medium grained, >1 mm, <5 mm
N	P	Q	Coarse grained, >5 mm, <2 cm
R	S	T	Pegmatitic, >2 cm
U	V	W	Pumiceous
X	Y	Z	Other

### Column 22 QUARTZ-FELDSPAR RELATION

Quartz-bearing

			Quartz-free (<5 percent quartz)
A	B		K-Na feldspars dominant
C	D		K-feldspar=plagioclase
E	F		Plagioclase dominant
G	H		Feldspar present
J	K		Little or no feldspar
L	M		Feldspathoidal

**Column 23    TENTATIVE NAME**

- |                              |                   |
|------------------------------|-------------------|
| A. Felsic igneous rock       | V. Anorthosite    |
| B. Intermediate igneous rock | W. Pyroxenite     |
| C. Mafic igneous rock        | X. Amphibolite    |
| D. Ultramafic igneous rock   | Y. Peridotite     |
| E. Alkalic igneous rock      | 1. Rhyolite       |
| F. Carbonatite               | 2. Trachyte       |
| G. Alaskite                  | 3. Phonolite      |
| H. Granite                   | 4. Quartz latite  |
| J. Pegmatite                 | 5. Latite         |
| K. Aplite                    | 6. Dacite         |
| L. Syenite                   | 7. Andesite       |
| M. Quartz monzonite          | 8. Basalt         |
| N. Monzonite                 | 9. Olivine basalt |
| P. Granodiorite              | + Lamprophyre     |
| Q. Quartz diorite            | - Volcanic glass  |
| R. Diorite                   | * Obsidian        |
| S. Gabbro                    | @ Pumice          |
| T. Diabase                   | Z. Other          |
| U. Dunite                    |                   |

## METAMORPHIC ROCK Use if column 19 contains a B

### Column 20 TYPE OF METAMORPHISM

Metagneous

			Metasedimentary
			Original rock type uncertain
A	B	C	Contact metamorphism
D	E	F	Regional metamorphism
G	H	J	Shear metamorphism
K	L	M	Hydrothermal (metamorphic or deuterite)
N	P	Q	Mixed types of metamorphism

### Column 21 FACIES OR GRADE\*

After Turner (1968)

A. Albite-epidote-hornfels facies	G. Greenschist facies
B. Hornblende-hornfels facies	H. Amphibolite facies
C. Pyroxene-hornfels facies	J. Granulite facies
D. Sanidinite facies	K. Glaucophane-lawsonite-schist facies
E. Zeolite facies	L. Eclogite facies
F. Prehnite-pumpellyite-metagraywacke facies	

#### General

M. Low grade	P. High grade
N. Medium grade	Z. Other (describe under "Comments")

### Column 22 METASOMATISM

1. Clearly metasomatic
2. May be metasomatic
3. No evidence for metasomatism

\* Turner, F.J., 1968, Metamorphic petrology: McGraw-Hill Book Company, p. 187 and 366.

**Column 23 TEXTURE**

Schistose (Fissile)

Gneissic (Layered)

Massive

A	B	C	Fine grained, <1 mm
D	E	F	Medium grained, >1, <5 mm
G	H	J	Coarse grained, >5 mm
K	L	M	Inequigranular
N	P	Q	Porphyroblastic

**Column 24 COMPOSITION**

Quartz Present

Quartz Not Present

Presence of Quartz Uncertain

A	B	C	Calcareous or dolomitic (marble)
D			Siliceous (quartzite)
E	F	G	Ferruginous or manganeseiferous
H	J	K	Aluminosilicate, pelitic (schist, phyllite, mica gneiss)
L	M	N	Calc-silicate (skarn)
P	Q	R	Feldspathic (granite gneiss, syenite gneiss, biotite gneiss)
S	T	U	Mafic (greenstone, greenschist, amphibolite)
+	V	W	Ultramafic (serpentinite, pyroxenite)
X	Y	Z	Other (specify under "Comments")

## **SEDIMENTARY ROCK**    Use if column 19 contains a C

### **Column 20    TENTATIVE NAME**

- |                                  |  |
|----------------------------------|--|
| A. Claystone                     | M. Bentonite                           |
| B. Mudstone                      | N. Phosphorite                         |
| C. Shale                         | P. Chert                               |
| D. Siltstone                     | Q. Breccia                             |
| E. Sandstone                     | R. Water-laid tuff                     |
| F. Quartzite                     | S. Oil shale                           |
| G. Conglomerate                  | T. Evaporite                           |
| H. Arkose                        | U. Sulfate deposit                     |
| I. Graywacke                     | (gypsum, anhydrite)                    |
| J. Limestone, marlstone          | V. Chloride deposit (halite, sylvite)  |
| K. Dolomite, dolomitic marlstone | W. Carbonate deposit (nahcolite, etc.) |
| L. Limestone and (or) dolomite   | Z. Other (describe briefly under       |
|                                  | “Comments”)                            |

### **Columns 21-22    MODIFIER** **(Code up to two in order of predominance)**

- |                           |                                   |
|---------------------------|-----------------------------------|
| A. Laminated              | U. Arkosic                        |
| B. Massive                | V. Lithic                         |
| C. Clastic                | W. Micaceous                      |
| D. Bioclastic             | X. Phosphatic                     |
| E. Concretionary          | Y. Siliceous                      |
| F. Nodular                | 1. Cherty                         |
| G. Oolitic                | 2. Tuffaceous                     |
| H. Pelletal               | 3. Volcanic                       |
| J. Sandy                  | 4. Zeolitic                       |
| K. Silty                  | 5. Petroliferous                  |
| L. Clayey                 | 6. Sulfatic                       |
| M. Calcareous             | (gypsum, anhydrite, etc.)         |
| N. Dolomitic              | 7. Chloridic                      |
| P. Bentonitic             | (halite, sylvite, etc.)           |
| Q. Ferruginous            | 8. Carbonatic                     |
| R. Manganiferous          | (nahcolite, etc.)                 |
| S. Carbonaceous (organic) | Z. Other (describe in “Comments”) |
| T. Glauconitic            |                                   |

### **Column 23    ENVIRONMENT OF DEPOSITION**

- A. Marine
- B. Continental
- C. Transitional

## **UNCONSOLIDATED SEDIMENT**    Use if column 19 contains a D

### **Column 20    NATURE OF MATERIAL**

1. Gravel
2. Sand
3. Silt
4. Clay
5. Mud (silt and (or) clay)
6. Ooze
7. Marl
8. Precipitate
9. Peat (may also be coded as organic fuel)

### **Columns 21-22    MODIFIER** **(Code up to two in order of predominance)**

- |                  |                                       |
|------------------|---------------------------------------|
| A. Laminated     | S. Carbonaceous (organic)             |
| B. Massive       | T. Glauconitic                        |
| C. Clastic       | U. Arkosic                            |
| D. Bioclastic    | V. Lithic                             |
| E. Concretionary | W. Micaceous                          |
| F. Nodular       | X. Phosphatic                         |
| G. Oolitic       | Y. Siliceous                          |
| H. Pelletal      | 1. Cherty                             |
| J. Sandy         | 2. Tuffaceous                         |
| K. Silty         | 3. Volcanic                           |
| L. Clayey        | 4. Zeolitic                           |
| M. Calcareous    | 5. Petroliferous                      |
| N. Dolomitic     | 6. Sulfatic (gypsum, anhydrite, etc.) |
| P. Bentonitic    | 7. Chloridic (halite, sylvite, etc.)  |
| Q. Ferruginous   | 8. Carbonatic (nahcolite, etc.)       |
| R. Manganiferous | Z. Other (describe in "Comments")     |

### **Column 23    ENVIRONMENT OF DEPOSITION**

- |                                      |  |
|--------------------------------------|--|
| A. Stream deposit                    | L. Tidal flat deposit                    |
| B. Lake deposit                      | M. Offshore bar or spit                  |
| C. Talus or colluvium                | N. Deltaic deposit                       |
| D. Alluvial fan deposit              | P. Lagoonal deposit                      |
| E. Dunes sand or loess               | Q. Estuarine deposit                     |
| F. Swamp deposit                     | R. Other type of marginal marine deposit |
| G. Spring deposit                    | S. Marine terrace deposit                |
| H. Residual or lag deposit           | T. Nearshore marine deposit              |
| I. Glacial deposit                   | U. Deep sea deposit                      |
| J. Other type of continental deposit | V. Other type of marine deposit          |
| K. Beach deposit                     | Z. Other                                 |

## **MINERAL**      Use if column 19 contains an E

### **Column 20   MINERAL GROUP**

- A. Native elements
- B. Sulfides
- C. Sulfosalts
- D. Oxides (excluding silicate)
- E. Multiple oxides containing niobium, tantalum, titanium
- F. Halides
- G. Carbonates
- H. Nitrates and borates
- J. Sulfates and chromates
- K. Phosphates
- L. Vanadates and uranates
- M. Arsenates and antimonates
- N. Selenium and tellurium compounds
- P. Molybdenates and tungstates
- Q. Salts of organic acids
- R. Forms of silicate
- S. Feldspars, feldspathoids, and zeolites
- T. Amphiboles, pyroxenes, and other chain structures  
(including polygorskite and sepiolite)
- U. Micas, clays, and other sheet structures
- V. Ring structures and isolated tetrahedra
- W. Other silicates
- Z. Other

**Column 21 HOST MATERIAL**

- |  |                                      |
|--|--------------------------------------|
| A. Mafic intrusive                       | R. Gneiss                            |
| B. Mafic extrusive                       | S. Granulite                         |
| C. Intermediate intrusive                | T. Marble                            |
| D. Intermediate extrusive                | U. Shear product                     |
| E. Felsic intrusive                      | V. Conglomerate, sandstone           |
| F. Felsic extrusive                      | W. Shale, siltstone                  |
| G. Pyroclastic                           | X. Limestone                         |
| H. Pegmatite, vein                       | Y. Dolomite                          |
| J. Serpentine, metamorphosed mafic rocks | 1. Evaporite                         |
| K. Hornfels                              | 2. Alluvium                          |
| L. Tactite                               | 3. Colluvium                         |
| M. Quartzite                             | 4. Glacial drift                     |
| N. Slate                                 | 5. Wind-blown deposit                |
| P. Phyllite                              | 6. Organic material                  |
| Q. Schist                                | 7. Beach deposit                     |
|  | Z. Other (describe under "Comments") |

**Columns 26-30 ALPHABETIC CODE FOR MINERAL NAME**

Use a five-letter code (one letter in each column). Use the first letter of the mineral name, whether it is vowel or consonant, followed by the next four consonants (delete: *a, e, i, o, u*, and *y* unless entire name is five letters or fewer). If there are fewer than four consonants in the name, leave blank columns on the right. [Exception: Standard Potassium Feldspar should be coded KSPAR.]

*Example:* Apatite becomes APTT.



**SOIL**    Use if column 19 contains an F

**Column 20    SOIL HORIZON**

- A. Top soil (A horizon)
- B. Intermediate zone (B horizon)
- C. Bottom zone (C horizon)
- E. Composite (mixture of zones)
- F. No zoning apparent

Note: Record depth from which sample was taken under "Comments."

**Column 21    SOIL CATEGORY\***

- A. Saline soil
- B. High sesquioxide (ferritic) soil (red to reddish-brown in some or all horizons)
- C. Organic soil (highly organic throughout profile; peat, bog)
- D. Well-drained non-saline, non-ferritic, *calcareous soil* with well-marked soil horizons (strong profile development)
- E. Well-drained non-saline, non-ferritic, *non-calcareous soil* with well-marked soil horizons
- F. Poorly drained non-saline, non-ferritic, *calcareous soil* with well-marked soil horizons
- G. Poorly drained non-saline, non-ferritic, *non-calcareous soil* with well-marked soil horizons
- H. Soil with poorly defined soil horizons (weak profile development) caused by climate (e.g., some desert soils, some arctic soils)
- I. Soil with poorly defined soil horizons caused by *youth of soil* (e.g., soil derived from recent alluvium, colluvium, residual bedrock)
- J. Humus (forest litter, etc.)

**Column 22    PRESENT BIOTIC SETTING**

- 1. Cultivated land (including orchards, pastures)
- 2. Native grassland
- 3. Scattered timber land
- 4. Forest
- 5. Swamp (including bog)
- 6. Desert
- 7. Tundra (including alpine tundra)
- 8. Shrub or brush covered (chaparral, sagebrush)
- Z. Other

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\* Ball, D.F., 1967, Classification of soils, in Peterken, G.F. ed., Guide to the Check Sheet of IBP Areas, p. 121-125: Oxford and Edinburgh, Blackwell Scientific Publications, p. 133.

## **WATER** Use if column 19 contains a G

### **Column 20 TYPE OF WATER**

#### *Surface Water*

- A. Stream
- B. Normal lake
- C. Evaporite lake
- D. Marginal marine (brackish)
- E. Normal marine
- F. Canals, reservoirs, and similar works of man
- G. Glacial
- H. Other surface water (describe under "Comments")

#### *Ground Water*

- J. Spring
- K. Well
- L. Mine
- M. Oil well brine
- N. Other ground water (describe under "Comments")

#### *Other Water*

- S. Atmospheric
- T. Liquid inclusions
- U. Pore water
- Z. Other (describe under "Comments")

### **Column 21 ENVIRONMENT AT COLLECTION SITE**

Water Temperature <75°F

Water Temperature >75°F

- |   |   |  |
|---|---|--|
| A | B | Igneous rocks                              |
| C | D | Metamorphic rocks                          |
| E | F | Sedimentary rocks                          |
| G | H | Alluvium or other unconsolidated sediments |

**PLANT**

Use if column 19 contains an H

Group Column 20	Class or Order Column 21	Examples
1. Dicotyledoneae	No Coding	Seed plants, broad-leafed, net-veined; trees, shrubs, forbs
2. Monocotyledoneae	No Coding	Seed plants; narrow-leafed, parallel- veined; grasses, sedges, lilies, etc.
3. Gymnospermae  <i>Mostly coniferous, evergreens, shrubs</i>	1. Pinales  2. Taxales 3. Ginkgoales 4. Gnetales 5. Cycadales	Pine, spruce, hemlock, fir, larch cypress, juniper, etc. Yew Ginkgo (maidenhair) tree Mormon tea, and a few others Cycads, "sago palm"
4. Pteridophyta  <i>The ferns and fern relatives</i>	1. Equisetinae 2. Lycopodinae 3. Filicineae 4. Others	Horsetails, "scouring rush" Lycopodium, "ground pine" True ferns, (azolla, marsilia) Selaginella, psilotum, isoetes, etc.
5. Bryophyta	1. Musci 2. Hepaticae 3. Anthocerotae 4. Sphagna	Mosses Liverworts, leafy and thallose Hornworts Sphagnum
6. Algae	1. Rhodophyta 2. Phaeophyta 3. Pyrrophyta 4. Chrysophyta 5. Chlorophyta 6. Charophyta 7. Euglenophyta 8. Cyanophyta	Red algae; mostly marine Brown algae; all marine Flame algae Golden algae Green algae, "pond scum" Stoneworts Euglena and other amoeba-like organisms Blue-green algae
7. Fungi	1. Phycomycetes 2. Ascomycetes 3. Basidiomycetes 4. Fungi imperfecti 5. Ascolichenes 6. Basidiolichenes 7. Lichenes imperfecti	Water molds, white rust, bread mold, etc. Yeast, ergot, powdery mildew, truffles, morels Mushrooms, puffballs, smuts, rusts, etc. Imperfect fungi Lichens with ascomycetes Lichens with basidiomycetes Imperfect lichens
8. Myxophyta	1. Myxomycetacea 2. Acrasieae 3. Plasmodiophoreae 4. Bacteriophyta	Slime molds   Bacteria

**Column 22-25 FAMILY**

The families are to be coded by a four-digit number, as presented in Family Names of the Plant Kingdom, International Plant Index.\* Use only the numbers to the right of the letter "V"; all entries must be four digits in length. If the number is less than four digits, it should be preceded by zeros (e.g., 42 should be 0042).

**Column 26-27 SPECIES**

Code the first two letters.

**Column 28-30 GENUS**

Code the first three letters.

Note: Reversal of the order of "Species" and "Genus" is deliberate to accommodate the data processing system.

**Column 35 PLANT PART**

- Whole plant
- 0. Above-ground parts (e.g., stems and leaves combined, seeds and fruits)
- 1. Roots
- 2. Stems (including twigs, branches, trunks, or wood)
- 3. Leaves (including leaf stalks or petioles)
- 4. Stem tips (young branch tips with immature leaves)
- 5. Bark of roots
- 6. Bark of stems (branches or trunk)
- 7. Seed
- 8. Fruit (Note: grass seed and cereal grains are fruits)
- 9. Flowers (including entire inflorescence)
- Z. Other

*Continued on next page...*

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\* Gould, Sidney W., 1962, Family names of the plant kingdom: International Plant Index Volume One, p. 9-33.

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**Column 36 HABITAT**

- 0. Xerophyte (plants specially adapted to and growing in dry locations)
- 1. Mesophyte (plants growing in soil of moderate moisture content)
- 2. Hydrophyte (plants growing in bogs, swamps; aquatic plants)
- 3. Phreatophyte (plants whose roots extend to groundwater table and are thus able to grow in very dry surface soil)
- 4. Halophyte (plants specially adapted to and growing in high-salt concentrations, including "alkali" soil)
- 5. Epiphyte (plants growing on other plants, but deriving moisture from the air)
- 6. Parasite (plants growing on other plants and deriving nourishment from them)
- 7. Saprophyte (plants growing on decaying organic matter)

**Column 37 LIFE FORM**

- 0. Tree, conifer (usually evergreen with needle-like leaves)
- 1. Tree, non-conifer (usually deciduous with broad leaves)
- 2. Shrub, conifer
- 3. Shrub, non-conifer
- 4. Forb (herbaceous, usually broad-leaved plants)
- 5. Grass and grass-like (including sedges and rushes)
- 6. Vine, woody
- 7. Vine, herbaceous
- Z. Other

**Column 38 BIOTIC SETTING**

- 1. Cultivated land (including orchards, pastures)
- 2. Native grassland (grazing land)
- 3. Scattered timber land
- 4. Forest
- 5. Swamp (including bog)
- 6. Desert
- 7. Tundra (including alpine tundra)
- 8. Shrub or brush covered (chaparral, sagebrush)
- Z. Other

## ORGANIC FUEL OR RELATED SUBSTANCE

Use if column 19 contains an I

### **Column 20    TENTATIVE NAME OF FUEL OR RELATED SUBSTANCE**

- A. Peat (may also be classified as an unconsolidated sediment)
- B. Coal
- C. Lignite
- D. Subbituminous coal
- E. Bituminous coal
- F. Anthracite coal
- J. Natural gas
- K. Petroleum
- L. Solid and semi-solid hydrocarbon (asphalt, gilsonite, etc.)
- Z. Other (describe under "Sample Description and Comments")

Note: Samples of oil shale should be coded as sedimentary rocks.

## **MISCELLANEOUS**    Use if column 19 contains a J

### **Column 20   MISCELLANEOUS**

- |                         |  |
|-------------------------|--|
| A. Gossan               | L. Synthetic solution                      |
| B. Limonite             | M. Synthetic product (other than solution) |
| C. Jasperoid            | N. Desert varnish                          |
| D. Nodule or concretion | P. Caliche                                 |
| E. Plant fossil         | Q. Duricrust                               |
| F. Invertebrate fossil  | R. Fumarolic sublimate                     |
| G. Vertebrate fossil    | S. Fault breccia, mylonite or gouge        |
| H. Modern shell         | T. Meteorite                               |
| J. Animal parts         | U. Tektite                                 |
| K. Artifact             |  |

These should be described briefly under "Comments."

## HEAVY-MINERAL CONCENTRATE

Use if column 19 contains a K

### Column 20 HEAVY-MINERAL CONCENTRATE

- A. C-1 highly magnetic fraction derived from stream sediment
- B. C-2 less magnetic fraction derived from stream sediment
- C. C-3 nonmagnetic fraction derived from stream sediment
- D. Bulk from stream sediment
  
- E. C-1 highly magnetic fraction derived from soil
- F. C-2 less magnetic fraction derived from soil
- G. C-3 nonmagnetic fraction derived from soil
- H. Bulk from soil
  
- I. C-1 highly magnetic fraction derived from lake sediment
- J. C-2 less magnetic fraction derived from lake sediment
- K. C-3 nonmagnetic fraction derived from lake sediment
- L. Bulk from lake sediment
  
- M. C-1 highly magnetic fraction derived from sand dune
- N. C-2 less magnetic fraction derived from sand dune
- O. C-3 nonmagnetic fraction derived from sand dune
- P. Bulk from sand dune
  
- Z. Other





## Other Considerations

### **Mailing Address**

*Submit Samples to:*

Sample Control  
US Geological Survey, Branch of Geochemistry  
PO Box 25046, MS 928  
Denver Federal Center  
Denver, CO 80225

### **ACSG Liaison**

The ACSG Liaison is responsible for organizing and coordinating specialized geoanalytical programs for scientists who wish to use the ACSG and/or BGC's research chemistry capability. Project chiefs and program managers who develop new research plans and initiatives may contact a liaison to discuss their requirements for chemical analysis. The ACSG liaison office is also responsible for the development of customized analytical protocols, which are designed to meet the needs of other funding agencies.

### **Processing Priority**

Samples are usually processed on a first-in, first-out basis. If a reason exists to process samples on a faster basis, priority may be granted. However, a priority may only be granted by the BGC Branch Chief. Request for priority must be in writing from the submitter's Branch Chief and should contain the following information:

1. Submitter name
2. Reason for priority request
3. Type of analysis required
4. Number of samples
5. Date that analysis is needed

### **Sample Sorting Rooms**

A sample sorting room is available in Denver for sample collector use. To schedule use of this facility, contact Sample Control at (303) 236-2479.

### **Catalog of Services**

The Catalog of Services provides information on routine services and custom analytical methods available through BGC. It covers such issues as species determination, limits of detection, concentration ranges, and assignment of uncertainty. The catalog is available on request by phoning (303) 236-2495.

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## **Quality Assurance/Quality Control**

Analytical work conducted by the BGC is subject to QA/QC procedure. Information and limitations on the routine service techniques covered by this program can be obtained through the branch QA/QC representative at (303) 236-2495. You may also refer to Open-File Report 90-668, the QA/QC Manual.

## **Retrievals**

Information relating to your samples, whether provided by you or generated by an analyst, is stored in the National Geochemical Database. (Data generated by an analyst are not available until you have received a computer printout of the results from Sample Control.) These data can be retrieved by contacting Branch Computer Support Personnel. Address a written request to:

Supervisor, Computer Support Group  
U.S. Geological Survey  
Branch of Geochemistry  
Box 25046, MS 973  
Denver Federal Center  
Denver, CO 80225-0046  
FAX (303) 236-3200

The request should contain the following information:

1. Requester name
2. Requester address and phone number
3. Job numbers (if possible)
4. Date needed
5. Type of media and format

Data can be retrieved on diskette (recommended) or hard copy. For diskette retrieval, specify the desired database, spreadsheet, or .NCM format.

If you have access to the USGS network, the requested data can be placed on the Branch of Geochemistry server. You can do an anonymous login to the ftp directory and copy your files. Further information will be provided to you if you request this service.

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## Appendix 1

### Branch Contacts

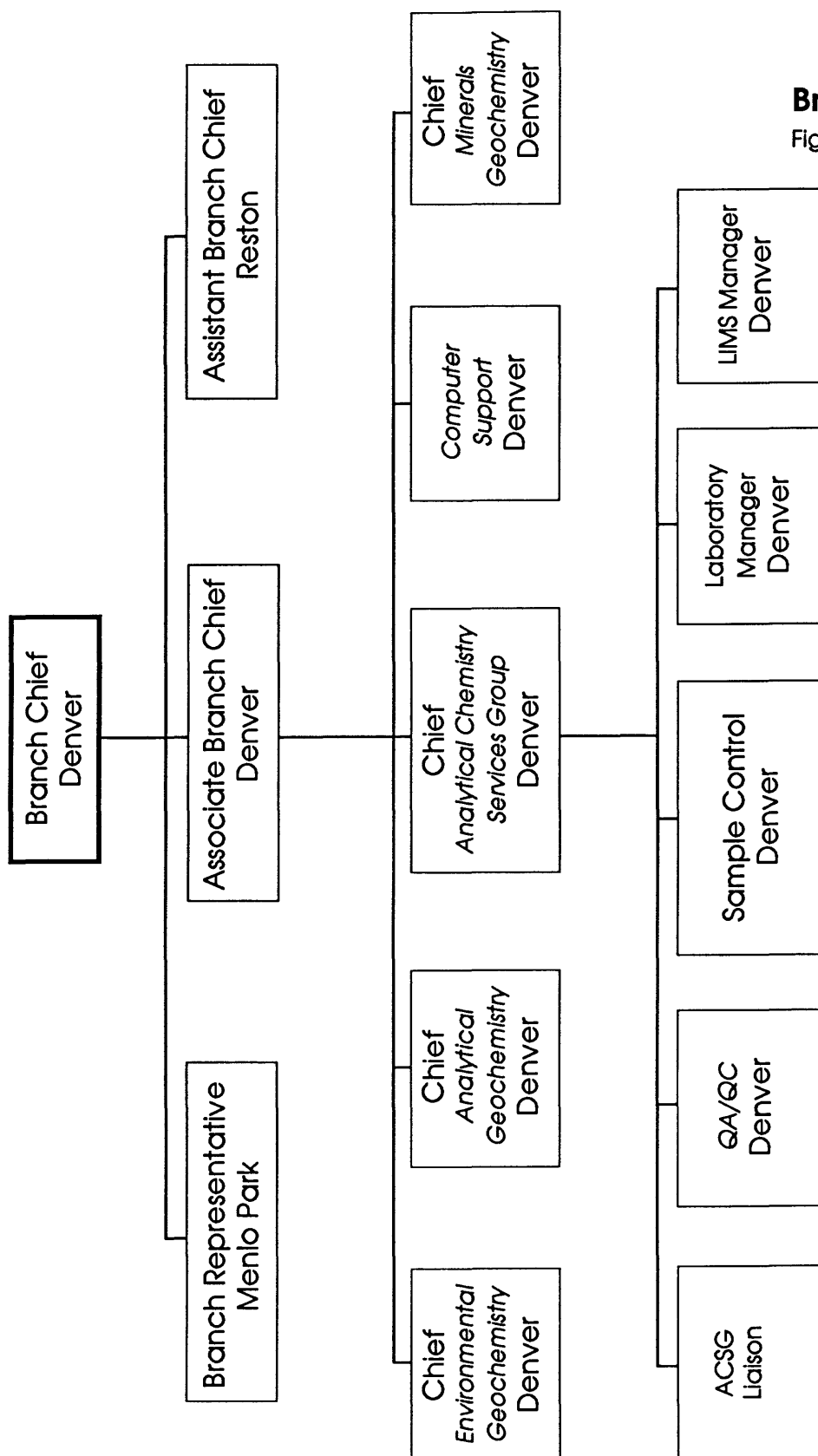
The Branch of Geochemistry prides itself on meeting your needs with the best available technology. To achieve this goal, the branch is divided into specialized elements (fig. 2). If you have problems, or if we can further assist you, please contact us.

<b>Denver, Colorado</b>	<b>Telephone</b>
<hr/>	
<i>Box 25046, MS 973</i>	
<i>Denver Federal Center</i>	
<i>Denver, CO 80225-0046</i>	
<hr/>	
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Steve McDanal, Computer Support Group	(303) 236-1187
Belinda Arbogast, Quality Assurance	(303) 236-2495
Christine Murphy, Sample Control	(303) 236-2479
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<i>12201 Sunrise Valley Drive, MS 923</i>	
<i>Reston, VA 22092-0001</i>	
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<i>345 Middlefield Road, MS 938</i>	
<i>Menlo Park CA 94025-3591</i>	
<hr/>	
Bi-Shia King, Branch Representative	(415) 329-5288
Terry Fries, ACSG Representative	(415) 329-5281

# Appendix 1

## Branch Contacts

Figure 2



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## Appendix 2

# State Abbreviations

Alabama	AL	New Hampshire	NH
Alaska	AK	New Jersey	NJ
Arizona	AZ	New Mexico	NM
Arkansas	AR	New York	NY
California	CA	North Carolina	NC
Colorado	CO	North Dakota	ND
Connecticut	CT	Ohio	OH
Delaware	DE	Oklahoma	OK
Florida	FL	Oregon	OR
Georgia	GA	Pennsylvania	PA
Hawaii	HI	Rhode Island	RI
Idaho	ID	South Carolina	SC
Illinois	IL	South Dakota	SD
Indiana	IN	Tennessee	TN
Iowa	IA	Texas	TX
Kansas	KS	Utah	UT
Kentucky	KY	Vermont	VT
Louisiana	LA	Virginia	VA
Maine	ME	Washington	WA
Maryland	MD	West Virginia	WV
Massachusetts	MA	Wisconsin	WI
Michigan	MI	Wyoming	WY
Minnesota	MN		
Mississippi	MS	Canal Zone	CZ
Missouri	MO	District of Colombia	DC
Montana	MT	Guam	GU
Nebraska	NE	Puerto Rico	PR
Nevada	NV	Virgin Islands	VI

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*Notes*