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**THE UINTA ARCH PROJECT — INVESTIGATIONS
OF URANIUM POTENTIAL IN PRECAMBRIAN X
AND OLDER METASEDIMENTARY ROCKS IN THE
UINTA AND WASATCH RANGES, UTAH AND
COLORADO**

FINAL REPORT

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Casper, Wyoming 82601

June 1980

PREPARED FOR U.S. DEPARTMENT OF ENERGY
Assistant Secretary for Resource Applications
Grand Junction Office, Colorado

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INTRODUCTION

This study is part of the United States Department of Energy's National Uranium Resource Evaluation Program to understand the geologic setting, amount, and availability of uranium resources within the boundaries of the United States. The systematic study of Precambrian quartz-pebble conglomerates and areas that may contain such conglomerates is an integral part of DOE's resource evaluation program, because deposits of world-wide importance occur in such terrains in Canada and South Africa, and because terrains similar to those producing uranium from quartz-pebble conglomerates exist elsewhere in the United States. Because of the ready availability of Tertiary sandstone and Colorado Plateau-type uranium deposits, large areas of Precambrian rocks in the U.S. have not been fully assessed for uranium potential. Thus, the Uinta Arch Project was undertaken to assess the favorability of Precambrian metasedimentary rocks in northern Utah for deposits of uranium in Precambrian quartz-pebble conglomerates.

Rocks of interest to this study are the thick, clastic sequences within the Uinta Arch (Figure 1) that are considered to be of Early Proterozoic age. The Uinta Arch area is known to contain rocks which generally fit the lithologic characteristics that are understood to limit the occurrence of Precambrian fossil placers. However, detailed geology of these rocks and their exact fit to the model described for uraniferous conglomerates was not known. The primary goal of the Uinta Arch Project was to determine how well these Precambrian rocks resemble known deposits and to describe the favorability of placer uranium deposits.

EXPLANATION: Areas of investigation in black; areas of mainly Phanerozoic rock in heavy stipple; Precambrian Y Uinta Mountain Group in light stipple; areas of mainly Quaternary deposits are clear.

Figure 1. Location of areas of investigation, Uinta Arch Project.

TERMINOLOGY

Work done by Roscoe (1969) in southern Canada established that uraniferous quartz-pebble conglomerates and associated clastic rocks of the Huronian Supergroup were deposited during Early Proterozoic time (2.2 to 2.5 b.y. ago). Although this assignment is justified in the Huronian Supergroup and establishes a minimum age of formation for uraniferous fossil placers, we now know that other such clastic sequences transcend the widely agreed on chronologic boundary of 2500 m.y. ago for the Archean and Proterozoic Eons. For example, the lowest portion of the metasedimentary rocks of the Witwatersrand district, the Pongola Sequence, is probably older than 3000 m.y. (Van Eeden, 1972) and the lowest portion of clastic sediments in the Snowy Range Supergroup (Graff, 1978) of southern Wyoming are older than about 2700 m.y. (Carl Hedge, pers. comm.). These early ages for clastic sequences are the result of cratonic stability being reached, as one would expect, at different times for different Archean cratons. Because of the spread of ages for early, mature clastic sequences, Houston and Karlstrom (1980, p.4) have initiated the term "Early Proterozoic-type metasedimentary sequences" to be applied to all rocks, of Early Proterozoic or older age, which are early clastic successions that reflect the achievement of crustal stability for their respective cratons. Because the exact ages of the rocks studied for the Uinta Arch Project are unknown, this new term is particularly applicable and is used in this report.

The methods by which other authors have divided Precambrian time are many and each scheme has its own merit (James, 1978). The nomenclature systems used for Precambrian time in this report are shown in the table below (Figure 2).

Figure 2. Nomenclature for divisions of Precambrian time used in this report. Modified from James, 1978; Houston and Karlstrom, 1980.

RED CREEK QUARTZITE

INTRODUCTION

The Red Creek Quartzite has been recognized as a separate Precambrian unit since the 1868 expedition of J. W. Powell, and in a later report, Powell (1876) describes the Red Creek rocks as basement for the Uinta Mountain Group. Other early investigators include Hayden (1872), King (1878), and Van Hise (Van Hise and Leith, 1909). These early studies concluded that the rocks at Red Creek are highly metamorphosed and stand at a high angle to gently dipping, unmetamorphosed, overlying Uinta Mountain Group rocks. The most notable of recent studies is that of Hansen (1965) who also describes the unconformity first recognized by Powell and provides the most complete report available on the geology of the area. In his report, Hansen lays the structural and lithologic ground work for Precambrian X rocks by structural analysis and stratigraphic division of the metasedimentary sequence.

Rocks of Precambrian X and older age are exposed as seven separate blocks which crop out over a distance of about 20 km along the upthrust side of the Uinta Fault in northeastern Utah (Figure 3). These blocks are composed of Red Creek Quartzite strata and a gneissic complex herein informally called the Owiyukuts Complex. These blocks are separated by unconformably overlying, and in-faulted strata of the Uinta Mountain Group (Figure 3), but contain a stratigraphic thickness of more than 4 km of metamorphosed miogeoclinal rocks that lie just north of the projected southern boundary of the Archean-aged Wyoming Province (Engel, 1963; Karlstrom, 1979). Structural and petrographic relationships suggest that

the miogeoclinal sequence was thrust northward onto the Archean craton. This thrusting occurred during waning phases of regional metamorphism, before emplacement of 1550 m.y. old pegmatites (Hansen, 1965) and is probably the result of activity during the Hudsonian orogenic period about 1800-1600 m.y.b.p. Subsequent development of the Uinta aulacogen disrupted the Red Creek Quartzite and juxtaposed contrasting tectonic levels along high angle faults. The Uinta aulacogen was the depositional site of the Uinta Mountain Group sediments between about 1500 and 900 m.y. ago (King, 1969; 1976). Closure of the aulacogen during the Laramide Orogeny may have reactivated aulacogen-forming faults with reverse movement and thrust Precambrian strata northward.

Figure 3. Location of Red Creek Quartzite and Oviyukuts Complex, northeast Uinta Mountains. Oviyukuts Complex (OC), Red Creek Quartzite (rc), Uinta Mountain Group (Yug), Phanerozoic rocks undivided (K), Browns Park Formation (Tbp).

STRATIGRAPHY

INTRODUCTION

Stratigraphic units used here to describe the Red Creek Quartzite are informal units which are defined on a lithostratigraphic basis. Lithologies of pre-Uinta Mountain Group Precambrian rocks used to make these divisions include: epidiorite of uncertain age; previously unreported quartzofeldspathic and granite gneisses which appear to have been basement for deposition of the Red Creek Quartzite; a thick section of highly folded quartz mylonite rocks; clastic and carbonate metasedimentary rocks; and thick bodies of amphibolite and amphibolite dike rocks.

Correlation and extrapolation of the clastic and carbonate rocks of the Red Creek Quartzite is accomplished by down-plunge projection between three separate blocks of Red Creek Quartzite. These blocks are separated by only a few hundred meters and the projection is made across depositional boundaries between Red Creek and Uinta Mountain Group rocks. Because of rapid lateral and vertical facies changes and covered areas between blocks, precise measurement of the thickness of units is not feasible, and the correlation developed by this projection is not without problems. Despite the problems of uncertainty, the section presented here (Figure 4) provides a working framework from which further and more detailed studies may be built.

OWIYUKUTS COMPLEX

The Owiukuts Complex is the name informally given and used in this paper to describe a previously unreported complex of granitic and quartzofeldspathic gneisses which is best exposed in the canyon of Beaver Creek

RED CREEK QUARTZITE

Fault Contact

Gneissic rock w/inlayed quartzite and schist. Gneisses are pegmatite, quartzites are gray, fine-grained. Approx. 200'. Thin interlayered carbonate and schist.

Quartzite, mass, white, w/gray banding, completely recrystallized. Fe-stained thin bands of chloritic schist, thin zone of pegmatite. Highly fractured w/distinct zone of breccia. Fine-grained green mica defining foliation. Thin micaceous schists. 500-800'.

Pelite. Thinly bedded quartzite, up to 2' gradually interfaced w/schist. Schists are rusty, contain decreasing amounts of clean quartzitic mica schists. Intruded by pegmatite. Quartzose schists, finely laminated w/ thin granitic veins, interbedded quartzites and graywackes. Silvery mica schist w/isoclinally folded, thin, quartzite beds. Marble-brownish-yellow carbonite. Approx. 20'. Silvery mica schist-very phyllitic w/chlorite layers, blueish mica schist thin layer w/magnetite clots, thin quartzite layers or lenses. Quartzose schist. Very thin banded iron-rich rock, approx. 10' thick. Dark brown fine-medium-grained quartzites, very thinly bedded, silvery schist w/some thick quartzite layers. Silvery mica-quartz schists w/ phyllitic partings and euhedral magnetite crystals. Marble-white crs-grained dolomite marble w/tremolite minor red l.s. interlayered w/green schist. Thickness approx. 2000' + 1000' of intrusive amphibolite (not shown)

Quartzite. Massive, white, fine-grained quartzite. Texture is sugary and completely recrystallized. Some minor amounts of garnet schists in the lower portion and local 1' thick marble layers. Lowest 800' characterized by purple quartzite. Lower contact is faulted against lower Pelite.

Pelite. Silver-gray and light brown
phyllitic fine-grained quartzite. Approx
400'.

Arkosic, quartzite interbedded carbonate (marbles) interlayered viter. quartzite, phyllitic quartzite.

SYMBOLS

- ◆ MAGNETITE CRYSTALS
- ★ STAUROLITE CRYSTALS
- GARNET CRYSTALS
- ▬ CARBONATE
- ▬ SCHIST
- ▬ QUARTZITE
- ▬ MICACEOUS PARTINGS, PHYLLITIC QUARTZITE

Figure 4. Stratigraphic column, Red Creek Quartzite.

along the Colorado-Utah border. This section may be greater than 3 km thick and is dominated by fine- to medium-grained potassium feldspar-rich granite gneisses. The granite gneiss is interleaved with quartzo-feldspathic gneiss, garnet gneiss, fine-grained biotite gneiss, migmatite, and garnet amphibolite. Rb-Sr ratios and total calcium and iron indicate that the granite gneisses are of igneous origin (Carl Hedge, pers. comm.). Minor amounts of sillimanite-potassium feldspar gneiss are interleaved with the upper (?) portion of the granite gneiss and may be part of the sedimentary sequence. The granitic gneiss is also exposed at highly weathered and altered outcrops on Mountain Home, on Bender Mountain, at Dutch John Gap, and on Dutch John Mountain.

Granite gneisses are least weathered and altered and are best exposed in the canyon of Beaver Creek. At that location the granite gneisses are interleaved with feldspathic quartz mylonites. Typical granite gneiss contains quartz and microcline with lesser amounts of muscovite and chlorite. At least some of the chlorite is retrograde after biotite. The rock has a mildly recrystallized granoblastic polygonal texture with a weak foliation defined by muscovite and elongate quartz grains. The interleaved nature of the outcrop is probably a tectonic feature and is on the scale of meters to a few tens of meters of thickness for each layer.

The biotite-plagioclase-quartz gneiss, garnet-bearing gneiss, and sillimanite-bearing gneiss which are interlayered with the granite gneiss may in part be metavolcanic and/or metasedimentary rock. Thin section analysis indicates that these rocks are a suite of quartz-plagioclase-biotite-chlorite gneisses that may or may not contain garnet and sillimanite.

All layers of gneiss sampled from this suite have granoblastic polygonal textures with some minor recrystallization and fracturing of plagioclase grains. Retrogressively formed chlorite after biotite and garnet is common in this suite.

RED CREEK QUARTZITE

The stratigraphic column developed here (Figure 4) for the Red Creek Quartzite is comprised of more than 4 km of mature clastic and carbonate metasediments exposed in the three largest and most tightly grouped areas of Red Creek Quartzite outcrop, located in Red Creek and Jesse Ewing Canyons and on Goslin Mountain. The section is carried from block to block by means of down-plunge projection of the Garnet Canyon Anticline (Hansen, 1965). This structure is the major feature in the central portion of Red Creek Quartzite and is traceable across the entire area of outcrop at Garnet Canyon. Extrapolation of the section is complicated by minor folds, faults of varying displacements, rapid vertical and horizontal facies changes, and intrusions of thick, lenticular amphibolite dikes.

GEOCHRONOLOGY

PREVIOUS WORK

Geochronological work which was done in conjunction with Hansen's (1965) U.S.G.S. Professional Paper has established the Early Proterozoic age of 2320 m.y. (Hansen, 1965, p. 31) as a minimum age for metamorphism of the Red Creek Quartzite. This age is based on Rb-Sr analysis of muscovite from

schist located in the Jesse Ewing Canyon area. Because this data was calculated by single mineral analysis of muscovite in a metamorphic rock, Hansen considers it to be a metamorphically reset age and, therefore, the rock must be older.

The Rb-Sr date reported by Hansen (1965) was calculated from muscovite that had an anomalously low $^{87}\text{Rb}/^{86}\text{Sr}$ ratio (Hills, pers. comm.). Because of this and recent reconsiderations of the use of $^{87}\text{Rb}/^{86}\text{Sr}$ initial ratios derived for igneous rocks in isochrons calculated for sedimentary rocks (Hills, pers. comm.), it is necessary to re-evaluate early geochronological data.

AGE OF AMPHIBOLITES

Because age of formation of host rocks is a critical factor in the application of the quartz-pebble model, more geochronological work was undertaken. Because of the generally intrusive relationships and the possibility of more than one age of amphibolites, radiometric techniques were applied to rocks that, according to field evidence, may indicate different ages of emplacement or different structural levels of emplacement. Four samples were chosen for K-Ar analysis from two sites. Two samples of ductily deformed amphibolites from the quartz mylonite at the mouth of Beaver Creek Canyon and two samples of fractured amphibolites from Red Creek quartzites in Garnet Canyon were selected for K-Ar analysis. These analyses were performed by Teledyne, Westwood, N.J., on hornblende separates from the amphibolites.

The results of these analyses are presented in Figure 5. On the basis of field evidence, both YC samples and both BC samples should yield similar ages.

SAMPLE NO.	LOCATION	AGE (M.Y.)
YC-1	SW $\frac{1}{4}$ Sec. 4, R.24E., T.2N.	1168.5 $\pm$ 58.4
YC-2	SW $\frac{1}{4}$ Sec. 4, R.24E., T.2N.	1553.1 $\pm$ 77.7
BC-1	SE $\frac{1}{4}$ Sec. 14, R.25E., T.2N.	930.8 $\pm$ 46.5
BC-2	SE $\frac{1}{4}$ Sec. 14, R.25E., T.2N.	1613.4 $\pm$ 80.7

Figure 5. K-Ar ages of amphibolites from the Red Creek quartzite. BC= Beaver Creek samples; YC = Yellow Canary samples.

Samples YC-2 and BC-2 are similar to ages reported by Hansen (1965) and reflect the last cooling through the 500°C. isotherm at about 1600 m.y. ago. This age probably reflects the end of the Hudsonian event. Inspection of the separate used for Sample YC-1 showed a higher degree of contamination of plagioclase and greenish, perhaps weathered, grains of amphibole. A chemical analysis of all separates revealed that Sample BC-1 contained an anomalous amount of K (1.10%) which is 200 per cent more than any other sample. Amounts of K in excess of 1% may indicate contamination of the sample with biotite. Thus, analytical results of samples YC-1 and BC-1 are suspect and their interpretation is not attempted here.

OWIYUKUTS COMPLEX

Gneisses examined in this study are previously unreported. These granite gneisses are best exposed near O-Wi-Yu-Kuts Mountain in the canyon formed by Beaver Creek along the Colorado-Utah state boundary. Analyses of these rocks show Rb-Sr ratios, total Ca and total Fe favoring an igneous origin (Carl Hedge, pers. comm.). Field observations and petrographic investigations suggest that these gneisses

were probably of higher metamorphic rank than any pelitic sequence in the Red Creek Quartzite. Because of the apparent higher metamorphic grade and tectonic features suggesting that these rocks are faulted into contact with sillimanite and K-spar-bearing quartz mylonites, a suite of six samples was collected for a Rb-Sr whole-rock age for the Owiukuts Complex. This suite was collected from exposures in the canyon of Beaver Creek in Sections 13 (NW $\frac{1}{4}$) and 12 (SW $\frac{1}{4}$) T.11N., R.104W., Moffat County, Colorado. Age of this unit is considered important because of the possibility that these rocks may be basement for the deposition of the Red Creek Quartzite. Analysis of the Owiukuts Complex was completed by Dr. Carl Hedge of the U.S. Geological Survey. Results of those analyses yield a Rb-Sr derived date of 2700 ± 50 m.y. for gneisses of the Owiukuts Complex.

AGE AND CORRELATION OF THE RED CREEK QUARTZITE

Age

From geochronological work performed for this study, a new interpretation of the chronologic history can be constructed. It is apparent that the Owiukuts Complex is a tectonically emplaced sliver of Archean (PCW) rock that represents depositional basement for the Red Creek Quartzite. The existence of gneisses tectonically emplaced in the Red Creek Quartzite, and the movement from south to north during Laramide time, demands that the edge of the Archean-age Wyoming Province lay to the south of the present location of the Red Creek Quartzite. The important implication to application of the quartz-pebble conglomerate model to the Uinta rocks is that the possibility exists that basal conglomeratic sections of an intercratonic-type clastic wedge may be located somewhere south of the

exposed Red Creek Quartzite, if so, these sections are buried by great thicknesses of younger rock.

Although Archean ages are established for the Owiukuts Complex, the age of the Red Creek Quartzite is still uncertain. Evidence from studies of the metamorphic and structural characteristics (this report) of the Red Creek Quartzite with respect to the Owiukuts gneisses suggests that the clastic sequence is younger than the Owiukuts Complex. This does not resolve the question of Archean or Proterozoic age for the quartzites. If ages of the Owiukuts Complex (2700 m.y.) and the ages of amphibolites (1550 m.y.) do describe a time bracket for deposition of the Red Creek rocks, then they may be as young as Middle Proterozoic in age, or may have been deposited during Early Proterozoic time. At the other end of the bracket, the possibility exists that the Red Creek rocks may be an Archean, Early Proterozoic-type (Houston and Karlstrom, 1980) sequence. As such, the possibility of placer uranium deposits still exists within the basal portion of the sequence.

Despite the ambiguity, reasonable assumptions for the age of Red Creek metasediments can be made. Such assumptions require fundamental comparisons to nearby similar sequences. From such comparisons, the age of exposed Red Creek strata can be estimated to be about 2000 m.y. or younger. An important part of this comparison is the word exposed. Tectonic history of the Red Creek Quartzite (this report) describes the "decapitation" of listric fault blocks during closure of the Uinta aulacogen and tectonic transport of these slivers of Red Creek rock at least 10 km to the north. Because of this fragmentation of the section and the fact that only parts of the complete section are seen in exposures of Red Creek rocks today, the extent

and character of the entire Red Creek section may never be known. But working with the exposures, especially those in the Red Creek and Jesse Ewing Canyon areas, along the Uinta Fault, lithostratigraphic comparisons and inferred correlations can be made with better exposed Precambrian sequences both east and west of the Uinta Mountains.

Correlation

Early Proterozoic-type sequences are well documented to the east of the Red Creek area in southern Wyoming (see Houston and others, 1968; Karlstrom, 1977; Divis, 1976; and Graff, 1978), but metasediments to the west associated with the Farmington Canyon Complex have not been so thoroughly studied and their stratigraphic and tectonic characteristics are not completely understood.

Correlation of Red Creek rocks with those Archean and Proterozoic metasediments of north central Utah is here discouraged, mainly because exposures are fragmented, tectonically isolated and age relationships are complex. Studies done for this report suggest that rocks of these areas are neither the time nor lithologic correlatives of the exposed section at Red Creek. Archean and Proterozoic quartzites of north central Utah are quite clean and uniform, lacking development of pelitic sequences or any carbonate rocks. The depositional environment of the Red Creek Quartzite in northeastern Utah is most likely near-shore marine as indicated by rocks of beach and carbonate bank facies, but the sequences in north central Utah lack any diagnostic primary sedimentary structures as well as any diagnostic suites of lithologies. Because of their very high quartz content and lack of interbedded facies within the quartzites, Red Creek rocks are herein considered fluvial or near-shore marine quartzites.

Metasediments within the Farmington Canyon Complex appear to be in-folded with Archean migmatites and quartzofeldspathic gneisses, and are relatively small pods of quartzite rather than an intra- or intercratonic wedge. Quartzites in the Willard Peak area may be younger, 1.6-1.8 m.y. old (Sorensen and Crittenden, 1976) and are bounded by thrust faults and unconformities. The metamorphic grade of these quartzites is high enough to have destroyed primary sedimentary structures. The depositional environment of these rocks is not known. As with the rocks of the Farmington Canyon Complex, correlation of the Red Creek Quartzites with Facer Creek rocks is unappealing at best.

A possible exception to this condition is that Red Creek rocks may be roughly the same age as the Little Willow Formation. This correlation is based on the fact that the Little Willow rocks do contain slightly radioactive conglomerates and thus may have been deposited during Early Proterozoic time. This remains only an undocumented possibility and though they may share a similar time of formation, depositional environments differed widely and lithostratigraphic correlation is not possible.

Correlation schemes with rocks to the east of Red Creek have been recognized for some time. Blackwelder (1935) suggested that similarities between the Red Creek Quartzites and quartzite rocks in the Sierra Madre and Medicine Bow Mountains needed to be examined as they may provide a correlation. He also suggested that such a correlation may be extended to the Lake Superior region of southern Canada. Hansen (1965) cites Blackwelder's suggested correlation and favors correlation to the Medicine Peak Quartzite (Blackwelder, 1926; Houston and others, 1968) of the Medicine Bow Mountains, as a possible equivalent of the Red Creek Quartzite.

Rocks of the Red Creek Quartzite are not clearly the correlatives of any strata of the Sierra Madre of Wyoming. A review of Graff (1978) and Karlstrom (1977) will provide arguments for placing rocks of the Deep Lake Group of southern Wyoming stratigraphically below the lithologies found in the Red Creek rocks. Deep Lake Group rocks are dominated by fluvial facies rocks separated by paraconglomerates. They lack the interbedded carbonates found in the Red Creek sequence, which may suggest marginal marine facies rocks.

In this report, we suggest two possibilities for correlation to rocks in southern Wyoming (Figure 6). The Medicine Peak Quartzite and Sugarloaf Quartzite (Houston and others, 1968) may both be likely candidates for correlation. Both units contain thick, very clean quartzites of near-shore character (Houston and others, 1968) and were probably deposited after the atmosphere contained a considerable amount of oxygen as contained iron minerals are oxidized phases. This condition is reflected in Red Creek rocks by recrystallized magnetite found in quartz schists. Although no stromatolites were recognized during this study of Red Creek rocks, the carbonates of the upper part of the Red Creek section may represent a stratigraphic position equal to the upper Sugarloaf Quartzite. Sugarloaf rocks are overlain in the Medicine Bow Mountains by thick, stromatolitic limestones of the Nash Formation. Houston and others (1968) reports thin beds of marble in the upper Sugarloaf Quartzite.

The Medicine Peak and Sugarloaf Quartzites are separated by some 380 m of interlayered schists and quartzites called the Lookout Schist. This unit may also represent time and lithological correlatives to the Red Creek Quartzite. As a result of recent geochronological investigations, the depositional age of these three formations in the Medicine Bow Mountains is known

MEDICINE
BOW MTS
Lanthier, 1978

Figure 6. Correlation
of Red Creek Quartzite,
Utah and Libby Creek
Group, Wyoming.

to be older than 2000 m.y. (Karlstrom, pers. comm.). Thus the age of these rocks, and mineralogical and lithological constraints, allow for the correlation of Red Creek rocks with any one unit, any two adjacent, or perhaps all three units in the Medicine Bow Range. If correlatives for Wyoming rocks suggested by Young (1970), Graff (1978), and Houston, Karlstrom and Graff (1977) are followed, then quartzites at Red Creek may be the correlatives of rocks in the Cobalt Group, particularly the Lorraine Formation, of the Huronian Supergroup of southern Canada.

These correlation schemes place the Red Creek Quartzite well above units in the Huronian and Snowy Range Supergroups that contain uranium-bearing quartz-pebble conglomerates. The Medicine Peak Quartzite does contain quartz-pebble conglomerate horizons, but none of these conglomerates are radioactive (Lanthier, 1978). In both the Red Creek and Medicine Peak Quartzites heavy mineral suites include Fe oxide minerals, particularly magnetite. If the correlation suggested here is valid, it appears to greatly reduce the possibility of exposed Red Creek strata containing Precambrian uranium placers.

METAMORPHIC CONDITIONS OF RED CREEK QUARTZITE

INTRODUCTION

Petrographic analysis of rock suites collected from the Red Creek Quartzite and the Owiukuts Complex suggests two grades of prograde metamorphism. Appendix I lists the salient metamorphic features and mineralogy of thin sections studied from the Red Creek area. Rock types in this suite are quartzofeldspathic and granitic gneiss, quartzite, and quartz schists, pelitic schist, and amphibolite.

METAMORPHIC GRADE

Pelitic rocks of the Red Creek Quartzite contain assemblages characteristic of the amphibolite facies. Guidotti (1974) has subdivided the amphibolite facies into four zones which are based upon important isograd reactions that occur with increasing grade in rocks of pelitic composition. These subdivisions, lower staurolite zone, upper staurolite zone, lower sillimanite zone, and upper sillimanite zone, along with the reactions which bound them, are summarized in Figure 7. The staurolite zones correspond to the more general medium grade and the sillimanite zones to high grade designations of Winkler (1974).

Assemblages in pelitic units of the Red Creek Quartzite from the Red Creek area are characteristic of the upper staurolite zone. Assemblages from the Red Creek Quartzite along Beaver Creek contain coexisting microcline and sillimanite, characteristic of the upper sillimanite zone. Assemblages unequivocally of the lower sillimanite zone were not found in the area. There is thus a distinct difference in grade between the maximum metamorphic conditions reached by the Red Creek Quartzite along Red Creek and the Owiukuts Complex and Red Creek Quartzite at Beaver Creek Canyon. The detailed analyses of each area indicate that this grade difference may be as much as 100°C.

METAMORPHIC FABRIC

Staurolite porphyroblasts in the Red Creek Quartzite show trails of quartz inclusions (assumed to be relicts of original compositional layering) which are straight and inclined at high angles to the current foliation.

Figure 7. Metamorphic grade of Red Creek Quartzite and Oviyukuts Complex. Petrogenetic guide simplified after Thompson (1976) to show only reactions important in interpreting rocks from the Red Creek area. Positions of lines assume $P_{H_2O} = P_{Total}$.

The current foliation was formed at the peak of metamorphic grade and is defined mainly by parallel orientation of muscovite blades. The angle between foliation and inclusion trains suggests that either achievement of highest grade was accompanied by considerable shear movement, or that two deformational events, with different stress configurations, may have accompanied the heating event.

All quartzites in the area show a strong mortar texture. Recrystallization has occurred along grain boundaries to minimize strain within a static stress system. Actual shear movement was apparently restricted to mylonitized zones from a few centimeters to several meters thick. These zones are pervasive throughout the quartzite layers. The static recrystallization of these quartzites probably occurred within cohesive blocks which were strained between shear zones where movement was concentrated. Pelitic and mafic units record very little evidence of this episode, although minor sericite and chlorite alteration suggests some local retrograde metamorphism due to introduction of water to the terrain (at about 300°C), which may have accompanied the shear recrystallization.

Mica-free samples from quartzite and quartzofeldspathic gneiss units of the Red Creek Quartzite commonly exhibit cataclastic textures indicative of a lower temperature deformational event subsequent to the main metamorphism. The intensity of cataclasis was highly variable, ranging from minimal to extreme. Several samples of quartzite retain relict textures, but most quartzites have been recrystallized. Cataclastic textures are not developed in schistose and amphibolitic units.

The textures developed in quartzites are characteristic of the amount of strain they experienced during cataclasis. Quartz grains from slightly

strained samples show strain shadows and have slightly cusped grain boundaries. Moderately strained samples show sutured grain boundaries in large crystals, with concomitant development of a matrix of quartz and feldspar (where present) grains with straight boundaries. Samples from areas of high strain developed a mortar texture with granoblastic porphyroclasts (about 1-3 mm) set in a much finer matrix (0.02 mm). The most strained samples are mylonitic with a weakly developed fabric of elongated quartz grains.

Some samples appear to be cataclastic breccias, with very coarse fragments (to 5 cm) in a reddish oxidized and recrystallized matrix of quartz grains. These breccias are restricted to specific zones in the field, and may have formed along fracture zones where strain was localized. The mica foliation in clasts shows no regular orientation, indicating that during brecciation and recrystallization, they were rotated relative to each other.

Tullis (1978) suggests that at low temperature and pressure, quartzites are deformed by brittle fracturing, and at high temperature and pressure they deform via ductile processes, involving dislocation glide and recrystallization without the development of fractures. The quartzites at Red Creek were apparently deformed at conditions between these extremes. Feldspars are often bent, fractured and broken, but more ductile quartz shows no evidence of brittle behavior. Brecciated areas may have been formed as wide fracture bands, or fault zones.

This textural evidence suggests that quartzites and quartzofeldspathic units of the Red Creek Quartzite underwent an unevenly distributed deformational event. This event may have been associated with fracturing in its later stages and caused a penetrative adjustment to stress chiefly by ductile recrystallization mechanisms, but with localized brittle behavior. This

deformation occurred after the main metamorphism of the area and at lower temperature and pressure, as evidenced by rotations of clasts, brittle behavior of feldspar grains, and the development of fault zones. The effects of this deformation were restricted to the more competent quartzites and gneisses.

STRUCTURE

FAULTS

The dominant structural feature in the Red Creek area is the Uinta Fault of Laramide age which defines the northern limit of Precambrian rocks of the Uinta Arch. Near the Colorado border the Uinta Fault is a zone of south-to-north thrusting which exceeds a kilometer in thickness. The fault zone places Precambrian rocks over Eocene strata as young as the Wasatch Formation. Within the fault zone, large, mappable blocks of Mississippian (?) limestone and Red Creek Quartzite "float" in cataclastic rocks, and dip into the fault zone. The Uinta Fault extends for tens of km to the west and may connect with the Henry's Fork and North Flank Faults. The attitude of the thrust at the surface is apparently related to the structural integrity and rheidity of the rock immediately beneath the fault. For example, between Goslin Mountain and the southwest portion of Clay Basin, the dip rotates from nearly vertical when overriding competent sandstones to nearly horizontal when riding over the incompetent Cretaceous shales. Disregarding steepening or flattening with depth, if an average dip of 30° is assumed as suggested by field relationships along Red Creek, and a structural relief of about 10 km is used (approximate stratigraphic distance between presently juxtaposed lower Red Creek and Tertiary Wasatch Formation rocks), lateral transport of Red Creek rocks is some

22 km to the north. With such large scale lateral transport, large scale fracturing due to flexing of the hanging wall block over steps in the footwall block is readily imaginable. Extension resulting from such flexing may have resulted in the initiation of the Browns Park graben on the up-thrown wall of the Uinta-North Flank Fault complex.

High-angle faults, which formed after deposition of the Uinta Mountain Group, are common and partially or completely bound the Red Creek Quartzite blocks and are most likely related to the thrusting which formed the Uinta Fault Zone. Other possible high-angle faults are suggested by rapid and abrupt changes of thickness of units within the lower, conglomeratic facies of the Uinta Mountain Group which suggests the possibility of syn-depositional faulting.

Deformation which occurred before deposition of the Uinta Mountain Group is seen in discrete zones of mylonite and breccia accompanied by recrystallization and ductile deformation, which are common in the lowest Red Creek rocks. In upper Red Creek strata, fracturing and brecciation are apparent and suggest a more brittle response to tectonic forces related to folding of schistosity. Pre-Uinta Mountain Group deformation includes the major folding event which accompanied the faulting and was most likely related to the Hudsonian orogeny.

FOLDS

The structure of the Red Creek Quartzite was first analyzed in detail by Hansen (1965). Designating each separate block of Red Creek rocks to be an individual sub area, Hansen plotted linear elements from each area. Although small aberrations are apparent, the results of this analysis provide evidence for one major penetrative deformation of Red Creek rocks. Hansen (1965, p. 143)

suggests that, if the net for area 5 (the Beaver Creek area) is rotated 90° about a vertical axis, the locus of linear features describes a similar concentration to the nets for the Red Creek rocks (Figure 8). Because area 5 is bounded by faults, Hansen (1965, p. 141) suggests that the Beaver Creek area may have been tectonically rotated.

Figure 8. Contour diagrams of linear structures measured at Red Creek and Beaver Creek. Net are identical to Figure 19 except that Beaver Creek data have been rotated counterclockwise 90° . Hansen, 1965.

STRUCTURE OF THE OWIYUKUTS GNEISSES

The Owi yukuts gneisses are exposed in small, disrupted bodies along the Uinta Fault near Dutch John Gap, Dutch John Mountain, Mountain Home, and in a large area on the south flank of O-Wi-Yu-Kuts Mountain. In most areas the gneissic unit is deformed into breccia and felsic cataclastic gneiss. In the Beaver Creek and Mountain Homes areas, the cataclastic and gneissic schistosity dips to the southeast at about 25° , but this schistosity is folded into northeast-facing folds plunging $30S60E$. The axial surfaces of these folds are commonly sheared and are themselves folded in a diffuse pattern about a southeasterly plunging axis.

The northwestern area of exposure on O-Wi-Yu-Kuts Mountain forms a southeasterly dipping homocline of gneissic schistosity. This area lacks significant cataclastic deformation and is not extensively refolded. It may represent the footwall block relative to the overlying cataclastic sequence to the southeast.

STRUCTURE OF THE RED CREEK QUARTZITE

The most intricately folded sequence of Red Creek Quartzite is a ribbon-like interlayered sequence of amphibolite and mylonite, which is exposed along the eastern side of Beaver Creek. At that location, schistosity parallels the compositional layering and is accentuated by thin chloritic selvages, at amphibolite contacts. The schistosity is crenulated about the hinges of folds of schistosity. The amphibolite is foliated throughout, and intrafolial folds are locally preserved. These folds are extremely attenuated, rootless, and isoclinal, and are outlined by quartzose aggregations.

Away from the Beaver Creek area, the Red Creek Quartzite is generally less strained than the gneissic and mylonitic rocks. Bedding, although rarely preserved, is folded about a gentle northeasterly plunging axis. Schistosity generally parallels compositional layering and is diffusely folded about a gentle northeasterly plunging axis which is approximately colinear with the axes of folds of bedding. The plunge of prominent lineations on bedding and schistosity surfaces of quartzites are scattered in the northeastern quadrant and represent approximately coaxial refolding of the tectonite.

The large scale Garnet Canyon antiform is a box-shaped fold of schistosity. The folds of schistosity in the metasedimentary sequence are open, flexural-slip folds or chevron folds with associated crenulations in schists.

URANIUM POTENTIAL OF THE RED CREEK AREA

Uranium mineralization was recognized in the Red Creek area as early as 1914 when Hess (1914) reported the occurrence of carnotite and tyuyamunite in Red Creek Canyon. Hansen (1965) also describes this area and his description (1965, pp. 182 and 184) is presented below:

Although the copper minerals are unaccompanied by obvious gangue in some places, they commonly are associated with some of the following minerals: Quartz, pyrite, calcite or red or brown carbonate, manganese oxides, opal, and hematite. Butler (in Butler, Loughlin, and Heikes, 1920, p. 605) reported occurrences also of bornite, chalcocite, and carnotite--the bornite and chalcocite being replacements of pyrite, and possibly of chalcopyrite. Wilmarth (1953, p. 5) reported tyuyamunite, volborthite, and hyalite, in addition to most of the minerals cited above,

at prospects in the canyon of Red Creek in the SE $\frac{1}{4}$ sec. 5, T.2N., R.24E. These prospects, which have been opened in the rubble of an old landslide, contain the only occurrences of uranium minerals known to me in the area, although, reportedly, uranium minerals have been found also at localities in Jesse Ewing Canyon.

Uranium has already been noted as an element associated with copper in the Red Creek Quartzite where it has been found in the minerals tyuyamunite (predominant) and carnotite (subordinate). As noted previously, the only prospects in the Red Creek Quartzite known to me to show visible uranium mineralization are in the rubble of an old landslide above Red Creek in the SE $\frac{1}{4}$ sec. 5, T.2N., R.24E. After I had ascertained to my own satisfaction that the hillslope was indeed a landslide, I traversed areas uphill from the slide with a scintillation counter but found no additional traces of uranium mineralization.

The mode of occurrence of tyuyamunite in the Red Creek was described by Wilmarth (1953, p. 5) as follows:

Tyuyamunite occurs, for the most part, as thin coatings, less than 3 millimeters thick, on fracture surfaces and as crystalline aggregates that partially fill small vugs, as much as 5 centimeters across, in the quartzite. The tyuyamunite grains are commonly thin bright-lemon-yellow to pale-yellow, nonfluorescent, tabular to subhedral flakes with their flat sides parallel to the surface on which they occur. Small but well-developed tabular crystals coat the more open fracture surfaces in the quartzite. The largest and best developed crystals of tyuyamunite were found in the hematite-filled vugs. Locally, botryoidal masses of tyuyamunite less than 1 millimeter across occur on the massive tyuyamunite fracture coatings. Gradations from the bright yellow characteristic of the tyuyamunite crystals to the pale-yellow tyuyamunite grains on the fracture surfaces may be found.

Moderately heavy prospecting during the 1950's brought to light other uranium occurrences in

the area, but no deposit of workable grade has been discovered. No visible uranium mineral, moreover, has been distinguished in any occurrence outside the canyon of Red Creek;....

The uranium occurrence at SE $\frac{1}{4}$ Section 4, T2N, R24E, known as the Yellow Canary Mine (Samples 152785, 153058, and 153059) is developed in landslide debris. Since the writing of Hansen's report, the area upslope of the mine adit has been trenched by bulldozers, but none of these trenches reach bedrock. They were all walked with gamma ray spectrometers during this investigation, but none contained anomalies. No source area for the uranium minerals could be found, nor were uranium minerals found in rock which was in place. During the summer of 1979, active exploration was being conducted by private industry in the immediate vicinity of the Yellow Canary Mine. Any results of this exploration have not yet been announced.

Kalliokoski and others (1978, p. 472) describe the Yellow Canary as having a high degree of similarity to the model described for unconformity vein deposits. However, we feel that because uranium occurs as secondary minerals that coat fractures in quartzite and because no primary phases of uranium mineralization have been identified, their origin appears to be deposition by percolating waters that leached uranium from an over-lying source. Such a source may be the gravels that cap nearby surfaces (NE $\frac{1}{4}$ Section 1, T2N, R23E). These caps are erosional remnants of areas of sediments that may have once covered the Yellow Canary Mine area. Hansen (1965) maps these sediments as Tertiary gravels that may correlate with the Browns Park Formation rocks, and as such, these gravels may have contained tuffaceous rock that supplied uranium to percolating ground waters.

In the above quotation from Hansen, he cites reports of uranium minerals in the Jesse Ewing Canyon area. Prospects located in that area are primarily for copper, but associated with a few, particularly at SE $\frac{1}{4}$ Section 1, T2N, R24W (sample 152717), there are hematitic gossans tht give small (2-6 x) gamma ray anomalies. These occurrences are small, very localized areas of mineralization that do not appear to be significant in size, and contain no visible uranium minerals.

With respect to the uraniferous quartz-pebble conglomerates, the rocks in the Red Creek area appear to be a relatively poor target with respect to the exploration model. From the description of stratigraphy and correlations suggested in this report, the exposed sequence in the Red Creek area appears to be representative of depositional environments which are not conducive to the formation of placer deposits. In particular, the sequence is dominated by marine facies rocks rather than by fluvial facies or rocks deposited in fan-glomerate regimes. Clastic rocks at Red Creek contain no recognizable fluvial conglomerates. The Red Creek Quartzite appears to be part of a section that is stratigraphically above the portion of section that, in the model, contains basal fluvial conglomerates or fanglomerates. Since there is no apparent basal sequence associated with the exposed Red Creek rocks, that portion of section may be buried and not exposed.

Most of the diagnostic primary sedimentary structures were destroyed by regional metamorphism. The removal of these features complicates the interpretation and reconstruction of stratigraphic relationships. Without such features, the determination of such fundamental data as stratigraphic tops is particularly vexing.

Metamorphic grades recorded by the pelites at Red Creek are much

higher than those which effect the classic Canadian and South African deposits. The quartzites of the northern Uinta have been raised to at least middle amphibolite grade, while the rocks of the type deposits have been subject to regional greenschist conditions. Even if uranium was deposited in this sequence, the difference in grade allows for a considerable amount of leaching of Red Creek rocks by flushing water released by dehydration reactions through the system at relatively high temperature. The Eh-pH conditions of such interformational waters are not known, but at elevated temperatures, could be expected to mobilize any uranium in the system.

The Red Creek rocks contain almost no pyrite or other heavy mineral concentrations that would suggest the development of placers in the exposed portion of the Red Creek sequence. The principal heavy minerals are disseminated grains of magnetite. If these grains are primary, then, because of their oxidation state, they suggest that the rocks in which they are contained were deposited after the development of an oxygenated atmosphere.

The regional structural setting is greatly different between the type-deposit areas and the area of investigation. While rocks of Canada and South Africa have been only broadly warped, rocks at Red Creek have been tightly folded, locally overturned, and have been tectonically transported great distances.

Radiometric anomalies are almost absent over the Red Creek Quartzite. Where anomalies do occur, they are small, spotty, and can be explained by local pods of mineralization or secondary mineralization. In the Red Creek strata, no stratiform anomalies and no conglomerate-based cycles of deposition were recognized.

Rock chip sampling performed during this investigation was designed to produce the following suites of samples: a random suite to provide an unbiased selection of samples from the Red Creek area; a stratigraphic suite to provide representative samples from each unit and concentrated on the lower part of each unit; and sampling of any mineralized or conglomeratic rock. Sampling density in the Red Creek area is about 17 samples per square mile.

The results of chemical analysis of the samples are presented in Appendix III and summary statistics for these analyses are presented in Figures 9 and 10. Figure 9 shows the statistics for all samples from the Red Creek area. Figure 10 shows a revision of those data in which four samples have been removed. These samples, numbers 152717, 152785, 153058, and 153059, are mineralized samples which have no apparent genetic relationship to the fossil-placer model. Removal of these four samples produces dramatic changes in such statistics as standard deviation and mean, and provides a more realistic application of the data to the model and to the evaluation of fossil-placer occurrences.

In addition to chemical analysis, radiometric readings, using McPhar TV-1A hand-held, gamma ray spectrometers, were continually monitored during traverses and collected over the outcrop area. In Appendices IIA and IIIA readings taken at each station are tabled and cross-referenced to station location and to chemical analyses of rocks collected at some of the radiometric stations. Station density in the Red Creek area is 50.6 stations per square mile. Readings of K⁴⁰Th gamma radiation range from 100 to 7500 and average about 1700 counts per minute (CPM). Readings taken at the same stations, for U-²³⁵Th generated radiation, ranged from 55-330 CPM and averaged 115 CPM. These values have also been adjusted to exclude the anomalies produced by occurrences not related to the model (Samples 152717,

NO. SAMPLES ANALYZED		BELOW									COEFFICIENT OF		LN TRANSFORMATION			
MEASURABLE DETECTION		DETECTION	MINIMUM	MAXIMUM	MEAN	MEDIAN	MODE	STANDARD	OF		MEAN	S. D.	MEAN	S. D.		
ELEMENT	VALUES	LIMIT	LIMIT	VALUE	VALUE			DEVIATION	VARIATION							
U	178	13	<0.25	<0.25	3724.00	24.62	1.22	0.63	279.411	11.347	0.41	1.13	0.21	0.99		
U-NT	192			0.0	500.70	7.67	0.70	0.29	44.824	5.845						
AL	191			0.05	10.81	2.92	1.65	0.22	2.784	0.954	0.37	1.35	0.42	1.19		
R	18	173	<10	<10	480	45	<10	<10	109.3	2.4	3.05	0.91				
BA	191			5	1961	182	70	26	257.8	1.4	4.45	1.23	4.44	1.20		
BE	89	102	<1	<1	12	1	<1	<1	1.5	0.9	0.37	0.52				
CA	141	50	<0.05	<0.05	31.68	2.00	0.13	<0.05	4.967	2.489	-0.97	1.67	-2.01	2.29		
CD	84	107	<4	<4	118	20	<4	<4	21.9	1.1	2.58	0.88				
CR	189	2	<1	<1	1372	53	15	8	162.7	3.0	2.97	1.26	2.94	1.13		
CU	164	27	<2	<2	19692	160	5	<2	1543.1	9.6	2.28	1.51	1.68	2.11		
FE	188	3	<0.05	<0.05	13.13	1.87	0.49	0.06	2.735	1.464	-0.44	1.54	-0.50	1.52		
LI	184	7	<1	<1	81	7	4	<1	9.8	1.3	1.48	1.01	1.40	1.13		
MG	151	40	<0.05	<0.05	6.92	0.95	0.21	<0.05	1.563	1.645	-2.00	1.32	-1.65	1.90		
MN	191			5	2285	231	43	10	452.0	2.0	4.07	1.62	4.02	1.73		
MO	8	183	<4	<4	6	4	<4	<4	0.7	0.2	1.52	0.16				
NA	125	66	<0.05	<0.05	5.28	1.24	0.20	<0.05	1.299	1.044	-0.47	1.31	-1.66	2.18		
NR	59	132	<4	<4	19	9	<4	<4	4.0	0.4	2.13	0.45				
NI	172	19	<2	<2	1726	34	6	<2	150.8	4.4	2.18	1.26	1.82	1.55		
P	188	3	<5	<5	13537	383	114	49	1225.9	3.2	4.94	1.28	4.88	1.19		
TI	191			16	9986	1026	259	62	1566.6	1.5	5.89	1.52	5.87	1.41		
SC	176	55	<1	<1	173	9	<1	<1	17.6	1.9	1.42	1.27				
TH	146	45	<2	<2	33	6	4	<2	5.4	0.8	1.69	0.69	1.36	0.88		
V	181	10	<2	<2	2502	69	16	2	200.8	2.9	3.01	1.55	2.81	1.79		
Y	186	5	<1	<1	132	6	2	<1	13.1	1.9	1.20	1.16	0.99	1.44		
ZN	185	6	<2	<2	196	18	9	5	27.2	1.5	2.34	0.96	2.24	1.08		
ZR	185	6	<2	<2	146	17	9	7	19.8	1.1	2.43	0.92	2.36	1.02		
K	185	6	<0.02	<0.02	4.16	0.62	0.19	0.08	0.818	1.323	-1.35	1.37	-1.44	1.43		
SR	191			1	239	38	21	2	45.0	1.2	2.90	1.33	2.90	1.26		
CE	162	29	<10	<10	1042	49	24	15	88.8	1.8	3.47	0.80	3.18	0.96		

Figure 9. Summary statistics for all samples analyzed, Red Creek area.

NO. SAMPLES ANALYZED														
BELOW														
ELEMENT	VALUES	MEASURABLE DETECTION		MINIMUM	MAXIMUM	MEAN	MEDIAN	MODE	COEFFICIENT		LN TRANSFORMATION			
		LIMIT	LIMIT						STANDARD	OF	MEAN	S. D.	ROUSI	
				VALUE	VALUE				DEVIATION	VARIATION			MEAN	S. D.
U	174	13	<0.25	<0.25	8.64	1.87	1.19	0.63	1.625	0.871	0.30	0.81	0.18	0.95
ANT	168			0.0	9.99	1.87	0.89	0.27	2.022	1.083				
AL	187			0.05	10.81	2.97	1.78	0.22	2.787	0.937	0.41	1.34	0.46	1.18
A	18	169	<10	<10	480	45	<10	<10	109.1	2.4	3.05	0.91		
BA	187			5	1961	183	70	26	260.0	1.4	4.45	1.24	4.43	1.21
BF	85	102	<1	<1	17	1	<1	<1	1.5	0.9	0.36	0.52		
CA	139	48	<0.05	<0.05	31.68	2.00	0.13	<0.05	4.999	2.458	-0.57	1.66	-1.99	2.29
CO	80	107	<4	<4	113	18	<4	<4	19.5	1.0	2.53	0.86		
CR	185	2	<1	<1	1372	54	15	8	164.3	3.0	2.97	1.27	2.94	1.14
CU	160	27	<2	<2	446	24	5	<2	59.2	2.4	2.15	1.28	1.63	1.72
FE	184	3	<0.05	<0.05	11.59	1.83	0.52	0.06	2.629	1.434	-0.44	1.54	-0.50	1.51
LI	180	7	<1	<1	81	7	4	<1	9.9	1.3	1.49	1.01	1.41	1.13
MG	149	38	<0.05	<0.05	6.92	0.96	0.22	<0.05	1.571	1.635	-0.98	1.32	-1.62	1.89
MN	187			5	2285	231	44	10	454.2	2.0	4.07	1.63	4.02	1.74
MO	7	180	<4	<4	6	4	<4	<4	0.8	0.2	1.51	0.16		
NA	125	62	<0.05	<0.05	5.28	1.24	0.24	<0.05	1.299	1.044	-0.47	1.31	-1.58	2.15
NB	58	129	<4	<4	19	9	<4	<4	4.0	0.4	2.13	0.45		
NI	168	19	<2	<2	1726	33	6	<2	152.2	4.5	2.17	1.26	1.81	1.55
P	186	1	<5	<5	9247	314	120	49	760.7	2.4	4.92	1.24	4.89	1.13
PI	187			16	9986	1046	290	63	1577.1	1.5	5.92	1.52	5.91	1.42
SC	132	55	<1	<1	54	8	<1	<1	10.6	1.3	1.42	1.23		
TH	143	44	<2	<2	27	6	4	<2	5.0	0.7	1.60	0.68	1.35	0.87
V	177	10	<2	<2	428	50	14	2	76.7	1.5	2.93	1.48	2.76	1.71
Y	182	5	<1	<1	132	6	2	<1	11.3	1.8	1.17	1.13	0.96	1.42
ZN	181	6	<2	<2	196	18	9	5	27.4	1.5	2.35	0.96	2.25	1.09
ZP	181	6	<2	<2	146	17	9	7	20.0	1.1	2.43	0.93	2.36	1.03
K	181	6	<0.02	<0.02	4.16	0.63	0.19	0.08	0.823	1.303	-1.31	1.36	-1.49	1.43
SR	187			1	239	38	21	2	45.4	1.2	2.89	1.14	2.99	1.27
CF	159	28	<10	<10	1042	47	24	15	88.6	1.8	3.45	0.79	3.17	0.97

Figure 10. Revised summary statistics for chemical analyses of rocks, Red Creek area.

152785, 153058, and 153059).

Because of the lack of geochemical or radiometric anomalies and because of the poor fit to the described quartz-pebble conglomerate model, the Red Creek Quartzite is here considered a poor candidate for fossil-placer uranium deposits.

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FARMINGTON CANYON COMPLEX

INTRODUCTION

Farmington Canyon Complex rocks crop out along the Wasatch Front (Figure 1) from the Dry Mountain area near Santquin, Utah, to the area east of Willard, Utah. East of the Wasatch Range there are spotty areas of outcrop in canyons that cut through overlying strata. These areas were inspected for the occurrence of thick quartzites, but only one area of the Farmington Canyon Complex contains a relatively thick, mature, clastic sequence. This area lies south of Bountiful Peak in the Sessions Mountains and was the chief objective of this study.

The Farmington Canyon Complex was named by Eardley and Hatch (1940a), and the type locality is defined as Farmington Canyon and Bountiful Peak, Utah. Earlier workers had recognized the occurrence of great thicknesses of Precambrian crystalline rock. Stansbury (1853), Hayden (1872), and King, Emmons and Hague (1877) conducted reconnaissance studies in connection with early congressional reports on the Salt Lake area and the 40th Parallel Survey. Work performed in the Wasatch Mountains by these and other early workers is reviewed by Van Hise and Leith (1909, pp. 782-789). All of these early studies were of a reconnaissance nature and dealt with the geology of the entire region. Eardley and Hatch (1940a and 1940b) undertook a systematic study of the crystalline complex in the central Wasatch Mountains. They divided the crystalline complex into four "classes" of metamorphic rocks: 1) Metasedimentary, 2) Meta-igneous, 3) Migmatites (injection gneisses), and 4) Metamorphosed mafic rocks.

More recent work was completed by Bell (1951), who attempted facies classification of the Farmington Canyon Complex, and by Bryant (1979), who

has remapped the Farmington Canyon Complex.

The bulk of the Farmington Canyon Complex is an extremely structurally complex suite of metasedimentary and metavolcanogenic rocks which have been metamorphosed to sillimanite grade and mobilized to form a migmatitic terrain. Intrusive igneous rocks do occur in the Weber Canyon area, but are volumetrically minor. Most of the metasedimentary sequences are probably of volcanoclastic origin and reflect clastically immature mineralogy and may best be classified as metagraywacke.

PETROGRAPHY OF ROCKS FROM THE SESSIONS MOUNTAINS AREA, FARMINGTON CANYON COMPLEX

Precambrian rocks in the immediate area of the Sessions Mountains are divided into four main rock types. These are pelitic schist and gneiss, amphibolite, quartzofeldspathic gneiss, and quartzite.

Pelitic schists and gneisses are dominated by sillimanite (sometimes kyanite)-plagioclase-biotite-muscovite-quartz schist which exhibits the beginnings of light and dark compositional layering. Unaltered samples are coarse-grained (biotite grains to 1.5 mm) and are strongly foliated, with a dominant granoblastic polygonal texture. In highly altered samples, Al_2SiO_5 polymorphs and plagioclase have been converted to sericite; biotite has been converted to chlorite and sericite, and locally, to vermiculite.

Amphibolite rocks are primarily quartz-plagioclase-hornblende gneisses which, when fresh, have a granoblastic polygonal to slightly nematoblastic texture. Amphibolites have undergone a partial retrograde transformation and now contain the assemblage albite-epidote + hornblende + chlorite. The extent

to which this retrograde assemblage is developed is highly variable.

Two distinct types of quartzofeldspathic gneiss occur in the area. The first of these types is a fine-grained rock with variable feldspar content that exhibits a granoblastic polygonal texture which has been slightly affected by later cataclasis. The precursor to this gneiss was feldspathic sandstone. The second quartzofeldspathic gneiss is very coarse-grained meta-pegmatite containing quartz, plagioclase (albite), and microcline in roughly equal proportions. Bodies of this unit crosscut sedimentary and metamorphic layering, indicating that this unit was emplaced after metamorphism. Cataclasis of these pegmatites is indicated by a mortar texture with a fine-grained recrystallized matrix (grains approximately 0.01 mm) between the larger grains (up to 4 mm).

Quartzites are predominantly pure quartz but often contain from 1 to 15 percent muscovite and up to 10 percent feldspar. The original metamorphic texture of the quartzite was coarse-grained, granoblastic polygonal with a mica foliation. Some time after the metamorphism which produced the dominant metamorphic texture, the quartzite was subject to cataclasis which produced a weakly developed mortar texture in nearly all samples.

Except for the amphibolites, which were mafic flows, dikes or sills prior to metamorphism, and the meta-pegmatites, most rock types in the area are metasedimentary and represent a sequence of sandstones and shales. This sequence was metamorphosed to upper amphibolite facies--greater than 670°C and 6.5 kb (lower sillimanite zone). The grade is indicated by the assemblages of sillimanite-garnet-biotite-quartz-muscovite and kyanite-sillimanite. The main metamorphic event produced the dominant granoblastic polygonal texture and a strong mica foliation. This foliation was folded into tight isoclinal folds.

Subsequent to the main metamorphic event, the entire area was subjected to a much lower temperature retrograde event which is characterized by local rehydration reactions and the development of cataclastic textures in the quartzites and gneisses. In pelitic rocks, biotite was converted to chlorite, releasing potassium for the conversion of plagioclase and aluminosilicates to fine-grained muscovite. These reactions indicate that considerable amounts of water were added to the terrain during this event. In amphibolitic rocks, oligoclase-hornblende assemblages were converted to epidote-chlorite which also requires rehydration of the system. These assemblages indicate conditions characteristic of the greenschist facies (T about 350°C) existed during this retrograde event. The spotty development of retrograde assemblages is probably the result of uneven distribution of water when it was reintroduced to the system. The cataclastic textures developed in the quartzites and gneisses were most likely developed during the retrograde event seen in amphibolitic and pelitic rocks.

All metamorphic minerals have undergone severe chemical weathering at the surface; weathering has produced partial to complete conversion of feldspars to clay and sericite, and biotite to clay and vermiculite. Weathering products often mask and confuse the determination of retrograde minerals.

STRUCTURE OF THE SESSIONS MOUNTAINS AREA, FARMINGTON CANYON COMPLEX

The unraveling and separation of high grade Archean metamorphic events in the Farmington Canyon Complex by means of structural analysis is difficult because of intense deformation and poor exposures. Therefore, to simplify presentation for this report, major deformational events will be referred to in the

context of the metamorphic history described from the petrographic study presented above. Two events are evident: a high grade (major) metamorphic event and the subsequent lower grade event.

This structural history is based on the culmination of a high grade event in Late Archean time, about 2600-2900 m.y. ago. These ages have been determined for rocks in the complex by preliminary geochronological studies (Bryant, pers. comm.) which are not yet complete. Several deformations of the sequence may have preceded that event. Though these rocks are complexly deformed, a weakly developed regional foliation for gneisses and schists of the complex, which dip shallowly to the northwest, may be coeval with the last major metamorphic event. This regional feature is not apparent in the quartzite section located in the Sessions Mountains. Here, compositional layering and perhaps bedding (which in the quartzites are most often coincident) are nearly vertical and stand at high angles to the regional foliation and to compositional layering developed in the schists and gneisses. Thus, an apparent folded angular unconformity occurs at the contact of the gneisses and quartzites.

Bryant (pers. comm.) has recognized the existence of Precambrian, and perhaps post-Precambrian, shear zones throughout the Farmington Canyon Complex. These zones contain epidote-chlorite assemblages and represent a relatively brittle deformation. Adjacent to the shear zones, rocks are characterized by a rather strongly developed retrograde metamorphic event. Displacement associated with these zones is unknown.

URANIUM POTENTIAL OF THE FARMINGTON CANYON COMPLEX

Because of the locally sillimanite grade of metamorphism and the intense deformation, the possibility of remobilization of any uranium that may have been deposited in the sequence is very likely. Structural and metamorphic conditions are very dissimilar to the regional greenschist conditions recorded in southern Canada and South Africa.

Rock samples from the quartzite sequence exposed in the Farmington Canyon Complex were collected to provide a random population from the quartzite and to provide a suite of samples that included all mineralized areas. Sampling density for the area of investigation is about 17 samples per square mile.

Results of chemical analyses of these samples are shown in Appendix IIIB. Summary statistics are presented in Figures 11 and 12. Figure 11 presents the statistics computed for all samples and Figure 12 disregards samples 152807, 152820, and 152823 as these samples are, respectively, sheared pegmatite containing 90 percent K-spar, biotite gneiss (high K?), and highly altered quartzo-feldspathic gneiss containing 55 percent clay. The nature of these samples has no bearing on the fossil-placer model. There are two samples, however, that demand some notice. Sample 152975 contains at least 12 ppm uranium and may be a stretched pebble conglomerate. The clasts are strongly deformed and highly metamorphosed and could not be recognized in nearby outcrops. Sample 152851 contains 15 ppm uranium and concentrations of heavy minerals, chiefly magnetite and hematite. Although these iron phases are oxidized, such oxidation may have occurred during later metamorphism. Heavy mineral concentrations are rare in quartzites of the Farmington Canyon

Figure 11. Summary statistics for all samples analyzed, Farmington Canyon Complex.

ELEMENT	VALUES	MEASURABLE DETECTION LIMIT				COEFFICIENT OF VARIATION	STANDARD DEVIATION	MEAN	S. D.	S. D.	
		MINIMUM	MINIMUM	DETECTION	MAXIMUM					MEAN	S. D.
U	71	<0.25	<0.25	<0.05	27.04	2.95	1.25	4.114	1.993	1.01	0.33
AT	70	0.20	28.50	3.30	1.30	3.72	0.58	4.534	1.370	1.20	0.46
AL	75	<0.05	<0.05	<0.05	13.38	4.11	1.29	2.991	0.728	1.09	0.88
B	70	<10	<10	<10	41	22	<10	13.1	0.6	0.67	1.11
EA	70	<10	<10	<10	2602	373	20	933.4	1.4	1.40	1.38
BE	50	<1	27	<1	27	3	<1	5.3	1.9	0.88	0.33
CA	46	<0.05	8.94	0.07	0.07	0.07	<0.05	1.003	0.00	0.00	0.00
CU	34	<4	107	<4	22	44	<4	20.9	0.9	1.39	2.67
CH	70	<4	107	<4	107	107	<4	107	107	1.26	3.00
CU	63	<2	293	<2	293	293	<2	46.4	1.0	1.26	1.81
FE	73	<0.05	11.70	<0.05	2.17	0.00	0.10	2.700	1.273	1.54	1.72
LI	73	<1	70	<1	12	6	1	15.2	1.93	1.65	1.34
MG	58	<0.05	4.53	<0.05	0.74	0.13	<0.05	1.029	1.507	1.32	1.65
MN	75	<4	2341	<4	234	57	17	429.3	1.0	4.16	1.79
MO	1	<4	12	<4	12	<4	<4	0.0	0.0	0.0	1.51
NA	63	<0.05	3.95	<0.05	0.69	0.15	<0.05	0.709	1.112	1.32	1.51
NB	30	<4	76	<4	19	<4	<4	15.4	1.0	0.81	1.75
NI	62	<4	76	<4	19	<4	<4	15.4	1.0	0.81	1.75
P	76	<2	1342	<2	210	74	30	301.3	1.4	1.56	1.26
TI	76	<1	13514	<1	42	7	<1	2599.0	1.7	1.59	1.50
SC	62	<1	42	<1	42	2	<1	9.3	1.2	1.18	1.50
TH	60	<2	73	<2	11	5	<1	11.9	1.1	0.65	1.00
V	74	<2	921	<2	50	10	5	67.1	1.7	1.56	1.00
ZN	74	<1	87	<1	8	2	<1	13.0	1.0	1.20	1.06
SR	70	<2	105	<2	11	4	<2	17.7	1.5	1.05	1.59
K	70	<2	229	<2	42	11	3	60.7	1.4	1.44	1.44
CE	54	<10	5.32	<10	184	54	<10	48.1	0.9	0.88	1.06

Figure 12. Revised summary statistics for chemical analyses from Farmington Canyon Complex.

Complex and Sample 152851 is such an isolated occurrence.

A radiometric survey was completed over the area with McPhar TV-1A hand-held gamma ray spectrometers. Gamma ray activity was continuously monitored during investigation and formal stations were established for the survey. Station density for this survey is about 28.8 stations per square mile. These readings are tabled in Appendix IIB and KTh values range from 1000-7000 CPM while averaging about 2550 CPM. UTh values range from about 50 to 330 CPM and average 155 CPM. The values are adjusted by dropping Samples 152807, 152820, and 152823 from the statistics, as they have no apparent bearing on the evaluation of Farmington Canyon Complex with respect to the model. Readings of radioactivity at stations and chemical analyses of samples taken from some of those stations are cross-referenced in Appendices IIB and IIIB.

The thickest mature clastic pile in the Farmington rocks, quartzite in the Sessions Mountains, is relatively thin by standards set for the quartz-pebble model. Because of recrystallization during metamorphism, no basal conglomerate facies are recognizable. Environments of deposition, stratigraphic tops, and any cycles of deposition are no longer recognizable. Gamma ray anomalies and geochemical anomalies are absent in the Farmington Canyon Complex. The potential for uranium occurrences of ancient placer origin is here considered very poor, and potential for other type deposits is also considered poor.

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FORMATION OF FACER CREEK

INTRODUCTION

Proterozoic quartzites, which are informally named the formation of Facer Creek, occur in the area just north of Willard Peak, Utah. The stratigraphy of this area is discussed by Sorensen and Crittenden (1972, 1974, and 1976) and is shown in Figure 13 below. These rocks are located in a complexly thrust-faulted area in which PEX and younger rocks of the Willard thrust sheet are thrust over Cambrian strata which lie unconformably on PEW Farmington Canyon Complex. This thrust is overlain by a second thrust sheet which places PEX Facer Creek rocks over P6Z rocks that are deposited unconformably upon the Facer Creek rocks (Sorensen and Crittenden, 1976). These sheets are overlain by structurally unconformable younger P6Z metasediments. Facer Creek rocks are approximately 600 meters thick and yield metamorphic ages of 1.6-1.8 b.y. (Sorensen and Crittenden, 1976).

Facer Creek quartzites are chiefly clean, white, and completely recrystallized rocks with minor amounts of pelitic rock. The quartzites are massive with compositional layering rarely visible. Heavy mineral concentrations are generally absent, but locally quartzites are stained with blue-green colors and prospects for copper have been dug in these quartzites. The depositional environment for the Facer Creek rocks is uncertain because of the allocthonous character of the rocks and the lack of primary features. However, because of the lack of interbedded facies and the purity of quartzites, an environment of rather high energy, such as near-shore marine, is suggested.

North

WILLARD PEAK

South

LITTLE WILLOW CANYON

Figure 13. Stratigraphy at Willard Peak and Little Willow Canyon.

URANIUM POTENTIAL OF THE FORMATION OF FACER CREEK

Comparison of the Facer Creek rocks to the quartz-pebble model is bleak. Because no stratigraphic sequence was recognized in the quartzites of the formation of Facer Creek, the sampling program reflects a random population and a suite of rocks exhibiting mineralization. Sampling density is about 19 samples per square mile. Summary statistics are shown in Figures 14 and 15. Figure 14 represents all samples from the area of investigation and Figure 15 shows statistics adjusted to exclude samples that appear to have no relationship to mineralization described in the model. These samples (Samples 153033, 153039, and 153044) are from, respectively, a pebbly grit and slate outcrop that is stained with iron oxides and is probably part of overlying Precambrian Z strata, a breccia zone, and a small, hematite-stained area of quartzite. Exclusion of these data provides a more realistic set of statistics for summation of the data from the Facer Creek area.

Radiometric stations in the Facer Creek area totaled 109 and station density is about 39 stations per square mile. The range of KTh values is 100 to 7500 CPM, with an average of 2690 CPM. However, an average background value, if the small anomalies that have no bearing on the occurrences of fossil-placers are excluded, is more realistically set at about 1500 CPM. Data from UTh radiation values show a range of 10-400 CPM with an average of about 190 CPM. Radiometric survey station data are recorded and cross-referenced to chemical analyses in Appendices IIC and IIIC.

The uranium potential of the Facer Creek rocks is here considered very poor to nil with respect to the model and considered very poor to nil for other types of occurrences. This judgment is based on the lack of heavy

NO. SAMPLES ANALYZED		LN TRANSFORMATION												
BELOW		ROBUST												
MEASURABLE DETECTION LIMIT		MEAN S. D. MEAN S. D.												
ELEMENT	VALUES	DETECTION LIMIT	DETECTION LIMIT	MINIMUM VALUE	MAXIMUM VALUE	MEAN	MEDIAN	MODE	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MEAN	S. D.	MEAN	S. D.
U	53			0.27	63.35	3.27	1.48	1.28	8.652	2.644	0.51	0.92	0.46	0.27
U-NT	53			0.28	55.70	4.16	2.40	2.11	7.784	1.870	0.21	1.06	0.79	1.10
AL	53			0.14	15.55	4.76	3.38	0.40	4.203	0.883	0.81	1.51	0.85	1.38
R	14	39	<10	<10	171	35	<10	<10	41.3	1.2	3.20	0.78		
BA	53			22	2868	382	213	35	480.2	1.3	5.33	1.16	5.32	1.17
BE	35	18	<1	<1	14	2	<1	<1	2.6	1.0	0.73	0.68		
CA	32	21	<0.05	<0.05	6.98	0.45	0.07	<0.05	1.231	2.762	-1.73	1.03	-2.58	1.60
CO	26	27	<4	<4	68	25	<4	<4	18.1	0.7	2.90	0.94		
CR	53			2	320	53	18	4	65.7	1.2	3.09	1.46	3.09	1.36
CU	44	9	<2	<2	2300	87	8	<2	346.8	4.0	2.74	1.56	2.15	1.99
FE	52	1	<0.05	<0.05	18.23	4.32	2.64	0.21	4.194	0.971	0.66	1.58	0.64	1.57
LI	50	3	<1	<1	114	19	4	<1	28.7	1.5	1.92	1.52	1.63	1.92
MG	37	16	<0.05	<0.05	3.79	0.88	0.10	<0.05	0.993	1.128	-0.90	1.36	-1.92	1.99
MN	51	2	<4	<4	1987	365	88	15	516.8	1.4	4.67	1.79	4.55	1.87
MO	6	47	<4	<4	91	22	<4	<4	34.0	1.5	2.40	1.16		
NA	32	21	<0.05	<0.05	2.54	0.36	0.10	<0.05	0.474	1.318	-1.49	0.92	-2.40	1.63
NIJ	6	47	<4	<4	51	16	<4	<4	17.5	1.1	2.41	0.86		
NT	43	10	<2	<2	98	29	8	<2	29.3	1.0	2.76	1.26	2.30	1.57
P	53			8	2212	424	287	27	430.8	1.0	5.35	1.40	5.38	1.26
TI	53			28	5084	1137	461	85	1337.2	1.2	6.17	1.47	6.18	1.38
SC	40	13	<1	<1	32	12	4	<1	10.0	0.8	2.06	1.12	1.57	1.40
TH	45	8	<2	<2	28	10	8	3	7.0	0.7	2.16	0.69	1.96	0.94
V	52	1	<2	<2	292	78	31	10	85.8	1.1	3.50	1.51	3.49	1.53
Y	45	8	<1	<1	35	6	2	<1	8.0	1.2	1.27	1.11		
ZN	53			2	194	52	21	10	56.4	1.1	3.26	1.30	3.28	1.36
ZR	42	11	<2	<2	39	8	3	<2	10.5	1.2	1.63	0.95		
K	53			0.03	5.00	1.25	0.87	0.07	1.358	1.084	-0.51	1.42	-0.49	1.45
SR	53			1	432	39	17	8	66.6	1.7	2.82	1.34	2.81	1.51
CE	40	13	<10	<10	194	46	17	<10	43.3	0.9	3.47	0.86	2.98	1.24

Figure 14. Summary statistics for all samples analyzed, Facer Creek area.

NO. SAMPLES ANALYZED														
BELOW														
MEASURABLE		DETECTION	DETECTION	MINIMUM	MAXIMUM	COEFFICIENT								
ELEMENT VALUES		LIMIT	LIMIT	VALUE	VALUE	MEAN	MEDIAN	MODE	STANDARD	OF	LN TRANSFORMATION			
									DEVIATION	VARIATION	MEAN	S. D.	MEAN	S. D.
U	51			0.27	8.95	1.93	1.40	1.83	1.581	0.818	0.40	0.72	0.39	0.75
U-NT	51			0.20	14.80	2.98	2.30	4.30	2.620	0.880	0.72	0.94	0.73	0.99
AL	51			0.14	12.34	4.64	3.38	0.40	3.951	0.852	0.82	1.47	0.87	1.37
U	13	38	<10	<10	171	36	<10	<10	42.7	1.2	3.22	0.81		
BA	51			22	2868	371	213	113	470.8	1.3	5.32	1.13	5.32	1.15
BE	34	17	<1	<1	14	2	<1	<1	2.6	1.0	0.70	0.68		
CA	32	19	<0.05	<0.05	6.98	0.45	0.08	<0.05	1.231	2.762	-1.73	1.03	-2.51	1.57
CO	26	25	<4	<4	68	25	<4	<4	18.1	0.7	2.90	0.94		
CR	51			2	320	53	18	4	66.5	1.2	3.10	1.46	3.10	1.38
CU	42	9	<2	<2	2300	81	7	<2	352.9	4.3	2.63	1.50	2.06	1.93
FE	50	1	<0.05	<0.05	18.23	4.34	2.64	0.21	4.214	3.971	0.68	1.56	0.66	1.55
LI	48	3	<1	<1	114	19	4	<1	28.5	1.5	1.91	1.50	1.63	1.92
MG	36	15	<0.05	<0.05	3.79	0.86	0.10	<0.05	1.802	1.161	-0.93	1.37	-1.92	1.99
MN	49	2	<4	<4	1987	372	88	15	524.9	1.4	4.69	1.79	4.56	1.90
MO	6	45	<4	<4	91	22	<4	<4	34.8	1.5	2.40	1.16		
NA	31	20	<0.05	<0.05	2.54	0.35	0.10	<0.05	0.480	1.363	-1.53	0.91	-2.40	1.64
NI	42	9	<2	<2	98	29	8	<2	29.6	1.0	2.74	1.27	2.30	1.56
P	51			8	2212	434	287	28	435.5	1.0	5.38	1.40	5.42	1.28
TI	51			28	5084	1154	461	92	1354.3	1.2	6.18	1.46	6.20	1.35
SC	39	12	<1	<1	32	12	4	<1	10.0	0.8	2.03	1.11	1.57	1.41
TH	43	8	<2	<2	28	10	8	<2	6.6	0.6	2.15	0.67	1.96	0.92
V	50	1	<2	<2	292	78	31	11	86.2	1.1	3.49	1.52	3.48	1.55
Y	43	8	<1	<1	35	6	2	<1	8.1	1.2	1.27	1.11		
ZN	51			2	194	50	21	9	54.1	1.1	3.25	1.28	3.27	1.34
ZR	41	10	<2	<2	38	7	3	<2	9.5	1.2	1.58	0.91		
K	51			0.03	5.00	1.25	0.87	0.07	1.365	1.088	-0.50	1.39	-0.47	1.47
SR	51			1	432	38	17	8	66.3	1.7	2.83	1.31	2.82	1.45
CE	38	13	<10	<10	190	43	17	<10	36.5	0.8	3.45	0.82	2.96	1.21

Figure 15. Revised summary statistics for chemical analyses of rocks, Facer Creek area.

mineral concentrations, the absence of pyrite, the absence of fluvial or conglomeratic facies, and the relatively high grade of metamorphism.

LITTLE WILLOW FORMATION

INTRODUCTION

A sequence of metasediments which includes pebble conglomerates is exposed in the area near the mouth of Deaf Smith Canyon, Draper Quadrangle, Utah. This area was studied by government geologists during exploration of the 40th Parallel Survey (King, 1871) and is periodically mentioned in early reports on the Precambrian rocks of the area (Wolcott, 1876; Blackwelder, 1910; and Hintze, 1913). These rocks were first studied in detail by Crittenden, Sharp, and Calkins (1952), who proposed the name Little Willow Series, and later by Neff (1962), and James (1979).

PETROLOGY

During this study, two rock types were found to dominate the Little Willow Formation: metasedimentary rocks in the northwest area and probable meta-igneous rocks in the southeast area of outcrop (Figure 16). A 10 m thick actinolite schist layer is in the metasedimentary unit near its contact with the meta-igneous unit. Amphibolite units occur within the meta-igneous unit.

The meta-igneous units are primarily biotite-muscovite-chlorite-plagioclase-quartz gneisses having little or no foliation. Mica is generally less than 10 percent, plagioclase 50 percent, and quartz 40 percent. The plagioclase is about An₁₂ and grains range from 0.5 mm to 6 mm in size, with a strong bimodal separation between evenly-spaced large grains and smaller grains in a matrix with quartz. This size distribution may be a recrystallization effect of metamorphism, but is more likely a relic of an initial

Figure 16. Geology of Little Willow Formation. Modified from James, 1979.

Explanation for Figure 16
GEOLOGY OF LITTLE WILLOW FORMATION

-- E X P L A N A T I O N --

Q
Tqm
Pc ^b c

Quaternary units.

Tertiary quartz monzonite.

Precambrian Big Cottonwood Formation rocks.

LITTLE WILLOW FORMATION ROCKS

Amphibolites. Major sills and dikes.

Areas of rock dominated by pelitic schists.

Areas of rock dominated by quartz-rich schists.

Areas of rock dominated by quartzite.

Areas of rock dominated by sericitic quartz schists and lenses of stretched quartz-pebble conglomerate.

Areas of rock dominated by metavolcanic schists and gneisses.

Faults.

Thrust faults.

Contacts. Locations are approximate, dashed where inferred or transitional.

Dip and strike of foliation.

igneous texture. Some plagioclase grains contain small muscovite grains. The coarse plagioclase grains are surrounded by a finer matrix of mica, small plagioclase grains and quartz. The probable precursors for these meta-igneous rocks were rhyodacitic volcanic flows or volcanoclastic rocks, although an origin as a feldspathic sediment cannot be ruled out completely.

The metasedimentary units are a metamorphosed sequence of quartz sandstones, quartz-pebble paraconglomerates, argillaceous sandstones, and feldspathic sandstones which is a minimum of 600 meters thick. The dominant rock type is muscovite-quartzite with a well-developed granoblastic polygonal texture. Grain boundaries are slightly cusped and muscovite (up to 30 percent) defines a good foliation. Quartz grains range from 0.1 mm to 0.9 mm in diameter; generally all are about the same size in any one sample. Magnetite, zircon, and apatite are present in small amounts.

Several sandstone units contain large, pure quartz aggregates from 1 cm to 5 cm in maximum dimension. These aggregates are generally elongate sub-parallel to foliation (which wraps around them) and are comprised of quartz grains which are about twice the size of matrix quartz grains. These aggregates may be metamorphic segregations, but the lack of such aggregates in other quartzites in the area, which are otherwise identical, suggests that the aggregates were originally quartz pebbles deposited in a finer matrix of quartz sand and up to 25 percent clay (Figure 17).

Additional units in the Little Willow are chlorite-actinolite schist (Sample GW-108) and an amphibolite unit (Sample HLW-9). The schist contains 75 percent actinolite and 25 percent chlorite. It has a strong nematoblastic

Figure 17. Quartz pebbles in mica schist. Quartz (equant) and muscovite (elongate) are chief minerals. Note coarser quartz in pebble finer material at extremities of pebble and elongation parallel to foliation. Sketch from thin section of Sample GW 101-b.

texture, and probably is the result of total decarbonation of what was originally a marlstone layer in the metasediments. The amphibolite contains hornblende (65 percent), quartz (15 percent), plagioclase (An_{33} , 20 percent), and minor magnetite and sphene. It is nematoblastic, but shows slight evidence of a later recrystallization. This amphibolite is a metamorphosed mafic flow or dike.

James (1979) divides the Little Willow Formation into a complex pile of schists (Figure 18) and meta-igneous rocks that may be some 1,200 m thick. His mapping includes conglomerates that were first mapped by Crittenden (1965) and which can be traced for several hundred meters. These lenses contain

Figure 18. Geology of Little Willow Formation, Big Cottonwood District.
James, 1979.

Explanation for Figure 18

ROCK UNITS

- Qal, Qm Alluvium and glacial moraine.
- qv Bull quartz veins, Tertiary (?) age.
- ip Small pyroxenite (?) body in Poulson Canyon. Dark green, very heavy rock comprised mainly of elongate crystals. Not strongly foliated; may be intrusive.
- am Amphibolite bodies, lens-like or conformable with bedding. Dark green actinolite and chlorite with light aggregates of quartz and feldspar. Largely the same as mapped by Crittenden (1965).
- cg Traceable bed or beds of sericite schist containing stretched quartz cobbles. Partly after Crittenden (1965).
- cb Thin beds of elongated clasts of biotite schist enclosed in less mafic schist.
- ag Light-colored gneiss and schist. Typically consists of plagioclase (?) feldspar and subordinate chlorite or sericite and quartz. A hard rock, often poorly foliated or bedded; locally some looks like aplite. Locally has textures suggesting possible origin as a felsic lava.
- sqs Sericite-quartz schist. Includes silvery beds of malleable sericite rock with minimal quartz. In places is interbedded with purer quartzite. Locally contains stretched quartz cobbles.
- qzt Bedded quartzite, contains minor mica or chlorite in most areas.
- ims Quartz-chlorite-biotite-sericite schists, varied composition. From light gray-green to dark green.
- ms Mafic schist. Dark green, dense rock, largely amphibole, chlorite, possibly pyroxene, with evident foliation. Interbedded with unit ag in places.

cobbles that have been considerably stretched and deformed (Figure 19). Cobbles of this unit are matrix-supported clasts which are embedded in a dark, sericitic, quartzose matrix. Sutures within the individual pebbles suggest that they are composite grains in a recrystallized matrix (Figure 17).

In addition to the traceable conglomerate beds, small lenses of quartzite, up to a few meters long, occur as isolated lenses in the sericite quartz schist which dominates the northwest area of outcrop. Micaceous quartzites occur stratigraphically above and below the conglomerates as thin, tabular bodies which pinch out along strike. Other quartzites, containing varying amounts of mica, occur within felsic schists and gneisses that may be felsic metavolcanics.

Environments of deposition for the Little Willow Formation may include fluvial and mass movement (debris flows) that were accompanied by considerable volcanic activity.

Figure 19. Stretched and folded quartz cobbles, Little Willow Formation. Pencil lies in plane of axial planar schistosity.

URANIUM POTENTIAL OF THE LITTLE WILLOW FORMATION

The comparison of the rocks exposed in the Little Willow area to the Precambrian quartz-pebble conglomerate model is not favorable. The exposed strata consist of sericitic and commonly "dirty" quartzose rocks which compose some 600 m of section. The Little Willow strata lack thick, clean, quartz-pebble conglomerates. Pyrite and heavy minerals are rare. The presumed source area, the Farmington Canyon Complex, does not contain granites. Metamorphic and structural histories are relatively high grade and complex. Conglomerates are para-conglomerates, and are scattered throughout the section and are not clearly fluvial in character and may be, in part, the result of debris flows.

Despite the lack of fit to the model, the conglomerates exposed in the Deaf Smith Canyon area are slightly anomalous with respect to uranium. These anomalies are first reported by Houston and Karlstrom (1980). The most radioactive of these conglomerates is approximately 2 m thick and contains stretched quartz pebbles and cobbles in a sericitic, schistose matrix. This conglomerate, like all conglomerates of the Little Willow Formation, is matrix supported and lacks significant concentrations of heavy minerals. Pyrite is also absent or rare. The thin conglomerate is traceable for a few hundred meters and contains locally more radioactive areas but is on the average somewhat more radioactive than the surrounding schists, although quartzite lenses on either side of the conglomerate are also locally above background levels of radioactivity. Gamma ray anomalies range from about 1.5x to 3x background levels and are centered on the conglomerate. One sample, Sample 152696, contains greater than 10 ppm uranium.

The samples taken from the Little Willow Formation provide both a random selection and a stratigraphic suite. Sampling density is about 24 samples per square mile.

The chemical analyses of the Little Willow samples are presented in Appendix IIID. Summary statistics for these samples are seen in Figure 20. Stretched pebble conglomerates occur in small lenses and layers and analyses of these rocks and adjoining quartzites (Samples 152689, 152696, and 152711) show anomalous amounts of uranium ranging from 0.2 ppm to 22 ppm.

A radiometric grid with a station density of 39 stations per square mile has KTh gamma ray values (Appendix IID) from 1000 to 7100 CPM which average 3070 CPM, and UTh values from 60-290 CPM that average 130 CPM. The background KTh level of radiation is more realistically set at about 2000 CPM. The average value is somewhat elevated by including small anomalies over the conglomerate outcrops.

Summary statistics for the chemical analyses of rocks from the Little Willow Formation are presented in Figure 20. The Little Willow Formation is here considered a poor candidate for economic concentrations of uranium. This evaluation is based on both geologic and social parameters. Geologically, the fit to the model is poor with respect to lithologies and lithological sequences, structure, and metamorphic grade. The conglomerates are thin and have a rather "dirty" micaceous matrix. Indicators are absent; there are no heavy mineral concentrations; rare pyrite and only small gamma ray anomalies are present.

Social problems include urbanization of the immediate area of Deaf Smith Canyon and collection of water for urban use from the canyons in the Little Willow area. Such problems may preclude extensive mine development of

NO. SAMPLES ANALYZED													
LITTLE WILLOW FORMATION													
ELEMENT	VALUES	MEASURABLE	DETECTION	DETECTION	MINIMUM	MAXIMUM	MEAN	MEDIAN	MODE	STANDARD	COEFFICIENT	MEAN	S. D.
		LIMIT	LIMIT	LIMIT	VALUE	VALUE				DEVIATION	OF		
											VARIATION		
U	28				0.48	18.61	3.32	2.02	0.75	3.901	1.172	0.73	0.96
U-MT	28				0.20	21.50	3.79	1.93	0.52	4.560	1.206	0.79	1.06
AL	26				0.43	8.17	5.26	5.43	8.19	1.797	0.342	1.06	0.43
U	0	20	<10	<10	<10	<10	<10	<10	<10				
BA	28				15	1713	551	456	909	412.6	0.7	5.90	1.14
EE	24	3	<1	<1	<1	3	1	<1	<1	0.6	0.5	0.24	0.39
CA	23	3	<0.05	<0.05	<0.05	6.10	0.07	0.21	0.07	1.313	1.957	-1.27	1.22
CU	17	11	<4	<4	<4	63	16	6	<4	15.4	1.0	2.49	0.71
CR	28				1	1607	92	12	2	302.9	3.3	2.72	1.74
CU	25	3	<2	<2	<2	270	41	14	5	67.5	1.6	2.64	1.33
FE	28				0.17	8.07	1.95	1.35	1.34	1.862	0.951	0.32	0.90
LI	28				1	18	7	6	6	4.0	0.6	1.76	0.66
MG	26	2	<0.05	<0.05	<0.05	4.46	0.84	0.47	0.57	1.046	1.243	-0.60	0.68
MN	28				5	1589	285	190	287	362.7	1.3	5.06	1.19
MO	3	25	<4	<4	<4	8	5	<4	<4	2.1	0.4	1.69	0.35
NA	28				0.09	4.29	1.77	0.53	0.40	1.652	0.935	-0.20	1.46
NU	20	3	<4	<4	<4	16	8	6	<4	3.4	0.4	2.05	0.41
NI	27	1	<2	<2	<2	517	34	8	3	98.5	2.9	2.39	1.24
P	28				35	869	242	202	282	192.8	0.6	5.20	0.62
TI	28				57	4373	1590	1294	627	1164.0	0.7	6.99	1.06
SC	26	2	<1	<1	<1	29	5	3	<1	6.0	1.2	1.20	0.91
TH	24	4	<2	<2	<2	69	15	9	5	16.4	1.0	2.41	0.79
V	28				2	238	38	22	12	46.1	1.3	3.10	1.09
Y	26	2	<1	<1	<1	11	3	2	<1	3.1	0.6	1.66	0.63
ZN	28				3	224	41	26	47	47.9	1.1	3.26	0.97
ZR	17	11	<2	<2	<2	8	4	<2	<2	2.1	0.4	1.46	0.51
K	28				0.05	3.35	1.36	0.96	0.93	0.964	0.697	-0.66	1.07
SR	28				5	234	85	71	24	67.6	0.8	4.03	1.04
CE	22	6	<10	<10	<10	113	44	32	<10	26.4	0.6	3.62	0.64

Figure 20. Summary statistics for all samples analyzed, Little Willow Formation.

any type in the Little Willow area.

No anomalies except those related to the conglomerates were found and the area appears to be a poor candidate for other types of uranium mineralization.

ANTELOPE ISLAND

INTRODUCTION

Studies conducted on Antelope Island in connection with this project consisted of only two days of reconnaissance investigations. As such, the conclusions presented here are cursory attempts to blend observational data gathered during the brief field visits with a re-interpretation of earlier reports, chiefly that of Larsen (1957). Ordinarily, conclusions would not be drawn from such preliminary data; however, because little is published about the geology of Antelope Island, with the exception of Larsen (1957), and because we offer rather different interpretations of those data, we present preliminary conclusions for consideration in further studies.

Precambrian crystalline complexes on Antelope Island were first studied in detail by Eardley and Hatch (1940a). They grouped the crystalline gneisses of Antelope Island with the Farmington Canyon Complex. The assignment of these gneisses to the Farmington Canyon Complex established precedent for other geologists to group the Antelope Island gneisses with the rocks that crop out in the Wasatch Range.

Larsen (1957) completed a detailed investigation of the rocks on Antelope Island and concluded that the exposed rocks comprised some 6,000 meters of metasediments. Larsen (1957, p. 10) divides the metasediments into three unnamed units of formational rank which are divided on the basis of contrasting mineral assemblages. The resulting lithological groups are (Larsen's terminology): a lower unit composed of quartzo-feldspathic schist and amphibolite; a middle unit formed of mica, quartzo-feldspathic and microcline schists; and an upper unit of quartz and quartzo-feldspathic schist,

metaquartzite and amphibolite.

Throughout his discussion, Larsen (1957, p. 9) describes the major rock units as thick "arkoses, exceptionally pure feldspar sandstones, calcareous shales, impure dolomitic and perhaps tuffaceous beds, and very pure quartz sandstones". The depositional environment for this pile of sediments is described as a slowly subsiding shallow marine environment in which sediments were "winnowed" and separated. Larsen (1957, pp. 26 and 31, respectively) describes amphibolites composed only of hornblende and plagioclase as probably the result of metamorphism of impure dolomitic beds, and at least some of the pegmatites as the result of metamorphism of debris in stream channels because of channel-like shapes of pegmatite bodies.

Using Larsen's (1957) measured sections for these three units (Figure 21), the lower unit is composed of a total of 1251 m of quartzofeldspathic schist which is separated by thin layers (lenses) of amphibolites which total 55 m. Similarly, the upper unit consists of some 3967 m of quartzofeldspathic schist and a total of only 80 m of amphibolites and other schists. The middle unit is about 782 m of mainly quartz-rich schists with minor amounts of amphibolites (about 44 m). Thus of a total of 6135 m of section, some 5954 m are composed of quartzofeldspathic schists which Larsen (1957) feels are the result of thick, arkosic, near-shore sediments.

Figure 21. Stratigraphic column, Antelope Island. Larsen, 1957.

A RE-INTERPRETATION OF ANTELOPE ISLAND GEOLOGY

We offer a different interpretation of Larsen's data and incorporate data that were gathered during our reconnaissance. First, the gneisses on Antelope Island are very different from gneisses of the Farmington Canyon Complex. We consider the quartzofeldspathic schists of the upper and lower units to be granite gneisses which are of a meta-igneous origin (Bryant and Graff, 1980). Because they are lithologically unlike any major units seen in the Farmington Canyon Complex (Bryant, pers. comm.), they may deserve their own classification. Amphibolites observed in

the upper and lower units are also igneous in nature. These rocks are amphibole-plagioclase rocks with relict sub-ophitic to ophitic texture, which cross-cut foliation as well as lie concordantly, and have no calc-silicate minerals to suggest dolomitic origin.

Thin sections of rocks collected from Antelope Island show evidence of a two-staged metamorphic history. As is seen in rocks of the Farmington Canyon Complex, the first episode of metamorphism represents the last major event that produced granoblastic polygonal textures. This event may have exceeded upper amphibolite grade metamorphism as a sillimanite phase exists in the metasedimentary rocks, and pyroxene occurs in the granite gneiss (Bryant, pers. comm.). The second stage is characterized by cataclastic textures and epidote-chlorite-albite assemblages that suggest temperatures well below 500°C and well within conditions of the greenschist facies. This second stage was retrograde and involved the rehydration of the rocks. All samples collected show evidence of varying degrees of retrograde activity and most samples exhibit a partially developed mortar texture. Locally, mylonites were formed which have a mica foliation developed parallel to mineral elongation. This suggests that the cataclasis and retrograde metamorphism were probably contemporaneous.

We generally agree with the geographical division of rock types that Larsen (1957) shows on his map. However, we feel that further studies may show that, at least at the northern portion of the gneissic rocks, the "upper unit" and "lower unit" of Larsen (1957) are the same rocks. As pointed out earlier, both units contain about the same ratio of amphibolite to granite gneiss, and characteristics of the granite gneisses are similar. The "upper unit" does, however, contain more and larger bodies of pegmatite than does the "lower unit". The southern third of the "upper unit" is somewhat different

from rocks elsewhere on the island. This area contains migmatites, pegmatites, and amphibolites as well as sheared and unsheared granite gneiss. Small discrete areas of shear occur parallel to, and at high angles to, the major shear zone.

Larsen's (1957) "middle unit" is here interpreted as a major mass of highly sheared rock with enclosed lenses of less sheared rock. This major north-south trending shear zone is composed of sheared metasedimentary rocks and sheared granite gneiss. The only sillimanite-bearing rocks found during our reconnaissance were in this shear zone. Retrograde metamorphism is most strongly developed in this zone. All rocks within this zone, including amphibolites, are strongly sheared although some pegmatite bodies in the zone are less sheared than surrounding rocks.

The absolute ages of the rocks and events on Antelope Island are not known. However, U/Pb systematics were attempted on zircon from the granite gneiss. The result of that analysis was a very uncertain age of about 2,000 m.y. This age is determined from a very poorly defined two (closely-spaced) point line and has a great degree of uncertainty (Bryant, pers. comm.).

The shear zone was formed some time before the deposition of the PGZ Mineral Fork Formation. Mineral Fork rocks unconformably overlie the sheared rocks and are faulted into the shear zone by later high-angle faults.

URANIUM POTENTIAL OF ANTELOPE ISLAND

Antelope Island probably has the best potential for uranium deposits of any of the areas studied for the Uinta Arch Project. Because of Larsen's (1957) report of massive metasediments, microcline pebble conglomerates

(augen gneiss) and quartzites, the area was approached as a possible quartz-pebble conglomerate locality. However, in our opinion, the Antelope Island suite is a "non-fit" to the model developed for such occurrences. Instead, we feel that the pile is a meta-igneous suite with minor amounts of in-faulted(?) metasediments which were later sheared during the development of the major shear zone.

Total gamma ray readings from hand-held spectrometers established a background over the granite gneiss of about 3x the values for the Farmington Canyon Complex. The background increases from 1.5x up to about 3x the granite gneiss values when measured over the shear zones; this equals 6-9x background values measured for the Farmington Canyon Complex. Local pods of altered rock within the shear zone read up to about 10x the granite gneiss values or 30 to 60x the average values recorded for the metasedimentary sequences investigated during the Uinta Arch Project.

Statistical anomalies of eU and eTh are reported by GeoLife (1979) for the Tooele Quadrangle in an analysis of airborne radiometric investigations. These anomalies were discovered by helicopter-borne aerorad equipment. Four east-west cross flights and one north-south longitudinal flight revealed one eU and two eTh anomalies, and one of the eTh anomalies and the eU anomaly are coincident over the north end of the gneissic complex on Antelope Island. Although only three statistical anomalies occur, the flight line data for flights over Antelope Island are all relatively high with respect to background gamma radiation values.

Individual samples analyzed for uranium content reflect the higher gamma ray activity. Samples of altered rock from the shear zone ranged from about 5 ppm to about 4,300 ppm U. In particular, three samples from a strongly

NO. SAMPLES ANALYZED		RELOW		MEASURABLE DETECTION		DETECTION	MINIMUM	MAXIMUM	MEAN	MEDIAN	MODE	COEFFICIENT OF		LN TRANSFORMATION			
ELEMENT VALUES		LIMIT		LIMIT		LIMIT	VALUE	VALUE				DEVIATION	VARIATION	MEAN	S. D.	ROBUST	
														MEAN	S. D.		
U	31						0.74	4295.00	210.88	4.22	1.96	795.974	3.775	2.09	2.07	1.96	2.28
U-NT	31						2.94	4431.00	221.04	6.72	4.20	823.928	3.728	2.53	1.82	2.38	2.00
AL	31						3.94	10.84	6.56	6.06	5.83	1.491	0.227	1.86	0.21	1.86	0.23
B	1	30	<10			<10	10	10	<10	<10		0.0	0.0	2.30	0.0		
DA	31					100	2309	1055	1178	736	598.2	0.6	6.68	0.91	6.71	0.91	
RF	31					1	7	3	3	3	1.4	0.4	1.11	0.45	1.12	0.47	
CA	31					0.05	1.53	0.60	0.61	0.73	0.393	0.654	-0.81	0.90	-0.78	0.88	
CD	12	19	<4			<4	44	18	<4	<4	15.1	0.8	2.59	0.90			
CR	30	1	<1			<1	236	27	7	2	52.6	1.9	2.21	1.43	2.06	1.80	
CU	30	1	<2			<2	691	51	8	9	137.4	2.7	2.59	1.37	2.39	1.69	
FE	31					0.68	31.64	5.32	3.92	2.00	5.676	1.067	1.38	0.71	1.37	0.68	
LI	31					1	45	13	7	7	12.1	0.9	2.20	0.92	2.22	0.97	
MG	31					0.05	4.40	0.94	0.31	0.37	1.276	1.353	-0.88	1.32	-0.89	1.50	
MN	31					104	3204	741	545	546	630.7	0.9	6.34	0.75	6.34	0.85	
MO	2	29	<4			<4	17	10	<4	<4	9.2	0.9	2.11	1.02			
NA	31					0.18	4.80	1.86	1.77	2.17	0.852	0.458	0.47	0.66	0.51	0.71	
NR	26	5	<4			<4	116	37	35	<4	19.7	0.5	3.51	0.57	3.45	0.46	
NI	23	8	<2			<2	102	20	<2	<2	30.8	1.5	1.94	1.47			
P	31					46	916	435	307	731	230.7	0.5	5.90	0.66	5.94	0.56	
TI	31					250	8451	2796	2287	2479	1921.4	0.7	7.71	0.71	7.74	0.70	
ST	31					1	43	19	7	8	10.2	0.9	2.04	0.84	2.06	1.01	
TH	31					3	220	43	23	23	56.8	1.3	3.25	0.97	3.25	1.24	
V	31					2	534	75	10	8	146.4	1.9	3.02	1.52	2.99	1.72	
Y	31					11	169	68	65	102	42.9	0.6	3.98	0.78	4.00	0.79	
ZN	31					22	271	118	100	47	66.3	0.6	4.60	0.62	4.62	0.61	
ZO	31					3	179	29	16	13	36.2	1.2	2.96	0.91	2.95	1.00	
K	31					0.38	6.02	2.58	2.62	3.14	1.238	0.479	0.80	0.62	0.83	0.66	
SR	31					10	139	70	18	101	36.9	0.5	4.08	0.66	4.11	0.65	
CE	30	1	<10			<10	1550	265	201	215	340.3	1.3	5.13	0.96	5.06	1.26	

Figure 22. Summary statistics for all samples analyzed, Antelope Island.

sheared amphibolite, samples numbered 153077-153079, returned uranium values of 910, 1,100, and 4,400 ppm, respectively. In outcrop, this occurrence is a pod-shaped body about 2 m across and lies next to a less-sheared pegmatite from which values below background levels of gamma radiation were recorded.

Sampling done on Antelope Island was strictly a reconnaissance program and represents a random sampling population and a suite of rocks from radioactively anomalous areas. Summary statistics for the program are shown in Figure 22. Uranium values range from about 1 ppm to about 4,400 ppm and reflect KUTH radiation values of 1,700 to 60,000 CPM with an average of 12,000 CPM; however, from observations of continuous monitoring of gamma ray activity during traverses, a more realistic background value for the granite gneisses is about 6,000 CPM. Radiation from UTH ranged from 100 to 2,000 CPM and averaged about 550 CPM. Chemical analyses, locations, and gamma radiation values are tabled and cross-referenced in Appendices IIE and IIIE.

The high background levels of gamma radiation, the anomalies associated with radiometric readings, the high values of chemically analyzed uranium, and the coincident major structural feature demand further investigations of Antelope Island. A different model, or perhaps a new model, must be developed to guide those investigations. In construction of such a model, the major shear zone must play a primary role in the movement, and perhaps the concentration, of uranium.

CONCLUSIONS AND RECOMMENDATIONS

RED CREEK QUARTZITE

The Red Creek Quartzite reflects the development of a thick, clastic sequence at the edge of the Archean craton. However, the exposed portion of the section is dominated by marine facies rocks which are not the most conducive environments to concentrations described by the model. In addition, our tectonic interpretation requires great vertical and horizontal transport of the exposed strata. If fluvial conglomerates exist in the Red Creek section, they are probably buried to the south beneath the Uinta Mountain Group strata.

Other parameters at Red Creek do not fit the model well. The metamorphic grade appears too high; pyrite or reduced phases are absent. Geochemical and radiometric surveys show no stratiform anomalies.

As a consequence, the favorability for locating uranium occurrences of the style described by the model is here considered poor.

Suggestions for further study include a drill hole at Garnet Canyon to test strata below the exposed limit. However, this drilling is considered to have a relatively poor chance of adding greatly to stratigraphic knowledge and an even poorer chance of intersecting fluvial conglomerates at that location.

Secondly, re-investigation of the mineralized areas, particularly the gossan pods, to test for some structural relationship or relationship to the unconformity above the Red Creek Quartzite, is a more attractive possibility for further studies. If there is some connection to the unconformity, then any areas of relatively thin Uinta Mountain Group should be studied.

FARMINGTON CANYON COMPLEX

Quartzites of the Farmington Canyon Complex have little in common with the model. Metamorphic grade is too high; sequences are too thin; structure is too complex; no conglomerates occur; no anomalies occur. The Farmington Canyon Complex is considered a very poor candidate for occurrences of the type described by the model. Favorability for any type of uranium occurrence is also considered very poor.

FORMATION OF FACER CREEK

Quartzites north of Willard Peak are extremely poor fits to the model described here. Metamorphic age determined for these rocks suggests that they may be too young. They are considered allocthonous and may be but a sliver of the section from which they were separated, and may have been transported great distances. Metamorphic grade is relatively high and the rocks are completely recrystallized. No heavy mineral concentrations are present; pyrite is also absent. No geochemical or radiometric anomalies occur within the formation of Facer Creek.

The favorability for quartz-pebble uranium occurrences in the Facer Creek rocks is considered very poor. The favorability for uranium occurrences of any style in the Facer Creek rocks is likewise here considered very poor.

LITTLE WILLOW FORMATION

The overall fit of Little Willow rocks to the developed model is not good. The thickness of metasedimentary rocks is relatively thin and does not represent a fluvial sequence similar to those developed in the type areas. The sequence at Little Willow lacks the clean, pyritiferous, densely packed quartz-pebble conglomerates. Age of these rocks is uncertain and the sequence commonly lacks pyrite and reduced phases. Metamorphic grade, although lower than the rocks of the nearby Farmington Canyon Complex, is still in the amphibolite facies; it is too high to fit the Canadian sequence but may be not too unlike the metamorphic grade seen in southern Wyoming. The structural setting at Little Willow is certainly more complex than that at the type areas, but again may be similar to the structural setting in southern Wyoming.

Despite the negative aspects of model comparison, geochemical and radiometric anomalies do occur in the Little Willow Formation. The anomalies are relatively small (up to about 5x) in both intensity and area, but are centered on small lenses of quartz-pebble conglomerates as the model requires. Due to the small scale of the anomalies, the lack of a thick conglomerate sequence, and perhaps most importantly, the urbanization of the immediate area, the Little Willow is considered a poor candidate for model-type uranium occurrences or large-scale development of any mineral interest.

ANTELOPE ISLAND

The rocks at Antelope Island were found to be mainly meta-igneous rather than metasedimentary and hence cannot be considered in terms of the quartz-pebble model. However, anomalies, large in both intensity and area,

were discovered during the course of this investigation. These radiometric and geochemical anomalies are apparently associated with a large shear zone that bisects the island. Because of the brevity and reconnaissance nature of our visit to the island, and the magnitude of the anomalies, we recommend that further studies be undertaken to determine the economic potential. It is our opinion that the favorability for significant uranium occurrences being located on the island is at the least fair. However, exploration for such occurrences should not be predicated on the quartz-pebble model, but on a model described for shear zone or fault-controlled types of deposits.

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APPENDIX I

Appendix I contains data on samples collected for petrographic analysis during the Uinta Arch Project. The first part of this appendix is a summation of salient petrographic features and bulk mineralogic composition. The second part is a sample-by-sample listing of each rock studied by petrographic analysis. Sample numbers are cross-referenced to location, radiometric readings, and chemical analysis numbers in Appendix II, and to chemical analyses in Appendix III.

SUMMARY OF PETROGRAPHIC CHARACTERISTICS

UINTA ARCH PROJECT

Sample #	Name	Texture	Qtz	Plag	K-spar	Ms	Bi	Ch	Al ₂ SiO ₅	St	Hb	At Trem	Cc	Opq	Assc	Gt	Ep	Alt
SR-101	Cataclastic granitic gn	Cataclastic	30	10-15	55-60	2												
				An4														
SR-102	Cataclastic Mortar quartzite		99			Tr		Tr						Tr				
SR-107	Ms-Qtz sch	gbp	65			30								5	Tour			
SR-108	Qtz-Ms sch	Lepido-blastic	42			55								3	Tour			
SR-110	Cataclastic Mortar quartzite breccia		99			1												
SR-111	Bi-Ms-Qtz sch	gbp/foliated	60			15	10-15	10-15						1				
SR-113	Ms-Ms quartzite	gbp/foliated	80			10								5-10	Ap	Tour		
SR-117	Cataclastic quartzite	Cataclastic	95			2								3				
SR-119	Quartzite	gbp/foliated	90			3		3						1	Tour			
SR-122	Micaceous quartzite	gbp/foliated	80			20		Tr								Zr	Tour	
SR-124	Sill-Ch-Ms-Plag-Qtz sch	gbp/foliated	35	45		6		6	Sill 2					2	Zr	Tour		
SR-129	Ch-Ky-And-Ms-Qtz sch	gbp/foliated	30			30		3-5	Ky And 30					3				
SR-131	At gn	gbb	40	25	An14			5				15	10-20					
SR-134	Qtz bearing marble	gbp	45			2							53					
SR-139	Cataclastic quartzite	Cataclastic	85-90	5-10				1						3				
SR-141	Bi-Ms-Qtz sch	gbp/foliated St pblasts	35			15	3			45				1				
SR-141	Ch-Bi-Ms-Qtz-St sch	gbp/foliated St pblasts	25			10	2	1		60				1				
SR-144A	Gr-Mt quartzite	gbp/Ch retrograde	80-90					3						5-10	Ap	5-10		
SR-144B	Mt-Gr quartzite	gbp/Ch retrograde	78					3						15		5		
SR-146	Ms-Trem-Ch sch	Nemato-blastic				10		50				35		5				
SR-148	Bi-Ch-Ms-St-Qtz sch	gbp/foliated St pblasts	40-50			20	5-10	5-10		20								
SR-148	Ch-Bi-Ms-St-Qtz sch	gbp/foliated St pblasts	30			25	5	2		35				2-5				
SR-148	Ch-Bi-St-Ms-Qtz sch	gbb/foliated St pblasts	45-50			25	5	5		15-25				1				
SR-148	Micaceous quartzite	gbp/Ms foliation	85-90			10-15		2								Zr	Tour	
SR-149	Ch-Bi-Ms-St-Plag-Qtz gn	gbp/foliated St pblasts	50	10-30		20	2	rtg		20								
SR-149	St-Gt-Ms-Qtz sch	gbp/foliated	65			30				1				1	Tour	2		

SUMMARY OF PETROGRAPHIC CHARACTERISTICS
 UINTA ARCH PROJECT
 (continued)

Sample #	Name	Texture	Qtz	Plag	K-spar	Ms	Bi	Ch	Al ₂ SiO ₅	St	Hb	At Trem	Cc	Opq	Assc	Gt	Ep	Alt
SR-152	Cataclastic qtzite	Cataclastic	98			2							Tr					
SR-153	Ch-Bi-Qtz- Gt-Plag gn	gbp/Ch retrograde	20	45 An30			2	2						1		30		
SR-153	Ch-Bi-Gt- Plag-Qtz sch	gbp/ foliated GT pblasts	50	15- 20 An30			10	5- 10						3	Ap Zr	20		
SR-156	Cataclastic qtzite	Cataclastic	98					2						Tr				
SR-159	Ms-Ky-Bi- Ch-Qtz sch	gbp/ foliated	50			3	10	30	Ky 2-5					3-5				
SR-164	Ch marble	gbp	5					10					85	2				
SR-166	Gt-Bi-Qtz- Plag gn	gbp Ch rtg some rextall	35	50			5- 10	rtg									5	
SR-171	Cataclastic qtzite	Cataclastic	98			2		Tr										
SR-176	Qtzite	gbp/x- fractures	98			2		1								Tour		
SR-181	Cataclastic qtzite	Mylonite	95	2		1		1						Tr	Ap			
SR-183	Qtzite breccia	Mortar- Cataclastic	99			1												
SR-184	Al ₂ SiO ₅ bearing qtzite	gbp Sill foliation	90			2			Ky 3 Sill 5									
SR-185	Plag-Qtz-Hb amphite	gbp Seri.	15	35				Tr			50			2				
SR-187	Cc-Hb-Ep- Plag-Qtz gn	gbp some alt	40	30							5		5	5	Sph		10	
SR-189	Qtzofeld- spathic gn	gbp/myrmekite	25	5	45						20		2	4	Sph			
SR-193	Ch-Bi-Ms- St-Qtz sch	gbp/ foliated	35			30	5	Tr		25				1-2	Ap			
SR-194	Qtzofeld- spathic gn	gbp mild rtg	30	40 An3	20		1	1			5		Tr	5- 10	Ap			
SR-200	Tremolite marble	gbp						3			15	80						
SR-201	Qtz-At sch	Nematoblastic	25								70		2	1	Ap			
SR-234	Gt-Bi-Ch- Qtz-Plag gn	gbp minor rextall.	35	45 An8			3-5	20						1		3		
SR-235	Gt-Bi-Plag- Qtz gn	gbp	35	35 An24			20- 25							Tr	Zr Tour	2		
SR-236	Gt-Qtz-Hb- Plag Amp.	gbp/ nematoblastic	10	40 An41							50			2		2		
SR-238	Qtzofeld- spathic gn	gbp/Seri.	40	45	10	5	2											
SR-239	Brecciated qtzofeld- spathic gn	Cataclastic Sericite	70	30				1							Ap Zr			
SR-241	Gt-Sill-Bi- K-spar-Qtz gn	gbp/Bi-Sill foliation	30		30		20- 30		Sill 10-20					1		2		
SR-244	Feldspathic qtzite	gbp	85	15														
SR-247	Qtzofeld- spathic gn	gbp/mild rextall.	70		20- 25	2		2										
SR-248	Qtzofeld- spathic gn	Mild rextall.	68		30	1		1										
SR-251	Ch-Trem sch	Nematoblastic						30- 40			60- 70							
SR-252	K-spar-Ms- Qtz-Plag gn	gbp/minor rextall.	25	45- 50	10	10- 15		5										

SUMMARY OF PETROGRAPHIC CHARACTERISTICS
 UINTA ARCH PROJECT
 (continued)

Sample #	Name	Texture	Qtz	Plag	K-spar	Ms	Bi	Ch	Al ₂ SiO ₅	St	Hb	At Trem	Cc	Opq	Assc	Gt	Ep	Alt
SR-259	Ms-Plag-Qtz sch	Lipidoblastic rextall. matrix	50- 55	20		25									Alt 1			
SR-273	Gt-Plag- Qtz-Bi gn	gbp	15	25		5 Alt	40	5 Alt						1	3		15	
SR-274	Qtzofeld- spathic gn	gbp	45	35 Myr	15		5	rtg								Ap		
SR-275	Qtzofeld- spathic cataclastic breccia	Mortar	50	5- 10	40			Tr										3
SR-277	Tour-Ms- Plag-Qtz gn	gbp/layered	30- 60	10- 40		10- 20									Tour 15			
SR-277	Tour-Plag- Qtz gn	ghp	60- 65	20											Tour 5-15	Ap Zr		
SR-278	St-Ms-Qtz sch	gbp Ms foliation	50			20- 25		5		20					1	Tour		
SR-289	Qtzofeld- cataclastic breccia	Cataclastic	60	20	20													10- 15
SR-291	Qtz-Plag breccia	Cataclastic	55- 65	30 An8	5			1								Zr		5- 10
SR-293	Qtzofeld- spathic gn	gbp/some rextall.	25	35 An6	40										1			
GR-2	Cataclastic qtzofeld gn	Mild cataclastic	85	10- 15 Ab		2												
GR-4	Ms-Gt-Qtz gn	gbp/Gt pblasts	58		1-2	20									Tr		20	
GR-7	Qtzite	Cataclastic	97			3												
BC 1G	Gt-Mt-Plag- Qtz-Hb-Bi sch	Lepidoblastic	15	15 An30			45				20				5		3	
BC 2G	K-spar-Bi- Gt-Plag- Qtz-Hb Amp	gbp/Seri	25	25	2		10- 15				35				Tr	Zr Ap	2	
BC 3G	Sill-Ms-Bi- Plag-K-spar Qtz gn	gbp/slight rextall.	40	2	40	3	5		Sill 2									
BC EW	Feldspathic qtzite	gbp/slight rextall.	75	15 Ab		1					Tr							
BC EW	Plag-Gt- Qtz-Hb Amp	gbp/ nematoblastic	25	5 An35							45- 50		Tr	4	Ap	15- 20		
MES BC	Cataclastic feldspathic qtzite	Cataclastic	80	20 An15		2-3 Seri										Zr		
GF-106	Qtzite	Mortar/ cataclastic	99			1												
GF-107	Feldspathic qtzite	Cataclastic/ altered	55- 65	(Altered)		5- 10												20- 30 Seri
GF-109	Micaceous qtzite	Cataclastic/ mortar	85- 90	1		10- 15												
GF-112	Qtzite	gbp	99			1										Zr		
GF-113	Qtzofeld- spathic gn	gbp	40	5 An15	55		1											
GW-100	Qtzite	gbp	99			1												
GW-101a	Bi-Ms-Qtz sch	gbp/pebbles	73			25	2	Tr							Tr			
GW-101b	Bi-Ms-Qtz sch	gbp/foliated pebbles	70- 80	1		15- 20	5- 10								1			
GW-102	Bi-Ms-Plag- Qtz gn	gbp/minor rextall.	50	40 An13		10	3	Tr							Tr			

SUMMARY OF PETROGRAPHIC CHARACTERISTICS
 UINTA ARCH PROJECT
 (continued)

Sample #	Name	Texture	Qtz	Plag	K-spar	Ms	Bi	Ch	Al ₂ SiO ₅	St	Hb	At Trem	Cc	Opq	Assc	Gt	Ep	Alt
GW-104	Bi-Ms-Ch- Plag-Qtz gn	gbp	40	50 An12		3	2	5							Tr			
GW-106	Bi-Ms-Qtz sch	gbp/pebbles	69	Tr		20	10	Tr									Tr	
GW-107	Qtz plag gn	gbp/ cataclastic	45	60 An11		1	2	1							Tr		Tr	
GW-108	Ch-At sch	Nematoblastic						20- 25				75- 80		3				
GW-109	Bi-Ch-Ms- Plag-Qtz sch	gbp/w/ foliation	40	2 An12		30- 50		5- 10						1			1	
GW-110	Plag-Ms-Qtz sch	gbp minor rextall.	70- 80	3 An20		10- 20	2	3							Tr			
GW-111	Bi-Ms-Qtz sch	gbb mica foliation	70			25	5							1				
H2W 3	Ms-K-spar- Qtz gn	gbp	60		30	10												
H2W 6	Feldspathic qtzite	Cataclastic mortar	80	15	Tr	3												
HLW 9	Qtz-Plag-Hb Amp	Nematoblastic	15	20 An33							65			1	sph			
HLW 12	Bi-Ms-Qtz sch	gbp	75- 85			15- 20	3	Tr							Tr			
HLW 14a	Ms-Qtz sch	gbp/ crenulated	60			35	Tr							1	Zr Tour			
HLW 14b	Ch-Ms qtzite	gbp/pebbles	85			10	Tr	2						1	Zr		Tr	
HF-2	Qtzofeld gn	Cataclastic mortar	5- 10	3 An25	90	Tr		Tr										Tr
HF-3	Ep-Ab-Hb Amp	gbp	10- 15	30 An2							45			3	sph		5- 10	
HF-5	Bi-Sill-Ms sch	Lepidoblastic sch	30			20	-	15 -										35 Seri
HF-6	Alt Ms-Bi- Qtz gn	gbp/Seri.	50			5- 10	10								Ap			40 Seri
HF-6	Alt Ky-Bi- Gt-Qtz gn	gbp/clay- Seri.	45					15	Kyl0							15		15 Vm
HF-7	Sill-Ms- Bi-Plag- Qtz gn	gbp/mica foliation	20	50 An20		10	20		Sill 2					1				Ch
HF-10	Feldspathic qtzite	gbp/Seri- rextall.	91	3 An14	5	1-2									Zr			
HF-11	Chloritic qtzite	Cataclastic	70			3		20									5	
HF-16	Cataclastic qtzite	Cataclastic	95	4		1												Seri
HF-16	Cataclastic qtzite	Cataclastic mortar	95	5		1												Seri
HF-17	Alt qtzo- feld gn	Fine Alt	45			2												Clay Seri 55
HF-17	Bi-Ms-Qtz gn	Altered	50			5- 10	20											Clay? 30
HF-22	Micaceous qtzite	gbp/slight rextall.	90			5- 10		1						Tr				
HF-27	Qtzite	Mortar	99			1												
HF-31	Sill-Bi-Ms- K-spar-Qtz gn	gbp/Ms foliation	65	2 An4	30	2	2		Sill 1					Tr				
HF-32	Qtzofeld- spathic gn	gbp	45	15 An10	20	1	1											

SUMMARY OF PETROGRAPHIC CHARACTERISTICS

UINTA ARCH PROJECT (continued)

Sample #	Name	Texture	Qtz	Plag	K-spar	Ms	Bi	Ch	Al ₂ SiO ₅	St	Hb	At Trem	Cc	Opq	Assc	Gt	Ep	Alt
SP-1	Qtzofeld- spathic gn	gbp	30		65		1							5- 10				
SP-2	Qtzofeld- spathic gn	gbp/weak foliation	45		45	1	2-5							5				
SP-3	Alt qtzo- feldspathic gn	gbp/Alt	40		40									10	Ap			Clay? 15%
SP-4	Qtzofeld- spathic gn	gbp	50	2-4 An23	40									5				Seri 5-10
SP-5	Ms-Bi-Qtz- Plag sch	gbp/foliated	32	40 An33		5	23							1			Tr	
SP-6	Plag-Qtz-Hb Amp	gbp	40	(10) Alt							50			2				Ms-Ep 5-10
SP-16	Qtzofeld- spathic gn	gbp	67	30	3		1								Er			
SP-17	K-spar- Plag-Qtz-Hb Amp	gbp/Alt	20	5	5						55				Ap-2 Sph-2		25	
GF-102	Ms-Ch-Qtz sch	Lepidoblastic much Seri.	40			20		10										Seri 30
GF-103	Micaceous qtzite	Cataclastic	97			3												
GF-104	Magnetite qtzite	gbp/some rextall.	80	2 An28		1								15	Ap-4			

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT

Sample Number: GW 100

Mineral	Mode	Remarks
Qtz	99%	0.6mm size average

Ms 1%

Rock Name: Quartzite

Texture: Granoblastic polygonal, with sutured grain boundaries.

Discussion: Average grain size approx. 0.5-0.8mm. In main only one size grain. No orientation, only slight if any recrystallization. Textural equilibration is approx. medium.

Precursor: Qtz sandstone

Sample Number: GW 101b

Mineral	Mode	Remarks
Qtz	70-80%	Size 0.6mm in pebbles, 0.2mm in matrix.
Ms	15-20%	Grains approx. 0.3mm, well oriented.
Bi	5-10%	Pleochroic in olive/brown green shades.
Mt	< 1%	Equant grains to 0.1mm diameter.
Plag?	< 1%	2V approx. 50°(+), porphyroblast, approx. 1mm size. May be cordierite. Numerous fine inclusions.

Rock Name: Biotite-Muscovite-Qtz schist

Texture: Granoblastic polygonal with lepidoblastic biotite and muscovite. Good foliation, with beginnings of light and dark layer segregation.

Discussion: Some zones may be recrystallized with grains down to 0.04mm. Have what may have been Qtz pebbles in conglomerate. Are to 3.5x5mm dimensions. Have well-developed pressure shadows & coarser grains within.

Precursor: Clayey sand or siltstone w/pebbles

Sample Number: GW 101a

Mineral	Mode	Remarks
Qtz	73%	Equant, usually 0.1-0.4mm size.
Ms	25%	Good foliation, to 0.8mm grains
Bi	2%	Grains scattered to 0.6mm
Mt	< 1%	Equant, 0.1mm
Ch	< 1%	Few small clumps. Is Mg rich/stable.

Rock Name: Biotite-Muscovite-Qtz schist

Texture: Granoblastic polygonal w/Bi-Ms foliation. Grain boundaries only lightly sutured. Closely approximates equilibrium texture.

Discussion: Few small (approx. 1mm) Qtz aggregates in "eye" shape that may have been pebbles. Qtz somewhat coarser in segregations.

Precursor: Pebbly quartzite w/clay

Sample Number: GW 102

Mineral	Mode	Remarks
Qtz	50%	

Ms 10% Elongate aggregates, individual grains approx. 0.2x0.8mm.

Bi 3%

Ch 1% Brown, Mg-rich & not altered. May be equant shaped (0.2mm).

Plag 40% 1x, extinction $\theta_{\text{O}10} = -3^\circ$ is An_{13} , grain size to 0.7mm (0.3-0.7). Often contain small Ms inclusions (later alteration?).

Mt 1% Few small grains

Rock Name: Bi-Ms-Plagioclase-Qtz gneiss

Texture: Granoblastic polygonal, though in some spots have finer aggregates of grains between coarser grains.

Discussion: May be some recrystallization. Ms defines main foliation.

Precursor: Dacite?

Sample Number: GW 104

Mineral	Mode	Remarks
Qtz	40%	Size from 0.06 - 0.6mm
Plag	50%	$\gamma_{\text{O}10} = -7^\circ$ grains equant to 1mm. An_{12} numerous inclusions of Ms.
Ms	3%	
Bi	2%	
Ch	5%	Grains & aggregates are Mg-rich.
Mt	< 1%	Few equant (approx. 0.2mm) grains.

Rock Name: Bi-Mx-Chlorite-Plag-Qtz gneiss

Texture: Granoblastic polygonal to gneissic, but no good foliation.

Discussion: Coarse Plag & Qtz grains and aggregates surrounded by smaller Qtz and Ms-Bi-Ch (sometimes aggregates) grains in poorly oriented matrix. Possibly effect of Tertiary intrusive (Big Cottonwood) events to the east. Contains some recrystallization. This may account for the mica grains as inclusions in Plag.

Precursor: Dacite or rhyodacite? Plagioclase rich.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: GW 106

Mineral	Mode	Remarks
Qtz	69%	Coarse grains to approx. 0.5mm and as fine 0.02 grains.
Ms	20%	
Bi	10%	Green, fair foliation.
Plag?	<1%	Few grains to 0.5mm, poikiloblastic w/numerous inclusions, has cleavage.
Ch	Tr	Brown, Mg-rich
Ep	Tr	Anhedral

Rock Name: Biotite-Muscovite-Qtz schist

Texture: Coarse quartz w/surrounding finer matrix of Qtz-Biotite-Ms. Quartz may be initially coarser grains?

Discussion: Has Qtz segregations which may have been pebbles. Ch-Bi-Ep grow together in approx. 0.5mm clumps.

Precursor: Clay rich sand or siltstone.

Sample Number: GW 107

Mineral	Mode	Remarks
Qtz	45%	To 0.7mm, also small recrystallized grains, sutured boundaries.
Plag.	60%	To 2mm size Y $\wedge$ 010 = -9° approx. An ₁₁ .
Ms } Bi } Ch }	3-5%	Interstitial aggregates, poorly oriented.
Mt	1%	Equant 0.08mm
Ep	1%	Few tiny grains w/Ch

Rock Name: Qtz-Plag gneiss

Texture: Granoblastic polygonal to mortar texture. foliation is poor.

Discussion: Numerous 0.02mm Qtz & Ms inclusions in plagioclase is recrystallization. Contact event? Contains sheared recrystallized zones & sectors. Plag. twins often bent & broken.

Precursor: Sodic rhyodacite or rhyolite

Sample Number: GW 108

Mineral	Mode	Remarks
Al	75-80%	Elongate needles approx. 0.4mm. Pleochroic clear to pale green. Fine matrix is approx. 0.01mm.
Ch	20-25%	White-brown birefringence, is Mg-rich. 2V approx. 5°(+).
Mt	3%	Numerous small grains approx. 0.08mm.

Rock Name: Chlorite-Actinolite schist

Texture: Nematoblastic, good Al foliation w/ aggregates of Ch.

Precursor: Calc-silicate(?)

Sample Number: GW 109

Mineral	Mode	Remarks
Qtz	40%	Granoblastic, 0.5mm, usually in well-defined layers.
Plag.	2%	Low An (12?), as irregular, poorly twinned grains, in one large pebble. Contains numerous 0.02mm mica & Qtz grains.
Ms	30-50%	Coarse to 1mm defines foliation.
Ch	5-10%	
Bi	5-10%	Green pleochroic, poorly oriented.
Ep	<1%	Xenomorphic, in with Bi & Ch
Mt	1%	Scattered grains (0.03-0.3mm) finer in micaceous layers.

Rock Name: Bi-Ch-Ms-Plag-Qtz schist

Texture: Granoblastic polygonal to lepidoblastic in layers.

Discussion: Has alternate Ms-poor & Ms-rich layers. Ms is kinked at approx. 70° to orientation of main foliation. Contains large (to 10mm) pore Qtz & Plag aggregates (eyes) occur in layers that are Qtz rich. Relict pebbles?

Sample Number: GW 110

Mineral	Mode	Remarks
Qtz	70-80%	Medium textural equilibration approx. 0.2-0.3mm size.
Plag.	3%	An approx. 20-30, matrix grains, fair twinning.
Ms	10-20%	As 0.5mm elongate grains, well oriented to fine aggregates of non-oriented smaller 0.02mm grains.
Ch } Bi }	3% } 2% }	Poorly oriented, matrix.
Opaq	<1%	Reddish, equant (approx. 0.1mm) hematite?

Rock Name: Plag-Ms-Qtz schist

Texture: Granoblastic polygonal; minor recrystallization.

Discussion: May be seeing some textural response to contact event in recrystallized Ms.

Precursor: Clay-rich sandstone

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: GW 111

Mineral	Mode	Remarks
Qtz	70%	Approx. 0.6mm down to approx. 0.1mm.
Ms	25%	
Bi	5%	In aggregates (not foliation)-green.
Mt	1%	Equant w/in Bi aggregates. Some alteration to hematite.

Rock Name: Bi-Ms-Qtz schist (Qtzite)

Texture: Granoblastic polygonal w/Ms foliation; approaches textural equilibrium.

Discussion: Some larger Qtz grains (approx. 10x matrix).

Precursor: Sandstone w/clays

Sample Number: HLW 3

Mineral	Mode	Remarks
Qtz	60%	Coarse is 0.4mm, finer to approx. 0.08mm.
Ms	10%	
K-spar	30%	Only as finer grained microcline, good twinning.

Rock Name: Ms-K-Spar-Qtz gneiss

Texture: Granoblastic polygonal w/Ms foliation. Good textural adjustment, but grains are 2 sizes.

Discussion: Has coarse Qtz, w/finer matrix of Plag & Qtz.

Precursor: Arkose

Sample Number: HLW 6

Mineral	Mode	Remarks
Qtz	80%	Granoblastic, coarse approx. 0.3mm, fine 0.02mm.
Plag	15%	Grains approx. 0.4mm size.
Ms	3%	Few 0.2mm grains; weak foliation.
K-spar	?	Few grains may have microcline twinning.

Rock Name: Feldspathic quartzite

Texture: Mortar texture-cataclastic w/large areas retaining granoblastic polygonal texture.

Discussion: Contains sheared & recrystallized zones. Some complete recrystallization along fracture zones. Twinning in Plag is broken & offset.

Precursor: Sandstone w/some feldspar grains

Sample Number: HLW 9

Mineral	Mode	Remarks
Hb	65%	Elongated to 0.9mm long, (most 0.5mm) 2V 60°(-), α_c 31° Pleochroic bluegreen to yellowgreen.
Qtz	15%	Grains to 0.4mm.
Plag	20%	Grains to 0.5mm. $X_{A001}=+15^\circ$, An_{33} .
Mt	1%	Euhedral to 0.1mm (one grain at 0.4mm)
Sphene	1%	Anhedral, to 0.2mm.

Texture: Nematoblastic, strongly aligned Hb xals make strong foliation.

Discussion: Some Hb (fine xals, needles) not well aligned; may be later rextallization; matrix shows rextallized quartz.

Precursor: Probably andesitic.

Sample Number: HLW 12

Mineral	Mode	Remarks
Qtz	75-85%	Grains 0.08-0.6mm size
Ms	15-20%	Grains to 0.5mm length
Bi	3%	Few scattered aggregates of green (olive) pleochroism.
Mt	<1%	
Ch	<1%	Minor, Fe-rich, after Bi.

Rock Name: Bi-Ms-Qtz schist

Texture: Granoblastic polygonal Qtz w/good Ms foliation. Stringers of Ms separate pure Qtz aggregates; textural equilib.

Precursor: Argillaceous sandstone.

Sample Number: HLW 14a

Mineral	Mode	Remarks
Qtz	60%	Coarse 1mm and fine 0.1mm grains.
Bi	<1%	Few grains.
Ms	35%	In zones, coarse (to 0.7mm long).
Mt	1%	0.1-0.2mm grains, scattered.
Zr	1%	To 0.15mm.
?		Clear, low α , high relief accessory mineral.
Tour	Tr	

Rock Name: Ms-Qtz schist

Texture: Granoblastic polygonal Qtz zones w/ lapidoblastic Ms layers. Ms layers w/ secondary crenulation.

Precursor: Argillaceous sand.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: HLW 14b

Mineral	Mode	Remarks
Qtz	85%	From 0.03 to 0.8mm grains, textural equilibration.
Ms	10%	Good foliation surrounding Qtz aggregates.
Bi	1%	
Ch	1-2%	In aggregates; grains approx. 0.1mm.
Ep	<1%	
Zr	<1%	0.1mm, scattered.
Mt	1%	

Rock Name: Ch-Ms-Quartzite (or schist)

Texture: Granoblastic Qtz w/zones of Ms foliation separating pure Qtz aggregates.

Discussion: May be metaconglomerate.

Precursor: Argillaceous sandstone or conglomerate Good pebble development.

Sample Number: HF 2

Mineral	Mode	Remarks
K-spar	90%	Large (to 6mm) microcline grains; some smaller.
Qtz	5-10%	Grains approx. 0.4 - 0.5mm, very strained & recrystallized - in aggregates.
Plag	< 3%	$Y_{AlO} \approx 10^\circ$, approx. An_{25} . Few small 0.2mm grains. Often in recrystallized matrix surrounding lg K-spar & Qtz grains.
Ms	<1%	Small blades in matrix.
Ch/Ep	Tr	Tiny amount of one spot may have been Bi.

Rock Name: Quartzofeldspathic gneiss

Texture: Almost mortar, w/fine-gr Qtz feldspar matrix (< 0.3mm) between very large grains, recrystallized?

Discussion: Matrix is only 2-3% of slide. Sample has adjusted to low T event. Extremely K-spar rich rock.

Precursor: Metapelite?

Sample Number: HF 3

Mineral	Mode	Remarks
Hb	45%	Euhedral, grains to approx. 0.9mm. 2V 70° (-) $\alpha_{ac}=240^\circ$ pleochroic olive green, pale yellow, deep green.
Qtz	10-15%	
Plag	30%	$Y_{AlO} \approx 17^\circ$ (Ly) An_2 , almost pure Albite. Largely altered to fine sericite & Ep.
Ep	5-10%	Xenomorphic, irregular, replaces plagioclase.
Mt	3%	Equant to irregular.
Sphene	<1%	Some hematite (later).

Rock Name: Ep-Albite-Hb Amphibolite

Texture: Granoblastic polygonal w/sericite and Ep.

Discussion: Low grade event converted Plagioclase to albite. Concurrent production of Ep from released Ca. Plag later to sericite. Two stages of retrograde?

Precursor: Mafic igneous (or possibly andesitic) rock.

Sample Number: HF 5

Mineral	Mode	Remarks
Qtz	30%	Grains to approx. 0.6mm
Ms	20%	Coarse (to 2mm) grains & as sericite alteration.
Bi } Ch }	15%	Little Bi remains, is altered to Ch & much sericite.
Serc	35%	

Rock Name: Bi-Sill-Ms schist

Texture: All altered, was lepidoblastic w/strong mica foliation. Sericite-Bi-Ch aggregates may have been Sill-Bi intergrowth at high grade.

Precursor: Aluminous pelitic shale

Sample Number: HF 6

Mineral	Mode	Remarks
Qtz	50%	Grains to 0.3mm size
Ap	1%	
Bi	10%	Was more, now highly altered.
Ms	5-10%	Few coarse grains
Serc }	~ 40%	After Sill & Plag. May be vermiculite after Bi?
Ch }		Fe rich, after Bi.

Rock Name: Altered Ms-Bi-Qtz schist or gneiss

Texture: Was granoblastic polygonal w/Bi foliation Qtz grains have sutured margins.

Sample Number: HF 6

Mineral	Mode	Remarks
Qtz	45%	Coarse 0.5mm pure aggregates between what were Bi-Ms layers.
Gt	15%	Large porphyroblasts, to 7mm w/Qtz, Mt. inclus.
Ky	10%	Length slow, (-), hi 2V.
Ch	15%	Platy, Fe-rich (Berlin Blue) after Bi.
Vm?	15%	Clear, 1st order, lower second order, after Bi?
Ms	<1%	0.01mm small grains in matrix after Ky.

Rock Name: Altered Ky-Bi-Gt-Qtz gneiss

Texture: Was granoblastic polygonal w/Bi foliation? Now much alteration.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: HF 6 (con't)

Discussion: Reactions in low grade water introduction event, Bi is altered to Ch + Vm? K⁺ released causes minor alteration of Ky to Ms. Low T event w/weathering superimposed.

Sample Number: HF 7

Mineral	Mode	Remarks
Qtz	20%	Grains approx. 0.4mm, generally smooth boundaries, only slight rextallization.
Plag	50%	Considerable fine micaceous alteration Y ₄₀ 10=1 ⁰ , An ₂₀ .
Sill	2%	Few altered sprays of fibrolite.
Bi	15-20%	Coarser grains to 1mm often altered to Ch/sericite.
Ms	5-10%	Coarse to 1.5mm, kinked. Some rextallization to sericite.
Mt	<1%	
Ch		Alteration of Bi, blue interf. Fe-rich.

Rock Name: Sill-Ms-Bi-Plag-Qtz gneiss

Texture: Granoblastic polygonal, Bi & Ms don't form good foliation; high grade texture.

Discussion: Very little alteration for Farmington Complex.

Precursor: Graywacke or intermediate volcanoclastic.

Sample Number: HF 10

Mineral	Mode	Remarks
Qtz	91%	Coarse (to 4mm) grains w/locally sutured margins.
Plag	3%	Small grains approx. 0.4mm maximum size. Y ₄₀ 10=5 ⁰ , An ₁₃₋₁₄ .
K-spar	5%	Microcline, small grains 0.1-0.2mm size.
Ms	1-2%	0.8mm laths - no foliation.
Zr	<1%	Few 0.02mm grains.

Rock Name: Feldspathic quartzite

Texture: Granoblastic polygonal

Discussion: Small aggregates of Qtz-K-spar-Plag. between larger Qtz grains. Late metamorphic event suggested by weak recrystallization & alteration (Seri) of Plag.

Precursor: Feldspathic sandstone.

Sample Number: HF 11

Mineral	Mode	Remarks
Qtz	70%	Grains 0.2-0.6mm size, cusped-sutured margins & strongly strained.
Ch	20%	Grains approx. 0.1mm, forms poor foliation interference colors low, gray. Mg-rich.
Ms	3%	0.1mm grains & Seri. aggregates.
Ep	5%	Irregular grains 0.06-0.3mm.

Rock Name: Chloritic Quartzite

Texture: Recrystallized strongly & strained. Chlorite forms very rough foliation.

Precursor: Argillaceous sand (clays Mg-rich).

Sample Number: HF 17

Mineral	Mode	Remarks
Qtz	45%	Strained grains 0.4mm-4mm; often irregular, between alteration patches.
Ms	2%	Few good blades.
Alteration	55%	Mixture of Seri. & patches of clay mixtures. Evidently after feldspar.

Rock Name: Altered quartzofeldspathic gneiss

Discussion: All feldspar altered.

Precursor: Feldspathic sandstone?

Sample Number: HF 16

Mineral	Mode	Remarks
Qtz	95%	Elongate grains to 3mm w/sutured boundaries.
Plag.	4%	Few approx. 0.8mm grains w/Seri. alteration.
Ms	1%	

Rock Name: Sheared quartzite

Texture: Cataclastic. Elongate Qtz grains w/sutured margins & small recrystallized zones. Grains show preferred orient.

Discussion: Late metamorphic event shown by rextallization texture.

Precursor: Nearly pure Qtz sandstone.

Sample Number: HF 16

Mineral	Mode	Remarks
Qtz	95%	Grains (2-3mm max.) are elongated, strained, w/sutured margins. Interstitial matrix of rextallized fine 0.02mm Qtz grains.
Plag	5%	Few 0.2mm sized grains. Largely altered to Seri.
Ms.	<1%	Few 0.6mm grains. Equant.

Rock Name: Feldspathic quartzite.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: HF 16 (con't)

Texture: Cataclastic, approaches mortar texture.

Discussion: Deformation (2nd mm event) evidenced by mortar texture & Seri. alteration of Plag.

Precursor: Feldspathic sandstone.

Sample Number: HF 17

Mineral	Mode	Remarks
Qtz	50%	Alteration products along fractures, often in pure aggregates.
Bi	20%	Intensely altered to chloride.
Ms	5-10%	Clear grains.
Alteration	30%	Low δ (1st order), clear, small grains; clays?

Rock Name: Altered Bi-Ms-Qtz gneiss

Texture: Granoblastic polygonal w/strong Bi-Ms foliation. Has been extensively altered in very low grade rehydration event.

Precursor: Argillaceous sandstone.

Sample Number: HF 22

Mineral	Mode	Remarks
Qtz	90%	Cr grains to 3mm; cusate to sutured margins, strained internally.
Ms	5-10%	As Cr (1.5mm) laths which define foliation & are sometimes kinked.
Opq	<1%	Also as fine interstitial aggregates w/Ch.
Ch	1%	Brown-gray extinction; Mg-rich.

Rock Name: Micaceous quartzite

Texture: Granoblastic polygonal, Qtz w/rextallized margins. Cr. Ms defines good foliation.

Discussion: Ms & Mg Ch w/some opaque in aggregates; may be breakdown of Bi. $H_2O + Bi \rightarrow Ms + Ch + Mg$ (?) Could be major retrograde reaction.

Precursor: Slightly argillaceous sandstone.

Sample Number: HF 27

Mineral	Mode	Remarks
Qtz	97%	Lg strained Qtz grains to 4mm. Sutured margins w/small 0.04mm Qtz grains along contacts of larger grains.
Ms		
Seri	3%	Ms as scattered blades. Some Seri along grain boundaries.

Rock Name: Quartzite

Texture: Approaches mortar, but not enough matrix

Precursor: Clean Qtz sandstone.

Sample Number: HF 31

Mineral	Mode	Remarks
Qtz	65%	Equant grains to 0.4mm.
K-Spar	30%	Microcline (approx. 0.4mm).
Plag.	2%	Is An_4 , $Y_{A010} = -12^\circ$.
Opq	<1%	
Ms	2%	Grains to 1.2mm.
Sill	1%	Fibrolite needles w/ Ms & Qtz.
Bi	2%	Partially altered to Ch.

Rock Name: Sill-Bi-Ms-K-spar-Qtz gneiss

Texture: Good granoblastic texture w/Ms dominated foliation.

Discussion: Very little alteration; no evidence of second late mm event. K spar is locally absent near some Sill, not univariant assemblage. May be indication that this reaction has not been surpassed. Fits well w/presence of Ky in other slides.

Precursor: Arkosic sand

Sample Number: HF 32

Mineral	Mode	Remarks
Qtz	88%	Lg grains to 2mm (often w/irregular Plag. inclusions). Smaller rextallized grains.
Plag.	10%	$Y_{A010} = +11^\circ$, An_{28} scattered anhedral, to 0.4mm.
Ms	1%	Few grains (to 0.5mm).
Sill	1%	Elongate fibrolite needles, some Seri. alteration. Grains cut by Qtz boundaries.

Rock Name: Sill-feldspathic-quartzite

Texture: Granoblastic polygonal, Qtz grains w/cusate to sutured margins. Has been some rextallization under strain. No good foliation.

Precursor: Argillaceous sandstone

Sample Number: HF 32

Mineral	Mode	Remarks
Qtz	45%	Grains to 0.6mm.
K-spar	20%	Grains to 0.4mm, microcl.
Plag.	15%	Grains to 0.4mm. Y_{A010} is approx. -7° to -12° , An_{8-14} .
Ms } Bi }	<1%	Few scattered elongate (0.6mm) grains. Define very poor foliation.

Rock Name: Quartzofeldspathic (granitic) gneiss

Texture: Granoblastic polygonal

Discussion: No evidence of later event. Qtz a little high for an igneous precursor.

Precursor: Rhyolite? Granite? Arkose?

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: GF 102

Mineral	Mode	Remarks
Qtz	40%	Grains from 0.03 to 0.4mm. Some fine Gr. aggregates; suggests rextallization during second event.
Ms	20%	Coarse Ms (to 1mm) is at hi $\angle$ to foliation (layering).
Seri	30%	
Ch	10%	Is Berlin Blue, pale yellow in planer light. Interlayered w/Ms as alteration of Bi.

Rock Name: Ms-Ch-Qtz schist

Texture: Lipidoblastic. Layers of Ms-Seri-Ch w/most grains // to layering. Was Bi-Sill-Ms schist? If so all Sill $\rightarrow$ Seri.

Discussion: Bi $\rightarrow$ Ch + Ms; Sill $\rightarrow$ Seri.
Evidence for low-grade secondary event.

Precursor: Shale

Sample Number: GF 103

Mineral	Mode	Remarks
Qtz	92%	Grains elongated due to cataclasis. Lengths to 0.8mm. 0.02 mm grains form matrix.
Ms	3%	Weak foliation.

Rock Name: Micaceous quartzite

Texture: Cataclastic. Qtz grains w/sutured edges. Fine Qtz aggregate interstitial.

Discussion: Rextallization due to shearing; is relatively strong.

Precursor: Qtz sandstone.

Sample Number: GF 104

Mineral	Mode	Remarks
Qtz	80%	Approx. grains 0.2mm-0.6mm. Highly strained w/strain shadows about Mt grains.
Ms	1%	Few scattered grains.
Plag.	2%	Y ₄₀ 10=+12°, An ₂₈ ; poor determination.
Mt	15%	Equant grains, evenly scattered. Are approx. 0.3mm size. Some localized alteration to Ch.
Ap	4%	Grains approx. 0.1mm size, scattered.

Rock Name: Mt Quartzite

Texture: Granoblastic polygonal, but Qtz w/ rextallized margins & strained.

Discussion: Shows evidence of second event as slight rextallization.

Precursor: Mt, Ap-rich Qtz sand.

Sample Number: GF 106

Mineral	Mode	Remarks
Qtz	99%	Lg, strained grains to 3mm diameter. Smaller grains interstitial.
Ms	1%	Elongate, well-formed grains (laths) approx. 0.3mm long. Are in Qtz grains.

Rock Name: Quartzite

Texture: Mortar. Fine rextallized matrix (approx. 2% rock). Large Qtz grains have sutured boundaries.

Discussion: See second mm event as minor rextallization?

Precursor: Quartzite (coarse?)

Sample Number: GF 107

Mineral	Mode	Remarks
Qtz	55-65%	Large (to 4mm) grains w/finer Qtz grains along sutured margins. Beginnings of mortar texture.
Ms	5-10%	Large & small grains not altered. Make good foliation.
Alteration	20-30%	Some is Seri. mixed w/ Qtz (fine); is after feldspar.

Rock Name: Altered feldspathic quartzite.

Texture: Granoblastic polygonal Qtz (to mortar) w/aggregates of pure Qtz & alteration.

Discussion: 2nd mm event evidenced by rextallization and alteration to Seri.

Precursor: Feldspathic sandstone.

Sample Number: GF 109

Mineral	Mode	Remarks
Qtz	85-90%	Strained & elongate grains evenly 0.5mm long, w/matrix of finer (0.01mm) grains between.
Plag.	1%	Few small (0.1mm) grains are about An ₁₀ .
Ms	10-15%	0.5mm long laths. Are evenly scattered. Form very good foliation.

Rock Name: Micaceous quartzite.

Texture: Mortar texture w/Ms foliation.

Discussion: No alteration of Plag, but strong rextallization and some shearing.

Precursor: Argillaceous sandstone.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: GF 112

Mineral	Mode	Remarks
Qtz	99%	Grains from 0.1-0.4mm. Very even grained. Grains only slightly cusped margins.
Ms	< 1%	Few elongate grains.
Zr		Few small 0.1mm grains.

Rock Name: Quartzite

Texture: Granoblastic polygonal

Discussion: No evidence of recrystallization or strain. Little intergranular Seri. or clay.

Precursor: Fine sandstone, pure.

Sample Number: GF 113

Mineral	Mode	Remarks
Qtz	40%	Grains approx. 0.6mm. Straight margins; somewhat strained.
K-spar	55%	Approx. 0.4-0.8mm grains of microcline.
Plag.	5%	$Y \wedge 010 = -(5-10)^\circ$ is An ₁₀₋₁₅ . Grains approx. 0.2-0.4mm scattered. Minor Seri. alteration.
Ri	1%	Only few small grains. Not altered.

Rock Name: Quartzofeldspathic gneiss

Texture: Good granoblastic polygonal. Only minor evidence of recrystallization.

Discussion: Almost no evidence of 2nd mm event in this slide.

Precursor: K-spar-rich igneous, rhyolite?

Sample Number: SP 1

Mineral	Mode	Remarks
Qtz	30%	Grains approx. 0.7mm.
K-spar	65%	Grains 0.5mm-2.0mm; are Microcline.
Seri.		In w/opaque.
Opaq	5-10%	Very irregular grains & aggregates.
Bi	1%	W/Ch and Seri.

Rock Name: Quartzofeldspathic gneiss

Texture: Granoblastic polygonal

Discussion: Little recrystallization, but some Ms; Opaque, may be Mt, somewhat oxidized.

Precursor: Arkosic sediments or odd rhyolite (all K-spar).

Sample Number: SP 2

Mineral	Mode	Remarks
Qtz	45%	Grains 0.2-0.8mm. Cusped margins.
K-spar	45%	Microcline approx. 0.5mm grains.
Ms	< 1%	After Bi?
Seri	5-10%	As mixture w/opaque.
Bi	2-5%	Is mixed w/variable amts of opaque.
Opaq	5%	Assoc. w/Bi & Seri; Is an oxidation? Is hematite?

Rock Name: Quartzofeldspathic gneiss.

Texture: Granoblastic polygonal w/weak foliation (was Bi?).

Discussion: Again have Bi → Seri + Opaq.

Precursor: Arkose?

Sample Number: SP 3

Mineral	Mode	Remarks
Qtz	40%	Grains to 1mm/cusped margins; some are separate aggregates.
K-spar	40%	Microcline grains approx. 0.5mm size.
Opaq	10%	As blades & equant. Blades w/Bi alteration may be hematite after Bi.
Ap	1%	Grains approx. 0.03mm sized; scattered.
Alteration	10-15%	Clays & Seri. May be after Plag.

Rock Name: Altered quartzofeldspathic gneiss

Texture: Granoblastic polygonal.

Discussion: Evidence of oxidation on weathering Bi-Alteration → Hematite. Are some oval pure Qtz aggregates. These may be segregations or originally Qtz pebbles?

Precursor: Arkosic sandstone?

Sample Number: SP 4

Mineral	Mode	Remarks
Qtz	50%	Grains 0.2-0.5mm; strained w/cusped margins.
K-spar	40%	Some recrystallization. Approx. 0.3mm grains.
Seri	5-10%	In patches.
Plag	2-4%	Is Not altered. Approx. An ₂₃ . Few scattered grains/poorly twinned.
Opaq	5%	Blades & equant. After Bi, has same habit.

Rock Name: Quartzofeldspathic gneiss

Texture: Granoblastic polygonal w/Opaq forming foliation (after Bi).

Precursor: Arkose?

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SP 5		
Mineral	Mode	Remarks
Qtz	32%	Grains approx. 0.5mm, strained.
Plag.	40%	Y _A 010=+16°, An ₃₃ partially altered to Seri.
Bi	23%	Unaltered laths to 4mm long. Defines foliation. Red brown pleochroism.
Ms	5%	Grains to 1.5mm.
Opaq	1%	In w/Bi elongate often.
Alteration		Plag altered to Seri. + Ep grains are to 0.04mm.

Rock Name: Ms-Bi-Qtz-Plag. schist.

Texture: Granoblastic polygonal w/Bi-Ms foliation.

Discussion: Alteration is Feldspar Ms(Seri) + Ep; w/paragonite?

Precursor: Feldspathic siltstone or shale?

Sample Number: SP 16		
Mineral	Mode	Remarks
Qtz	67%	Grains to 2mm, strained w/cusate margins.
Plag	30%	Largely altered to Seri. Grains to 1.5mm.
K-spar	3%	Small grains partially Sericitized.
Bi	1%	Patches, largely altered to Ch; are approx. 0.4mm.
Zr	< 1%	Few small 0.1mm grains euhedral.

Rock Name: Quartzofeldspathic gneiss

Texture: Granoblastic polygonal

Discussion: Alteration & cusate Qtz margins suggest slight effects of secondary mm event.

Precursor: Feldspathic sandstone.

Sample Number: SP 6		
Mineral	Mode	Remarks
Qtz	40%	Grains to 1.5mm in segregations.
Hornblende	50%	Equant grains to 0.9mm.
Mt	2%	

Alteration
Ms & Ep 5-10%

Rock Name: Plag-Qtz-Hb amphibolite

Texture: Granoblastic polygonal

Discussion: Note: Hb & Qtz separated w/large Qtz segregations. Retrograde feldspar → Ep & Seri.

Precursor: Intermediate igneous rock.

Sample Number: SP 17		
Mineral	Mode	Remarks
Qtz	20%	Grains 0.1-0.2mm.
Hb	55%	Grains to 1mm.
Plag	5%	Most now altered to Ep.
K-spar	5%	Small grains w/some in veins.
Ep	25%	Irregular, but large grains.
Ap	2%	
Sphene	2%	Have layer of pure Sphene approx. 0.2mm wide.

Rock Name: K-spar-Plag-Qtz-Hb amphibolite.

Texture: Granoblastic polygonal

Discussion: Have Plag → Ep.
Hb → Ep? Retrograde.

Precursor: Intermediate igneous rock.

Sample Number: GR 2		
Mineral	Mode	Remarks
Qtz	85%	Max. grain size 0.3mm.
Plag	10-15%	Albite in layers & in matrix; slightly Seri.
Ms	2%	

Rock Name: Quartzofeldspathic gneiss rextallized

Texture: Mild cataclasite. Rextallized to granoblastic. Weak Ms foliation. Qtz elongate // to foliation.

Discussion: All grain boundaries cusate. Curved fractures filled w/fine-gr. Qtz. Very little matrix.

Precursor: Feldspathic sandstone/siltstone.

Sample Number: GR 4		
Mineral	Mode	Remarks
Qtz	58%	Grains approx. 0.2mm.
Gt	20%	Euhedral poikiloblasts - 1.6mm diameter. Inclusion trails slightly sigmoid & at angle to foliation.
Ms	20%	Blades to 0.8mm.
K-spar	1-2%	Few scattered grains/no twinning.
Opaq	1%	Few inclusions in Gt

Rock Name: Ms-Gt-Qtz gneiss.

Texture: Granoblastic polygonal w/Ms foliation & poikiloblasts.

Discussion: No rextallization. Garnet inclusion trails at 4° to foliation. Trails aren't well developed.

Precursor: Argillaceous sandstone.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: GR 7

Mineral	Mode	Remarks
Qtz	97%	Grains to 3mm. Elongate w/foliation. Very finely cusped margins.
Ms	3%	Scattered grains, forms foliation. Some rextallized to Seri.

Rock Name: Quartzite (cataclasite)

Texture: Almost Mylonite. Qtz grains are elongated || to foliation.

Precursor: Was pure sandstone (coarse?).

Sample Number: BC 1G

Mineral	Mode	Remarks
Qtz	10%	
Bi	40%	Strong Bi foliation.
Hb	12%	
Di	10%	2V-30°. Granoblastic-lepidoblastic.
Plag	10%	W/small areas of slight rextallization.
Mt	1%	
Ap	1%	
Gt	1%	One large porphyroblast.

Rock Name: Gt-Di-Plag-Qtz-Hb-Bi gneiss.

Sample Number: BC 1G

Mineral	Mode	Remarks
Qtz	15%	Grains approx. 0.3mm.
Gt	3%	Irregular 3mm porphyroblast.
Plag	15%	Y _A 010-+13°, An ₃₀ , 0.3mm grains.
Hb	20%	Large prisms to 4mm.
Bi	45%	Grains to 2mm blades. Strong foliation.
Mt	5%	

Rock Name: Gt-Mt-Plag-Qtz-Hb-Bi schist.

Texture: Lepidoblastic.

Precursor: Graywacke??

Sample Number: BC 2G

Mineral	Mode	Remarks
Qtz	25%	Approx. 0.3mm..
Hb	35%	0.5mm grains/euhedral.
K-spar	2%	Few grains.
Gt	2%	0.5mm grains, irregular.
Opaq	< 1%	Reddish.
Plag	25%	Some Seri.
Bi	10-15%	Partially altered to Ch; partly retrograded.
Zr	1%	Elongate inclusions in Bi.

Sample Number: BC 2G (con't)

Mineral	Mode	Remarks
Ap	< 1%	
Rock Name: K-spar-Bi-Gt-Plag-Qtz-Hb amphibolite		
Texture: Granoblastic polygonal.		
Discussion: Retrograde Plag → Seri. Bi → Ch		

Precursor: Igneous? Dacite?

Sample Number: BC 3G

Mineral	Mode	Remarks
Qtz	40%	Grains to 1.2mm strained.
K-spar	40%	Grains to 1mm, microcline
Plag	2%	0.3mm grains.
Bi	5%	
Ms	3%	Blades to 0.4mm.
Sill	2%	Fibrolite.

Rock Name: Sill-Ms-Bi-Plag-Microcline-Qtz gneiss

Texture: Granoblastic polygonal/slightly rextallized; Ms-Bi-Sill foliation.

Precursor: Graywacke, argillaceous arkose.

Sample Number: BC 3G

Mineral	Mode	Remarks
Qtz	50%	
K-spar	30%	
Bi	10%	
Plag	5%	
Sill	2%	
Ms	1%	
Mt	1%	

Texture: Granoblastic polygonal but w/evidence of rextallization at grain boundaries.

Sample Number: BC EW

Mineral	Mode	Remarks
Qtz	74%	Rextallized, w/cusped margins. Some finer material; grains strained 0.4mm size.
Plag	25%	Sericitized, equant to 1mm size.
Ms	1%	Few small (0.5mm or less) grains.
Hb	Tr	One grain.

Rock Name: Feldspathic quartzite.

Texture: Granoblastic polygonal somewhat rextallized.

Discussion: Contains thin vein of plagioclase-rich material, ~ 0.5mm wide. This vein crosscuts slide. Contains Qtz & some Orthoclase?

Precursor: Feldspathic sandstone.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: BC FW		
Mineral	Mode	Remarks
Qtz	25%	Grains to 0.2mm in aggregates.
Plag	5%	An ₃₀ ? Grains to 0.2mm w/Seri.
Gt	15-20%	Euhedral, 0.4-0.7mm equant grains; some poikiloblastic.
Hb	45-50%	Elongate prisms.
Cc	< 1%	Secondary? Pleochroic, dark greens.
Opaq	4%	Scattered (approx. 0.2mm irregular grains).
Ap	< 1%	

Rock Name: Plag-Gt-Qtz-Hb amphibolite

Texture: Granoblastic polygonal, Hb slightly nematoblastic.

Precursor: Mafic-rich intermediate volcanoclastic?

Sample Number: MES BC		
Mineral	Mode	Remarks
Qtz	80%	Sutured margins 0.03-1mm.
Plag	20%	Sericitized, ~0.4-1mm. Not rextallized. ~An ₁₅ .
Ms Alteration }	2-3%	Some Bi w/Ms in rextallized zones. Makes foliation.

Zr Tr

Rock Name: Cataclastic feldspathic quartzite.

Texture: Cataclastic-Qtz grains have sutured margins & size variation. Planar zones of rextallization w/Ms (fine) aligned.

Discussion: Strongly rextallized w/foliation formation.

Precursor: Feldspathic sandstone.

Sample Number: SR 101		
Mineral	Mode	Remarks
Qtz	30%	W/strain shadows.
K-spar	55-60%	Cr-gr w/some inclusions & smaller, rextallized grains.
Plag	10-15%	Albite, ~ An ₄ , Y < 0.10--12° Many grains w/kinked Ab twins.
Ms	2%	0.7mm grains in patches.

Rock Name: Granitic cataclastic gneiss.

Texture: Cataclastic-granoblastic. Cr grains with rextallized matrix (15%). Some straight fractures w/fine-gr material.

Discussion: Rock shows strong rextallization & fracturing of grains.

Precursor: Pegmatite dike? Subjected to later rextallization.

Sample Number: SR 102		
Mineral	Mode	Remarks
Qtz	99%	Lg porphyroclasts to 4mm; also sm (0.02) grains in matrix. All sizes of porphyroblasts present.
Ms Ch Opaq }	1%	Few scattered grains.

Rock Name: Cataclastic quartzite.

Texture: Mortar, but w/no foliation. (Matrix up to 40% of rock).

Discussion: Static rextallization.

Precursor: Pure quartz sandstone.

Sample Number: SR 107		
Mineral	Mode	Remarks
Qtz	65%	Equant grains to 0.15mm
Ms	25-30%	Blades to 0.2mm length.
Mt	3-5%	Euhedral, equant, to 0.2mm
Tour	< 1%	0.05mm

Rock Name: Micaceous quartzite or Ms-Qtz schist

Texture: Granoblastic polygonal w/Ms foliation.

Discussion: No signs of rextallization.

Precursor: Argillaceous sand or siltstone.

Sample Number: SR 108		
Mineral	Mode	Remarks
Qtz	42%	Generally equant, approx. 0.1mm.
Ms	55%	Laths to 0.2mm
Mt	3%	Some lg-to 0.5mm-& euhedral grains.
Tour	Tr	Few grains

Rock Name: Qtz-Ms schist

Texture: Lepidoblastic, strong Ms foliation w/ granoblastic polygonal Qtz.

Discussion: No evidence of later stress; grain boundaries straight; bedding apparent as less micaceous layers.

Precursor: Siltstone, silty shale.

Sample Number: SR 110		
Mineral	Mode	Remarks
Qtz	99%	0.4mm in porphyroclasts where margins are cusped to sutured. Apparently no strain shadows matrix size variable down to 0.03 mm.
Ms	1%	Few blades

Rock Name: Cataclastic breccia (quartzite)

Texture: Cataclastic w/1-2mm porphyroclastic Qtz aggregates in fine matrix.

Precursor: Quartz sandstone.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SR 111

Mineral	Mode	Remarks
Qtz	60%	0.5mm grains.
Bi	10-15%	0.8mm blades, dark green brown; some Ch pleo-chroic alteration?
Ms	15%	0.8mm laths
Ch	10-15%	Blue δ Fe-rich & secondary? Follows Ms foliation.
Opaq	1%	Irregular, sooty aggregates.

Rock Name: Bi-Ms-Qtz schist

Texture: Granoblastic polygonal w/Ms, Ch foliation. Retrograde Bi $\rightarrow$ Ch.

Precursor: Argillaceous sandstone.

Sample Number: SR 113

Mineral	Mode	Remarks
Qtz	80%	Grains equant, 0.15-0.5mm, some elongated w/in foliation.
Ms	10%	Blades to 0.5mm long.
Ap } Tour }	1%	Irregular patches to 0.3mm. Few 0.2mm grains, euhedral.
Mt	5-10%	Grains 0.2-1.5mm.

Texture: Granoblastic polygonal w/good Ms foliation.

Discussion: No evidence of later rextallization, all grain boundaries smooth. Some pure Qtz pressure shadows at ends of Mt grains?

Precursor: Argillaceous sandstone w/detrital Mt.

Sample Number: SR 117

Mineral	Mode	Remarks
Qtz	95-98%	Strained grains 0.04mm-1.5mm.
Ms } Opaq }	2-5%	Intergrowths (blades) of Ms and Opaque to 0.5mm.

Rock Name: Rextallized quartzite.

Texture: Cataclastic. Rextallized w/some zones of matrix; all boundaries cusped. Static rextallization.

Precursor: Sandstone

Sample Number: SR 119

Mineral	Mode	Remarks
Qtz	90%	Equant grains to 0.6mm.
Ms } Ch }	5-7%	Often intergrown, Ch green, Mg-rich. Contains much opaque, which is locally Hematite.
Tour } Mt }	2%	Tour. in discrete layers.

Rock Name: Quartzite w/Tour.

Texture: Granoblastic polygonal w/Ms-Ch foliation. No signs of rextallization.

Sample Number: SR 119 (con't)

Discussion: One broken layer of almost pure Tour. & Mt, w/some Ms. Foliation // to layers of Tour; foliation // bedding. Relict x-bedding present?

Sample Number: SR 122

Mineral	Mode	Remarks
Qtz	80%	Grains strained through-out; uniform grain size; grains elongate // to foliation, 0.3-0.7mm.
Ms	20%	0.8mm long laths
Ch	Tr	
Zr	< 1%	Rounded grains (~0.05mm)
?	< 1%	Brown, high relief.
Tour.	Tr	Detrital, may be alteration of sphere.

Rock Name: Micaceous quartzite

Texture: Granoblastic polygonal w/strong Ms foliation; all Qtz strained; grain boundaries cusped.

Discussion: Contains veins ~ 0.06 wide of very fine (0.02mm) Qtz which undulate thru slide.

Precursor: Argillaceous sandstone w/detrital Zircon in one layer.

Sample Number: SR 124

Mineral	Mode	Remarks
Qtz	35%	0.5mm grains.
Plag.	45%	0.6mm grains.
Ms	6%	
Ch	6%	Some Ch w/Ms intergrown, After Bi (blue).
Sill	1-2%	Needles & fibrolite.
Tour }	1%	
Zr }	Tr	Scattered grains.
Opaq }	2%	

Rock Name: Sill-Ch-Ms-Plag-Qtz gneiss/schist

Texture: Granoblastic polygonal w/Ch, Ms, Sill foliation.

Discussion: Ch could be after Bi, but is no other retrograde evidence.

Precursor: Slightly argillaceous arkose.

Sample Number: SR 129

Mineral	Mode	Remarks
Qtz	30%	0.2mm grains.
Ms	30%	0.3mm blades--often in aggregates.
Ch	3-5%	0.3mm blades.
Ky } And }	30%	Surrounded by And grains to 2-3mm. Many Opaq + Qtz inclusions.
Opaq	3%	

Rock Name: Ch-Ky-And-Ms-Qtz schist

Texture: Qtz granoblastic polygonal. Ms foliation; w/Al₂SiO₅ poikiloblasts.

Discussion: Ky $\rightarrow$ And reaction present?

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SR 131

Mineral	Mode	Remarks
Qtz	40%	Usually in fine-Gr (< 0.02mm) aggregates, some coarser to 0.2mm.
Plag	25%	Y _A O ₁₀ =8°, An ₁₄ ? 0.2mm grains in aggregates w/ Act, Ch & Cc. Also in matrix.
At	15%	Pale green, Y _A c ~ 18° most grains ~ 0.7mm, but some 1mm + blades.
Cc	10-20%	Grains in aggregates (grain size 0.4mm).
Ch	5%	Primary, Mg-rich.

Rock Name: Actinolite gneiss.

Texture: Granoblastic polygonal w/variable grain size.

Precursor: Marlstone.

Sample Number: SR 134

Mineral	Mode	Remarks
Qtz	40-45%	0.4mm grains.
Cc (dolomite?)	55%	0.4mm equant uniform grs.
Ms	2%	Few blades.

Texture: Granoblastic polygonal (cusped boundaries).

Precursor: Siliceous limestone or dolomite.

Sample Number: SR 139

Mineral	Mode	Remarks
Qtz	85-90%	To 2mm, cusped margins irregular/broken. All highly strained.
Plag	5-10%	Few larger, broken grains and in matrix.
Ch	< 1%	Few grains, scattered.
Opaq	3%	Fine dusty material in matrix.

Rock Name: Cataclastite, was quartzofeldspathic gneiss.

Texture: Cataclastic. Mortar texture. Fine (Qtz-feld matrix, grains < 0.01mm) & coarser grains to 2mm. Matrix = 20-30%.

Discussion: Extreme recrystallization & fragmentation, broken plagioclase, etc. But, nothing is elongated, no foliation, suggests static recrystallization.

Precursor: Feldspathic sandstone.

Sample Number: SR 141

Mineral	Mode	Remarks
Qtz	35%	0.5mm grains.
St	45%	Euhedral porphyroblasts to 4mm.
Ms	15%	0.5mm blades
Bi	3%	
Opaq	1%	

Rock Name: Bi-Ms-Qtz-St schist.

Texture: Granoblastic polygonal w/St poikiloblasts & Ms foliation.

Discussion: Inclusion trails in St are all roughly // & only slightly helictic. In some places // to foliation (Ms) and others at ∠'s up to 30°.

Precursor: Pelitic shale

Sample Number: SR 141

Mineral	Mode	Remarks
Qtz	25%	Grains 0.3-0.7mm.
Ms	10%	Blades ~ 0.6mm.
St	60%	Euhedral poikiloblasts to 3mm. Inclusion trails ⊥ to elongation.
Ch	1%	
Bi	2%	
Opaq	1%	

Rock Name: Ch-Bi-Ms-Qtz-St schist

Texture: Granoblastic polygonal w/St poikiloblasts.

Discussion: Good St relations (slide ⊥ to lineation).

Precursor: Pelitic shale.

Sample Number: SR 144A

Mineral	Mode	Remarks
Qtz	80-90%	Grains 0.4-0.7mm, cusped margins, strained.
Gt (Ch)	5-10%	Equant grains ~ 0.15mm in layers. 70% altered to Mg-Ch.
Mt	5-10%	Grains 0.08-0.1mm scattered throughout.
Ch	3%	Strongly oxidized by retrograde.
Ap	1%	

Rock Name: Gt-Mt quartzite.

Texture: Granoblastic polygonal; w/some mild recrystallization.

Discussion: Retrograde Gt → Ch (Mg) present.

Precursor: Quartzite w/detrital Gt & Mt & Ap.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SR 144A		
Mineral	Mode	Remarks
Qtz	80-90%	Grains 0.4-0.7mm, cusped margins, strained.
Gt (Ch)	5-10%	Equant grains ~ 0.15mm in layers. 70% altered to Mg-Ch.
Mt	5-10%	Grains 0.08-0.1mm scattered throughout.
Ch	3%	Strongly oxidized by retrograde.
Ap	1%	

Rock Name: Gt-Mt quartzite.

Texture: Granoblastic polygonal, w/some mild recrystallization.

Discussion: Retrograde Gt → Ch (Mg) present.

Precursor: Quartzite w/detrital Gt & Mt & Ap.

Sample Number: SR 144B		
Mineral	Mode	Remarks
Qtz	78%	Grains all ~ same 0.1-0.2mm size.
Ch	3%	In matrix (few grains) was Bi?
Gt	5%	Poikiloblasts to 0.9mm and aggregates of 0.2mm grains. Almost totally altered to Ch.
Mg	15%	Grains scattered, equant, 0.05-0.2mm.

Rock Name: Mt-Gt quartzite.

Texture: Good granoblastic polygonal.

Discussion: Retrograde Gt → Ch
Bi → Ch, too?

Precursor: Quartzite w/detrital Mt.

Sample Number: SR 146		
Mineral	Mode	Remarks
Ms	10%	// foliation, 0.2mm grains.
Ch	50%	Brown interference, hi-Mg, 0.2mm grains, // foliation.
Trem	35%	Grains to 0.5mm, elongate clear.
Mt	5%	0.3mm euhedral grains scattered.

Rock Name: Ms-Trem-Ch schist

Texture: Nematoblastic (Actinolite), Ch-Ms make foliation.

Precursor: Marl, siliceous, argillaceous dolomite?

Sample Number: SR 148		
Mineral	Mode	Remarks
Qtz	45-50%	0.5-1.5mm grains.
Ms	25%	Blades to 1mm in pore patches.
St	15-20%	Poikiloblasts - euhedral to 5mm, elongate, // to foliation.
Ch	5%	
Bi	5%	
Opaq	1%	0.3mm grains.

Rock Name: Ch-Bi-St-Ms-Qtz schist

Texture: Granoblastic polygonal, w/strong Ms foliation & St poikiloblasts.

Discussion: No recrystallization; some mica kinked. Inclusion trails in St are at 70° angle.

Precursor: Pelitic shale.

Sample Number: SR 148		
Mineral	Mode	Remarks
Qtz	40-50%	0.4mm grains.
St	20%	Poikiloblasts to 2mm.
Bi	5-10%	0.8mm blades.
Ch	5-10%	1.0mm grains. Some is retrograde but some also stable.
Ms	20%	0.7mm blades.

Rock Name: Bi-Ch-Ms-St-Qtz schist.

Texture: Granoblastic polygonal w/Ms foliation & St poikiloblasts.

Discussion: Inclusion trains in St both // & inclined to foliation. Bi & Ch often at an angle to Ms foliation.

Good St-Ch tie line.

Sample Number: SR 148		
Mineral	Mode	Remarks
Qtz	30%	0.3mm matrix grains & as inclusions in St.
St	35%	Poikiloblasts to 3mm.
Bi	5%	1mm blades/plates.
Ch	2%	1mm plates.
Ms	25%	0.5mm blades form foliation in matrix.
Opaq	2-5%	Small 0.2mm grains in matrix.

Rock Name: Ch-Bi-Ms-St-Qtz schist

Texture: Granoblastic polygonal to lepidoblastic w/St porphyroblasts.

Precursor: Aluminous shale (pelite).

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SR 148		
Mineral	Mode	Remarks
Qtz	85-90%	Grains even, 0.3-0.5mm.
Ms	10-15%	Thin blades 0.5mm long.
Ch	2%	Patches w/ $\perp$ foliation and oxides.
Tcur } Zr }	Tr	Few grains.

Rock Name: Micaceous quartzite.

Texture: Granoblastic polygonal w/Ms foliation.

Discussion: No evidence of strain rextallization.

Precursor: Argillaceous sandstone.

Sample Number: SR 149		
Mineral	Mode	Remarks
Qtz	65%	Grains to 0.3mm.
Gt	2%	Poikiloblasts (1-1.5mm) inclusion trails slightly at angle to foliation.
Opaq	<1%	Scattered & w/Ms.
Ms	30%	Blades to 0.8mm, conc. in layers (1mm thick) and scattered in rest of slide.
St	1%	Remains of 1 poikiloblast.
Tour	<1%	

Rock Name: St-Gt-Ms-Qtz schist (or gneiss).

Texture: Granoblastic polygonal w/Ms foliation. Slightly cuspace Qtz margins.

Discussion: Gt is slightly retrograded to Ch.

Sample Number: SR 149		
Mineral	Mode	Remarks
Qtz	~ 50%	Equant grains (0.4mm).
Plag	10-30%	Conc. in layers grains to 0.4mm.
St	20%	Lg euhedral poikiloblast (9mm). Has inclusion trails at 20-30° to matrix foliation.
Ms	20%	Blades 0.3mm long. Some layers more Ms than others. Ms layering disrupted by St.
Ch } Bi }	2%	May be alteration.

Rock Name: Ch-Bi-Ms-St-Plag-Qtz schist/gneiss.

Texture: Granoblastic polygonal w/huge poikiloblasts.

Discussion: No rextallization.

Precursor: Argillaceous feldspathic sandstone.

Sample Number: SR 152		
Mineral	Mode	Remarks
Qtz	98%	Grains 0.1-0.5mm, sutured boundaries, very rextallized.
Ms	2%	Foliation // to rextallized layers.
Cc	<1%	In rextallized zone.
?	Tr	Brown, irreg.

Rock Name: Rextallized quartzite.

Texture: Cataclastic, w/rextallized zones, weak Ms foliation.

Discussion: Cc in rextallized zone.

Precursor: Quartz sandstone.

Sample Number: SR 153		
Mineral	Mode	Remarks
Qtz	50%	Equant 0.3mm grains.
Gt	20%	Poikiloblasts/euhedral w/Qtz inclusions. Size to 3-4mm.
Bi	10%	0.9mm blades. Y ₁₀ O ₁₀ =+12° An ₂₉ . Conc in certain layers 0.3mm grains.
Opaq	3%	~ 0.2mm grains.
Ap } Zr }	1%	

Rock Name: Ch-Bi-Gt-Plag-Qtz schist/gneiss

Texture: Granoblastic polygonal, w/Gt poikiloblasts & Bi-Ch foliation.

Discussion: No rextallization. Inclusion trails in Gt not rotated, trails are // foliation and layering. Plagioclase is partially altered to Sericite; some Ch after Bi?

Precursor: Graywacke?

Sample Number: SR 153		
Mineral	Mode	Remarks
Qtz	20%	0.3mm grains.
Gt	30%	Euhedral poikiloblasts (~1.8mm) are helictic.
Plag	46%	0.5mm grains w/Seri ~ An ₃₀ .
Ch/Bi	4%	Fe-rich; but stable?
Opaq	<1%	w/Bi.

Rock Name: Ch/Bi-Qtz-Gt-Plag gneiss

Texture: Granoblastic polygonal.

Discussion: No rextallization, Gt & Bi → Ch(Fe) retrograde effects. Plag → Seri.

Precursor: Arkose w/clays?

PETROGRAPHIC ANALYSES--UINTA ARCH. PROJECT (continued)

Sample Number: SR 156		
Mineral	Mode	Remarks
Qtz	98%	Grains 0.03-0.1mm. Sutures margins.

Ch 2%

Opag Tr

Rock Name: Cataclastic quartzite.

Texture: Cataclastic

Discussion: Static rextallization.

Precursor: Pure Qtz sandstone.

Sample Number: SR 159		
Mineral	Mode	Remarks
Qtz	50%	Grains to 0.4mm, cusped margins.
Ky	2-5%	lg poikiloblasts to 3mm, are oriented // to foliation & conc. in layers.
Bi	10%	Blades, sometimes at angles to foliation.
Ch	30%	Two generations, one retrograde after Bi.
Ms	3%	
Opag	3-5%	0.08mm grains conc. in layers, usually w/Bi & Ch.

Rock Name: Ms-Ky-Bi-Ch-Qtz schist

Texture: Granoblastic polygonal, w/mica foliation

Discussion: Little rextallization, but retrograde Bi → Ch (Fe). Presence of Ky-Bi tie line indicates that reaction. St + Ch → Ky + Bi is surpassed. Elsewhere in Red Creek this is not the case.

Precursor: Silty shale.

Sample Number: SR 164		
Mineral	Mode	Remarks
Cc	85%	Grains approx. 0.8mm max.
Ch	10%	Mg & Fe types.
Qtz	4-5%	0.1-0.7mm grains w/Ch.
Opag	2%	Zones of x-cutting, less stained material present.

Rock Name: Chloritic marble/dolomite?

Texture: Granoblastic polygonal, w/chlorite packets.

Precursor: Slightly siliceous limestone or dolomite.

Sample Number: SR 166		
Mineral	Mode	Remarks
Flag	50%	Grains to 0.9mm; some- times pure aggregates (decussate).
Qtz	35%	Grains to 0.4mm.
Gt	5%	Poikiloblasts to 1.5mm.
Bi (Ch)	5-10%	Mostly gone to Ch blades to 0.9mm.

Rock Name: Gt-Bi-Qtz-Flag gneiss.

Texture: Portions granoblastic polygonal, but other areas strongly rextallized.

Discussion: Some sheared zones w/fine rextallized material. Most of sample is unxtallized. Much alteration. Bi → Ch + oxides. Flag → Ser. Gt → Fe-oxides. Prominent shear zones.

Precursor: Graywacke or intermediate volcaniclastic?

Sample Number: SR 171		
Mineral	Mode	Remarks
Qtz	98%	Grains 0.02-0.4mm size.
Ms	2%	Few grains to 0.4mm long. Define very weak foliation

Ch Tr

Rock Name: Quartzite

Texture: Cataclastic. Qtz grains have sutured margins. Strong strain shadows present.

Discussion: Strongly rextallized, static, but no real matrix yet.

Precursor: Pure quartz sandstone.

Sample Number: SR 176		
Mineral	Mode	Remarks
Qtz	98%	One coarse layer (grains to 3mm), but most grains equant, 0.2-0.4mm. Some cusped margins, but many straight.
Ms } Ch }	2%	Scattered elongate blades (0.4mm long), form foliation.

Tour Tr Few small grains.

Rock Name: Quartzite

Texture: Granoblastic polygonal w/mica foliation and minor, localized cusped boundaries.

Discussion: Few x-fractures w/finer material. Very little rextallization.

Precursor: Pure Qtz sandstone.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SR 181

Mineral	Mode	Remarks
Qtz	95%	Grains from 0.02-0.5mm.
Plag	2%	Scattered, but also in one layer w/Ms & Ch.
Ms } Ch }	1-2%	All in layer, w/Plag, some Ms throughout.
Ap	1%	Small scattered grains.
Mt	Tr	Small scattered grains.

Rock Name: Cataclastic quartzite.

Texture: Approaches My. Many Qtz are elongated, but form cataclastic foliation.

Discussion: All strained & sutured margins. Considerable recrystallization.

Precursor: Qtz sandstone.

Sample Number: SR 183

Mineral	Mode	Remarks
Qtz	99%	All sized, w/sutured margins & strain shadows.
Ms	1%	Grains in porphyroclasts are approx. 0.4mm size.

Rock Name: Cataclastic quartzite breccia?

Texture: Cataclastic. Porphyroclasts to 10mm in matrix of finer material, recrystallized & clasts.

Discussion: Matrix (35% rock) has grain size of approx. 0.02mm minimum. Porphyroclasts are fragments of the original cataclastic quartzite. Mica foliation in clasts is rotated; they are not // . Indicates some shear rotation.

Precursor: Quartz sandstone.

Sample Number: SR 184

Mineral	Mode	Remarks
Qtz	90%	Grains 0.1-0.2mm cusped to sutured margins.
Ms	2%	
Ky	3%	
Sill	5%	Coarse prisms & fibrolite.

Rock Name: Aluminosilicate-bearing quartzite.

Texture: Granoblastic polygonal. Cusped Qtz margins. Foliation defined by Sill fibers.

Discussion: Ky-Sill indicates higher P.

Precursor: Kaolinite-bearing Quartz sandstone.

Sample Number: SR 185

Mineral	Mode	Remarks
Hb	50%	Anhedral aggregates, approx. 0.6mm size. 2V(-), $\gamma_{Ac}=23^\circ$ pleochroism=pale yellow to blue green.
Qtz	15%	Grains equant, approx. 0.1mm, often in pure aggregates.
Plag	35%	Grains to 0.4mm-in w/Qtz.
Mt	2%	Equant euhedral grains 1.2mm.
Ch	< 1%	Few grains (secondary)?

Rock Name: Plag-Qtz-Hb amphibolite.

Texture: Granoblastic polygonal, w/Qtz-Hb layers and some elongate Hb prisms.

Discussion: Some Plag grains quite large. Slight Seri alteration of poorly twinned Plag.

Precursor: Intermediate (diorite, Qtz diorite) intrusive.

Sample Number: SR 187

Mineral	Mode	Remarks
Qtz	40%	
Plag	30%	Sericitized to some extent.
Hb	5%	Deep green.
Cc	5%	Some coarse (to 0.3mm) but much fine throughout.
Ep	10%	Anhedral, but likely primary.
Mt	5%	0.1-0.15mm euhedral grains scattered.
Sphene	1-2%	In aggregates

Rock Name: Cc-Hb-Ep-Plag-Qtz gneiss

Texture: Granoblastic polygonal w/secondary alteration scattered throughout.

Discussion: Ch(Fe), Seri & Cc as alterates.

Precursor: Graywacke, Marl, volcanoclastic??

Sample Number: SR 189

Mineral	Mode	Remarks
Qtz	25%	0.4mm grains.
Plag	5%	
K-spar	45%	Lg Carlsbad twins, appears to be imperfect microcline conversion.
Hb	20%	1mm grains.
Cc	2%	Patchy, small, 0.1mm grs.
Opaq } Sphene }	5%	Few aggregates of both together.

Rock Name: Quartzofeldspathic-Hb gneiss.

Texture: Granoblastic polygonal w/myrmekite.

Precursor: Argillaceous arkose or mafic-rich rhyolitic.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SR 193

Mineral	Mode	Remarks
Qtz	35%	Grains approx. 0.3mm.
St	25%	Euhedral 0.6mm grains w/ inclusions scattered thru slide.
Ms	30%	
Bi	5%	
Ch	<1%	Few grains.
Opaq	1-2%	0.2mm grains scattered throughout.
Ap	<1%	Few small 0.2mm grains.

Rock Name: Ch-Bi-Ms-St-Qtz schist.

Texture: Granoblastic polygonal, w/strong foliation.

Discussion: St elongate // to foliation. No evidence of rextallization. Layering St-free zones on either side of St zone. Layers are ~10mm wide. Foliation is at slightly different angle in St zone than in St-free areas (~20°).

Precursor: Pelitic shale.

Sample Number: SR 194

Mineral	Mode	Remarks
Qtz	30%	Some cusped boundaries.
Plag	40%	Y _A 010=-13°, An ₂ , often w/Qtz intergrowths.
Mic	20%	
Hb	5%	Pale green, low δ
Opaq	5-10%	Mt? Numerous & scattered.
Ch } Bi }	2%	After Hb? Few grains.
Ap	<1%	Small 0.03mm scattered grains.
Cc	<1%	Few irregular grains.

Rock Name: Quartzofeldspathic gneiss.

Texture: Mainly granoblastic polygonal. Many small grains of Ch, amphibole.

Discussion: Mild rextallization, evidence of retrograde? (Ch & Cc?)

Precursor: Arkose or rhyolitic volcanic/volcaniclastic.

Sample Number: SR 200

Mineral	Mode	Remarks
Trem- At	15%	Euhedral grains to 0.4mm, scattered.
Cc (Dolomite?)	80%	Grains uniform, equant, to 0.5mm.
Ch	3%	0.4mm aggregates low δ , Mg-rich.

Rock Name: Tremolite marble.

Texture: Granoblastic polygonal.

Precursor: Marl.

Sample Number: SR 201

Mineral	Mode	Remarks
Qtz	25%	Small grains up to 1mm.
At	20%	Grains from 0.4-2mm. Size often in fine needles. Pale pleochroism-greenish. $\delta_{Ac}=17^\circ$.
Ap	1%	
Mt	1%	
Cc	2%	Apparently stable, w/At.

Rock Name: Qtz-At schist.

Texture: Nematoblastic At, Qtz aggregates are granoblastic polygonal.

Discussion: Assemblage is At-Qtz-Cc. Some At needles are broken, due to later shear stress. Looks like kinks.

Precursor: Marlstone?

Sample Number: SR 234

Mineral	Mode	Remarks
Qtz	35%	Cusped margins.
Plag	45%	Y _A 010~8° - An ₈ grains. ~ 0.4-0.6mm.
Gt	3%	Grains to 0.2mm, altered to Ch.
Bi	3-5%	Some Bi → Ch.
Ch	20%	Much is Mg-rich & stable.
Opaq	1%	Often w/Bi & Ch; was Mt?, now oxidized in some spots.

Rock Name: Gt-Bi-Ch-Qtz-Plag gneiss.

Texture: Granoblastic polygonal w/minor rextallization. Some Plag grains broken & bent.

Discussion: Some rextallization.
 Gt → Ch } Have secondary Fe-rich
 Bi → Ch } chlorite.
 Retrograde event. Some oxidation.

Precursor: Felsic volcanic/volcaniclastic or Plag arkose? or graywacke?

Sample Number: SR 235

Mineral	Mode	Remarks
Qtz	35%	Grains to approx. 0.5mm.
Plag	35%	Y _A 010=+7°, ~ An ₂₄ grains.
??	3-5%	To 1.2mm, V~40°(?) , always surrounded by Bi.
Bi	20-25%	
Gt	2%	Poikiloblasts 0.4-2mm size.
Zr	Tr.	
Tour	1%	Few grains, some near Qtz to 0.7mm w/inclusions.
Opaq	<1%	

Rock Name: Gt-Bi-Plag-Qtz gneiss.

Texture: Granoblastic polygonal, some cusped Qtz and finer material.

Discussion: Minor retrograde Bi to Ch.

Precursor: Graywacke?

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT
(continued)

Sample Number: SR 235		
Mineral	Mode	Remarks
Qtz	35%	Grains to approx. 0.5mm.
Plag	35%	Y _A 010 = +17°; An ₂₄ grains.

?? 3-SZ To 1.2mm, V 40°(+), always surrounded by Bi.

Bi 20-25x

Gt 2% Poikiloblasts 0.4-2mm size

Zr Tr

Tour	1%	Few grains some near Qtz to 0.7mm. w/inclusions.
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Opaq <1Z

Rock Name: Gt-Bi-Plag-Qtz gneiss.

Texture: Granoblastic polygonal, some cusped
Qtz and finer material.

Discussion: Minor retrograde Bi to Ch.

Precursor: Graywacke?

Sample Number: SR 236		
Mineral	Mode	Remarks
Qtz	10%	
Hb	50%	$Y_{Ac} + 24^{\circ}$ grains to 1mm.
Plag	40%	$Y_{Al} 010=21^{\circ}$, An_{41} .
Gt	2%	0.6mm/poikiloblastic.
Mt	2%	

Rock Name: Gt amphibolite.

Texture: Granoblastic polygonal. Hb may be weakly nematoblastic.

Sample Number: SR 238		
Mineral	Mode	Remarks
Qtz	40%	Strained w/cuspsate margins to approx. 1mm.
Plag	45%	Sericite alteration (partial).
Mic	10%	
Ms	5%	0.4mm laths make a foliation.
Bi Ch	2%	Few grains, low T alteration to Ch.

Texture: Granoblastic polygonal. Qtz w/cusped margins.

Precursor: Arkose, or rhyodacitic.

Sample Number: SR 239		
Mineral	Mode	Remarks
Qtz	70%	Strain shadows in clasts to 1mm long // to breccia zones.
Plag	30%	Sericite alteration.
Ch	1%	Fe-rich makes weak foliation.
Zr Ap }	Tr	Few grains.

Sample Number: SR 239 (con't)

Rock Name: Brecciated quartzofeldspathic gneiss.

Texture: Cataclastic; only slightly rextallized, portions divided up by rextallized zones.

Discussion: Zones of breccia are pervasive.

Precursor: Feldspathic sandstone.

Sample Number: SR 241		
Mineral	Mode	Remarks
Qtz	30%	Grains to 0.6mm.
K-spar	30%	Grains to 1mm, Mic.
Bi	20-30%	0.7mm blades.
Sill	10-20%	Prisms & fibrolite // to foliation.
Gt	2%	Few 0.6mm grains.
Opaq	1%	

Rock Name: Gt-Sill-Bi-K-spar-Qtz gneiss.

Texture: Granoblastic polygonal, w/strong Bi,
Sill foliation.

Discussion: Qtz in layers is gneissic. K-spar
in what were Ms layers?

Is above Ms + Qtz $\rightarrow$
K-spar + Sill, w/all Ms
consumed.

Precursor: Pelitic shale?

Mineral	Mode	Remarks
Qtz	85%	Coarse, grains usually > 1 mm.
Plag	15%	Grains ~ 1mm. Altered to Serri (partial).

Rock Name: Quartzite.

Texture: Granoblastic polygonal, but Qtz w/
cusps to sutured margins.

Discussion: Slight rextallization w/one rextallized zone (fracture).

Precursor: Feldspathic sandstone.

Sample Number: SR 247		
Mineral	Mode	Remarks
Qtz	70%	Elongate w/strain shadows & cusped to sutured margins. Max dimension is 0.9mm.
K-spar	20-25%	Microcline grains to 0.6mm.
Ms }	2%	Make poor foliation. Often intergrown w/opaque & Ms. Ch may be after Bi.
Ch }	2%	

Rock Name: Qtzofeldspathic gneiss.

Texture: Granoblastic polygonal. Foliation from Ms and elongate Qtz. Mild recrystallization.

Discussion: At least some Ch is retrograde.

Precursor: Arkose or feldspathic sandstone.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SR 248

Mineral	Mode	Remarks
Qtz	68%	Strain shadows, elongate in weak foliation. Grains to 1mm w/sutured margins.

Mic 30% Grains 0.2-0.8mm, sutured margins.

Ms 1%

Ch 1% Some low T.

Rock Name: Quartzofeldspathic gneiss.

Texture: Rextallized (mild) from granoblastic polygonal.

Discussion: Mild rextallization.

Precursor: Arkose.

Sample Number: SR 251

Mineral	Mode	Remarks
Trem-At	60-70%	Blades to 1mm, pale green pleochroism.

Ch 30-40% Blades 0.6mm; Hi Mg.

Opaq Tr Few patches of opaque & reddish alteration.

Rock Name: Ch-Trem schist.

Texture: Probably nematoblastic.

Precursor: Marl, siliceous dolomite?

Sample Number: SR 252

Mineral	Mode	Remarks
Qtz	25%	Strain shadows, some rextallization.
Plag	45-50%	Some Seri alteration, grain ~ 0.7mm.
Ms	10-15%	
Mic	10%	
Ch	5%	W/Opaq & oxidation product (is secondary).

Rock Name: Mic-Ms-Qtz-Plag gneiss.

Texture: Granoblastic polygonal, w/Ms-Ch foliation.

Discussion: Some rextallization. Several fine rextallized zones, bent Plag & kinked Ms. Kinking & folding of oldest foliation (Ms). Elongate Plag & layers (comp.) also follow.

Sample Number: SR 259

Mineral	Mode	Remarks
Qtz	50-55%	0.03-0.3mm, rextallized.
Plag	20-25%	Grains to 0.5mm. Somewhat sericitized.
Ms	25%	Grains approx. 1mm long (tapered at ends & surrounded by thin alteration sheaths).
Alteration	1%	Reddish brown, oxidized.
Opaq	<1%	Few grains.

Sample Number: SR 259 (con't)

Texture: Lepidoblastic. Rextallized fine Qtz matrix w/larger Plag & Ms (also a few larger Qtz).

Discussion: Some Sericite & oxidized alteration.

Precursor: Argillaceous feldspathic sandstone.

Sample Number: SR 273

Mineral	Mode	Remarks
Qtz	15%	Grains approx. 0.2mm w/ Plag in segregations.
Bi	40%	No orientation, yellow green colors.
Plag	25%	Y ₄₀ Al ₁₀ =+15 ⁰ , An ₃₃ . Grains 0.2-0.5mm.
Gt	15%	Euhedral 0.4mm grains scattered.
Cc	1%	Few ragged grains throughout (secondary?).
Mr	3%	0.4mm grains.
Ms/Ch	10%	Alteration of Bi.

Rock Name: Gt-Plag-Qtz-Bi gneiss.

Texture: Granoblastic polygonal, mafic phase euhedral.

Discussion: Considerable retrograde Ch & Seri. from Bi.

Precursor: Graywacke?

Sample Number: SR 274

Mineral	Mode	Remarks
Qtz	45%	Strained to 0.7mm.
Plag	35%	Strongly altered (reddish) grains to 0.5mm w/ inclusions & myrmekite.
Mic	15%	0.4mm or less grains.
Bi } Ch }	5%	Is altered.
Ap	Tr	

Rock Name: Quartzofeldspathic gneiss.

Texture: Granoblastic polygonal, w/few rextallized zones.

Discussion: Reddish alteration of Plag & minor rextallization.

Precursor: Arkose or felsic volcanic/volcaniclastic.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SR 275

Mineral	Mode	Remarks
Qtz	50%	Grains to 0.7mm.
Mic	40%	Grains to 0.9mm.
Plag	5-10%	Ab, 0.6mm size.
Ch	Tr	Few grains.
Alteration	~3%	Pervasive reddish/oxid.

Rock Name: Quartzofeldspathic gneiss/breccia.

Texture: Granoblastic porphyroclasts in cataclastic matrix (to < 0.01mm) of Qtz and K-spar.

Discussion: Sample is strongly brecciated w/ porphyroclasts of original rock.

Precursor: Arkose?

Sample Number: SR 277

Mineral	Mode	Remarks
Qtz	30-60%	Grains 0.2mm max.
Ms	10-20%	Blades approx. 0.4mm long; random orient.
Plag	10-40%	Variable, Tour-rich layers have more Plag.
Tour	15%	In layers, some layers (9mm spacing) very rich in Tour.

Rock Name: Tour-Ms-Plag-Qtz gneiss.

Texture: Granoblastic polygonal, some sutured & cusped margins on Qtz.

Discussion: Sedimentary layering in Tour, Plag, Ms distribution, layers ~7mm thick. Pure Qtz vein (coarse & x-cutting).

Precursor: Feldspathic sandstone w/detrital Tour.

Sample Number: SR 277

Mineral	Mode	Remarks
Qtz	60-65%	Grain size variable w/ layers from 0.09mm to 0.4 mm.
Plag	20%	0.1-0.4mm grains.
Tour	5-15%	Equant to prismatic. Grains usually ~0.1mm.
Ms	Tr	
Ap	Tr	
Zr	Tr	

Texture: Granoblastic polygonal, some strain shadows & cusped margins.

Discussion: Minor recrystallization. Original bedding defined by layers rich in Tour.

Precursor: Feldspathic sandstone w/Tour.

Sample Number: SR 278

Mineral	Mode	Remarks
Qtz	50%	0.3mm, uniform grains.
St	20%	Restricted to one layer; euhedral 0.9mm poikiloblasts.
Ms	20-25%	0.4mm long laths.
Ch } Opaq }	5%	Green Ch almost totally choked w/fine Opaq material (graphite?).
Tour	1%	Small scattered grains.

Rock Name: St-Ms-Qtz schist.

Texture: Layering apparent, at high angle to foliation. St in one layer only. Two stages of foliation: 1) Dominant is Ms. 2) Second, at ~70° to first, is also // alignment of Ms grains. Is also start of new comp. layering.

Precursor: Argillaceous S.S. siltstone.

Sample Number: SR 289

Mineral	Mode	Remarks
Qtz	60%	Grains ~0.4mm in granoblastic porphyroclasts.
Plag	20%	
K-spar	20%	Microcline.

Alteration }
Opaq } 10-15% Reddish alteration of the cataclastic matrix.

Rock Name: Quartzofeldspathic cataclastic breccia.

Texture: Cataclastic w/clasts in fine matrix.

Discussion: Cataclastic event & later oxidation alteration.

Sample Number: SR 291

Mineral	Mode	Remarks
Qtz	55-65%	Often recrystallized. Grains 0.5mm in porphyroclasts.
Plag	30%	Y _A 010 = ~10°, is An ₈ . Grains to 0.5mm.
K-spar	5%	Grains 0.3mm.
Ch	1%	Few grains.
Zr	Tr	

Alteration }
Opaq } 5-10% Mainly in cataclastic matrix.

Rock Name: Qtz-Plag breccia w/gneissic porphyroclasts.

Texture: All grains broken, some recrystallized. Cataclastic matrix w/much oxidized alteration. Porphyroclasts (to 1.5mm) of original gneiss.

Discussion: Pervasive red-brown oxidation; is late alteration.

Precursor: Felsic volcanic/arkose?

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: SR 293

Mineral	Mode	Remarks
Qtz	25%	Strained, cusped margins grains to 1mm.
Plag	35%	Often kinked, Y _A 010 > 10°, ~ An ₂₋₆ .
Mic	40%	Grains to 1mm.
Opaq	1%	Few equant grains.

Rock Name: Quartzofeldspathic gneiss.

Texture: Granoblastic polygonal, but w/broken Plag (kink) and one 0.5mm wide brecciated fracture.

Discussion: Plag → Seri. Considerable oxidation. Reddish brown alteration product throughout.

Precursor: Arkose or felsic igneous, even pegmatite.

Sample Number: GA 3

Mineral	Mode	Remarks
Qtz	30%	Grains ~ 0.2mm in re-crystallized aggregates to 0.6mm.
K-spar	35%	Microcline w/some perthite to 0.6mm.
Plag	30%	An _{~8} - Albite.
At	5%	Very darkly altered. Has low Al colors.
Opaq	2%	Large grains & as alteration(?) in amphibole.

Rock Name: At-Plag-K-spar-Qtz gneiss.

Texture: Granoblastic polygonal, now cataclastic (moderate) w/some fine matrix.

Precursor: Volcanic or intrusive, rhyodacitic, to rhyolitic composition.

Sample Number: GA 6

Mineral	Mode	Remarks
Qtz	20%	0.7mm grains & smaller in matrix.
K-spar	70%	1-2mm grains, microcline.
Plag	2%	In matrix.
Ch	3-10%	Green, partly oxidized, often aggregates of fine Bi fans.
Ms	1%	
Zr	Tr	
Opaq	1%	Irregular aggregates, often w/Ch.

Rock Name: Ch-Qtz-K-spar gneiss?

Texture: Mortar w/Ch-Ms overprint, micas random.

Discussion: Was cataclastic, but somewhat rehealed, not strongly sutured. Ms-Ch may be later overprint. Few thin, x-veins of Qtz. Very K-spar rich (volcaniclastic??).

Sample Number: GA 7

Mineral	Mode	Remarks
Qtz	10%	0.2mm grains.
Plag	20%	Albite? Grains to 0.8mm.
Bi } Ms }	40%	Much of Bi altered was an intergrowth w/ sillimanite.

Alteration 30% Sericite and clays. Some Ch & Opaq.

Zr Tr Few grains.

Rock Name: Altered Sill-Ms-Bi-Qtz-Plag gneiss.

Texture: Was lepidoblastic w/Ms & Bi, but now altered.

Discussion: Rock was high-grade foliated schist.

Precursor: Aluminous (pelitic) shale.

Sample Number: GA 8

Mineral	Mode	Remarks
Qtz	35%	Some strain shadows, slightly cusped margin.
K-spar	30%	Grains to 0.8mm orthoclase, some perthite.
Opaq	3%	0.3mm grains w/Ch.
Plag	25%	0.4mm grains, altered to sericite/epidote.
Ep	2%	Irregular grains.
Ch	3%	2 generations. One more Mg-rich, primary.

Monazite Zr Tr Few very small grains.

Rock Name: Ch-Plag-K-spar-Qtz gneiss.

Texture: Granoblastic polygonal w/slight oriented retrograde overprint.

Precursor: Rhyolitic volcanic or volcaniclastic.

Sample Number: GA 10

Mineral	Mode	Remarks
Qtz	40%	0.3mm grains, some aggregates.
Zr Monazite } Ap }	Tr	Few small grains.
K-spar	40%	Some large grains to 4mm and smaller also.
Plag	15%	0.6mm grains, largely altered to sericite.
Opaq	3%	An ₆ Albite.
Ep } Bi } Ms }	5%	Intergrowth, Bi reddish makes weak foliation. Some Ch in oxidized intergrowths.

Rock Name: Bi-Plag-Qtz-K-spar gneiss (altered).

Texture: Granoblastic polygonal, large K-spar porphyroblasts. May be relic volcanic texture. Slight foliation (Bi) mild cataclasis.

Precursor: Volcanic, porphyritic rhyolite lava flow.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: GA 12A

Mineral	Mode	Remarks
Qtz	15%	To ~ 0.15mm scattered & aggregates.
Ch	40%	Pale green, some abnormal after Hb?
Plag	40%	0.6mm almost totally altered to sericite.
Opaq	5%	0.3mm equant grains.

Rock Name: Qtz-Ch-Plag schist.

Texture: All altered; was granoblastic polygonal.

Discussion: Metamorphosed intermediate or mafic flow or volcanoclastic? Now altered to sericite-chlorite. Alternate Ch & Plag-rich layers, ~ 7mm thick.

Precursor: Was amphibolite.

Sample Number: GA 12C

Mineral	Mode	Remarks
Qtz	15%	0.2mm, scattered.
Plag (Ms)	45%	Were grains to 2mm; now altered to Ms.
Cc	5%	Irregular, scattered.
Ch	25%	Pale green, gray interf. colors, brown-green pleochroic.
Bi	3%	
Opaq	3%	Well-formed to 5mm elongate to 1mm. Mt & Hm? and mixed w/Ch.

Rock Name: Cc-Bi-Ch-Qtz-Plag gneiss.

Texture: Granoblastic? Now have poorly oriented overprint of Ch & Ms.

Discussion: Bi-Ch-Ms as alteration/retrograde. Was intermediate volcanoclastic(?) Noticeably retrograded. No evidence of much cataclasis.

Precursor: Bi-Qtz-Plag gneiss(?), From volcanic(?)

Sample Number: GA 13

Mineral	Mode	Remarks
Qtz	20%	
K-spar	75%	Large, to 6mm. In matrix as well.
Plag	2%	Matrix only.
Alteration	3%	Sericite, Ch.

Rock Name: Qtz-K-spar gneiss.

Texture: Mortar, very large K-spar grains in finer 0.2mm matrix. Cataclastic.

Precursor: Intrusive, very K-spar-rich, feldspar-rich granite?

Sample Number: GA 14

Mineral	Mode	Remarks
Qtz	35%	0.5mm grains, slightly cusped margins, strain shadows.
K-spar	45%	To 0.8mm, some perthite little twinning. orthoclase (?).
Plag	5%	Variably altered to sericite, An ₄ .
Ep	10-15%	Replaces Plag, grains 0.3mm and irregular, intergrown w/Opaq.
Ch	2%	W/Ep. Gray ?.
Monazite	1/2%	Scattered 0.09mm prisms, brown, low 2V(+).
Opaq	3%	Usually small, w/Ep.
Zr	Tr	Few euhedral grains.

Rock Name: Ep-Plag-K-spar-Qtz gneiss.

Texture: Granoblastic polygonal w/overprinted Ep-Ch. Evidence of cataclasis. Is variable. Definitely some recrystallization.

Discussion: Stable assemblage: Ab-Ep-Ch.

Precursor: Rhyolite, flow or volcanoclastic.

Sample Number: GA 18

Mineral	Mode	Remarks
Qtz	25%	0.3mm grains w/some strain shadows cusped margins.
K-spar	25%	
Plag	20%	0.3mm grains, strained, some bent.
Ms	15%	As sericite and grains to 0.3mm
Ch	15%	Brown-blue, sometimes radial aggregates.
Ep	Tr	Few irregular grains.
Zr } Ap }	Tr	

Rock Name: Ms-Ch-Plag-K-spar-Qtz gneiss.

Texture: Granoblastic polygonal, now w/random retrograde overprint.

Discussion: Was good gneiss, now overprinted.

Precursor: Rhyolitic-rhyodacitic volcanic/volcanoclastic.

PETROGRAPHIC ANALYSES--UINTA ARCH PROJECT (continued)

Sample Number: GA 19

Mineral	Mode	Remarks
Qtz	35%	0.25mm grains.
K-spar	5-10%	Few microcline grains.
Plag	45%	0.4mm, equant, slightly sericitized, apparently Albite An 10.
Hb	10%	Dark, irregular, some oxidation and opaque formation.
Opag Ep	3%	Grains to 0.5mm and as Hb alteration w/ oxidation mat.
Monazite?	Tr	Few grains.
Zr	Tr	

Rock Name: Hb-K-spar-Qtz-Plag gneiss.

Texture: Granoblastic polygonal. No cataclasis except for strain shadows.

Precursor: Intermediate volcanic/volcaniclastic.

Sample Number: GA 21

Mineral	Mode	Remarks
Qtz	30%	Grains to 0.6mm. 0.1mm or less in matrix.
K-spar	30%	Grains to 0.8mm.
Plag	30%	Albite w/sericite clasts to 1mm.
Ep	5-10%	In veins and scattered.
Bi	3%	Green w/much Ch intergrown.

Rock Name: Cataclastic Bi-Ep-Plag-K-spar-Qtz gneiss.

Texture: Cataclastic, feldspar/Qtz in finer matrix. Some elongation foliation. Mica foliation. Ep vein // to elongation foliation.

Discussion: Ep in vein. Strongly rextallized. retrograde and cataclasis suggests that they were contemporaneous.

Sample Number: GA 23

Mineral	Mode	Remarks
Qtz	45-50%	Clasts to 1.5mm w/strain shadows 0.07mm or less in matrix.
K-spar	20%	Mainly 0.5mm or smaller grains.
Plag	1%	Few small grains.
Ep	30%	Grains to 0.7mm in matrix.
Ch	1-4%	Locally to 5%
Opag	~ 1%	

Rock Name: Ep-K-spar-Qtz cataclastic gneiss.

Texture: Cataclastic, mainly Qtz porphyroclasts in fine cataclastic matrix of Qtz & Ep.

Precursor: Volcaniclastic, rich in Qtz.

Sample Number: GA 25

Mineral	Mode	Remarks
Qtz	32%	0.5mm grains w/strain shadows.
K-spar	30%	
Plag	20%	Slightly sericitized to 0.4mm.
Ep Ch	15% 3%	Grains irregular to 0.5mm together in aggregates. Is probably after Amp (diamond pseudomorphs).
Ap Monazite	Tr	

Rock Name: Ch-Ep-Plag-K-spar-Qtz gneiss.

Texture: Granoblastic polygonal, but contains a fine cataclastic zone.

Precursor: Intermediate volcanic/volcaniclastic.

Sample Number: GA 27

Mineral	Mode	Remarks
Qtz	15%	to 3mm.
Plag	30%	Coarse, to 5mm.
Ms	35%	As sericite and grains to 0.3mm.
Bi-Ch	10%	Mainly Bi, w/Fe Ch.

Rock Name: Ms-Bi-Plag-Qtz gneiss.

Texture: Lepidoblastic mica layers alternate w/ coarse Qtz-Plag layers (granoblastic polygonal).

Discussion: Muscovite is secondary overprint and not as well oriented.

Sample Number: GA 28

Mineral	Mode	Remarks
Qtz	30%	0.3mm grains in aggregate.
Plag	30%	Some large grains to 3mm somewhat sericitized.
K-spar	30%	Grains to 4mm and small.
Bi	3%	Brown, near Opag (secondary).
Opag	3%	To 3mm.
Ms-Ep	1%	Slight alteration.

Rock Name: Bi-K-spar-Plag-Qtz gneiss.

Texture: Porphyroblastic w/granoblastic polygonal matrix. Slight rextallization, slightly cataclastic.

Precursor: Porphyritic igneous, intrusive(?).

APPENDIX II

Appendix II is a table of all locations and radiometric data. Raw field spectrometry data are those recorded by use of McPhar TV-1A hand-held gamma-ray spectrometer. Because of inadequate crystal size in hand-held instruments, and therefore poor resolution and inconsistencies between instruments, no attempt is made to convert readings to ppm U. However, raw data for samples listed in this appendix may be compared to chemical analyses for the same samples (Appendix IIII0, to establish a rough approximation of KUTH readings to actual ppm U derived by chemical analysis. Since both radiometric KUTH data and analytically determined ppm U are known for all sample sites, intervening station sites, where only radiometric KUTH data are known can be compared with nearby sample site data and at least "ball park" estimates of uranium content can be made.

Cross-referenced in this appendix are: Radiometric Station Number, Field Number, Chemical Analysis Number, Location, and KUTH Spectrometry Data.

LOCATION AND RADIOMETRIC GRID DATA UINTA ARCH PROJECT

RED CREEK QUARTZITE

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KUTh	UTh	Th
1-1			40°56'06"	109°08'42"	22	-	-
1-2	SR-101	152712	- 55'42"	- 08'27"	20	2	1
1-3			- 55'33"	- 08'40"	17	1	0.8
1-4			- 55'34"	- 08'40"	12	0.7	0.7
1-5			- 55'37"	- 08'40"	10	0.75	0.4
1-6			- 55'38"	- 08'40"	17	1.5	0.5
1-7	SR-102	- 713	- 55'40"	- 08'40"	10	1.3	0.5
1-8			- 55'41"	- 08'40"	8	0.6	0.5
1-9	SR-103	- 714	- 55'42"	- 08'44"	10	2	0.8
1-10			- 55'44"	- 08'46"	20	1.5	0.65
1-11	SR-104	- 715	- 55'45"	- 08'47"	13	1.0	0.8
1-12			- 55'52"	- 08'50"	14	1	1
1-13			- 55'54"	- 08'52"	22	1.5	0.6
1-14	SR-105	- 716	- 55'57"	- 08'56"	14	0.75	0.45
1-15			- 55'58"	- 08'57"	15	1.2	0.7
1-16	SR-106	- 717	- 56'03"	- 08'59"	70	3.5	1
2-1	SR-107	- 718	- 56'08"	- 08'35"	60	2.5	0.8
	SR-108	- 719	- 56'08"	- 08'35"	60	2.5	0.8
2-2	SR-109	- 720	- 56'05"	- 08'33"	45	2.5	0.7
2-3			- 56'12"	- 08'32"	15	1	0.8
2-4	SR-110	- 721	- 56'13"	- 08'27"	15	1	0.9
2-5	SR-111	- 722	- 56'14"	- 08'26"	32	1.3	0.7
2-6			- 56'07"	- 08'20"	11	0.8	0.6
2-7	SR-112	- 723	- 56'07"	- 08'16"	40	2	0.9
2-8	SR-113	- 724	- 56'04"	- 08'20"	27	1.2	0.9
2-9			- 56'02"	- 08'22"	28	1.7	0.5
2-10	SR-114	- 725	- 55'59"	- 08'24"	27	1.5	1
2-11			- 55'56"	- 08'27"	20	0.9	0.6
2-12	SR-115	- 726	- 55'54"	- 08'29"	25	1.8	0.6
2-13			- 55'51"	- 08'30"	50	1.8	0.7
2-14	SR-116	- 727	- 55'56"	- 08'38"	45	2	0.8
2-15			- 55'46"	- 08'26"	10	0.8	0.3
2-16			- 55'47"	- 08'23"	10	0.75	0.4
2-17			- 55'48"	- 08'21"	10	1.5	0.7
2-18	SR-117	- 728	- 55'49"	- 08'17"	10	1.2	0.7

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KTh	UTh	Th
2-19			40°55'50"	109°08'10"	8	0.9	0.7
2-20			- 55'53"	- 08'05"	9	0.9	0.8
2-21	SR-118	152729	- 55'53"	- 07'52"	10	1.3	0.5
2-22	SR-119	- 730	- 56'03"	- 07'55"	18	1.5	0.9
2-23			- 56'03"	- 08'03"	8	1	0.4
2-24			- 55'58"	- 08'11"	22	1.4	0.6
2-25	SR-120	- 731	- 55'57"	- 08'14"	45	2	0.8
3-1			- 55'40"	- 08'49"	13	1.3	0.9
3-2			- 55'39"	- 08'54"	10	0.8	0.6
3-3			- 55'40"	- 08'58"	10	0.9	0.7
3-4			- 55'39"	- 09'09"	10	0.8	0.5
3-5			- 55'39"	- 09'14"	18	1.2	0.8
3-6			- 55'37"	- 09'20"	22	1.2	0.8
3-7			- 55'35"	- 09'30"	13	1.1	0.7
3-8			- 55'30"	- 09'32"	22	1	0.9
3-9			- 55'28"	- 09'37"	11	1	0.9
3-10			- 55'24"	- 09'30"	25	1.6	1
3-11	SR-121	- 732	- 55'20"	- 09'34"	40	1.8	0.8
3-12			- 55'15"	- 09'45"	25	1.1	0.8
3-13			- 55'17"	- 09'45"	12	0.8	0.5
3-14			- 55'21"	- 09'45"	15	1	0.8
3-15	SR-122	- 733	- 55'23"	- 09'44"	40	1.6	0.8
	SR-123	- 734	- 55'26"	- 09'50"	65	3	1
	SR-124	- 735	- 55'26"	- 09'50"	45	1.7	0.9
	SR-125	- 736	- 55'27"	- 09'47"	50	1.5	1
	SR-126	- 737	- 55'28"	- 09'46"	55	2	0.6
3-16			- 55'33"	- 09'42"	48	1.5	0.5
3-17			- 55'42"	- 09'33"	55	2.2	1.2
3-18			- 55'40"	- 09'28"	50	1.8	1
3-19			- 55'43"	- 09'24"	37	1.2	0.8
3-20			- 55'51"	- 09'22"	30	1.5	0.8
3-21	SR-127	- 738	- 55'57"	- 09'19"	32	1.1	0.5
3-22			- 56'01"	- 09'17"	25	1.5	0.5
3-23	SR-128	- 739	- 56'05"	- 09'10"	35	1.2	1

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KUTh	UTh	Th
3-24			40°56'05"	109°09'01"	25	1.2	1
4-1			- 56'10"	- 08'44"	57	3.2	1.1
4-2	SR-129	152740	- 56'30"	- 09'17"	35	1.8	1.2
4-3			- 56'26"	- 09'22"	11	0.6	0.5
4-4			- 56'24"	- 09'22"	14	0.9	0.8
4-5			- 56'22"	- 09'30"	12	1	0.9
4-6			- 56'19"	- 09'30"	28	1.4	1
4-7	SR-130	- 741	- 56'13"	- 09'33"	13	1.1	0.8
4-8			- 56'08"	- 09'35"	13	1	0.8
4-9			- 56'05"	- 09'32"	12	0.9	0.6
4-10	SR-131	- 743	- 56'03"	- 09'29"	20	1.1	0.9
4-11	SR-132	- 744	- 56'00"	- 09'27"	30	1.8	1.1
4-12			- 55'57"	- 09'28"	29	1.5	0.9
4-13			- 55'53"	- 09'32"	28	1.4	1
4-14			- 55'47"	- 09'41"	28	1	0.6
4-15			- 55'40"	- 09'47"	26	1.2	0.8
4-16			- 55'40"	- 09'51"	28	1.4	1
4-17			- 55'37"	- 09'52"	32	1.5	1.2
4-18			- 55'43"	- 09'58"	23	1	0.6
4-19			- 55'47"	- 09'56"	30	1.4	0.4
4-20	SR-133	- 745	- 55'50"	- 09'58"	8	2	0.7
4-21			- 55'53"	- 09'58"	8	0.9	0.6
4-22			- 55'57"	- 09'58"	7	0.6	0.5
4-23			- 56'01"	- 09'58"	7	1	0.5
4-24			- 56'05"	- 09'57"	7	0.8	0.6
4-25			- 56'09"	- 09'51.5"	12	1.4	0.7
4-26			- 56'13"	- 09'47"	10	0.6	0.4
4-27			- 56'19"	- 09'40"	14	0.9	0.5
4-28	SR-134	- 746	- 56'24"	- 09'40"	10	0.7	0.5
4-29			- 56'27"	- 09'35"	26	1	0.5
5-1	SR-135	- 747	- 57'06"	- 10'00"	11	0.8	0.6
5-2			- 57'06"	- 10'11"	9	0.9	0.7
5-3			- 57'04"	- 10'23"	10	0.9	0.6
5-4	SR-136	- 748	- 57'04"	- 10'25"	11	1.3	0.8

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KTh	UTh	Th
5-5			40°57'05"	109°10'35"	9	1.2	0.6
5-6			- 57'05"	- 10'41"	8	1.1	0.8
5-7			- 57'06"	- 10'48"	10	0.7	0.6
5-8			- 57'06"	- 10'56"	9	0.9	0.5
5-9	SR-137	152749	- 57'04"	- 11'03"	10	1.6	0.8
5-10	SR-138	- 750	- 57'03"	- 11'09"	14	1.2	0.6
5-11			- 57'00"	- 11'18"	12	0.9	0.6
5-12	SR-139	- 751	- 56'59"	- 11'23"	13	1	0.9
5-13	SR-140	- 752	- 56'56"	- 11'25"	19	1	0.8
5-14			- 56'55"	- 11'35"	13	0.9	0.6
5-15			- 56'52"	- 11'40"	14	1.1	0.8
5-16			- 56'49"	- 11'43"	10	1	0.8
5-17			- 56'49"	- 11'47"	11	0.8	0.7
5-18			- 56'52"	- 11'55"	12	1	0.8
5-19			- 56'50"	- 12'04"	10	0.8	0.7
5-20			- 56'50"	- 12'07"	15	1.5	0.8
5-21			- 56'50"	- 12'12"	12	0.7	0.6
5-22	SR-141	- 753	- 56'51"	- 12'15"	32	2	1
5-23			- 56'48"	- 12'20"	10	1.4	0.6
5-24			- 56'45"	- 12'24"	8	0.9	0.6
5-25			- 56'47"	- 12'28"	8	0.9	0.7
5-26			- 56'50"	- 12'34"	7	1	0.6
5-27			- 56'52"	- 12'37"	10	1.2	0.7
5-28			- 56'55"	- 12'40"	6	0.8	0.5
5-29			- 56'57"	- 12'42"	9	0.9	0.6
5-30			- 56'55"	- 12'30"	12	0.8	0.6
5-31	SR-142	- 754	- 56'57"	- 12'21"	20	0.9	0.6
5-32			- 56'47"	- 12'03"	15	0.8	0.7
5-33	SR-143	- 755	- 56'45"	- 11'53"	12	1	0.8
5-34			- 56'45"	- 11'43"	11	1	0.6
5-35			- 56'44"	- 11'37"	10	0.8	0.7
5-36	SR-144	- 756	- 56'44"	- 11'18"	23	1	0.8
5-37			- 56'45"	- 11'13"	10	0.7	0.6
5-38			- 56'46"	- 11'01"	10	0.7	0.65

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE
(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KTh	UTh	Th
5-39			40°56'54"	109°10'53"	10	1	0.8
5-40			- 56'57"	- 10'47"	9	1	0.6
5-41			- 56'59"	- 10'41"	10	1.2	0.7
5-42			- 57'02"	- 10'13"	10	0.9	0.7
6-1	SR-145	152757	- 55'35"	- 13'33"	15	1.1	0.6
6-2	SR-146	- 758	- 55'39"	- 13'30"	9	0.6	0.5
6-3			- 55'37"	- 13'32"	11	1	0.6
6-4			- 55'40"	- 13'33"	10	0.6	0.5
6-5			- 55'43"	- 13'40"	9	0.7	0.6
6-6	SR-147	- 759	- 55'45"	- 13'34"	10	0.7	0.6
6-7			- 55'48"	- 13'27"	9	0.5	0.45
6-8	SR-148A	- 760	- 55'50"	- 13'23"	11	1.1	0.8
	SR-148B	- 761	- 55'50"	- 13'23"	27	1.1	1
6-9	SR-148C	- 762	- 55'54"	- 13'21"	23	1.9	0.8
6-10	SR-149	- 763	- 55'55"	- 13'24"	29	1.5	0.9
6-11			- 55'56"	- 13'26"	19	0.9	0.8
6-12	SR-150	- 764	- 55'57"	- 13'27"	23	1.5	1.2
6-13	SR-151	- 765	- 56'00"	- 13'30"	20	1	0.6
6-14	SR-152	- 766	- 56'05"	- 13'30"	10	0.6	0.55
6-15			- 56'07"	- 13'35"	10	0.8	0.6
6-16			- 56'11"	- 13'37"	9	0.9	0.8
6-17			- 56'11"	- 13'42"	9	0.8	0.7
6-18			- 56'14"	- 13'53"	7	0.7	0.6
6-19	SR-153	- 767	- 56'13"	- 14'06"	22	1.4	1.2
6-20	SR-154	- 768	- 56'14"	- 14'12"	25	1.2	0.9
6-21	SR-155	- 769	- 56'15"	- 14'20"	10	0.9	0.7
6-22	SR-156	- 771	- 56'15"	- 14'25"	10	0.7	0.4
6-23			- 56'17"	- 14'35"	9	0.8	0.6
6-24			- 56'12"	- 14'40"	8	0.6	0.5
6-25			- 56'18"	- 14'45"	10	1.2	0.6
6-26			- 56'32"	- 14'47"	11	1.2	0.6
6-27			- 56'38"	- 14'37"	15	1.2	0.6
6-28			- 56'44"	- 14'35"	10	0.6	0.5
6-29	SR-157	- 772	- 56'47"	- 14'37"	20	1	0.9

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE
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IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KUTh	UTh	Th
6-30	SR-158	152773	40°56'56"	109°14'33"	11	0.9	0.6
6-31			- 56'42"	- 14'16"	16	0.6	0.5
6-32			- 56'36"	- 14'10"	16	0.6	0.5
6-33			- 56'38"	- 14'03"	13	0.7	0.6
6-34			- 56'36"	- 13'55"	17	0.5	0.4
6-35			- 56'37"	- 13'40"	11	0.6	0.5
6-36			- 56'30"	- 13'33"	11	0.8	0.6
6-37			- 56'30"	- 13'25"	13	0.9	0.6
7-1			- 56'08"	- 13'09"	11	1.2	0.8
7-2	SR-159	- 774	- 56'07"	- 13'05"	30	1.6	0.6
7-3			- 56'07"	- 13'03"	45	2.3	1.1
7-4	SR-160	- 775	- 56'06"	- 12'53"	47	2.7	1.5
7-5			- 56'03"	- 12'47"	32	2.4	0.6
7-6	SR-161	- 776	- 56'01"	- 12'46"	45	2.4	1.0
7-7	SR-162	- 777	- 56'04"	- 12'41"	45	2.1	1.2
7-8			- 56'05"	- 12'46"	39	2.0	1.2
7-9			- 56'11"	- 12'48"	21	0.9	0.5
7-10			- 56'13"	- 12'48"	21	1.9	0.5
7-11			- 56'17"	- 12'34"	30	2.0	1.0
7-12	SR-163	- 778	- 56'17"	- 12'28"	23	1.7	1.0
7-13	SR-164	- 779	- 56'17"	- 12'22"	20	1.8	0.9
7-14			- 56'20"	- 12'20"	27	2.2	0.9
7-15			- 56'30"	- 12'17"	23	1.2	0.9
7-16	SR-165	- 780	- 56'33"	- 12'18"	28	1.6	0.7
7-17			- 56'33"	- 12'35"	23	2.0	1.0
7-18	SR-166	- 781	- 56'32"	- 12'41"	35	1.9	0.5
7-19			- 56'32"	- 12'40"	21	1.6	0.9
7-20	SR-167	- 782	- 56'22"	- 12'35"	36	1.8	1.1
7-21	SR-168	- 783	- 56'17"	- 12'44"	22	1.5	1.2
7-22			- 56'17"	- 12'47"	16	0.9	0.6
7-23			- 56'16"	- 12'53"	40	1.0	0.5
7-24			- 56'15"	- 13'01"	15	1.4	0.8
7-25	SR-169	- 784	- 56'04"	- 13'14"	35	2.0	1.2
7-26	SR-170	- 785	- 56'04"	- 13'15"	75	6.0	0.9

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KUTh	UTh	Th
8-1			40°56'10"	109°13'12"	21	1.0	0.5
8-2	GR-1	152786	- 56'15"	- 13'17"	28	1.0	0.4
8-3			- 56'25"	- 13'18"	25	1.1	0.5
8-4			- 56'35"	- 13'17"	23	0.4	0.3
8-5			- 56'44"	- 13'14"	19	0.9	0.25
8-6	GR-2	- 787	- 56'45"	- 13'13"	31	1.1	0.5
8-7			- 56'50"	- 13'13"	48	1.3	0.3
8-8	GR-3	- 788	- 56'53"	- 13'13"	30	1.2	0.4
8-9			- 56'54"	- 13'14"	29	1.0	0.95
8-10	GR-4	- 789	- 56'56"	- 13'14"	40	1.2	0.5
8-11	GR-5	- 790	- 56'59"	- 13'11"	28	0.9	0.35
8-12			- 57'00"	- 13'02"	23	0.55	0.5
8-13			- 57'02"	- 12'49"	22	0.45	0.35
8-14	GR-6	- 791	- 57'03"	- 12'37"	21	0.6	0.55
8-15			- 57'07"	- 12'38"	27	1.1	0.45
8-16			- 57'13"	- 12'40"	38	1.0	0.45
8-17			- 57'07"	- 12'53"	20	0.55	0.5
8-18			- 57'07"	- 13'03"	20	0.45	0.5
8-19			- 57'07"	- 13'13"	19	0.75	0.4
8-20			ND	ND	ND	ND	ND
8-21			- 57'10"	- 13'44"	11	0.9	0.6
8-22			- 57'13"	- 13'55"	8	0.9	0.55
8-23	GR-7	- 792	- 57'10"	- 14'07"	9	1.0	0.35
8-24			- 57'05"	- 13'55"	7	1.1	0.6
8-25			- 57'01"	- 13'43"	9	1.0	0.5
8-26			- 56'57"	- 13'35"	11	0.85	0.4
8-27			- 56'48"	- 13'34"	13	1.3	0.4
8-28			- 56'42"	- 13'33"	13	0.95	0.3
8-29			- 56'36"	- 13'27"	19	1.3	0.4
9-1	SR-171	- 793	- 58'33"	- 14'02"	11	0.9	0.7
9-2	SR-172	- 794	- 58'23"	- 17'17"	15	0.9	0.6
9-3			- 58'22"	- 17'02"	12	1.1	1.0
9-4			- 58'17"	- 16'57"	11	0.9	0.8
9-5	SR-173	- 795	- 58'13"	- 16'47"	13	1.7	0.9

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KUTh	UTh	Th
9-6	SR-174	152796	40°58'09"	109°16'37"	24	2.0	1.4
9-7	SR-175	- 797	- 58'07"	- 16'27"	14	1.0	0.9
9-8	SR-176	- 798	- 58'06"	- 16'24"	15	1.5	1.1
9-9	SR-177	- 799	- 58'05"	- 16'22"	11	1.0	0.6
9-10	SR-178	- 800	- 58'03"	- 16'14"	12	1.5	0.8
9-11			- 58'01"	- 16'08"	15	0.8	0.7
9-12	SR-179	- 801	- 58'00"	- 15'59"	20	1.1	1.0
9-13			- 57'54"	- 15'55"	9	0.9	0.6
9-14	SR-180	- 802	- 57'32"	- 15'35"	11	1.0	0.7
9-15	SR-181	- 803	- 57'27"	- 15'35"	19	1.9	1.1
9-16			- 57'20"	- 15'35"	25	2.1	1.2
9-17	SR-182	- 804	- 57'14"	- 15'33"	9	1.8	0.7
9-18			- 57'07"	- 15'30"	9	1.0	0.5
9-19			- 56'54"	- 15'37"	14	0.9	0.8
9-20			- 57'05"	- 15'52"	15	1.1	0.8
9-21	SR-183	- 805	- 57'24"	- 16'10"	12	1.4	0.9
10-1	SR-184	- 955	- 09'20"	- 56'28"	21	1.4	0.8
10-2	SR-185	- 956	- 09'24"	- 56'25"	25	1.6	0.8
10-3	SR-186	- 957	- 09'21"	- 56'22"	16	1.0	0.5
10-4			- 09'05"	- 56'18"	21	1.4	0.5
10-5			- 09'02"	- 56'11"	27	1.8	0.5
10-6			- 09'02"	- 55'58"	21	1.1	ND
10-7	SR-187	- 958	- 09'06"	- 55'54"	12	1.1	0.6
10-8	SR-188	- 959	- 09'13"	- 55'52"	16	1.3	0.7
	SR-189	- 960	- 09'13"	- 55'52"	16	1.3	0.7
10-9			- 09'15"	- 55'50"	30	1.4	0.7
10-10	SR-190	- 961	- 09'37"	- 55'39"	45	1.9	0.7
10-11	SR-191	- 962	- 10'14"	- 55'17"	35	1.2	0.25
10-12			- 10'20"	- 55'27"	21	1.4	0.45
10-13	SR-192	- 963	- 10'06"	- 55'40"	25	1.5	0.7
10-14	SR-193	- 964	- 10'05"	- 55'45"	30	1.1	0.6
10-15	SR-194	- 965	- 10'13"	- 55'48"	25	2.0	1.1
10-16			- 10'28"	- 55'43"	37	1.6	0.6
10-17	SR-195	- 966	- 10'39"	- 55'34"	10	0.9	0.6

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KUTh	UTh	Th
11-1	SR-196	152967	40°11'31"	109°56'53"	16	1.4	1.3
11-2	SR-197	- 968	- 11'18"	- 56'57"	16	1.4	1.3
12-1			- 07'47"	- 57'09"	17	1.3	0.5
12-2			- 06'19"	- 57'44"	10	0.9	0.7
12-3			- 06'16"	- 57'50"	9	0.8	0.5
12-4			- 06'08"	- 57'47"	9	0.8	0.5
12-5			- 05'58"	- 57'52"	11	1.0	0.6
12-6			- 05'57"	- 57'47"	10	1.1	0.4
12-7			- 05'46"	- 57'47"	11	0.7	0.5
12-8			- 05'32"	- 57'48"	11	1.2	0.7
12-9	SR-198	- 858	- 05'29"	- 57'49"	11	0.8	0.7
12-10			- 05'27"	- 57'43"	10	1.5	0.75
12-11			- 05'22"	- 57'41"	16	1.1	0.5
12-12			- 05'15"	- 57'49"	14	1.0	0.7
12-13			- 05'15"	- 57'51"	12	1.3	0.7
12-14			- 05'17"	- 57'53"	7	1.4	0.8
12-15			- 05'10"	- 57'53"	10	1.0	0.6
12-16	SR-199	- 860	- 05'02"	- 57'56"	10	1.0	0.8
12-17			- 04'57"	- 57'56"	9	1.1	0.8
12-18	SR-200	- 861	- 04'38"	- 57'44"	14	1.0	0.7
	SR-201	- 862	- 04'38"	- 57'44"	14	1.0	0.7
12-19			- 04'33"	- 57'40"	13	1.5	1.2
12-20	SR-202	- 863	- 04'32"	- 57'49"	14	1.6	0.0
12-21	SR-203	- 864	- 04'30"	- 57'51"	36	1.6	0.6
12-22	SR-204	- 865	- 04'27"	- 57'49"	27	1.9	1.1
12-23			- 04'25"	- 57'52"	11	0.9	0.8
12-24	SR-205	- 866	- 04'17"	- 57'52"	32	2.0	1.0
	SR-206	- 867	- 04'17"	- 57'52"	32	2.0	1.0
12-25			- 04'12"	- 57'45"	ND	ND	ND
G12-1	SR-207	- 868	- 08'02"	- 57'08"	10	1.0	0.7
G12-2	SR-208	- 869	- 08'05"	- 57'08"	7.5	1.4	0.5
G12-3	SR-209	- 870	- 07'12"	- 56'49"	16	1.0	0.55
G12-4	SR-210	- 871	- 07'08"	- 56'45"	16	1.8	0.65
G12-5	SR-211	- 872	- 06'59"	- 56'47"	9	1.3	0.5

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KUTh	UTh	Th
G12-6			40°06'48"	109°56'53"	10	1.75	0.75
G12-7	SR-212	152873	- 06'36"	- 56'57"	10	1.6	0.6
G12-8			- 06'30"	- 56'54"	9	1.6	0.55
G12-9	SR-213	- 874	- 06'36"	- 56'59"	9	1.3	0.7
G12-10			- 06'31"	- 57'01"	10	1.5	0.75
G12-11	SR-216	- 875	- 06'26"	- 57'01"	10	1.5	0.7
G12-12	SR-217	- 876	- 06'08"	- 57'03"	10	1.5	ND
G12-13			- 06'28"	- 57'06"	10	1.2	0.8
G12-14	SR-218	- 877	- 06'22"	- 57'16"	8.5	1.4	0.45
G12-15			- 06'18"	- 57'20"	11	1.1	0.8
G12-16	SR-219	- 878	- 06'18"	- 57'24"	8	1.5	0.6
G12-17	SR-220	- 879	- 06'27"	- 57'19"	8	1.0	0.55
G12-18			- 06'26"	- 57'24"	10	1.0	0.45
G12-19			- 06'20"	- 57'32"	9	1.1	0.7
G12-20	SR-221	- 880	- 03'57"	- 57'51"	10	1.0	0.65
G12-21	SR-222	- 881	- 03'58"	- 57'52"	20	2.5	0.6
G12-22	SR-223	- 882	- 04'02"	- 57'52"	10	1.9	0.75
G12-23	SR-224	- 883	- 04'10"	- 57'44"	11	1.5	0.5
13-1			- 03'14"	- 54'24"	11	0.8	0.4
13-2	SR-225	- 884	- 03'14"	- 54'26"	11	0.9	0.6
13-3			- 03'16"	- 54'30"	9.5	0.8	0.6
13-4	SR-226	- 885	- 03'17"	- 54'32"	25	1.8	0.8
13-5			- 03'17"	- 54'35"	32	2.0	0.6
13-6	SR-227	- 886	- 03'18"	- 54'38"	12	0.7	0.5
13-7			- 03'19"	- 54'44"	12	1.0	0.5
13-8			- 03'21"	- 54'48"	22	2.5	0.45
13-9	SR-228	- 887	- 03'19"	- 54'52"	14	1.3	0.55
13-10	SR-229	- 888	- 03'17"	- 54'56"	8	0.7	0.6
13-11			- 03'16"	- 54'59"	10	1.0	0.25
13-12			- 03'15"	- 55'05"	10	1.1	0.7
13-13	SR-230	- 889	- 03'12"	- 55'08"	13	0.8	0.65
13-14	SR-231	- 890	- 03'13"	- 55'14"	12	1.1	0.7
13-15	SR-232	- 891	- 03'30"	- 55'13"	12	1.0	0.7
13-16			- 03'36"	- 55'10"	17	1.0	0.9

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LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

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IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KUTh	UTh	Th
13-17	SR-233	152892	40°03'37"	109°55'07"	15	1.4	0.6
13-18			- 03'40"	- 55'15"	16	1.0	0.9
13-19	SR-234	- 893	- 03'50"	- 55'16"	16	1.5	0.4
13-20			- 03'57"	- 55'12"	22	1.4	0.95
13-21	SR-235	- 894	- 04'01"	- 55'08"	16	1.0	0.5
	SR-236	895	- 04'01"	- 55'08"	16	1.0	0.5
13-22			- 04'02"	- 55'15"	15	1.0	0.7
13-23	SR-237	- 896	- 04'07"	- 55'17"	26	1.4	0.5
13-24			- 04'13"	- 55'16"	15	1.0	0.75
13-25	SR-238	- 897	- 04'23"	- 55'18"	20	1.1	0.9
13-26	SR-239	- 898	- 04'26"	- 55'14"	13	1.1	0.8
13-27			- 04'32"	- 55'18"	10	0.7	0.5
13-28			- 04'25"	- 55'07"	27	1.25	0.5
13-29			- 04'19"	- 55'03"	25	1.0	0.75
13-30	SR-240	- 899	- 04'18"	- 55'00"	32	1.5	ND
13-31			- 04'08"	- 54'57"	12.5	1.0	0.65
13-32			- 03'56"	- 54'53"	26	1.6	0.85
13-33			- 03'38"	- 54'43"	28	1.05	0.75
13-34	SR-241	- 900	- 03'36"	- 54'41"	28	1.7	0.85
13-35	SR-242	- 901	- 03'22"	- 54'32"	16	1.2	0.4
G13-1	SR-243	- 902	- 03'18"	- 54'14"	10	0.9	0.4
G13-2	SR-244	- 903	- 03'09"	- 54'22"	7.5	1.2	0.45
G13-3			- 03'07"	- 54'28"	12	1.6	0.3
G13-4	SR-245	- 904	- 03'01"	- 55'01"	8	1.5	0.35
G13-5	SR-246	- 905	- 02'57"	- 55'10"	10	1.5	0.5
G13-6			- 02'54"	- 55'11"	7.5	0.6	0.4
G13-7			- 02'44"	- 55'12"	12.5	1.75	0.6
G13-8	SR-247	- 906	- 02'34"	- 55'16"	15	1.5	0.45
G13-9	SR-248	- 907	- 02'31"	- 55'20"	14	2.2	0.65
G13-10	SR-249	- 908	- 02'22"	- 55'20"	10	1.6	0.7
G13-11			- 02'20"	- 55'24"	11	1.7	0.4
G13-12			- 02'04"	- 55'20"	13	0.95	0.45
G13-13			- 02'44"	- 54'15"	14	1.9	0.4
G13-14			- 02'41"	- 54'13"	12	0.9	0.35

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UINTA ARCH PROJECT
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RED CREEK QUARTZITE

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IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KUTh	UTh	Th
G13-15			40°02'40"	109°54'09"	11	1.2	0.35
G13-16			- 02'44"	- 54'08"	14	1.1	0.3
G13-17			- 02'56"	- 54'11"	10	1.0	0.45
16-1	SR-250	152909	- 03'39"	- 58'12"	17	1.4	1.0
16-2			- 03'33"	- 58'18"	14	1.0	0.85
16-3	SR-251	- 910	- 03'28"	- 58'23"	16	1.0	0.75
16-4			- 03'29"	- 58'27"	13.5	1.0	0.75
16-5			- 03'31"	- 58'31"	31	1.5	0.75
16-6			- 03'31"	- 58'33"	21	1.5	1.0
16-7			- 03'42"	- 58'38"	14	1.0	0.75
16-8			- 03'40"	- 58'32"	10	1.4	1.0
16-9			- 03'36"	- 58'27"	20	1.0	0.75
16-10	SR-252	- 911	- 03'35"	- 58'26"	22.5	2.0	0.85
16-11	SR-253	- 912	- 03'48"	- 58'25"	14	1.4	1.2
16-12			- 03'49"	- 58'22"	16.5	1.4	0.8
16-13			- 03'49"	- 58'18"	17	1.2	1.0
16-14			- 03'53"	- 58'23"	15	1.1	0.7
16-15			- 03'54"	- 58'21"	12	1.0	0.75
16-16			- 04'04"	- 58'30"	12.5	1.0	0.65
16-17			- 04'15"	- 58'25"	13.5	0.9	0.7
16-18			- 04'14"	- 58'28"	11	1.1	0.8
16-19			- 04'19"	- 58'20"	19	1.4	0.9
16-20			- 04'12"	- 58'15"	13	1.0	0.85
16-21			- 04'15"	- 58'13"	20	1.5	0.7
16-22			- 04'19"	- 58'11"	13.5	1.35	0.9
16-23			- 04'23"	- 58'09"	11	1.2	0.75
16-24			- 04'18"	- 58'06"	15	0.9	0.75
16-25			- 03'06"	- 58'56"	7	0.8	0.6
16-26			- 03'10"	- 58'50"	10	0.6	0.5
16-27			- 03'09"	- 58'45"	15	1.4	0.9
16-28			- 03'11"	- 58'36"	18	1.5	0.75
16-29			- 03'20"	- 58'32"	15	0.9	0.5
16-30			- 05'50"	- 58'24"	9	0.9	0.6
17-1			- 02'26"	- 59'04"	15	1.3	0.8

LOCATION AND RADIOMETRIC GRID DATA
 UINTA ARCH PROJECT
 (continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBER	LATITUDE	LONGITUDE	KTh	UTh	Th
17-2			40°00'51"	109°59'05"	9	1.0	0.8
17-3			- 00'59"	- 59'10"	10	1.0	0.5
17-4			- 01'04"	- 59'10"	10	1.5	0.9
17-5			- 01'17"	- 59'09"	10	0.9	0.5
17-6			- 02'21"	- 59'06"	9	1.0	0.75
17-7			- 03'01"	- 58'44"	13	1.25	0.75
17-8			- 03'03"	- 58'36"	18	1.6	0.8
17-9			- 03'24"	- 58'37"	15	1.4	0.8
17-10			- 04'45"	- 57'57"	15	0.9	0.8
17-11			- 04'41"	- 58'02"	10	0.9	0.5
17-12	SR-254	152913	- 04'43"	- 58'05"	9	0.9	0.6
17-13			- 04'44"	- 58'09"	10	1.1	0.6
17-14			- 04'45"	- 58'13"	14	1.0	0.7
17-15			- 04'50"	- 58'05"	10	1.2	0.7
17-16			- 05'44"	- 58'17"	16.5	1.15	0.8
17-17			- 05'46"	- 58'08"	16	1.2	0.5
17-18			- 05'26"	- 58'09"	11.5	0.8	0.75
18-1			- 05'22"	- 58'04"	13	1.0	0.8
18-2			- 05'06"	- 57'46"	11	1.0	0.6
18-3			- 05'14"	- 57'40"	11.5	1.0	0.75
18-4			- 05'24"	- 57'38"	7.5	1.1	1.0
18-5			- 05'45"	- 57'46"	12.5	1.1	0.75
18-6			- 05'52"	- 57'44"	9	0.95	0.9
18-7			- 07'06"	- 57'26"	12	0.8	0.6
18-8			- 07'29"	- 57'20"	26	1.5	0.6
18-9			- 07'58"	- 57'13"	9.5	0.85	0.75
18-10			- 07'48"	- 57'12"	10	0.75	0.7
18-11			- 08'07"	- 57'09"	9.5	0.8	0.7
18-12			- 08'18"	- 57'05"	20	1.7	0.7
18-13			- 08'26"	- 57'05"	22	1.3	0.8
18-14			- 08'32"	- 57'11"	14.5	1.1	0.5
18-15			- 08'39"	- 57'08"	10	0.8	0.55
18-16			- 09'39"	- 57'09"	27	1.1	0.5
18-17			- 10'42"	- 57'16"	ND	ND	ND

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KTh	UTh	Th
18-18			40°11'33"	109°57'07"	ND	ND	ND
19-1			- 18'49"	- 58'20"	10.5	0.8	0.75
19-2			- 18'49"	- 58'15"	11	1.1	0.8
19-3			- 18'46"	- 58'13"	10.5	0.8	0.45
19-4	SR-255	152914	- 18'42"	- 58'10"	12	1.0	0.9
19-5			- 18'40"	- 58'05"	12	1.0	0.85
19-6			- 18'34"	- 58'03"	14	1.0	0.6
19-7	SR-256	- 915	- 18'29"	- 58'02"	13	1.1	0.75
19-8	SR-257	- 916	- 18'25"	- 58'14"	14	0.85	0.75
19-9			- 18'21"	- 58'17"	14	1.0	0.75
19-10	SR-258	- 917	- 18'20"	- 58'23"	15	1.15	0.8
19-11			- 18'22"	- 58'28"	12	0.9	0.8
19-12			- 18'18"	- 58'29"	15	1.3	0.7
19-13	SR-259	- 918	- 18'23"	- 58'34"	25	1.6	0.8
19-14	SR-260	- 919	- 18'29"	- 58'34"	17	1.3	1.0
19-15			- 18'38"	- 58'34"	13	1.0	0.65
19-16			- 18'42"	- 58'34"	10	1.2	1.0
19-17	SR-261	- 920	- 18'46"	- 58'30"	10	1.1	0.75
19-18			- 18'45"	- 58'25"	11.5	0.75	0.65
19-19			- 22'28"	- 57'41"	12	0.85	0.75
19-20			- 22'36"	- 57'39"	15	0.8	0.6
19-21			- 22'39"	- 57'38"	12	1.0	0.5
19-22	SR-262	- 922	- 22'40"	- 57'36"	9.5	1.1	1.0
19-23			- 22'50"	- 57'36"	10	0.9	0.5
19-24			- 22'42"	- 57'33"	9	0.75	0.55
19-25			- 22'38"	- 57'30"	10	0.8	0.65
19-26	SR-263	- 923	- 22'36"	- 57'26"	20	1.2	0.55
19-27			- 22'48"	- 57'24"	10	1.2	0.6
19-28			- 22'52"	- 57'24"	10	0.6	0.4
19-29			- 22'57"	- 57'23"	10	1.1	0.75
19-30			- 22'55"	- 57'17"	10	0.7	0.5
19-31	SR-264	- 924	- 22'50"	- 57'15"	10	0.9	0.5
19-32			- 22'47"	- 57'14"	14.5	0.9	0.7
19-33			- 22'44"	- 57'14"	11	0.7	0.5

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
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RED CREEK QUARTZITE

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IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
19-34			40°22'41"	109°57'13"	15	1.0	0.6
19-35			- 22'40"	- 57'15"	10	0.9	0.7
19-36			- 22'40"	- 57'21"	10	0.75	0.6
19-37			- 22'32"	- 57'21"	9.5	0.9	0.7
19-38	SR-265	132925	- 22'27"	- 57'21"	10	0.85	0.65
19-39			- 22'29"	- 57'26"	10	0.75	0.7
19-40			- 22'22"	- 57'27"	12.5	1.1	0.6
20-1	SR-266	- 926	- 14'43"	- 57'28"	25	1.25	1.0
20-2			- 14'45"	- 57'30"	23.5	1.8	0.8
20-3			- 14'47"	- 57'35"	12	0.6	0.5
20-4			- 14'50"	- 57'37"	9	1.0	0.8
20-5	SR-267	- 927	- 14'56"	- 57'38"	11.5	0.95	0.45
20-6			- 15'00"	- 57'39"	10	0.8	0.7
20-7			- 15'04"	- 57'38"	8.5	1.0	0.5
20-8	SR-268	- 928	- 15'08"	- 57'36"	8	0.75	0.5
20-9			- 15'14"	- 57'35"	8	0.75	0.6
20-10	SR-269	- 929	- 15'19"	- 57'35"	18	0.9	0.75
20-11			- 15'24"	- 57'34"	7	0.5	0.4
20-12	SR-270	- 930	- 15'27"	- 57'34"	7.5	1.0	0.75
20-13			- 15'30"	- 57'33"	9	0.8	0.6
20-14			- 15'26"	- 57'07"	8.5	0.75	0.6
20-15			- 15'24"	- 57'06"	8	0.8	0.7
20-16	SR-271	- 931	- 15'17"	- 57'06"	7	0.0	0.7
20-17			- 15'13"	- 57'09"	7	0.8	0.75
20-18			- 15'08"	- 57'10"	7	1.4	0.75
20-19			- 15'06"	- 57'10"	7	0.8	0.7
20-20			- 15'02"	- 57'10"	8	0.5	0.4
20-21	SR-272	- 932	- 15'00"	- 57'11"	7	0.8	0.7
20-22			- 14'48"	- 57'11"	10	0.65	0.55
20-23			- 14'48"	- 57'17"	9	0.8	0.7
20-24			- 14'46"	- 57'21"	10	0.65	0.5
20-25	SR-273	- 933	- 29'30"	- 57'14"	19	1.0	0.6
20-26	SR-274	- 934	- 29'25"	- 57'16"	35	1.25	0.95
20-27			- 29'21"	- 57'16"	52	2.5	0.8

LOCATION AND RADIOMETRIC GRID DATA
UINTA ARCH PROJECT
(continued)

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
20-28	SR-275	152935	40°29'17"	109°57'16"	30	2.1	0.75
21-1			- 10'20"	- 56'02"	8	1.1	0.6
21-2			- 10'24"	- 56'00"	10	0.7	0.6
21-3	SR-276	- 936	- 10'29"	- 55'58"	10	0.75	0.5
21-4			- 10'32"	- 55'58"	11	0.75	0.6
21-5			- 10'37"	- 55'57"	11	0.75	0.55
21-6			- 10'38"	- 55'54"	12	1.0	0.6
21-7			- 10'38"	- 55'49"	10	1.1	0.8
21-8			- 10'38"	- 55'46"	25	1.3	0.65
21-9			- 10'40"	- 55'41"	15	1.0	0.7
21-10	SR-277	- 937	- 10'40"	- 55'38"	27	1.6	0.8
21-11			- 10'43"	- 55'34"	28	1.4	0.4
21-12			- 10'46"	- 55'32"	13	1.0	0.5
21-13	SR-278	- 938	- 11'05"	- 55'36"	28	1.7	0.75
21-14			- 11'06"	- 55'40"	12	1.0	0.7
21-15			- 11'10"	- 55'42"	10	0.75	0.6
21-16			- 11'10"	- 55'46"	10	1.0	0.6
21-17			- 11'07"	- 55'49"	10	0.9	0.5
21-18			- 11'01"	- 55'50"	10	0.8	0.65
21-19			- 10'58"	- 55'48"	10	0.8	0.6
21-20	SR-279	- 939	- 10'41"	- 55'52"	11	1.1	0.6
22-1	SR-280	- 940	- 14'38"	- 57'21"	11	0.8	0.5
22-2	SR-281	- 941	- 14'34"	- 57'15"	11	0.75	0.5
22-3	SR-282	- 942	- 14'33"	- 57'12"	11	1.0	0.5
	SR-283	- 943	- 14'33"	- 57'12"	11	1.0	0.5
22-4	SR-284	- 944	- 14'38"	- 57'07"	11.5	0.9	0.7
22-5	SR-285	- 945	- 14'38"	- 57'03"	11.5	1.0	0.7
22-6	SR-286	- 946	- 14'38"	- 57'00"	12	0.8	0.5
22-7	SR-287	- 947	- 14'38"	- 56'58"	10	0.95	0.7
22-8	SR-288	- 948	- 14'46"	- 57'06"	13	0.9	0.5
22-9	SR-289	- 949	- 26'59"	- 57'10"	40	1.2	0.7
22-10			- 26'53"	- 57'10"	24	1.4	0.55
22-11	SR-290	- 950	- 26'44"	- 57'10"	25	1.0	0.65
22-12	SR-291	- 951	- 26'36"	- 57'10"	30	2.0	1.2

LOCATION AND RADIOMETRIC GRID DATA FARMINGTON CANYON COMPLEX

RED CREEK QUARTZITE

(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
22-13	SR-292	152952	40°26'31"	109°57'09"	22	1.5	0.8
22-14	SR-293	- 953	- 26'20"	- 57'06"	21	1.7	1.0
22-15	SR-294	- 954	- 26'20"	- 57'03"	18	0.8	0.7
23-1	SR-295	153064	- 02'38"	- 54'24"	11	1.7	0.5
23-2	SR-296	- 063	- 03'43"	- 54'26"	14	1.1	0.6
23-3	SR-297	- 062	- 04'15"	- 54'26"	13	0.75	0.6
23-4	SR-298	- 061	- 04'26"	- 54'26"	10	0.55	0.45
23-5	SR-299	- 060	- 04'40"	- 54'20"	30	0.9	0.6
23-6	SR-300A	- 059	- 13'15"	- 56'08"	150	9.0	6.0
	SR-300B	- 058	- 13'15"	- 56'08"	140	16.0	8.0

FARMINGTON CANYON COMPLEX

MC-1			40°51'52"	111°49'45"	30	2.0	0.65
MC-2			- 51'49"	- 49'46"	28	1.6	0.45
MC-3			- 51'48"	- 49'38"	31	2.1	0.85
MC-4			- 51'46"	- 49'26"	32	1.5	0.7
MC-5	GF-100	152843	- 51'46"	- 49'24"	28	1.6	0.55
MC-6			51'46"	- 49'17"	23	1.9	0.5
MC-7	GF-101	- 844	- 52'02"	- 49'11"	30	1.6	0.45
MC-8	GF-102	- 845	- 52'03"	- 49'02"	36	2.75	0.6
MC-9			- 52'02"	- 48'59"	40	2.5	0.8
MC-10			- 52'06"	- 48'48"	23	1.45	0.65
MC-11	GF-103	846	- 52'04"	- 48'36"	21	1.1	0.75
MC-12	GF-104	- 847	- 52'04"	- 48'29"	20	1.0	0.55
MC-13	GF-105	- 848	- 52'06"	- 48'22"	30	1.9	0.7
MC-14	GF-106	- 849	- 52'12"	- 48'21"	25	1.75	0.4
	GF-107	- 850	- 52'12"	- 48'21"	25	1.75	0.4
MC-15	GF-108	- 851	- 52'16"	- 48'27"	25	1.7	0.45
MC-16			- 52'13"	- 47'56"	23	1.1	0.7
MC-17			- 52'12"	- 47'40"	30	0.6	0.6
MC-18	GF-109	- 852	- 51'53"	- 48'26"	28	1.2	0.5
MC-19	GF-110	- 853	- 51'52"	- 48'29"	27	1.4	0.55
MC-20	GF-111	- 854	- 51'47"	- 49'00"	28	1.1	0.35
MC-21	GF-112	- 855	- 54'48"	- 47'02"	35	1.1	0.8
MC-22	GF-113	- 856	- 54'35"	- 46'51"	50	1.5	ND

LOCATION AND RADIOMETRIC GRID DATA
FARMINGTON CANYON COMPLEX
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IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
MC-23			40°54'08"	111°46'35"	30	1.4	0.7
MC-24	GF-114	152857	- 53'41"	- 46'43"	37	1.8	0.7
MC-25			- 53'37"	- 46'58"	20	1.1	0.55
F10-1	HF-1	- 807	- 54'51"	- 48'06"	35	2.0	1.5
F10-2			- 54'47"	- 48'06"	45	2.6	1.0
F10-3			- 54'36"	- 47'50"	42	3.3	1.9
F10-4	HF-2	- 808	- 54'26"	- 48'01"	35	2.4	1.2
F10-5	HF-3	- 809	- 54'27"	- 47'50"	37	2.4	1.3
F10-6	HF-4	- 810	- 54'21"	- 47'47"	48	2.9	1.4
F10-7			- 54'17"	- 47'50"	22	1.9	1.0
F10-8	HF-5	- 811	- 54'14"	- 47'51"	45	3.0	1.2
F10-9	HF-6	- 812	- 54'15"	- 47'46"	70	3.0	0.9
F10-10	HF-7	- 813	- 54'10"	- 47'44"	36	3.0	1.0
F10-11			- 54'13"	- 47'39"	32	2.6	1.2
F10-12	HF-8	- 814	- 54'14"	- 47'32"	15	1.2	1.0
F10-13			- 54'17"	- 47'23"	15	1.0	0.6
F10-14	HF-9	- 815	- 54'13"	- 47'22"	14	0.9	0.6
F10-15			- 54'06"	- 47'23"	9	0.8	0.7
F10-16			- 54'01"	- 47'20"	13	0.8	0.7
F10-17	HF-10	- 816	- 53'53"	- 47'21"	15	1.2	1.0
F10-18	HF-11	- 817	- 53'54"	- 47'27"	21	1.1	0.8
F10-19			- 53'57"	- 47'33"	14	1.0	0.6
F10-20			- 54'03"	- 47'36"	28	1.5	0.5
F10-21	HF-12	- 818	- 54'05"	- 47'40"	29	1.5	0.9
F11-1			- 54'50"	- 47'25"	26	2.0	1.2
F11-2	HF-13	- 819	- 54'46"	- 47'30"	35	1.4	1.0
F11-3			- 54'44"	- 47'29"	36	1.6	0.9
F11-4	HF-14	- 820	- 54'43"	- 47'26"	40	2.4	0.9
F11-5	HF-15	- 821	- 54'42"	- 47'25"	40	2.5	1.4
F11-6	HF-16	- 822	- 54'40"	- 47'25"	30	1.5	0.6
F11-7	HF-17	- 823	- 54'37"	- 47'26"	43	2.3	0.7
F11-8			- 54'33"	- 47'25"	18	0.7	0.6
F11-9	HF-18	- 824	- 54'27"	- 47'25"	32	1.2	1.0
F11-10			- 54'33"	- 47'11"	22	2.6	0.65

LOCATION AND RADIOMETRIC GRID DATA
FARMINGTON CANYON COMPLEX
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IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
F11-11	HF-19	152825	40°54'27"	111°47'12"	55	3.0	1.1
F11-12			- 54'26"	- 47'12"	23	2.0	0.9
F11-13			- 54'19"	- 47'10"	30	2.0	0.5
F11-14			54'14"	- 47'04"	15	1.4	0.6
F11-15	HF-20	- 827	- 54'13"	- 46'57"	15	0.9	0.5
F11-16	HF-21	- 828	- 54'11"	- 46'50"	11	1.0	0.6
	HF-22	- 829	- 54'11"	- 46'50"	11	1.0	0.6
F11-17			- 54'02"	- 46'53"	16	1.0	0.7
F11-18	HF-23	- 830	- 53'57"	- 47'00"	14	1.3	0.8
F11-19	HF-24	- 831	- 53'55"	- 46'49"	15	1.0	0.7
F11-20			- 55'53"	- 46'43"	10	2.1	0.7
F13-1	HF-25	- 832	- 53'38"	- 47'01"	12	1.0	0.5
F13-2	HF-26	- 833	- 53'39"	- 47'16"	18	1.3	0.7
F13-3			- 53'38"	- 47'18"	16	1.4	0.65
F13-4	HF-27	- 834	- 53'32"	- 47'19"	12	1.75	0.95
F13-5	HF-28	- 835	- 53'36"	- 47'27"	28	2.0	0.8
F13-6	HF-29	- 836	- 53'35"	- 47'33"	17	1.1	0.5
F13-7	HF-30	- 837	- 53'35"	- 47'35"	20	1.5	0.6
F13-8			- 53'35"	- 48'01"	29	2.1	0.9
F13-9			- 53'37"	- 48'12"	22	1.8	0.55
F13-10	HF-31	- 838	- 53'31"	- 48'36"	41	2.0	0.85
F13-11	HF-32	- 839	- 53'31"	- 48'46"	18	1.1	0.5
F13-12	HF-33	- 840	- 53'33"	- 48'58"	16	1.4	0.8
F13-13			53'38"	49'06"	30	1.75	0.45
F13-14	HF-34	- 841	- 53'26"	- 49'17"	14	1.6	0.7
F13-15			- 53'26"	- 49'25"	32	2.0	ND
F13-16			- 53'24"	- 49'44"	24	1.4	0.55
F13-17			- 53'27"	- 50'12"	36	2.3	0.45
F13-18	HF-35	- 842	- 53'23"	- 50'24"	34	1.8	0.4
F13-19			- 53'42"	- 50'42"	31	1.4	0.65
SH-1	SP-1	- 969	- 52'28"	- 46'48"	45	2.1	1.0
	SP-2	- 970	- 52'28"	- 46'48"	45	2.1	1.0
	SP-3	- 971	- 52'28"	- 46'48"	45	2.1	1.0
	SP-4	- 972	- 52'28"	- 46'48"	45	2.1	1.0

LOCATION AND RADIOMETRIC GRID DATA
FARMINGTON CANYON COMPLEX
(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
SH-2	SP-5	152973	40°52'27"	111°46'50"	31	1.4	0.65
SH-3			- 52'26"	- 46'55"	42	2.0	0.8
SH-4	SP-6	- 974	- 52'26"	- 47'05"	23	1.4	0.7
SH-5	SP-7	- 975	- 52'23"	- 47'11"	29	1.0	0.5
SH-6	SP-8	- 976	- 52'22"	- 47'12"	14	1.0	0.9
SH-7			- 52'19"	- 47'16"	7	0.7	0.6
SH-8	SP-9	- 977	- 52'27"	- 47'13"	7.5	0.75	0.65
SH-9	SP-10	- 978	- 52'32"	- 47'13"	22	0.7	0.4
SH-10	SP-11	- 979	- 52'38"	- 47'13"	30	1.8	0.5
SH-11	SP-12	- 980	- 52'43"	- 47'15"	6	0.75	0.4
SH-12	SP-13	- 981	- 52'47"	- 47'16"	10	0.5	0.4
SH-13	SP-14	- 982	- 52'52"	- 47'18"	10	0.5	0.4
SH-14	SP-15	- 984	- 52'51"	- 47'21"	7	0.5	0.45
SH-15	SP-16	- 985	- 52'43"	- 47'34"	9	0.75	0.5
SH-16	SP-17	- 986	- 52'44"	- 47'38"	8.5	1.1	0.25
SH-17	SP-18	- 987	- 52'41"	- 47'39"	25	0.6	0.5
SH-18			- 52'39"	- 47'40"	10	0.5	0.4
SH-19	SP-19	- 988	- 52'35"	- 47'41"	5	0.5	0.3
SH-20	SP-20	- 989	- 52'32"	- 47'43"	24	1.1	0.9
SH-21	SP-21	- 990	- 52'30"	- 47'45"	5	0.7	0.4
SH-22			- 52'32"	- 48'28"	25	1.6	0.9
SH-23			- 52'31"	- 48'48"	20	1.5	0.75
SH-24			- 52'44"	- 49'34"	35	1.5	1.0
SH-25	SP-22	- 991	- 52'44"	- 49'39"	42	1.8	1.0
SH-26			- 52'39"	- 49'50"	30	1.2	0.75
SH-27			- 50'38"	- 48'56"	35	1.1	0.6
SH-28			- 51'02"	- 49'07"	30	1.5	1.0
SH-29			- 51'08"	- 49'04"	28	1.6	0.9
SH-30			- 51'10"	- 49'10"	27	1.7	1.0
SH-31	SP-29	- 997	- 51'06"	- 49'11"	45	2.6	1.1
G-1	SP-23	- 992	- 52'20"	- 47'24"	7.5	1.1	0.55
G-2	SP-24	- 993	- 52'20"	- 47'26"	7	0.8	0.7
G-3	SP-25	- 994	- 52'25"	- 47'39"	21	1.8	0.75
G-4			- 52'34"	- 47'34"	18	1.1	0.45

LOCATION AND RADIOMETRIC GRID DATA FACER CREEK

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KTh	UTh	Th
G-5	SP-26	152995	40°52'43"	111°47'42"	11	1.0	0.8
G-6			- 52'44"	- 48'02"	18	1.4	0.55
G-7			- 52'45"	- 48'09"	19	1.5	0.6
G-8			- 52'48"	- 48'26"	15	1.2	0.65
G-9	SP-27	- 996	- 52'36"	- 48'27"	20	1.75	0.65
<u>FORMATION OF FACER CREEK</u>							
F1-1	T-101	- 998	41°24'40"	111°57'56"	ND	ND	ND
F1-2	T-102	- 999	- 23'31"	- 58'13"	15	1.6	0.7
F1-3			- 23'28"	- 58'13"	12	1.4	0.75
F1-4	T-103	153000	- 23'25"	- 58'11"	13	1.4	0.7
F1-5	T-104	- 001	- 23'26"	- 58'09"	10	1.6	0.8
F1-6	T-105	- 002	- 23'33"	- 58'01"	16	2.0	0.9
F1-7	T-106	- 003	- 23'41"	- 58'00"	6	0.9	0.8
F1-8	T-107		- 23'52"	- 57'58"	27	2.4	1.3
F1-9	T-108	- 004	- 23'56"	- 57'59"	21	1.6	1.1
F1-10			- 24'14"	- 57'59"	6	1.5	0.55
F1-11	T-109	- 005	- 24'19"	- 57'59"	11	1.0	0.65
	T-110	- 006	- 24'19"	- 57'59"	11	1.0	0.65
F1-12	T-111	- 007	- 24'22"	- 57'59"	15	1.8	0.95
F1-13	T-112	- 009	- 24'28"	- 58'00"	16	1.6	0.8
F1-14			- 24'41"	- 58'04"	18	1.75	0.85
F1-15	T-113	- 010	- 24'48"	- 48'08"	10	2.0	0.6
F1-16			- 24'56"	- 58'15"	10	1.1	0.85
F1-17			- 25'02"	- 58'18"	12	1.4	0.7
F1-18	T-114	- 011	- 25'10"	- 58'17"	25	3.0	1.3
F1-19			- 25'22"	- 58'23"	13	1.2	0.8
F1-20	T-115	- 012	- 25'28"	- 58'28"	14	2.0	0.7
F1-21	T-116	- 013	- 25'38"	- 58'35"	14	2.0	0.7
F1-22			- 25'22"	- 58'35"	12	1.1	0.45
F1-23			- 25'16"	- 58'34"	13	1.5	0.75
F1-24	T-117	- 014	- 25'13"	- 58'37"	9	1.75	0.6
F1-25	T-118	- 015	- 25'12"	- 58'37"	8.5	1.5	0.45
F1-26			- 25'10"	- 58'45"	10	1.3	0.55

LOCATION AND RADIOMETRIC GRID DATA
FACER CREEK
(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
F1-27	T-119	153016	41°25'08"	111°58'49"	14	2.1	0.65
F1-28	T-120	- 017	- 24'31"	- 58'31"	43	2.75	1.1
F1-29	T-121	- 018	- 24'37"	- 58'27"	35	2.6	0.4
F1-30	T-122	- 019	- 24'34"	- 58'26"	55	3.5	1.85
F1-31	T-123	- 020	- 24'32"	- 58'25"	55	3.2	1.3
F1-32			- 24'29"	- 58'23"	50	3.5	1.3
F1-33			- 24'23"	- 58'21"	60	3.0	1.2
F1-34			- 24'18"	- 58'20"	43	2.4	1.5
F1-35	T-124	- 021	- 24'17"	- 58'20"	50	3.0	1.4
F1-36			- 24'14"	- 58'18"	14	1.1	0.6
F1-37			- 24'07"	- 58'17"	15	1.4	0.8
F1-38			- 24'03"	- 58'14"	14	1.6	0.9
F1-39			- 23'56"	- 58'14"	18	1.9	0.7
F2-1			- 23'39"	- 58'48"	43	2.5	1.2
F2-2			- 23'44"	- 58'48"	50	2.3	1.2
F2-3			- 23'49"	- 58'50"	45	2.3	1.3
F2-4			- 23'53"	- 58'55"	43	3.2	1.2
F2-5			- 23'55"	- 58'55"	52	2.2	1.1
F2-6	T-125	- 022	- 24'00"	- 59'00"	40	1.8	1.1
F2-7	T-126	- 023	- 24'11"	- 59'00"	40	2.3	1.1
G2-8			- 24'18"	- 50'57"	38	2.2	1.1
F2-9	T-127	- 024	- 24'04"	- 59'06"	62	3.5	1.1
F2-10			- 23'59"	- 59'09"	65	3.3	1.2
F2-11			- 23'57"	- 59'15"	50	2.4	1.3
F2-12			- 23'58"	- 59'19"	45	1.8	0.9
F2-13			- 23'53"	- 59'18"	27	1.7	0.5
F2-14	T-128	- 025	- 23'47"	- 59'18"	35	2.5	1.1
F2-15			- 23'43"	- 59'18"	32	2.1	0.6
F2-16	T-129	- 026	- 23'41"	- 59'17"	25	1.7	0.9
F2-17			- 23'47"	- 59'28"	30	1.7	1.1
F2-18			- 23'49"	- 59'30"	30	2.0	1.0
F2-19			- 23'53"	- 59'32"	26	1.8	0.8
F2-20	T-130	- 027	- 23'55"	- 59'34"	22	1.7	0.9
F2-21	T-131	- 028	- 24'00"	- 59'39"	75	4.0	1.2

LOCATION AND RADIOMETRIC GRID DATA
FACER CREEK
(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUth	Uth	Th
	T-132	153029	41°24'00"	111°59'39"	50	3.0	1.0
F2-22			- 24'04"	- 59'42"	20	1.2	0.6
F2-23	T-133	- 030	- 24'08"	- 59'45"	24	1.3	0.95
F2-24			- 24'10"	- 59'51"	25	1.5	0.7
F2-25			- 24'13"	- 59'54"	24	1.7	0.6
F2-26			- 23'44"	- 59'27"	35	2.0	0.7
F2-27	T-134	- 031	- 23'42"	- 59'26"	27	1.8	0.8
F2-28	T-135	- 032	- 23'41"	- 59'25"	32	2.2	0.9
F2-29	T-136	- 033	- 23'40"	- 59'21"	55	3.8	1.0
F2-30	T-137	- 034	- 23'38"	- 59'18"	21	1.6	0.8
F2-31			- 23'36"	- 59'15"	42	2.3	1.1
F2-32			- 23'34"	- 59'12"	49	3.3	1.4
F2-33			- 23'31"	- 59'09"	32	2.5	1.0
F2-34	T-138	- 035	- 23'25"	- 59'04"	58	3.8	1.0
F2-35			- 23'22"	- 59'02"	25	2.1	0.8
F2-36	T-139	- 036	- 23'16"	- 58'58"	20	1.3	0.9
F2-37	T-140	- 037	- 23'14"	- 58'54"	38	2.5	0.9
F2-38	T-141	- 038	- 23'14"	- 58'49"	40	2.5	1.0
F2-39			- 23'12"	- 58'44"	32	2.0	1.0
F2-40			- 23'11"	- 58'41"	25	1.7	0.8
F3-1	T-142	- 039	- 25'33"	- 59'30"	3	0.55	0.35
F3-2			- 25'30"	- 59'39"	1	0.1	0.05
F3-3	T-143	- 040	- 25'27"	- 59'49"	25	1.6	1.0
	T-144	- 041	- 25'27"	- 59'49"	25	1.6	1.0
F3-4	T-145	- 042-044	- 25'25"	- 59'49"	30	2.0	0.8
F3-5	T-146	- 045	- 25'27"	- 59'54"	23	1.5	0.8
F3-6			- 25'24"	- 59'59"	10	1.0	0.8
F3-7	T-147	- 046	41°25'24"	112°00'02"	35	1.2	1.1
F3-8	T-148	- 047	- 25'23"	- 00'06"	17	1.5	0.85
F3-9			- 25'24"	- 00'10"	14	1.2	0.9
F3-10	T-149	- 048	- 25'23"	- 00'14"	11	1.1	0.75
F3-11			- 25'25"	- 00'25"	10	1.0	0.8
F3-12			- 25'23"	- 00'30"	10	0.5	0.4
F3-13			- 25'22"	- 00'34"	9	1.0	0.5

LOCATION AND RADIOMETRIC GRID DATA LITTLE WILLOW FORMATION

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
F3-14	T-150	153049	41°25'21"	112°00'14"	40	2.0	0.5
F3-15			- 25'16"	- 00'13"	ND	ND	ND
F3-16	T-151	- 050	41°25'09"	111°59'36"	ND	ND	ND
F3-17			- 25'06"	- 59'17"	ND	ND	ND
F3-18	T-152	- 051	- 25'12"	- 59'17"	ND	ND	ND
F3-19			- 25'20"	- 59'24"	ND	ND	ND
F3-20			- 25'26"	- 59'28"	ND	ND	ND
F4-1	T-153	- 052	- 23'06"	- 58'43"	38	1.5	0.75
F4-2			- 23'05"	- 58'39"	25	1.6	1.0
F4-3			- 23'05"	- 58'36"	40	2.5	1.2
F4-4			- 23'06"	- 58'33"	35	2.5	0.5
F4-5			- 23'03"	- 58'34"	20	0.9	0.75
F4-6			- 23'03"	- 58'31"	12	1.0	0.6
F4-7	T-154	- 053	- 23'02"	- 58'28"	13	0.9	0.8
F4-8	T-155	- 054	- 22'59"	- 58'26"	10	1.0	0.75
F4-9	T-156	- 055	- 22'56"	- 58'25"	12	1.2	1.0
F4-10	T-157	- 056	- 22'54"	- 58'25"	26	1.6	1.0
F4-11	T-158	- 057	- 22'47"	- 58'28"	14	1.0	0.6
F4-12			- 22'42"	- 58'30"	22	1.0	0.6
F4-13			- 23'00"	- 58'38"	12	1.3	0.8
F4-14			- 23'08"	- 58'47"	40	2.5	1.25
<u>LITTLE WILLOW FORMATION</u>							
L12-1	HLW-1	153697	40°35'10"	111°47'20"	16	0.7	0.6
L12-2			- 35'07"	- 47'16"	11	0.7	0.4
L12-3			- 35'04.5"	- 47'18.5"	12	0.9	0.6
L12-4			- 35'05"	- 47'15"	10	0.7	0.6
L12-5	HLW-2	- 698	- 35'02"	- 47'12"	17	1.1	0.7
L12-6	HLW-3A	- 699	- 35'01.5"	- 47'08"	20	1.4	1.2
	HLW-3B	- 700	- 35'01.5"	- 47'08"	31	2.9	1.0
L12-7			- 34'56"	- 47'05"	11	1.1	1.0
L12-8			- 34'52"	- 46'58"	21	1.0	0.6
L12-9	HLW-4	- 701	- 34'47"	- 46'54"	25	1.6	0.6
L12-10			- 34'51"	- 46'47"	27	1.6	0.6

LOCATION AND RADIOMETRIC GRID DATA
LITTLE WILLOW FORMATION
(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
L12-11	HLW-5	153702	40°35'03"	111°46'42"	23	1.0	0.6
L12-12			- 35'04"	- 46'40"	30	1.5	1.0
L12-13	HLW-6	- 703	- 35'06"	- 46'43"	14	1.1	0.7
L12-14			- 35'09"	- 46'44"	20	1.2	0.7
L12-15	HLW-7	- 704	- 35'15"	- 46'45"	20	1.0	0.5
L12-16			- 35'15"	- 46'50"	15	1.0	0.5
L12-17	HLW-8	- 705	- 35'16"	- 46'54.5"	23	1.0	0.6
L12-18			- 35'16"	- 46'57"	15	0.8	0.75
L12-19	HLW-9	- 706	- 35'16"	- 47'01.5"	16	0.6	0.5
L12-20			- 35'14"	- 47'05"	14	0.8	0.6
L12-21			- 35'13"	- 47'07"	15	1.5	0.6
L12-22	HLW-10	- 707	- 35'15"	- 47'09"	ND	0.8	0.6
L12-13	HLW-11	- 708	- 35'17"	- 47'12"	24	1.0	0.5
L12-24	HLW-12	- 709	- 35'18"	- 47'13"	25	1.4	0.5
L12-25	HLW-13	- 710	- 35'19"	- 47'17"	50	2.4	1.0
L12-26	HLW-14	- 711	- 35'18"	- 47'15.5"	46	1.6	0.9
LW-1			- 35'33"	- 47'23"	34	0.85	0.45
LW-2	GW-100A	152683	- 35'26"	- 47'05"	48	1.6	0.3
	GW-100B	- 684	- 35'26"	- 47'05"	48	1.6	0.3
LW-3	GW-101	- 685	- 35'24"	- 47'02.5"	40	0.8	0.4
LW-4			- 35'26"	- 47'02"	50	1.6	0.6
LW-5			- 35'26"	- 47'02"	55	1.8	0.35
LW-6	GW-102	- 686	- 35'26"	- 46'59"	33	1.2	0.35
LW-7	GW-103	- 687	- 35'26"	- 46'55"	42	1.2	0.3
	GW-104	- 688	- 35'27"	- 46'55"	42	1.2	0.3
	GW-105	- 689	- 35'27"	- 46'55"	42	1.2	0.3
LW-8	GW-106	- 690	- 35'28"	- 46'54"	38	1.3	0.4
LW-9	GW-107	- 691	- 35'28"	- 46'44"	26	1.0	0.45
LW-10	GW-108	- 692	- 35'28"	- 46'42"	26	1.4	0.5
LW-11			- 35'30"	- 46'40"	38	1.1	0.6
LW-12			- 35'30"	- 46'40"	23	0.8	0.25
LW-13	GW-109	- 693	- 35'39"	- 46'53"	23	0.8	0.5
LW-14			- 35'39"	- 46'57"	68	2.4	0.35
LW-15	GW-10	- 694	- 35'37"	- 46'59"	65	2.6	0.35

LOCATION AND RADIOMETRIC GRID DATA ANTELOPE ISLAND

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KTh	UTh	Th
LW-16	GW-111	152695	40°35'34"	111°47'03"	41	1.3	0.45
LW-17	GW-112	- 696	- 35'37"	- 47'08"	41	1.0	0.25
LW-18			- 35'36"	- 47'12"	71	2.1	0.35
<u>ANTELOPE ISLAND</u>							
GA-1		153065	40°57'09"	112°14'01"	60	2.75	1.2
GA-2		- 067	- 57'11"	- 13'56"	42	2.5	0.55
GA-3		- 068	- 57'06"	- 13'34"	55	2.75	1.5
GA-4		- 069	- 57'06"	- 13'24"	55	2.2	0.85
GA-5		- 070	- 57'16"	- 13'06"	130	6.75	1.0
GA-6		- 071	- 57'16"	- 13'06"	17	7.5	1.3
GA-7		- 072	- 57'18"	- 12'58"	50	1.1	0.55
GA-8		- 073	- 57'22"	- 12'48"	55	1.75	0.8
GA-9		- 074	- 57'30"	- 12'48"	40	1.75	0.75
GA-10		- 075	- 57'34"	- 12'48"	55	2.4	0.55
GA-11		- 076	- 57'39"	- 12'51"	110	6.5	1.5
GA-12A		- 077	- 57'21"	- 12'53"	600	20.0	0.8
GA-12B		- 078	- 57'21"	- 12'53"	600	20.0	0.8
GA-12C		- 079	- 57'21"	- 12'53"	600	20.0	0.8
GA-13		- 080	- 57'08"	- 11'35"	150	12.0	1.3
GA-14		- 081	- 55'22"	- 13'31"	45	2.0	0.8
GA-15		- 082	- 55'27"	- 12'52"	38	1.0	0.6
GA-16		- 083	- 55'34"	- 12'32"	55	3.0	0.65
GA-17		- 084	- 55'30"	- 12'12"	40	2.2	0.7
GA-18		- 085	- 55'22"	- 11'37"	40	2.1	0.55
GA-19		- 086	- 54'48"	- 11'50"	55	ND	ND
GA-20		- 087	- 53'57"	- 11'38"	38	1.3	0.8
GA-21		- 088	- 53'45"	- 11'45"	40	2.0	0.8
GA-22		- 089	- 53'36"	- 11'39"	75	3.2	0.95
GA-23		- 090	- 52'59"	- 11'32"	35	2.0	0.7
GA-24		- 091	- 52'56"	- 11'34"	90	5.0	1.1
GA-25		- 092	- 52'35"	- 11'18"	41	1.5	0.45
GA-26		- 093	- 52'15"	- 11'03"	35	1.5	0.45
GA-27		- 094	- 51'49"	- 10'58"	35	1.75	0.65

LOCATION AND RADIOMETRIC GRID DATA
ANTELOPE ISLAND
(continued)

IDENTIFICATION NUMBERS			LOCATION		SPECTROMETER READINGS X 100		
STATION NUMBER	FIELD NUMBER	CHEMICAL ANALYSIS NUMBERS	LATITUDE	LONGITUDE	KUTh	UTh	Th
GA-28		153095	40°51'43"	112°10'59"	200	15.0	3.2
GA-29		- 096	- 51'38"	- 10'57"	250	10.0	2.0

APPENDIX III

Appendix III lists the results of chemical analyses of samples collected during the Uinta Arch Project. In these analyses, each sample is analyzed for 28 elements. Uranium is calculated in parts per million and is determined by two methods. One method involves analysis of an acid solution obtained from the sample to determine soluble uranium. The second method is by neutron activation and should account for total uranium in the analyzed sample split.

CHEMICAL ANALYSIS--RED CREEK AREA

RED CREEK QUADRANGLE												SECTION 1 OF J		
OR SAMPLE	D. O. E.	SAMPLE	NUMBER	U	L-NT	AL	B	BA	BE	CA	CC	CR	CU	FF
NUMERO	ST	LAT	LONG	L	TY	RE						(PPM)	(PPM)	(%)
152712	40-40.928	-109.141	-3-92-	1.9	2.3	5.3	<10	95	6	0.18	<4	1	11	0.33
152713	40-40.928	-109.144	-3-92-	0.56	0.80	0.43	<10	73	<1	0.08	<4	9	4	0.22
152714	40-40.928	-109.146	-3-92-	1.2	0.40	0.26	<10	25	1	0.12	<4	4	21	0.32
152715	40-40.929	-109.146	-3-92-	1.2	1.4	5.2	<10	170	1	2.5	64	2	72	9.4
152716	40-40.932	-109.149	-3-92-	0.29	0.30	2.4	<10	7	<1	0.05	<4	12	<2	0.76
152717	40-40.934	-109.150	-3-92-	91.	110.	0.54	<10	52	4	3.1	120	25	460	13.
152718	40-40.936	-109.143	-3-92-	1.4	2.0	2.3	<10	85	1	0.13	2	93	<2	2.6
152719	40-40.936	-109.143	-3-92-	4.4	3.6	8.6	<10	350	1	0.21	4	110	<2	1.9
152720	40-40.938	-109.142	-3-92-	2.5	3.5	2.3	<10	84	1	0.21	22	150	3	6.8
152721	40-40.937	-109.141	-3-92-	0.90	0.80	0.40	<10	44	<1	0.07	4	8	420	0.30
152722	40-40.937	-109.141	-3-92-	5.2	4.7	5.9	<10	240	1	0.14	30	38	31	7.1
152723	40-40.935	-109.138	-3-92-	4.8	5.3	3.3	<10	430	1	0.32	15	26	21	2.0
152724	40-40.934	-109.139	-3-92-	3.5	3.9	2.0	<10	100	1	0.08	5	76	2	2.3
152725	40-40.933	-109.140	-3-92-	2.9	2.8	3.2	<10	310	1	0.18	10	61	2	4.6
152726	40-40.932	-109.141	-3-92-	5.3	5.1	4.2	<10	37	1	1.4	18	<1	19	4.5
152727	40-40.932	-109.144	-3-92-	1.3	2.5	2.9	<10	140	<1	<0.05	12	72	<2	3.0
152728	40-40.930	-109.138	-3-92-	1.3	0.80	0.46	<10	44	<1	<0.05	<4	10	55	0.35
152729	40-40.931	-109.131	-3-92-	0.70	0.30	0.25	<10	42	<1	<0.05	<4	7	6	0.08
152730	40-40.934	-109.132	-3-92-	1.8	1.7	1.1	37	49	<1	0.07	<4	16	71	1.1
152731	40-40.922	-109.159	-3-92-	3.5	5.5	6.7	<10	380	3	0.34	5	80	<2	1.6
152732	40-40.922	-109.159	-3-92-	4.8	5.7	5.2	<10	84	3	2.2	30	180	32	6.0
152733	40-40.923	-109.162	-3-92-	1.4	3.1	4.7	<10	770	1	0.06	<4	100	3	0.47
152734	40-40.924	-109.164	-3-92-	3.7	4.9	8.4	18	690	2	0.23	4	57	2	1.3
152735	40-40.924	-109.164	-3-92-	4.5	5.8	6.9	<10	290	2	0.93	8	25	5	1.4
152736	40-40.924	-109.163	-3-92-	8.6	9.9	11.	22	1000	6	0.32	20	43	99	1.8
152737	40-40.924	-109.163	-3-92-	7.6	8.6	5.5	19	270	2	0.09	14	55	6	2.2
152738	40-40.932	-109.155	-3-92-	1.6	2.0	1.6	<10	74	1	0.15	27	63	10	4.5
152739	40-40.935	-109.153	-3-92-	2.4	2.9	6.6	22	370	2	0.34	<4	82	4	1.1
152740	40-40.942	-109.155	-3-92-	6.8	6.1	9.0	<10	240	2	<0.05	14	110	30	1.9
152741	40-40.937	-109.159	-3-91-	0.55	0.60	0.41	<10	32	<1	0.05	9	12	18	0.56
152743	40-40.934	-109.158	-3-92-	1.0	1.1	6.5	<10	20	1	5.6	<4	86	<2	2.1
152744	40-40.933	-109.157	-3-92-	1.6	3.1	6.5	71	270	2	0.91	<4	72	<2	1.1
152745	40-40.931	-109.166	-3-92-	0.67	0.10	0.11	<10	10	<1	19.	<4	4	11	0.81
152746	40-40.940	-109.161	-3-92-	0.50	0.10	0.06	<10	12	<1	22.	<4	1	2	0.06
152740	40-40.951	-109.184	-3-92-	0.61	0.30	4.7	<10	47	1	0.11	<4	15	2	0.61
152750	40-40.951	-109.186	-3-92-	0.79	0.30	3.1	<10	590	<1	<0.05	<4	16	<2	0.41
152751	40-40.950	-109.190	-3-92-	0.70	0.80	2.5	<10	45	<1	0.12	5	19	44	1.2
152752	40-40.949	-109.190	-3-92-	0.99	1.1	6.7	<10	330	1	0.14	<4	2	3	1.1
152753	40-40.947	-109.204	-3-92-	8.6	8.2	2.7	<10	480	<1	0.06	6	41	6	1.9
152754	40-40.949	-109.206	-3-92-	2.8	3.6	6.6	14	200	3	1.0	18	82	<2	2.5
152755	40-40.946	-109.198	-3-92-	0.38	0.20	0.26	<10	34	<1	<0.05	<4	5	<2	0.25
152756	40-40.946	-109.187	-3-92-	3.5	3.6	0.97	<10	45	<1	0.42	18	18	5	12.
152757	40-40.926	-109.226	-3-92-	0.34	0.30	0.14	<10	130	<1	<0.05	<4	7	3	0.09
152758	40-40.926	-109.225	-3-92-	0.84	0.70	0.87	<10	270	<1	2.1	110	1200	190	5.1
152759	40-40.929	-109.226	-3-92-	1.3	0.60	5.9	<10	71	2	4.3	57	100	180	10.0
152760	40-40.931	-109.223	-3-92-A		4.5									
152761	40-40.931	-109.223	-3-92-B	3.9	4.4	6.1	<10	460	1	0.46	11	66	13	1.6
152762	40-40.931	-109.223	-3-92-C	0.75	1.4	3.3	<10	250	1	<0.05	<4	28	<2	0.55
152763	40-40.932	-109.223	-3-92-	4.0	6.1	5.9	10	490	1	0.13	4	63	5	2.0
152764	40-40.932	-109.224	-3-92-	5.1	4.9	0.46	<10	27	<1	0.29	6	11	34	7.3
152765	40-40.933	-109.225	-3-92-	2.3	3.7	2.7	<10	270	<1	0.17	<4	70	3	1.6
152766	40-40.935	-109.225	-3-92-	0.81	0.50	0.89	<10	46	<1	0.07	<4	27	3	0.14
152767	40-40.937	-109.235	-3-92-	4.0	3.0	4.7	<10	85	1	0.70	10	43	19	8.7
152768	40-40.937	-109.237	-3-92-	4.0	5.4	3.89	<10	25	<1	<0.05	<4	12	<2	0.08
152769	40-40.938	-109.239	-3-92-	1.6	1.8	3.1	<10	150	1	0.88	14	59	<2	5.1

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CHEMICAL ANALYSIS--RED CREEK AREA (continued)

OR SAMPLE NUMBER	RED CREEK QUADRANGLE										SECTION 2 OF 3				
	LI (PPM)	MG (%)	MN (PPM)	MO (PPM)	NA (%)	NB (PPM)	NI (PPM)	P (PPM)	TI (PPM)	SC (PPM)	TH (PPM)	V (PPM)	Y (PPM)	ZN (PPM)	ZR (PPM)
152712	4	0.07	56	<4	3.0	12	<2	320	71	1	<2	5	4	10	8
152713	8	0.06	86	5	<0.05	<4	3	110	140	<1	2	8	2	4	9
152714	5	0.16	31	<4	<0.05	<4	2	77	130	1	<2	2	1	9	7
152715	12	1.7	1400	<4	1.8	<4	9	260	4200	42	2	430	21	78	26
152716	1	<0.05	8	<4	2.1	<4	3	67	110	1	<2	5	1	<2	7
152717	5	0.19	800	5	<0.05	10	160	14000	68	170	<2	150	98	4	20
152718	3	0.12	35	<4	0.11	6	12	441	650	5	12	40	9	5	22
152719	7	0.41	44	<4	0.32	19	12	750	2200	15	14	78	15	<2	42
152720	11	0.30	71	<4	0.39	<4	14	270	390	5	11	80	4	7	24
152721	4	0.11	26	<4	<0.05	<4	11	300	56	1	5	5	2	7	6
152722	8	1.7	130	<4	0.16	7	85	580	1700	6	6	66	5	25	49
152723	23	0.23	2100	<4	0.15	9	17	2100	3300	6	9	55	22	100	150
152724	2	0.24	34	<4	0.11	<4	15	320	460	3	11	28	4	9	14
152725	4	0.44	49	<4	0.70	<4	26	240	350	1	15	45	3	16	13
152726	8	0.27	210	<4	3.4	12	4	680	4600	18	9	45	23	15	32
152727	8	0.46	41	<4	0.25	<4	17	210	560	3	7	35	2	5	17
152728	3	0.05	12	<4	<0.05	<4	2	43	220	<1	<2	6	2	20	8
152729	<1	<0.05	5	<4	<0.05	<4	4	32	60	<1	5	3	1	4	5
152730	3	0.24	54	<4	<0.05	<4	41	300	370	2	2	19	3	7	11
152731	3	0.23	15	<4	0.40	10	27	1500	1300	10	7	63	8	2	16
152732	59	3.8	530	<4	0.90	<4	170	9200	8900	12	5	140	24	84	80
152733	11	0.21	17	<4	0.19	<4	3	200	1400	4	9	27	6	5	38
152734	18	0.27	95	<4	1.5	8	11	360	1800	8	12	59	7	11	9
152735	12	0.74	210	<4	3.3	12	7	270	1500	8	8	32	6	27	16
152736	12	0.27	68	<4	1.7	8	18	1000	2400	16	<2	87	130	21	13
152737	23	0.32	56	5	0.24	10	21	270	2300	12	9	85	8	17	33
152738	12	0.91	190	<4	0.05	5	35	520	760	4	7	62	4	8	22
152739	3	0.29	40	<4	0.57	<4	11	480	2000	8	14	100	6	12	67
152740	81	0.52	33	<4	0.19	<4	61	110	1000	12	23	64	7	6	69
152741	3	0.21	88	<4	<0.05	<4	13	72	110	<1	2	5	1	19	7
152743	25	4.8	491	<4	3.5	<4	24	460	1600	12	13	53	12	27	38
152744	4	0.43	72	<4	3.9	4	20	530	1400	10	11	74	7	6	35
152745	2	6.6	390	<4	<0.05	9	10	270	76	1	6	6	2	<2	2
152746	2	0.26	270	<4	<0.05	7	<2	310	59	<1	<2	<2	<1	2	<2
152749	6	0.41	69	<4	3.5	<4	7	110	250	1	<2	15	2	8	5
152750	2	0.05	10	<4	1.0	<4	2	41	270	<1	3	10	1	2	<2
152751	3	0.21	77	<4	1.9	<4	8	180	180	1	<2	38	1	14	7
152752	5	0.37	73	<4	3.9	<4	2	250	600	1	10	21	1	13	17
152753	6	0.21	57	<4	0.16	11	4	290	2000	14	24	58	6	9	58
152754	17	1.0	300	<4	4.0	11	14	300	3600	4	10	65	7	27	49
152755	2	0.15	22	<4	<0.05	<4	6	66	83	<1	<2	3	1	4	7
152756	7	0.40	330	<4	<0.05	<4	16	1800	320	3	9	210	14	32	7
152757	2	<0.05	6	<4	<0.05	<4	3	29	42	<1	5	3	1	3	4
152758	4	6.1	690	4	0.05	7	1700	94	350	7	4	61	8	69	12
152759	8	2.9	1300	<4	1.6	6	56	470	4000	49	5	270	22	61	18
152760															
152761	9	0.81	450	<4	2.6	15	17	280	1900	10	14	71	12	19	53
152762	7	0.28	19	<4	0.20	<4	8	110	630	4	5	26	2	3	22
152763	10	0.69	63	<4	0.24	7	22	430	2100	12	17	76	7	10	62
152764	2	0.27	99	<4	<0.05	<4	6	960	200	2	4	100	5	17	9
152765	2	0.14	39	<4	0.15	<4	9	640	600	5	16	39	7	6	45
152766	1	0.05	11	<4	0.05	<4	4	69	140	1	8	5	1	4	9
152767	6	0.60	830	<4	1.1	<4	8	550	980	9	10	83	18	24	18
152768	<1	<0.05	7	<4	<0.05	<4	<2	13	87	<1	4	3	1	17	2
152769	17	3.9	340	<4	2.0	<4	44	710	2600	19	<2	170	6	26	23

CHEMICAL ANALYSIS--RED CREEK AREA (continued)

SECTION 3 OF 3

DR SAMPLE	RED CREEK QUADRANGLE		
NUMBER	K (%)	SR (PPM)	CE (PPM)
152712	1.7	21	<10
152713	0.15	9	39
152714	0.06	5	12
152715	0.62	110	33
152716	0.04	7	<10
152717	0.04	34	41
152718	1.1	6	42
152719	4.2	22	66
152720	0.85	11	81
152721	0.09	3	25
152722	1.2	17	16
152723	0.96	57	72
152724	0.57	26	120
152725	1.5	32	29
152726	0.05	27	12
152727	1.2	16	31
152728	0.14	7	15
152729	0.08	6	17
152730	0.35	4	68
152731	3.0	25	26
152732	0.22	88	320
152733	1.7	30	52
152734	2.1	65	150
152735	0.95	160	78
152736	2.9	90	1000
152737	2.4	10	32
152738	0.42	8	13
152739	2.5	19	<10
152740	1.5	52	120
152741	0.03	3	18
152742	0.09	58	20
152743	0.60	110	75
152744	0.02	78	<10
152745	<0.02	56	<10
152746	0.06	29	<10
152750	2.8	40	14
152751	0.06	14	<10
152752	1.2	65	19
152753	0.77	84	140
152754	0.66	220	42
152755	0.05	5	12
152756	0.03	5	26
152757	0.03	3	31
152758	<0.02	5	20
152759	0.28	150	60
152760			
152761	1.1	85	66
152762	1.3	46	32
152763	1.5	100	120
152764	0.93	3	25
152765	0.82	42	83
152766	0.28	23	38
152767	0.28	95	52
152768	0.32	5	20
152769	0.57	71	20

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CHEMICAL ANALYSIS--RED CREEK AREA (continued)

RED CREEK QUADRANGLE										SECTION 1 OF 3				
OR SAMPLE NUMBER	D. D. F. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	AL (%)	B (PPM)	BA (PPM)	BE (PPM)	CA (%)	CC (PPM)	CR (PPM)	CU (PPM)	FE (%)
152771	40-40.938	-109.240	-3-92-	0.95	0.50	0.50	<10	43	<1	0.06	<4	12	4	0.53
152772	40-40.946	-109.244	-3-92-	0.88	0.90	2.5	14	120	<1	<0.05	<4	32	<2	0.11
152773	40-40.949	-109.242	-3-92-	0.71	0.80	0.99	<10	29	<1	<0.05	<4	9	<2	0.06
152774	40-40.935	-109.218	-3-92-	3.6	7.7	6.1	<10	280	2	0.79	29	120	4	4.6
152775	40-40.935	-109.215	-3-92-	3.3	4.5	7.9	<10	760	1	0.36	23	110	38	2.1
152776	40-40.934	-109.213	-3-92-	4.7	5.1	3.4	<10	200	1	0.30	25	47	33	4.5
152777	40-40.934	-109.213	-3-92-	4.3	5.5	7.2	<10	560	1	0.13	8	85	4	1.4
152778	40-40.938	-109.208	-3-92-	1.9	0.80	6.4	<10	220	1	4.4	43	110	150	9.4
152779	40-40.937	-109.206	-3-92-	1.5	2.0	0.36	<10	17	1	19.	11	9	12	1.0
152780	40-40.942	-109.211	-3-92-	3.5	4.9	7.3	<10	360	2	0.18	7	95	<2	4.0
152781	40-40.942	-109.211	-3-92-	2.6	3.7	6.4	<10	140	2	0.57	15	71	3	3.7
152782	40-40.939	-109.211	-3-92-	3.8	5.1	4.3	<10	120	1	0.16	34	75	<2	3.5
152783	40-40.938	-109.212	-3-92-	1.4	0.80	5.8	<10	170	2	1.4	74	82	6	11.
152784	40-40.934	-109.221	-3-92-	5.7	5.1	6.5	13	530	3	0.34	5	88	3	2.0
152785	40-40.934	-109.221	-3-92-	24.	500.	0.17	<10	84	2	<0.05	25	29	1900	0.21
152786	40-40.938	-109.221	-3-92-	1.2	0.70	0.57	<10	29	<1	<0.05	<4	44	3	0.10
152787	40-40.946	-109.220	-3-92-	0.43	0.60	2.3	<10	43	<1	0.21	<4	7	2	0.07
152788	40-40.948	-109.220	-3-92-	1.7	3.3	5.2	<10	86	1	1.8	4	37	3	0.75
152789	40-40.949	-109.221	-3-92-	2.9	6.5	5.1	<10	460	1	0.11	9	63	16	3.2
152790	40-40.950	-109.220	-3-92-	<0.25	0.20	0.11	<10	11	<1	0.42	<4	3	<2	0.12
152791	40-40.951	-109.210	-3-92-	0.69	0.30	0.56	<10	32	<1	<0.05	<4	10	23	0.10
152792	40-40.953	-109.235	-3-92-	0.77	0.40	0.45	<10	26	<1	<0.05	<4	12	8	0.07
152793	40-40.976	-109.234	-3-92-	0.47	0.30	0.25	<10	35	<1	<0.05	<4	18	<2	0.13
152794	40-40.973	-109.288	-3-92-	0.77	1.0	0.46	<10	37	<1	<0.05	<4	9	2	0.13
152795	40-40.970	-109.280	-3-92-	1.4	0.70	0.50	<10	35	<1	<0.05	<4	10	2	0.19
152796	40-40.968	-109.277	-3-92-	1.0	1.5	4.9	<10	920	2	0.23	12	15	39	1.4
152797	40-40.969	-109.274	-3-92-	2.3	3.7	3.6	<10	54	1	0.51	<4	18	10	0.18
152798	40-40.968	-109.273	-3-92-	1.3	0.50	0.43	<10	29	<1	<0.05	<4	5	5	0.25
152799	40-40.968	-109.273	-3-92-	1.4	0.70	5.4	<10	160	2	7.1	27	27	7	5.5
152800	40-40.967	-109.271	-3-92-	1.2	1.2	1.3	<10	26	<1	1.3	4	19	65	0.26
152801	40-40.967	-109.266	-3-92-	2.3	3.5	8.1	<10	160	2	1.5	7	100	9	1.6
152802	40-40.959	-109.260	-3-92-	0.72	0.50	0.20	<10	26	<1	<0.05	<4	9	4	0.11
152803	40-40.957	-109.260	-3-92-	1.1	0.90	0.40	<10	44	<1	0.11	<4	11	6	0.37
152804	40-40.954	-109.259	-3-92-	1.9	1.3	0.91	<10	1300	1	0.05	<4	33	10	0.36
152805	40-40.957	-109.269	-3-92-	1.4	1.1	0.35	<10	30.	<1	<0.05	<4	9	2	0.10
152806	40-40.957	-109.269	-3-92-	0.98	1.0	0.57	11	19	<1	<0.05	<4	6	14	0.13
152809	40-40.964	-109.091	-3-92-	0.41	0.30	0.40	<10	27	<1	0.16	<4	12	4	0.11
152860	40-40.966	-109.084	-3-92-	1.3	1.2	0.96	<10	130	<1	0.08	12	14	21	1.1
152861	40-40.962	-109.077	-3-92-	1.1	1.2	2.7	<10	26	4	21.	10	37	18	2.2
152862	40-40.962	-109.077	-3-92-	0.29	0.30	0.31	<10	11	12	11.	4	8	20	2.1
152863	40-40.964	-109.076	-3-92-	<0.25	0.60	0.90	<10	60	<1	<0.05	<4	18	14	0.40
152864	40-40.964	-109.075	-3-92-	2.3	2.6	5.7	<10	580	1	0.08	10	24	7	1.8
152865	40-40.964	-109.074	-3-92-	2.5	3.4	5.9	<10	210	2	0.35	5	19	6	1.6
152866	40-40.964	-109.071	-3-92-	0.89	2.2	5.6	<10	620	1	0.08	<4	9	6	1.2
152867	40-40.964	-109.071	-3-92-	<0.25	0.30	7.5	<10	140	1	4.9	38	230	15	7.0
152868	40-40.952	-109.134	-3-92-	<0.25	0.30	0.22	<10	31	<1	0.09	<4	8	6	0.17
152869	40-40.952	-109.135	-3-92-	<0.25	0.40	0.27	<10	23	<1	0.06	<4	14	2	0.05
152870	40-40.947	-109.120	-3-92-	<0.25	0.50	0.53	<10	40	<1	0.23	<4	12	2	0.40
152871	40-40.946	-109.119	-3-92-	0.70	0.40	0.31	<10	25	<1	<0.05	<4	8	3	0.18
152872	40-40.946	-109.116	-3-92-	0.82	0.30	0.37	<10	32	<1	0.05	<4	8	3	0.06
152873	40-40.949	-109.110	-3-92-	1.0	0.40	0.42	<10	21	<1	<0.05	<4	11	<2	0.06
152874	40-40.950	-109.110	-3-92-	1.4	0.40	0.63	<10	28	<1	0.17	<4	15	3	0.33
152875	40-40.950	-109.107	-3-92-	0.62	0.30	0.27	<10	18	<1	<0.05	<4	7	3	0.07
152876	40-40.951	-109.102	-3-92-	<0.25	0.30	0.17	<10	24	<1	<0.05	<4	9	2	0.08
152877	40-40.954	-109.106	-3-92-	<0.25	0.50	0.42	<10	32	<1	<0.05	<4	10	2	0.07

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CHEMICAL ANALYSIS--RED CREEK AREA (continued)

DR SAMPLE NUMBER	RED CREEK QUADRANGLE			MO (PPM)	NA (%)	NB (PPM)	NI (PPM)	P (PPM)	TI (PPM)	SC (PPM)	TH (PPM)	V (PPM)	SECTION 2 OF 3		
	LI (PPM)	MG (%)	MN (PPM)										Y (PPM)	ZN (PPM)	ZR (PPM)
152771	3	0.44	49	<4	<0.05	<4	4	87	160	1	3	10	1	10	10
152772	3	0.07	13	<4	0.38	<4	3	22	349	2	3	23	1	5	7
152773	13	<0.05	5	<4	<0.05	<4	3	13	41	<1	4	<2	1	2	4
152774	23	2.7	250	<4	1.4	17	62	980	3500	15	6	82	10	18	96
152775	6	0.50	99	<4	0.64	18	14	840	2700	14	10	56	8	10	35
152776	11	0.70	350	<4	0.54	7	22	460	1000	6	14	100	16	16	37
152777	4	3.49	47	<4	0.77	15	19	380	1900	12	15	84	8	6	39
152778	18	3.1	1100	<4	1.1	<4	61	550	3100	36	2	260	24	47	5
152779	16	1.9	2200	<4	<0.05	17	11	460	200	2	<2	30	8	3	7
152780	17	0.49	23	<4	0.42	<4	44	520	1400	12	23	72	8	10	59
152781	14	0.72	280	<4	3.3	11	22	280	1700	9	8	110	10	16	33
152782	19	1.5	89	<4	0.14	10	130	670	1700	7	18	44	9	8	62
152783	13	2.7	500	<4	1.7	<4	110	360	2500	40	2	230	16	37	15
152784	11	3.38	73	4	0.32	8	22	720	2000	15	27	90	11	12	40
152785	3	<0.05	19	<4	<0.05	<4	7	<5	100	1	5	440	3	4	13
152786	3	<0.05	9	<4	<0.05	<4	<2	19	100	<1	<2	2	1	4	2
152787	1	0.06	10	<4	1.5	<4	2	120	94	<1	<2	<2	1	3	7
152788	3	1.3	110	<4	3.5	4	13	330	740	6	5	35	9	5	19
152789	5	0.30	230	<4	0.30	13	6	280	2700	12	9	120	16	10	32
152790	2	0.14	28	<4	<0.05	<4	12	9	25	<1	<2	<2	<1	3	3
152791	<1	<0.05	5	<4	<0.05	<4	<2	68	80	1	2	3	1	5	4
152792	1	<0.05	7	<4	<0.05	<4	2	37	48	<1	2	3	1	5	6
152793	1	0.09	15	<4	<0.05	<4	2	56	38	<1	2	2	2	5	11
152794	3	0.18	15	<4	<0.05	<4	4	63	48	<1	3	2	2	9	17
152795	2	0.19	8	<4	<0.05	<4	7	44	96	<1	2	4	1	4	8
152796	9	0.24	400	<4	2.2	14	9	150	1300	6	9	34	16	30	17
152797	3	0.07	33	<4	2.4	5	7	50	320	1	8	8	3	<2	23
152798	3	0.12	30	<4	3.06	<4	6	49	98	1	2	6	1	5	5
152799	4	2.7	510	<4	3.1	<4	69	220	990	36	5	250	21	12	12
152800	4	0.32	62	<4	0.76	6	2	3400	970	1	3	13	12	9	16
152801	13	0.57	140	<4	4.5	13	15	290	2600	12	13	58	9	4	69
152802	1	<0.05	7	4	<0.05	<4	3	48	65	<1	6	2	1	2	9
152803	1	0.10	23	<4	0.79	<4	3	420	200	1	5	38	7	4	10
152804	2	0.15	21	<4	0.08	<4	18	73	250	<1	2	6	2	3	33
152805	3	0.06	9	<4	<0.05	<4	2	68	100	<1	5	6	1	6	8
152806	6	<0.05	9	<4	<0.05	<4	<2	37	67	<1	9	2	1	3	11
152808	5	0.09	14	<4	<0.05	<4	2	29	70	<1	<2	4	1	4	9
152809	29	0.40	483	<4	<0.05	<4	15	230	310	3	2	18	4	28	19
152811	19	2.4	2300	<4	0.64	11	17	200	960	4	3	35	4	39	3
152812	4	6.4	2200	<4	0.07	6	5	200	190	1	3	30	2	100	3
152813	7	0.25	33	<4	<0.05	<4	3	51	200	1	<2	19	1	8	17
152814	11	0.61	240	<4	1.3	7	10	150	1500	7	7	36	12	23	19
152815	11	0.65	160	<4	2.3	9	16	170	1400	5	10	19	7	18	33
152816	11	0.50	100	<4	0.74	12	5	190	1400	4	7	17	6	17	28
152817	30	4.1	1400	<4	0.95	<4	68	160	2400	38	2	210	11	87	3
152818	1	<0.05	20	<4	<0.05	<4	5	53	66	<1	4	5	1	5	9
152819	<1	<0.05	8	<4	<0.05	<4	<2	32	83	1	8	3	1	3	9
152820	4	0.26	19	<4	<0.05	<4	4	43	120	<1	<2	7	1	7	6
152821	2	0.11	13	<4	<0.05	<4	4	48	77	<1	<2	<2	1	6	5
152822	1	<0.05	13	<4	<0.05	<4	3	140	36	<1	<2	4	1	4	10
152823	1	<0.05	5	<4	<0.05	<4	<2	99	110	<1	<2	2	1	7	6
152824	3	0.19	53	<4	<0.05	<4	3	100	99	1	<2	8	1	6	11
152825	<1	<0.05	7	<4	<0.05	<4	2	45	62	<1	<2	2	1	3	8
152826	<1	<0.05	6	<4	<0.05	<4	<2	60	52	<1	<2	2	1	4	6
152827	1	<0.05	8	<4	<0.05	<4	<2	67	88	<1	<2	2	2	5	16

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CHEMICAL ANALYSIS--RED CREEK AREA (continued)

SECTION 3 OF 3

OR SAMPLE	RED CREEK QUACRANGLE		
NUMBER	K (%)	SR (PPM)	CF (PPM)
152773	0.05	3	<10
152773	1.1	10	21
152773	0.08	16	16
152774	2.0	120	70
152775	3.4	100	58
152776	0.69	48	100
152777	2.5	60	110
152778	0.36	57	19
152779	0.04	64	20
152780	1.3	47	110
152781	0.55	160	57
152782	1.2	21	100
152783	0.35	83	35
152784	1.9	96	94
152785	0.03	11	52
152786	0.22	2	<10
152787	0.15	24	15
152788	0.17	110	58
152789	1.5	50	88
152790	<0.02	2	<10
152791	0.18	11	31
152792	0.18	6	21
152793	0.07	4	39
152794	0.13	6	36
152795	0.13	6	42
152796	1.5	150	87
152797	0.13	120	27
152798	0.10	5	19
152799	0.07	36	19
152800	0.07	16	27
152801	0.40	240	76
152802	0.07	3	37
152803	0.04	4	140
152804	0.26	6	12
152805	0.08	17	25
152806	0.06	17	32
152809	0.13	6	24
152860	0.20	37	25
152861	0.13	84	17
152862	0.03	12	<10
152863	0.38	2	<10
152864	1.4	25	58
152865	0.79	80	29
152866	1.6	40	26
152867	0.99	94	<10
152868	0.07	3	24
152869	0.10	2	20
152870	0.12	5	19
152871	0.08	2	<10
152872	0.13	6	21
152873	0.15	2	30
152874	0.19	4	22
152875	0.09	4	25
152876	0.05	2	29
152877	0.14	5	31

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CHEMICAL ANALYSIS--RED CREEK AREA (continued)

RED CREEK QUADRANGLE					SECTION 1 OF 3										
OR SAMPLE NUMBER	D. O. ST	E. LAT	SAMPLE LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	AL (%)	BR (PPM)	BA (PPM)	BE (PPM)	CA (%)	CC (PPM)	CR (PPM)	CU (PPM)	FE (%)
152878	40-40.957	-109.105	-3-92-		1.2	0.20	0.34	<10	31	<1	0.37	<4	24	6	0.18
152879	40-40.955	-109.107	-3-92-		<0.25	0.30	0.22	<10	69	<1	<0.35	<4	4	2	0.16
152880	40-40.964	-109.066	-3-92-		0.69	0.40	0.45	<10	210	<1	0.39	<4	9	7	0.11
152881	40-40.964	-109.066	-3-92-		0.30	0.40	0.38	<10	42	<1	<0.05	<4	12	3	0.15
152882	40-40.964	-109.067	-3-92-		2.1	3.3	6.1	<10	280	2	0.28	<4	22	8	0.83
152883	40-40.962	-109.069	-3-92-		0.61	0.40	0.39	<10	57	<1	0.05	<4	8	10	0.39
152884	40-40.907	-109.054	-3-92-		0.57	0.30	0.90	<10	32	<1	0.11	7	8	8	0.40
152885	40-40.909	-109.055	-3-92-		1.1	0.80	0.52	<10	44	<1	32.	<4	12	5	0.43
152886	40-40.911	-109.055	-3-92-		0.57	0.40	0.49	<10	27	<1	0.09	<4	7	3	0.26
152887	40-40.914	-109.055	-3-92-		0.80	0.50	1.3	<10	310	<1	0.05	5	13	29	0.44
152888	40-40.916	-109.138	-3-92-		0.53	0.30	2.5	<10	59	1	0.22	<4	10	7	0.33
152891	40-40.920	-109.058	-3-92-		0.87	0.90	0.41	<10	41	<1	<0.05	<4	9	3	0.12
152892	40-40.919	-109.060	-3-92-		1.6	1.4	1.1	<10	22	1	0.16	<4	21	35	0.35
152893	40-40.921	-109.064	-3-92-		1.4	2.5	5.8	<10	130	1	0.66	14	57	39	2.4
152894	40-40.919	-109.067	-3-92-		1.7	3.3	7.5	22	88	1	1.8	32	130	47	5.4
152895	40-40.919	-109.067	-3-92-		0.84	1.0	5.6	<10	55	1	4.2	31	80	47	8.1
152896	40-40.921	-109.069	-3-92-		7.0	8.0	6.1	<10	250	2	0.98	12	100	130	2.5
152897	40-40.922	-109.073	-3-92-		2.2	0.60	6.4	<10	690	1	0.31	<4	2	5	0.29
152898	40-40.921	-109.074	-3-92-		1.1	1.1	2.2	<10	120	<1	0.27	5	20	52	0.70
152899	40-40.917	-109.072	-3-92-		4.8	4.5	4.5	<10	700	1	0.66	5	24	27	1.1
152900	40-40.911	-109.060	-3-92-		3.9	7.2	5.4	<10	500	1	0.19	14	79	7	3.6
152901	40-40.909	-109.056	-3-92-		0.67	0.20	0.17	<10	16	<1	<0.05	<4	4	2	0.06
152902	40-40.904	-109.055	-3-92-		1.5	0.60	1.5	<10	190	<1	<0.05	<4	6	7	0.17
152903	40-40.906	-109.052	-3-92-		1.7	0.90	0.85	<10	30	<1	<0.05	<4	8	12	0.20
152904	40-40.917	-109.050	-3-92-		<0.25	0.50	0.44	<10	17	<1	<0.05	<4	9	2	<0.05
152905	40-40.919	-109.049	-3-92-		0.44	0.50	1.4	<10	36	<1	0.22	7	9	11	0.20
152906	40-40.921	-109.043	-3-92-		2.1	0.20	2.9	<10	460	<1	<0.05	<4	18	<2	0.85
152907	40-40.922	-109.042	-3-92-		1.0	0.30	2.7	<10	380	<1	<0.05	<4	12	3	0.52
152908	40-40.922	-109.039	-3-92-		0.62	0.60	2.0	<10	41	<1	0.09	<4	8	4	0.38
152909	40-40.970	-109.061	-3-92-		0.72	0.60	3.8	<10	15	2	1.9	67	1300	260	7.0
152910	40-40.973	-109.058	-3-92-		0.63	0.40	2.5	<10	96	1	4.2	66	1400	3	7.5
152911	40-40.974	-109.050	-3-92-		2.1	3.1	8.3	<10	740	2	0.63	5	65	6	2.1
152912	40-40.974	-109.053	-3-92-		2.7	1.7	0.90	<10	44	<1	0.06	<4	19	4	0.66
152913	40-40.968	-109.079	-3-92-		0.36	0.80	2.8	<10	32	2	2.2	4	10	6	2.5
152914	40-40.969	-109.082	-3-92-		0.92	0.70	1.2	<10	96	<1	0.05	<4	8	3	0.09
152915	40-40.967	-109.088	-3-92-		0.70	0.40	3.7	<10	300	<1	0.09	<4	16	5	0.09
152916	40-40.971	-109.087	-3-92-		0.26	0.50	1.9	<10	160	<1	0.06	<4	7	4	0.07
152917	40-40.973	-109.086	-3-92-		0.87	0.40	1.1	<10	85	<1	<0.05	<4	6	3	0.11
152918	40-40.976	-109.086	-3-92-		2.1	2.7	7.5	<10	810	2	0.45	6	53	23	2.6
152919	40-40.976	-109.088	-3-92-		0.74	0.30	0.23	<10	89	<1	0.15	<4	12	4	0.17
152920	40-40.975	-109.083	-3-92-		<0.25	0.40	0.31	<10	30	<1	<0.05	<4	13	3	0.18
152926	40-40.958	-109.245	-3-92-		2.2	3.6	9.9	<10	300	2	0.55	5	33	2	1.3
152927	40-40.961	-109.249	-3-92-		0.44	0.30	0.36	<10	17	<1	<0.05	<4	17	3	0.35
152928	40-40.960	-109.252	-3-92-		0.75	0.40	0.78	<10	50	<1	0.20	<4	9	<2	0.16
152929	40-40.960	-109.255	-3-92-		2.1	3.5	7.5	10	880	1	0.35	15	77	19	5.3
152930	40-40.959	-109.257	-3-92-		0.54	0.30	0.17	<10	27	<1	<0.05	<4	3	2	<0.05
152931	40-40.952	-109.255	-3-92-		0.56	0.0	0.12	<10	31	<1	<0.05	<4	3	4	0.11
152932	40-40.953	-109.250	-3-92-		0.78	0.40	1.2	<10	120	<1	0.08	<4	15	3	0.15
152936	40-40.933	-109.175	-3-92-		0.35	0.30	0.28	<10	34	<1	<0.05	<4	5	3	0.08
152937	40-40.927	-109.178	-3-92-		1.8	2.3	5.6	483	24	1	0.42	<4	10	3	0.16
152938	40-40.927	-109.185	-3-92-		1.4	2.7	9.8	17	510	1	0.07	5	78	2	1.5
152939	40-40.931	-109.178	-3-92-		0.68	0.70	0.76	<10	92	<1	0.05	<4	19	3	0.61
152940	40-40.956	-109.244	-3-92-		0.41	0.20	0.36	<10	42	<1	0.77	<4	14	9	0.12
152941	40-40.954	-109.244	-3-92-		0.46	0.40	0.47	<10	20	<1	<0.05	<4	10	2	0.05
152942	40-40.953	-109.242	-3-92-		0.80	0.30	1.4	<10	89	<1	0.05	<4	10	2	0.09

CHEMICAL ANALYSIS--RED CREEK AREA (continued)

NO SAMPLE NUMBER	RED CREEK QUADRANGLE											SECTION 2 OF 3				
	LI (PPM)	MG (%)	MN (PPM)	MO (PPM)	NA (%)	NB (PPM)	NI (PPM)	P (PPM)	TI (PPM)	SC (PPM)	TH (PPM)	V (PPM)	Y (PPM)	ZN (PPM)	ZR (PPM)	
152878	1	0.15	30	<4	<0.05	<4	10	37	110	1	5	5	1	5	6	
152879	1	<0.05	27	<4	<0.05	<4	2	78	62	<1	2	4	1	5	8	
152880	1	0.05	23	<4	0.07	<4	3	49	130	<1	3	2	2	39	9	
152881	2	<0.05	12	<4	<0.05	<4	4	39	130	<1	5	4	1	7	9	
152882	4	0.34	100	<4	3.5	14	9	150	1500	5	10	38	6	13	64	
152883	5	0.21	31	<4	<0.05	<4	3	570	110	1	3	10	1	13	6	
152884	3	0.09	33	<4	0.41	<4	5	38	170	1	4	7	2	14	3	
152885	2	0.28	1500	4	0.14	15	4	320	330	2	3	10	16	9	6	
152886	2	0.09	23	<4	0.15	<4	3	24	190	1	3	6	1	9	4	
152887	4	0.07	27	<4	0.17	<4	10	120	240	1	4	16	2	9	7	
152888	4	0.13	33	<4	1.0	<4	3	40	270	1	2	7	1	18	7	
152891	1	<0.05	17	<4	<0.05	<4	4	19	81	<1	4	3	1	4	5	
152892	5	0.13	50	<4	0.43	<4	7	75	290	2	<2	13	4	9	11	
152893	13	1.4	250	<4	3.0	<4	40	560	2100	7	2	70	4	35	11	
152894	32	3.2	330	<4	1.7	5	59	440	3400	14	6	120	13	32	9	
152895	4	3.2	1200	<4	1.2	<4	40	580	7000	34	5	290	18	61	9	
152896	20	1.4	150	<4	2.3	4	38	340	2600	11	5	94	7	18	8	
152897	8	0.14	42	<4	3.5	<4	3	180	210	<1	<2	3	1	8	9	
152898	7	0.25	44	<4	0.88	<4	9	30	520	1	2	5	1	14	4	
152899	13	0.42	190	<4	1.4	4	11	260	1200	3	8	27	6	37	9	
152900	41	0.82	150	<4	0.31	11	37	580	4100	11	7	110	10	31	13	
152901	2	<0.05	17	<4	<0.05	<4	<2	42	99	<1	2	<2	2	3	2	
152902	3	0.05	10	<4	0.24	<4	4	48	140	<1	<2	5	1	11	7	
152903	3	<0.05	19	<4	0.51	<4	4	37	87	<1	5	7	2	6	5	
152904	2	<0.05	5	<4	<0.05	<4	<2	12	39	<1	<2	<2	1	4	4	
152905	3	0.09	14	<4	0.64	<4	3	36	210	<1	3	5	1	7	5	
152906	5	0.10	23	<4	0.39	<4	3	66	520	2	2	14	1	7	4	
152907	3	0.14	29	<4	0.43	<4	9	41	350	1	3	12	1	8	4	
152908	4	0.19	40	<4	0.83	<4	4	73	230	1	2	7	1	8	3	
152909	23	6.4	1500	<4	0.31	<4	630	92	2200	24	<2	170	9	91	5	
152910	5	6.4	1500	<4	0.20	<4	750	150	1500	14	2	150	8	66	4	
152911	9	0.68	250	<4	2.3	12	16	220	2400	11	13	68	29	23	29	
152912	11	0.57	97	<4	<0.05	<4	10	91	420	1	6	18	3	33	62	
152913	12	0.50	370	<4	0.49	<4	5	240	1700	9	6	100	7	25	7	
152914	1	<0.05	12	<4	0.38	<4	2	39	210	1	4	8	1	4	20	
152915	2	<0.05	24	<4	1.7	<4	2	180	430	1	6	11	1	41	12	
152916	1	<0.05	10	<4	0.95	<4	2	35	230	1	<2	6	1	3	7	
152917	1	<0.05	21	<4	0.13	<4	2	53	180	<1	<2	5	2	9	7	
152918	14	0.62	200	<4	1.3	7	19	390	2100	8	9	55	7	45	21	
152919	1	0.06	46	<4	<0.05	<4	3	82	55	<1	<2	4	1	8	8	
152920	1	0.11	19	<4	<0.05	<4	5	83	88	<1	<2	3	2	6	8	
152926	8	1.1	94	<4	3.3	<4	30	300	1500	8	7	43	6	16	29	
152927	3	0.18	49	<4	<0.05	<4	4	62	89	<1	<2	7	1	10	5	
152928	1	0.27	10	<4	<0.05	<4	2	25	100	<1	<2	3	1	5	19	
152929	5	0.53	570	<4	0.30	6	20	690	2000	9	7	110	20	11	53	
152930	<1	<0.05	7	<4	<0.05	<4	<2	42	39	<1	<2	<2	1	3	5	
152931	7	<0.05	12	<4	<0.05	<4	<2	17	16	<1	<2	<2	<1	5	<2	
152932	1	0.05	22	<4	0.32	<4	2	66	300	1	5	6	1	7	3	
152936	1	<0.05	11	<4	<0.05	<4	<2	40	62	1	4	4	2	5	9	
152937	1	0.07	13	6	4.1	4	2	480	330	1	6	16	5	<2	51	
152938	11	0.34	92	<4	0.25	11	13	58	1700	15	13	94	6	12	41	
152939	9	<0.05	58	<4	0.05	<4	2	95	120	1	<2	9	1	11	7	
152940	2	0.07	19	<4	<0.05	<4	2	39	110	<1	3	4	1	10	3	
152941	1	<0.05	5	<4	<0.05	<4	2	21	61	<1	4	2	1	6	3	
152942	2	<0.05	13	<4	0.09	<4	3	25	170	1	4	6	1	8	4	

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CHEMICAL ANALYSIS--RED CREEK AREA (continued)

SECTION 3 OF 3

OR SAMPLE NUMBER	RED CREEK QUADRANGLE		
	K (%)	SR (PPM)	CE (PPM)
152878	0.10	16	21
152879	0.06	22	14
152880	0.12	6	29
152881	0.14	4	17
152882	0.92	48	72
152883	0.76	13	46
152884	0.10	14	14
152885	0.19	160	42
152886	0.11	6	16
152887	0.59	8	17
152888	0.31	47	10
152891	0.14	1	15
152892	0.13	8	51
152893	0.34	86	12
152894	0.46	52	52
152895	0.17	44	15
152896	1.2	50	27
152897	1.6	110	<10
152898	0.31	52	10
152899	1.5	180	38
152900	2.0	65	76
152901	0.03	3	15
152902	0.72	13	11
152903	0.07	8	20
152904	0.13	2	16
152905	0.11	35	12
152906	2.6	43	<10
152907	2.0	35	19
152908	0.28	24	17
152909	0.04	13	<10
152910	<0.02	8	<10
152911	1.7	100	130
152912	0.17	4	47
152913	0.13	200	24
152914	0.23	9	10
152915	0.51	23	15
152916	0.26	23	<10
152917	0.38	6	<10
152918	1.8	91	90
152919	0.05	1	32
152920	0.17	4	35
152926	1.0	77	120
152927	0.04	2	11
152928	0.24	3	<10
152929	1.6	64	48
152930	0.06	5	24
152931	0.03	3	<10
152932	0.29	5	20
152936	0.10	5	24
152937	0.06	55	<10
152938	2.3	28	93
152939	0.19	5	10
152940	0.12	7	14
152941	0.15	7	16
152942	0.44	15	15

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CHEMICAL ANALYSIS--RED CREEK AREA (continued)

RED CREEK QUADRANGLE										SECTION 1 OF 3				
OP SAMPLE NUMBER	D. O. F. ST LAT	SAMPLE LCNG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	AL (%)	B (PPM)	BA (PPM)	BE (PPM)	CA (%)	CC (PPM)	CR (PPM)	CU (PPM)	FE (%)
152943	40-40.953	-109.242	-3-92-	1.2	0.90	5.8	<10	160	2	1.8	42	3	16	11.
152944	40-40.952	-109.244	-3-92-	0.44	0.30	0.42	<10	29	<1	0.10	<4	4	<2	<0.05
152945	40-40.951	-109.244	-3-92-	1.6	1.4	1.1	<10	2000	<1	0.72	7	8	60	0.38
152946	40-40.950	-109.244	-3-92-	0.86	1.0	1.7	<10	200	<1	0.38	<4	18	4	0.12
152947	40-40.949	-109.244	-3-92-	0.81	0.60	5.8	<10	89	2	3.3	21	14	77	9.1
152948	40-40.952	-109.246	-3-92-	0.29	0.50	1.6	<10	110	<1	<0.35	<4	9	2	0.09
152955	40-40.941	-109.156	-3-92-	<0.25	0.0	0.08	<10	10	<1	18.	<4	11	2	0.67
152956	40-40.940	-109.157	-3-92-	1.3	0.80	7.9	<10	130	1	4.8	41	95	200	8.7
152957	40-40.939	-109.156	-3-92-	2.1	1.9	0.34	<10	66	<1	12.	<4	22	25	0.45
152958	40-40.933	-109.152	-3-92-	1.0	0.80	5.4	<10	56	1	5.1	35	91	450	6.8
152959	40-40.931	-109.154	-3-92-	1.9	1.9	6.8	<10	33	<1	0.32	<4	87	15	0.96
152960	40-40.931	-109.154	-3-92-	2.6	2.5	6.3	<10	17	<1	1.3	<4	18	54	1.4
152961	40-40.927	-109.160	-3-92-	1.5	2.3	1.2	15	42	<1	<0.35	<4	36	<2	0.27
152962	40-40.921	-109.171	-3-92-	2.3	3.3	6.6	<10	560	2	0.46	12	21	12	1.8
152963	40-40.928	-109.168	-3-92-	0.55	0.80	4.5	<10	250	5	0.20	<4	65	<2	1.4
152964	40-40.929	-109.168	-3-92-	2.8	3.9	5.9	18	320	1	0.09	9	68	27	2.4
152965	40-40.930	-109.170	-3-92-	3.2	3.4	5.8	<10	25	2	0.96	6	<1	12	7.7
152966	40-40.926	-109.177	-3-92-	<0.25	0.20	0.43	<10	57	<1	<0.05	<4	4	4	0.14
152967	40-40.948	-109.192	-3-92-	0.36	0.40	0.66	<10	56	3	<0.05	<4	7	13	0.43
152968	40-40.949	-109.188	-3-92-	2.0	1.9	0.05	<10	5	<1	21.	<4	1	<2	0.22
153058	40-40.936	-109.221	-3-92-B	220.	240.	0.20	<10	69	1	<0.05	25	7	240	0.27
153059	40-40.936	-109.221	-3-92-A	3700.	270.	0.21	<10	310	1	0.07	20	21	20000	0.42
153060	40-40.908	-109.078	-3-92-	4.1	1.3	6.6	<10	350	1	0.22	<4	1	14	0.38
153061	40-40.907	-109.074	-3-92-	2.4	0.40	0.24	<10	29	<1	<0.05	<4	11	15	0.11
153062	40-40.907	-109.071	-3-92-	2.4	0.30	0.56	12	38	<1	0.46	<4	6	3	0.15
153063	40-40.907	-109.062	-3-92-	2.7	0.40	0.37	<10	47	<1	0.05	<4	4	<2	0.13
153064	40-40.907	-109.044	-3-92-	1.9	0.60	0.36	<10	22	<1	0.14	<4	8	6	0.15

CHEMICAL ANALYSIS--RED CREEK AREA (continued)

DR. SAMPLE NUMBER	RED CREEK QUACRANGLE				NA (%)	NB (PPM)	NI (PPM)	P (PPM)	TI (PPM)	SC (PPM)	TH (PPM)	V (PPM)	SECTION 2 OF 3		
	LI (PPM)	MS (%)	MY (PPM)	MD (PPM)									Y (PPM)	ZN (PPM)	ZR (PPM)
152943	37	2.9	1430	<4	1.2	<4	12	890	5100	27	<2	400	14	150	<2
152944	1	0.10	119	<4	0.05	<4	<2	27	37	<1	<2	<2	<1	4	2
152945	4	0.34	160	<4	0.71	<4	8	71	180	2	5	9	5	170	11
152946	1	0.09	18	<4	0.81	<4	2	46	190	1	5	9	2	4	6
152947	9	2.5	1600	<4	2.3	<4	21	580	10000	31	3	380	21	200	13
152948	1	<0.05	15	<4	0.48	<4	<2	47	240	1	4	6	1	4	4
152955	4	6.5	460	<4	<0.05	6	3	49	32	<1	3	4	1	7	<2
152956	10	5.0	1100	<4	2.6	<4	71	220	2300	54	3	260	18	55	10
152957	5	0.21	1400	<4	<0.05	4	3	59	190	1	3	20	4	14	10
152958	4	1.3	770	<4	2.7	<4	39	510	8100	28	3	300	21	25	4
152959	4	0.17	54	<4	5.3	4	10	260	2000	6	21	35	7	11	17
152960	3	1.3	270	<4	4.8	<4	10	740	5600	24	7	150	15	15	31
152961	5	0.05	5	<4	0.97	<4	3	67	510	2	4	20	2	9	23
152962	6	0.26	150	<4	2.4	9	14	170	1300	7	11	42	20	21	11
152963	8	0.23	22	<4	0.72	7	10	340	1400	7	5	44	4	<2	12
152964	30	0.43	62	<4	0.28	<4	36	370	1300	11	13	72	4	8	32
152965	4	0.52	70	<4	3.7	<4	13	600	2400	15	9	72	20	18	20
152966	2	<0.05	12	<4	0.08	<4	3	48	70	<1	2	5	1	6	4
152967	3	0.28	49	<4	0.27	<4	6	74	200	1	<2	5	1	11	17
152968	2	6.2	380	<4	<0.05	11	3	<5	17	<1	<2	3	<1	20	<2
153058	2	<0.05	23	<4	<0.05	<4	4	43	65	1	8	390	2	11	9
153059	2	0.09	42	<4	<0.05	<4	8	<5	97	3	33	2500	18	8	13
153060	3	0.11	33	<4	1.2	4	<2	420	230	1	3	4	3	5	4
153061	1	<0.05	10	<4	<0.05	<4	2	10	95	<1	<2	3	1	9	6
153062	2	0.06	12	<4	<0.05	<4	2	28	51	1	7	5	1	6	5
153063	2	<0.05	15	<4	0.10	<4	<2	65	130	<1	<2	2	1	6	5
153064	3	<0.05	24	<4	0.12	<4	3	81	140	1	2	3	1	5	3

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CHEMICAL ANALYSIS--RED CREEK AREA (continued)

SECTION 3 OF 3

DR SAMPLE	RED CREEK QUADRANGLE	K	SP	CF
NUMBER	(%)	(PPM)	(PPM)	(PPM)
152943	0.37	33	26	
152944	0.13	4	10	
152945	0.05	41	68	
152946	0.24	29	16	
152947	0.12	38	25	
152948	0.36	9	20	
152955	<0.02	75	<10	
152956	0.50	85	<10	
152957	0.09	37	25	
152958	0.32	95	12	
152959	0.18	41	29	
152960	0.04	32	17	
152961	0.40	15	41	
152962	1.3	120	140	
152963	2.8	17	21	
152964	1.6	27	63	
152965	0.09	28	54	
152966	0.13	2	15	
152967	0.09	5	<10	
152968	<0.02	28	<10	
153058	0.44	8	<10	
153059	0.08	43	230	
153060	0.8	44	10	
153061	0.06	1	<10	
153062	0.19	3	10	
153063	0.45	3	35	
153064	0.03	2	33	

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CHEMICAL ANALYSIS--FARMINGTON CANYON COMPLEX (continued)

FARMINGTON QUADRANGLE										SECTION 1 OF 3				
OR SAMPLE NUMBER	G. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	AL (%)	B (PPM)	BA (PPM)	RE (PPM)	CA (%)	CC (PPM)	CR (PPM)	CU (PPM)	FE (%)
152807	40-40.914	-111.802	-3-92-	7.5	8.4	7.0	<10	1100	3	1.1	14	82	16	4.4
152808	40-40.906	-111.800	-3-92-	1.0	2.8	7.2	<10	1600	<1	0.07	<4	2	3	0.14
152809	40-40.907	-111.797	-3-92-	1.0	9.90	5.4	<10	250	<1	5.7	57	100	150	9.5
152810	40-40.906	-111.796	-3-92-	2.3	1.9	5.3	<10	290	2	0.43	<4	1	18	0.44
152811	40-40.904	-111.797	-3-92-	4.5	5.8	8.9	<10	290	3	<0.05	21	140	130	4.1
152812	40-40.904	-111.796	-3-92-	1.6	1.9	4.6	<10	44	1	0.16	28	68	<2	9.5
152813	40-40.903	-111.796	-3-92-	3.1	5.5	9.2	<10	490	2	0.57	19	130	41	3.3
152814	40-40.904	-111.792	-3-92-	0.75	0.40	0.75	<10	9	<1	<0.05	<4	3	<2	<0.05
152815	40-40.904	-111.789	-3-92-	0.50	0.50	<0.05	<10	19	27	1.2	22	19	19	<0.05
152816	40-40.898	-111.789	-3-92-	1.7	1.8	1.8	<10	93	<1	<0.05	4	40	9	0.22
152817	40-40.898	-111.791	-3-92-	2.9	2.8	4.3	<10	58	2	0.20	18	14	3	4.8
152818	40-40.901	-111.794	-3-92-	7.1	10.	4.9	<10	83	3	0.09	22	120	60	2.6
152819	40-40.913	-111.792	-3-92-	7.3	11.	5.4	<10	640	2	0.42	10	51	46	2.4
152820	40-40.912	-111.791	-3-92-	14.	16.	6.5	<10	340	3	1.3	14	89	21	3.5
152821	40-40.912	-111.790	-3-92-	0.54	2.2	3.9	<10	570	5	0.90	5	18	5	0.74
152822	40-40.911	-111.790	-3-92-	0.84	1.0	1.4	<10	60	1	0.11	<4	7	4	0.31
152823	40-40.910	-111.791	-3-92-	27.	29.	11.	41	290	3	0.05	21	150	100	5.4
152824	40-40.907	-111.790	-3-92-	3.5	3.5	6.3	<10	2100	1	0.50	<4	2	<2	0.75
152825	40-40.907	-111.787	-3-92-	4.7	5.6	6.1	<10	980	2	0.37	<4	4	32	1.3
152827	40-40.904	-111.782	-3-92-	0.56	0.40	2.1	<10	200	1	<0.05	<4	21	6	0.41
152828	40-40.903	-111.781	-3-92-	0.34	0.40	1.5	<10	31	<1	<0.05	<4	7	5	0.15
152829	40-40.903	-111.781	-3-92-	0.53	0.30	1.8	<10	130	<1	<0.05	4	7	<2	1.1
152830	40-40.899	-111.783	-3-92-	3.1	3.6	1.0	<10	42	<1	<0.05	<4	7	4	0.07
152831	40-40.899	-111.783	-3-92-	0.39	0.50	0.71	<10	23	1	<0.05	<4	20	34	0.08
152832	40-40.902	-111.776	-3-92-	0.51	0.80	0.89	<10	23	1	0.08	<4	37	4	0.19
152833	40-40.894	-111.788	-3-92-	1.7	1.8	1.3	<10	23	1	<0.05	<4	14	4	0.36
152834	40-40.892	-111.789	-3-92-	0.53	0.70	0.93	<10	22	<1	<0.05	<4	19	<2	0.10
152835	40-40.893	-111.791	-3-92-	3.7	5.2	7.7	11	630	1	0.17	<4	89	<2	1.6
152836	40-40.893	-111.792	-3-92-	0.78	1.0	1.1	<10	33	<1	<0.05	<4	9	2	<0.05
152837	40-40.893	-111.793	-3-92-	0.55	0.40	3.7	<10	340	1	0.05	4	38	4	1.3
152838	40-40.892	-111.810	-3-92-	2.6	4.7	9.6	<10	470	5	0.32	24	140	8	5.3
152839	40-40.892	-111.813	-3-92-											
152840	40-40.892	-111.816	-3-92-	1.3	0.90	0.61	<10	65	<1	<0.05	<4	12	<2	0.10
152841	40-40.890	-111.821	-3-92-	0.49	0.50	2.7	<10	60	<1	<0.05	<4	10	2	0.26
152842	40-40.890	-111.840	-3-92-	5.5	8.4	11.	12	360	3	0.09	26	140	41	5.1
152843	40-40.863	-111.823	-3-92-	2.5	2.7	6.8	<10	140	14	8.9	14	120	26	5.0
152844	40-40.867	-111.820	-3-92-	1.2	0.90	6.8	<10	25	4	0.26	<4	2	4	0.54
152845	40-40.867	-111.817	-3-92-	3.2	3.6	10.	<10	380	3	0.15	25	170	<2	5.5
152847	40-40.868	-111.808	-3-92-	0.76	1.0	3.1	<10	220	<1	0.13	10	20	65	0.71
152848	40-40.868	-111.806	-3-92-	2.1	2.6	4.5	<10	110	2	0.10	52	38	41	7.0
152849	40-40.870	-111.806	-3-92-	0.92	0.70	1.1	<10	63	<1	<0.05	<4	33	3	0.30
152850	40-40.870	-111.806	-3-92-	3.6	13.	2.7	<10	110	1	<0.05	6	13	2	0.74
152851	40-40.871	-111.807	-3-92-	15.	0.60	0.64	<10	26	<1	0.05	110	5	19	2.1
152852	40-40.865	-111.807	-3-92-	2.5	0.30	2.8	<10	180	1	<0.05	<4	10	<2	0.12
152853	40-40.864	-111.808	-3-92-	<0.25	0.30	2.7	<10	130	1	0.51	<4	20	6	0.20
152854	40-40.861	-111.817	-3-92-	0.62	0.40	2.5	<10	190	<1	<0.05	<4	17	5	0.16
152855	40-40.913	-111.784	-3-92-	<0.25	0.50	0.40	<10	14	<1	<0.05	<4	12	3	0.13
152856	40-40.910	-111.781	-3-92-	3.2	4.3	4.8	<10	700	2	0.29	7	2	7	0.46
152857	40-40.895	-111.779	-3-92-	1.1	0.50	2.4	11	53	<1	<0.05	<4	12	11	0.60
152860	40-40.875	-111.780	-3-92-	3.3	6.4	5.0	28	1200	3	0.07	<4	14	5	3.3
152870	40-40.874	-111.780	-3-92-	3.6	5.7	4.6	33	1400	8	<0.05	5	4	7	2.4
152871	40-40.874	-111.780	-3-92-	5.0	7.7	4.7	<10	2600	8	0.12	5	5	8	3.0
152872	40-40.873	-111.780	-3-92-	3.6	6.5	4.3	<10	1500	9	0.07	7	2	3	2.4
152873	40-40.874	-111.781	-3-92-	3.4	4.3	6.6	<10	800	26	1.3	42	110	19	5.9
152874	40-40.874	-111.786	-3-92-	0.61	0.90	5.6	<10	110	3	5.3	35	26	120	12.

CHEMICAL ANALYSIS--FARMINGTON CANYON COMPLEX (continued)

OP. SAMPLE NUMBER	FARMINGTON QUADRANGLE			MO (PPM)	NA (%)	NB (PPM)	NI (PPM)	P (PPM)	TI (PPM)	SC (PPM)	TH (PPM)	V (PPM)	SECTION 2 OF 3		
	LI (PPM)	MG (%)	MN (PPM)										Y (PPM)	ZN (PPM)	ZR (PPM)
152807	32	1.2	540	<4	1.6	9	46	580	3500	9	17	100	19	100	6
152808	2	<0.05	14	<4	0.86	<4	2	120	100	<1	13	2	3	11	4
152809	8	2.6	1900	<4	1.7	17	36	1100	11000	36	5	340	37	140	29
152810	2	0.05	48	<4	1.6	5	<2	32	370	1	11	4	3	7	11
152811	21	0.67	150	<4	0.09	6	30	300	1700	17	5	99	4	26	2
152812	25	4.0	470	<4	0.07	<4	91	180	4500	7	4	180	9	48	<2
152813	32	1.3	370	<4	2.6	5	66	440	3800	14	8	120	9	64	2
152814	3	<0.05	<4	<4	<0.05	<4	2	32	69	<1	3	<2	1	<2	<2
152815	21	0.45	22	12	0.69	9	20	18	21	22	19	19	21	21	22
152816	4	0.10	14	<4	0.48	<4	6	26	170	1	8	10	1	5	5
152817	52	3.9	510	<4	0.14	18	19	190	1300	6	10	31	15	47	11
152818	27	1.8	270	<4	<0.05	4	33	380	2600	7	9	54	8	44	7
152819	33	0.61	310	<4	0.75	13	16	220	2800	6	16	63	6	84	6
152820	30	1.1	430	<4	1.8	12	32	760	3600	8	26	85	14	81	12
152821	9	0.26	130	<4	1.6	7	10	120	980	2	2	26	3	16	4
152822	5	0.12	26	<4	0.41	<4	4	51	160	1	7	7	2	10	9
152823	18	1.1	140	<4	0.09	<4	55	280	2900	21	9	180	5	32	5
152824	7	0.13	96	<4	1.5	5	5	160	640	1	73	5	6	9	18
152825	12	0.14	130	<4	1.2	19	4	190	1500	3	55	18	15	22	15
152827	2	0.06	17	<4	0.12	<4	4	14	220	1	4	15	1	5	2
152828	5	<0.05	6	<4	<0.05	<4	2	20	81	<1	<2	4	1	2	<2
152829	9	0.15	40	<4	<0.05	<4	<2	55	160	1	5	6	1	7	2
152831	1	<0.05	12	<4	0.08	<4	<2	29	100	<1	4	4	1	10	2
152831	<1	<0.05	8	<4	0.05	<4	4	5	88	<1	3	8	1	7	2
152832	2	0.05	20	<4	0.36	<4	<2	43	170	1	3	5	1	6	3
152833	11	0.06	100	<4	0.06	<4	<2	58	130	<1	<2	5	1	7	<2
152834	1	<0.05	5	<4	0.05	<4	2	9	110	1	6	4	1	2	3
152835	26	0.45	57	<4	0.98	<4	28	310	1800	9	16	71	6	7	2
152836	3	<0.05	4	<4	<0.05	<4	<2	30	60	<1	10	3	2	<2	2
152837	8	0.35	57	<4	0.40	<4	19	55	660	3	<2	28	1	10	8
152838	21	1.4	180	<4	0.14	<4	54	410	2800	22	28	160	10	33	5
152839															
152840	<1	<0.05	11	<4	<0.05	<4	<2	29	120	<1	7	2	2	7	<2
152841	1	<0.05	6	<4	0.07	7	<2	23	230	2	4	11	1	4	<2
152842	14	1.2	130	<4	0.11	<4	57	380	1200	22	15	160	5	22	2
152843	2	0.11	1500	<4	0.05	8	26	670	2900	9	9	130	17	76	10
152844	21	0.12	56	<4	1.0	76	3	120	200	6	5	2	2	26	<2
152845	63	1.7	520	<4	0.20	<4	76	730	2500	18	13	140	7	93	2
152847	5	0.16	61	<4	0.08	4	9	450	360	2	3	18	4	7	8
152848	36	<0.05	1000	<4	<0.05	6	32	210	1600	6	13	100	11	16	110
152849	7	0.12	23	<4	0.16	7	2	26	390	2	3	4	1	7	2
152850	6	0.44	56	<4	<0.05	16	4	74	180	4	4	7	3	13	10
152851	9	0.43	99	<4	<0.05	<4	8	54	46	1	<2	16	1	12	<2
152852	2	<0.05	11	<4	0.25	<4	<2	38	310	1	4	8	<1	4	<2
152853	2	0.12	78	<4	1.6	<4	3	11	470	1	<2	7	1	6	2
152854	3	0.06	14	<4	0.07	4	5	35	390	1	14	6	1	11	5
152855	3	0.05	14	<4	<0.05	<4	5	17	58	<1	2	2	1	5	6
152856	3	0.10	44	<4	1.5	5	4	59	290	1	14	3	2	3	14
152857	9	0.18	56	<4	0.07	<4	2	24	210	1	3	14	1	6	2
152860	3	0.30	66	<4	0.07	30	11	190	1500	5	21	16	11	19	50
152870	2	0.25	50	<4	0.07	35	7	150	1500	6	23	8	13	10	58
152871	2	0.28	120	<4	0.68	42	4	260	1300	7	27	2	23	13	38
152872	5	0.55	170	<4	0.07	40	2	290	1700	6	26	5	24	25	55
152873	70	1.9	880	<4	1.5	27	95	920	8400	21	12	160	34	130	42
152874	14	2.5	1500	<4	0.90	<4	47	1800	14000	27	2	420	30	170	5

CHEMICAL ANALYSIS--FARMINGTON CANYON COMPLEX (continued)

SECTION 3 OF 3

SAMPLE NUMBER	FARMINGTON QUADRANGLE		
	Y (%)	SP (PPM)	CF (PPM)
152A07	2.2	220	68
152A08	5.2	190	19
152A09	0.02	160	30
152A10	2.1	58	11
152A11	4.0	8	78
152A12	0.37	6	<10
152A13	2.4	85	70
152A14	0.07	3	15
152A15	0.21	20	<10
152A16	0.57	8	<10
152A17	0.63	11	140
152A18	1.9	5	58
152A19	1.9	100	77
152A20	1.3	200	89
152A21	1.0	180	10
152A22	0.22	29	18
152A23	2.8	8	87
152A24	3.1	99	73
152A25	3.1	85	150
152A27	0.83	10	<10
152A28	0.34	2	<10
152A29	0.71	4	17
152A30	0.31	8	26
152A31	0.31	4	15
152A32	0.10	7	11
152A33	0.10	2	<10
152A34	0.35	6	21
152A35	2.5	24	38
152A36	0.38	3	81
152A37	1.5	14	<10
152A38	2.7	15	86
152A39			
152A40	0.24	4	32
152A41	1.0	5	<10
152A42	3.1	11	54
152A43	0.38	210	44
152A44	1.7	10	<10
152A45	2.7	12	47
152A47	1.9	8	20
152A48	0.25	20	24
152A49	0.41	3	<10
152A50	1.0	2	<10
152A51	0.03	3	<10
152A52	1.0	6	<10
152A53	0.21	85	<10
152A54	1.4	12	20
152A55	0.20	2	18
152A56	3.5	76	17
152A57	0.74	6	<10
152A60	3.2	17	150
152A70	4.8	15	91
152A71	4.9	35	160
152A72	5.0	19	180
152A73	3.1	180	55
152A74	0.50	65	59

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CHEMICAL ANALYSIS--FARMINGTON CANYON COMPLEX (continued)

FARMINGTON QUADRANGLE										SECTION 1 OF 3					
OP SAMPLE NUMBER	D. O. F. ST	SAMPLE LAT	NUMBER LONG	L TY REP	U (PPM)	U-NT (PPM)	AL (%)	B (PPM)	BA (PPM)	BE (PPM)	CA (%)	CC (PPM)	CR (PPM)	CU (PPM)	FE (%)
152975	40-40.873	-111.786	-3-92-		12.	15.	13.	<10	530	3	0.09	30	160	<2	6.0
152976	40-40.873	-111.787	-3-92-		1.2	0.30	1.5	<10	110	<1	0.08	<4	37	4	0.44
152977	40-40.874	-111.787	-3-92-		0.90	0.50	1.3	<10	23	<1	<0.05	<4	9	6	0.14
152978	40-40.876	-111.787	-3-92-		1.6	1.4	2.9	<10	130	1	<0.05	<4	21	9	0.59
152979	40-40.877	-111.787	-3-92-		1.0	0.90	2.4	<10	42	<1	<0.05	<4	28	<2	0.23
152980	40-40.879	-111.787	-3-92-		0.58	0.50	2.4	<10	97	<1	<0.05	<4	31	2	0.40
152981	40-40.880	-111.788	-3-92-		<0.25	0.50	3.0	<10	45	8	0.46	<4	5	4	0.10
152982	40-40.881	-111.788	-3-92-		0.97	0.90	1.4	<10	15	<1	<0.05	<4	8	<2	0.11
152983	40-40.881	-111.789	-3-92-		2.9	3.9	0.83	<10	86	1	<0.05	<4	3	7	0.21
152985	40-40.879	-111.794	-3-92-		0.38	0.70	1.3	<10	100	<1	<0.05	<4	20	2	0.28
152986	40-40.879	-111.794	-3-92-		0.53	1.1	3.9	<10	140	2	6.4	51	160	52	11.
152987	40-40.878	-111.794	-3-92-		1.7	3.3	5.2	<10	170	1	0.26	25	120	47	3.8
152988	40-40.876	-111.795	-3-92-		0.48	0.20	7.2	<10	1000	<1	0.08	<4	13	7	0.06
152989	40-40.876	-111.795	-3-92-		1.3	1.3	5.0	<10	220	1	0.16	5	54	57	1.7
152990	40-40.875	-111.796	-3-92-		0.50	0.70	0.84	<10	35	1	0.07	<4	15	4	0.33
152991	40-40.879	-111.827	-3-92-		4.2	5.9	5.7	<10	1500	4	0.90	<4	12	12	3.3
152992	40-40.872	-111.790	-3-92-		<0.25	0.60	1.2	<10	47	1	<0.05	<4	18	3	0.13
152993	40-40.872	-111.791	-3-92-		0.88	0.40	0.42	<10	51	<1	<0.05	<4	17	4	0.14
152994	40-40.874	-111.794	-3-92-		2.0	2.4	5.3	<10	260	1	0.33	5	33	290	2.4
152995	40-40.879	-111.795	-3-92-		<0.25	0.40	1.5	<10	120	<1	<0.05	<4	10	<2	0.08
152996	40-40.877	-111.807	-3-92-		1.2	2.2	9.4	<10	270	4	1.7	<4	77	7	2.1
152997	40-40.852	-111.820	-3-92-		4.3	4.9	5.7	<10	1500	4	0.75	<4	14	14	2.9

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CHEMICAL ANALYSIS--FARMINGTON CANYON COMPLEX (continued)

DR. SAMPLE NUMBER	FARMINGTON QUADRANGLE												SECTION 2 OF 3		
	LI (PPM)	MG (%)	MN (PPM)	MO (PPM)	NA (%)	NB (PPM)	NI (PPM)	P (PPM)	TI (PPM)	SC (PPM)	TH (PPM)	V (PPM)	Y (PPM)	ZN (PPM)	ZR (PPM)
152975	59	1.5	620	<4	0.22	<4	74	270	2700	30	5	170	10	110	24
152976	5	0.14	42	<4	0.35	<4	7	31	430	2	4	23	2	9	26
152977	9	<0.05	7	<4	<0.05	<4	3	16	110	1	3	5	1	2	2
152978	9	0.09	31	<4	0.08	16	2	42	560	5	14	15	3	14	12
152979	5	<0.05	17	<4	0.09	<4	<2	25	490	1	4	11	1	8	2
152980	3	0.07	12	<4	0.10	<4	2	21	390	3	<2	21	<1	5	3
152981	5	0.05	58	<4	1.7	<4	11	83	160	<1	2	2	1	11	<2
152982	10	<0.05	9	<4	<0.05	<4	<2	22	200	1	4	6	1	3	2
152983	3	0.08	18	<4	0.29	<4	3	38	54	<1	2	2	2	13	3
152984	2	0.08	33	<4	0.06	4	<2	49	160	1	<2	3	1	8	4
152985	9	4.5	2200	<4	0.43	<4	150	380	12000	42	7	420	20	140	9
152986	38	1.4	320	<4	0.72	6	61	130	3100	9	<2	85	2	55	6
152987	1	<0.05	12	<4	1.2	<4	<2	230	33	<1	<2	<2	1	8	<2
152988	10	0.62	190	<4	1.6	13	14	120	920	6	13	33	7	27	3
152989	2	0.11	57	<4	0.38	5	2	40	270	2	4	4	2	15	4
152990	14	0.13	710	<4	1.4	42	<2	420	2100	7	22	6	87	120	4
152991	1	<0.05	16	<4	0.28	<4	3	46	290	1	5	3	1	20	2
152992	<1	<0.05	11	<4	<0.05	<4	2	26	89	<1	<2	2	1	8	<2
152993	15	0.75	130	<4	1.5	11	14	260	1500	6	8	28	10	23	6
152994	1	<0.05	6	<4	0.05	<4	2	51	160	<1	3	3	1	5	<2
152995	18	0.45	250	<4	3.9	13	15	830	2600	11	18	45	9	30	4
152996	11	0.28	640	<4	0.98	27	5	380	2300	7	18	9	56	82	5

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CHEMICAL ANALYSIS--FARMINGTON CANYON COMPLEX (continued)

SECTION 3 OF 3

DR SAMPLE NUMBER	FARMINGTON QUADRANGLE		
	K (%)	SR (PPM)	CE (PPM)
152975	2.6	29	51
152976	0.64	5	13
152977	0.37	3	<10
152978	1.1	5	19
152979	0.04	2	18
152980	0.85	7	<10
152981	0.12	39	12
152982	0.20	2	19
152984	0.30	3	<10
152985	1.1	15	<10
152986	0.31	81	23
152987	2.0	30	<10
152988	5.3	120	<10
152989	1.4	26	67
152990	0.10	6	13
152991	2.2	64	180
152992	0.35	4	20
152993	0.16	2	<10
152994	1.0	67	68
152995	0.05	5	10
152996	0.94	230	19
152997	3.1	100	150

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CHEMICAL ANALYSIS--FACER CREEK AREA (continued)

WILLARD QUADANGLE										SECTION 1 OF 3				
OR SAMPLE	D. O. E.	SAMPLE	NUMBER	U	U-NT	AL	B	BA	BE	CA	CC	CR	CU	FE
NUMBER	ST	LAT	LONG	I. TY	REP	(PPM)	(PPM)	(X)	(PPM)	(PPM)	(X)	(PPM)	(PPM)	(X)
152998	40-41.411	-111.966	-3-92-	1.3	1.1	0.14	<10	31	<1	<0.05	<4	4	7	0.08
152999	40-41.392	-111.970	-3-92-	1.1	2.0	12.	14	2900	2	<0.05	<4	140	3	3.7
153000	40-41.390	-111.970	-3-92-	1.3	0.70	0.98	<10	220	<1	0.07	<4	19	8	1.1
153001	40-41.391	-111.969	-3-92-	1.3	1.0	2.8	<10	220	2	<0.05	<4	8	5	0.28
153002	40-41.392	-111.967	-3-92-	1.2	2.1	7.8	<10	390	2	0.11	38	130	150	6.9
153003	40-41.395	-111.967	-3-92-	1.3	1.0	0.25	<10	120	<1	<0.05	<4	5	5	0.19
153004	40-41.399	-111.966	-3-92-	0.97	2.7	10.	<10	800	2	0.14	36	130	5	10.0
153005	40-41.405	-111.966	-3-92-	2.4	2.3	0.16	<10	22	<1	<0.05	<4	6	32	0.66
153007	40-41.406	-111.966	-3-92-	2.2	2.1	1.1	<10	160	1	0.18	5	18	2	9.0
153009	40-41.408	-111.967	-3-92-	0.84	0.70	0.60	<10	170	<1	0.16	12	6	22	18.
153010	40-41.413	-111.969	-3-92-	3.2	2.3	0.14	<10	45	1	7.0	<4	7	21	0.32
153011	40-41.419	-111.971	-3-92-	2.5	2.9	8.3	19	500	3	0.12	11	68	<2	5.9
153012	40-41.424	-111.974	-3-92-	0.47	0.40	0.21	<10	100	<1	0.05	<4	5	2	0.14
153013	40-41.427	-111.976	-3-92-	0.51	0.40	0.18	<10	120	<1	<0.05	<4	5	10	0.11
153014	40-41.420	-111.977	-3-92-	0.76	0.70	0.51	<10	44	<1	<0.05	<4	20	11	0.21
153015	40-41.420	-111.977	-3-92-	0.50	0.60	1.3	<10	110	<1	<0.05	<4	320	3	0.29
153016	40-41.419	-111.980	-3-92-	0.60	0.60	7.0	17	130	1	<0.05	<4	110	2	0.47
153017	40-41.409	-111.975	-3-92-	3.5	7.2	8.5	39	960	5	0.15	<4	2	<2	4.0
153018	40-41.410	-111.974	-3-92-	5.3	15.	11.	170	330	30	0.06	<4	53	<2	2.4
153019	40-41.409	-111.974	-3-92-	1.6	4.4	5.5	<10	1300	2	0.08	<4	6	4	1.4
153020	40-41.409	-111.974	-3-92-	1.7	5.0	5.7	<10	1000	1	0.12	4	2	<2	2.3
153021	40-41.405	-111.972	-3-92-	2.1	4.8	4.9	<10	1000	1	<0.05	9	2	5	5.9
153022	40-41.400	-111.983	-3-92-	1.5	2.2	2.7	<10	150	1	0.08	4	12	5	1.4
153023	40-41.403	-111.983	-3-92-	2.1	3.4	10.	35	750	3	0.12	<4	97	6	2.7
153024	40-41.401	-111.985	-3-92-	3.4	6.5	9.6	<10	690	3	0.10	24	74	19	8.3
153025	40-41.396	-111.988	-3-92-	1.8	4.4	7.3	<10	390	14	0.20	45	95	110	7.5
153026	40-41.395	-111.988	-3-92-	1.1	2.5	7.8	10	520	2	0.26	29	89	<2	6.0
153027	40-41.399	-111.993	-3-92-	1.3	2.1	8.3	<10	450	2	0.11	47	240	<2	7.8
153029	40-41.400	-111.994	-3-92-	5.0	7.5	4.0	<10	240	2	<0.05	47	25	20	3.9
153030	40-41.402	-111.996	-3-92-	2.1	3.3	9.9	<10	580	3	0.35	43	170	9	7.3
153031	40-41.395	-111.991	-3-92-	1.8	4.1	9.1	10	830	4	0.21	14	120	2	6.6
153032	40-41.395	-111.990	-3-92-	1.3	3.2	8.2	<10	290	3	0.14	51	120	<2	13.
153033	40-41.394	-111.989	-3-92-	63.	56.	16.	21	1300	5	<0.05	<4	79	340	7.5
153034	40-41.394	-111.988	-3-92-	0.88	1.3	2.7	12	210	1	<0.05	7	6	9	1.8
153035	40-41.390	-111.984	-3-92-	4.0	6.0	7.4	<10	520	3	<0.05	10	51	36	6.6
153036	40-41.388	-111.983	-3-92-	1.2	3.0	7.2	<10	280	2	1.6	27	86	34	6.7
153037	40-41.387	-111.982	-3-92-	1.5	3.2	8.6	<10	380	3	0.23	38	100	61	10.
153038	40-41.387	-111.980	-3-92-	0.83	1.4	4.0	<10	240	1	<0.05	26	17	13	4.8
153039	40-41.426	-111.992	-3-92-	11.	13.	0.20	<10	48	<1	<0.05	<4	4	79	0.16
153040	40-41.424	-111.997	-3-92-	0.64	0.40	0.68	<10	54	<1	<0.05	<4	5	34	0.28
153041	40-41.424	-111.997	-3-92-	1.5	1.7	0.89	17	57	<1	0.13	<4	11	18	1.7
153042	40-41.424	-111.997	-3-92-A	1.8	1.4	2.5	35	130	1	0.05	<4	23	110	1.1
153043	40-41.424	-111.997	-3-92-B	3.8	4.5	12.	49	490	4	0.21	<4	89	110	2.6
153044	40-41.424	-111.997	-3-92-C	8.9	8.2	2.1	44	110	<1	0.23	30	25	2300	15.
153045	40-41.424	-111.998	-3-92-	3.9	4.4	1.2	<10	120	1	0.23	4	12	14	4.6
153050	40-41.418	-111.993	-3-92-	4.5	4.3	0.30	<10	54	<1	<0.05	<4	4	28	0.18
153051	40-41.420	-111.988	-3-92-	0.87	0.80	0.40	<10	95	<1	<0.05	<4	7	13	2.2
153052	40-41.385	-111.979	-3-92-	0.59	3.2	8.9	<10	380	2	0.25	68	110	170	8.0
153053	40-41.384	-111.974	-3-92-	1.9	4.5	2.5	<10	61	1	0.47	4	18	<2	5.8
153054	40-41.383	-111.974	-3-92-	0.27	0.40	0.25	<10	31	<1	<0.05	<4	5	2	0.11
153055	40-41.382	-111.974	-3-92-	0.49	0.20	0.28	<10	33	<1	<0.05	<4	3	3	<0.05
153056	40-41.382	-111.974	-3-92-	1.0	1.3	0.50	<10	49	<1	0.05	<4	7	<2	0.20
153057	40-41.380	-111.973	-3-92-	1.8	2.6	7.9	<10	130	1	1.0	31	51	26	6.6

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CHEMICAL ANALYSIS--FACER CREEK AREA
(continued)

OR SAMPLE NUMBER	WILLARD QUADRANGLE															SECTION 2 OF 3		
	LI (PPM)	MG (%)	MN (PPM)	MO (PPM)	NA (%)	NR (PPM)	NI (PPM)	P (PPM)	TI (PPM)	SC (PPM)	TH (PPM)	V (PPM)	Y (PPM)	ZN (PPM)	ZR (PPM)			
152998	<1	<0.05	5	<4	<0.05	<4	<2	15	78	<1	<2	<2	1	6	7			
152999	2	0.19	85	<4	0.26	<4	13	190	1200	17	14	120	1	11	6			
153000	5	0.07	29	<4	<0.05	<4	3	92	140	1	3	53	1	9	3			
153001	8	0.10	20	9	0.10	<4	4	29	320	2	3	11	1	3	8			
153002	110	0.99	720	<4	0.12	<4	71	530	1400	23	2	190	5	110	10			
153003	1	<0.05	19	<4	<0.05	<4	2	34	120	<1	<2	4	<1	24	2			
153004	78	1.6	760	<4	0.21	<4	75	620	2400	32	10	230	10	130	31			
153005	1	<0.05	55	<4	<0.05	<4	18	43	28	<1	<2	8	<1	15	<2			
153007	1	0.11	310	<4	<0.05	<4	10	1000	160	3	3	73	5	49	<2			
153009	5	0.08	480	<4	<0.05	<4	34	840	110	<1	<2	13	2	63	<2			
153010	3	3.8	330	<4	<0.05	5	4	55	59	<1	5	8	1	45	3			
153011	5	0.21	89	<4	0.23	<4	37	810	1200	10	12	100	2	21	4			
153012	3	<0.05	95	<4	<0.05	<4	<2	190	77	<1	<2	3	<1	5	2			
153013	2	<0.05	8	<4	<0.05	<4	<2	30	74	1	6	5	1	16	3			
153014	3	<0.05	22	<4	<0.05	<4	4	29	90	<1	6	5	1	10	2			
153015	2	0.06	10	<4	<0.05	<4	4	41	500	2	8	20	1	6	2			
153016	4	0.11	10	<4	0.16	<4	4	57	1300	5	9	45	1	8	2			
153017	19	0.42	91	9	0.38	51	<2	830	3800	11	27	22	13	24	12			
153018	9	0.50	20	15	0.05	5	24	900	2800	12	23	110	2	53	29			
153019	4	0.06	22	<4	0.13	12	4	420	610	6	17	11	5	21	7			
153020	2	<0.05	14	<4	0.14	<4	3	660	280	3	20	9	4	13	6			
153021	2	<0.05	51	<4	0.11	<4	5	530	200	10	22	14	3	20	6			
153022	6	0.15	270	<4	1.2	<4	7	170	200	2	11	16	2	22	5			
153023	47	0.60	330	<4	0.41	<4	2	820	1200	15	<2	110	1	44	38			
153024	110	1.5	570	<4	0.39	<4	58	460	760	14	14	82	4	190	32			
153025	16	0.99	1890	4	0.11	14	61	370	4200	27	14	240	27	90	22			
153026	23	1.3	440	<4	0.63	<4	62	610	2400	19	12	130	19	86	3			
153027	60	2.5	750	<4	0.76	<4	96	270	2900	25	8	220	9	130	2			
153029	24	0.40	1600	91	0.11	<4	31	110	480	6	28	36	5	96	10			
153030	45	2.2	860	<4	0.76	<4	91	680	2400	32	11	150	25	130	2			
153031	12	0.35	540	<4	0.51	<4	31	150	3100	28	13	240	35	46	3			
153032	50	2.2	1300	<4	0.07	<4	87	500	5100	20	9	210	25	190	<2			
153033	42	1.5	380	<4	0.60	<4	37	320	1400	25	28	140	10	180	39			
153034	4	0.07	120	4	0.19	<4	8	120	440	1	5	10	2	34	6			
153035	70	0.26	150	<4	0.31	<4	34	200	780	11	16	58	3	170	23			
153036	62	3.0	1700	<4	0.10	<4	50	630	2400	14	7	140	11	110	3			
153037	31	1.5	2000	<4	0.18	<4	67	1000	4100	25	10	280	8	150	5			
153038	12	0.66	240	<4	0.06	<4	33	99	510	3	7	46	1	99	2			
153039	1	<0.05	12	<4	<0.05	<4	<2	34	62	<1	4	12	1	7	<2			
153040	<1	<0.05	11	<4	<0.05	<4	<2	85	260	<1	4	3	<1	8	<2			
153041	<1	<0.05	49	<4	<0.05	<4	11	600	340	2	10	14	2	16	2			
153042	2	0.08	22	<4	0.08	<4	9	220	710	3	3	21	1	16	2			
153043	5	0.31	30	<4	0.30	9	14	980	2700	14	9	83	5	13	3			
153044	2	0.10	370	<4	0.17	<4	28	1000	290	8	20	120	5	64	<2			
153045	1	0.08	88	<4	<0.05	<4	<2	1200	360	4	8	26	6	2	<2			
153050	1	<0.05	23	<4	<0.05	<4	2	61	85	<1	<2	5	<1	8	2			
153051	1	<0.05	14	<4	<0.05	<4	4	23	89	1	4	11	<1	8	<2			
153052	27	0.89	1000	<4	0.16	<4	98	960	3600	27	8	290	12	120	3			
153053	4	0.08	27	<4	<0.05	<4	8	2200	310	9	15	84	5	11	3			
153054	1	<0.05	<4	<4	<0.05	<4	<2	21	92	<1	4	2	<1	4	3			
153055	2	<0.05	6	<4	<0.05	<4	<2	8	49	<1	3	2	<1	3	<2			
153056	1	<0.05	<4	<4	<0.05	<4	<2	340	64	<1	<2	5	1	3	<2			
153057	30	2.5	680	<4	2.5	<4	46	360	2000	27	9	210	9	72	3			

CHEMICAL ANALYSIS--FACER CREEK AREA (continued)

SECTION 3 OF 3

NO SAMPLE NUMBER	WILLARD QUADRANGLE		
	K (%)	SR (PPM)	CE (PPM)
152999	0.05	1	<10
152999	1.2	37	30
153000	0.36	5	11
153001	1.4	15	<10
153002	1.2	24	25
153003	0.07	3	<10
153004	1.3	68	41
153005	0.05	5	<10
153007	0.44	2	<10
153009	0.13	430	20
153010	0.03	91	<10
153011	2.9	30	13
153012	0.06	31	<10
153013	0.06	10	<10
153014	0.21	2	10
153015	0.57	2	11
153016	2.6	13	10
153017	3.8	12	190
153018	4.6	5	16
153019	4.9	15	61
153020	5.0	11	49
153021	4.5	18	120
153022	0.38	16	21
153023	2.1	110	<10
153024	1.7	44	32
153025	1.2	34	54
153026	1.3	54	95
153027	0.99	50	54
153029	0.91	20	62
153030	1.2	120	89
153031	1.8	130	79
153032	0.73	21	41
153033	2.4	120	190
153034	0.69	23	13
153035	1.4	34	10
153036	0.90	23	60
153037	1.0	37	53
153038	0.98	8	12
153039	0.06	2	13
153040	0.23	3	<10
153041	0.28	5	24
153042	0.84	5	11
153043	3.0	15	47
153044	0.54	13	15
153045	0.44	16	75
153050	0.10	2	<10
153051	0.15	2	<10
153052	1.5	33	48
153053	1.0	18	32
153054	0.09	8	10
153055	0.10	2	<10
153056	0.14	160	19
153057	0.74	28	52

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CHEMICAL ANALYSIS--LITTLE WILLOW FORMATION (continued)

LITTLE WILLOW QUADRANGLE										SECTION 1 OF 3					
OP SAMPLE NUMBER	D. O. ST	E. LAT	SAMPLE LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	AL (%)	9 (PPM)	BA (PPM)	BE (PPM)	CA (%)	CO (PPM)	CR (PPM)	CU (PPM)	FE (%)
152683	40-40.592	-111.790	-3-92-A		0.53	0.20	0.43	<10	34	<1	0.05	<4	2	3	0.28
152684	40-40.592	-111.790	-3-92-B		1.6	1.9	8.2	<10	1100	2	0.37	5	33	18	1.2
152685	40-40.590	-111.784	-3-92-		2.9	4.7	5.7	<10	580	2	0.18	8	41	33	1.4
152686	40-40.591	-111.783	-3-92-		2.6	2.0	6.3	<10	640	<1	0.41	7	4	21	1.9
152687	40-40.591	-111.782	-3-92-		7.0	7.0	5.0	<10	460	2	<0.35	12	99	52	1.8
152688	40-40.591	-111.782	-3-92-		0.90	1.4	6.9	<10	680	1	0.46	6	4	99	1.3
152689	40-40.591	-111.781	-3-92-		5.4	11.	5.1	<10	300	1	0.38	12	300	82	1.8
152690	40-40.591	-111.781	-3-92-		1.8	2.0	7.5	<10	790	1	0.60	13	24	2	4.0
152691	40-40.591	-111.779	-3-92-		1.3	1.8	5.2	<10	610	1	0.27	5	4	6	1.3
152692	40-40.591	-111.779	-3-92-		0.82	0.60	2.1	<10	15	1	2.7	63	1600	<2	7.1
152693	40-40.594	-111.781	-3-92-		5.9	7.1	5.7	<10	910	2	0.25	11	92	14	2.4
152694	40-40.594	-111.783	-3-92-		3.8	3.7	2.7	<10	360	1	0.06	11	26	61	1.4
152695	40-40.593	-111.784	-3-92-		4.4	5.8	3.4	<10	250	1	<0.95	12	69	18	1.7
152696	40-40.592	-111.787	-3-92-		11.	12.	5.7	<10	640	1	0.07	36	80	270	4.9
152697	40-40.586	-111.789	-3-92-		0.58	0.60	7.3	<10	570	1	0.47	<4	10	4	1.0
152698	40-40.584	-111.787	-3-92-		0.67	1.7	6.7	<10	230	<1	0.40	<4	3	5	1.4
152699	40-40.584	-111.786	-3-92-A		1.4	1.0	4.9	<10	1700	1	<0.05	<4	13	3	0.35
152701	40-40.580	-111.782	-3-92-		2.4	3.7	5.6	<10	1000	3	0.18	<4	3	25	1.4
152702	40-40.584	-111.778	-3-92-		0.48	1.3	5.1	<10	900	3	0.23	<4	1	5	0.81
152703	40-40.585	-111.779	-3-92-		2.0	2.8	5.1	<10	46	1	0.24	<4	2	<2	0.17
152704	40-40.587	-111.779	-3-92-		3.5	4.7	5.3	<10	370	1	0.23	8	5	20	2.0
152705	40-40.587	-111.779	-3-92-		1.9	0.50	5.4	<10	320	1	0.21	<4	3	6	0.76
152706	40-40.588	-111.784	-3-92-		0.74	0.60	6.6	<10	60	1	6.1	38	84	38	8.1
152707	40-40.587	-111.786	-3-92-		2.5	1.5	8.2	<10	1400	1	0.75	<4	7	7	1.6
152708	40-40.588	-111.787	-3-92-		2.5	1.5	5.8	<10	540	1	1.3	11	3	13	2.4
152709	40-40.588	-111.787	-3-92-		0.59	0.80	6.2	<10	420	2	0.06	<4	20	<2	1.4
152710	40-40.589	-111.788	-3-92-		3.5	3.7	3.0	<10	330	1	<0.05	<4	12	15	0.26
152711	40-40.588	-111.787	-3-92-		19.	22.	3.1	<10	150	<1	<0.05	15	33	230	1.2

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CHEMICAL ANALYSIS--LITTLE WILLOW FORMATION (continued)

LITTLE WILLOW QUADRANGLE													SECTION 2 OF 3		
7P SAMPLE NUMBER	LI (PPM)	HG (%)	MN (PPM)	MO (PPM)	NA (%)	NB (PPM)	NI (PPM)	P (PPM)	TI (PPM)	SC (PPM)	TH (PPM)	V (PPM)	Y (PPM)	ZN (PPM)	ZR (PPM)
152693	1	<0.05	8	<4	0.10	<4	3	79	57	<1	<2	2	1	5	<2
152694	4	1.42	90	<4	0.45	7	16	42	1400	3	7	36	1	40	<2
152695	6	0.47	110	<4	0.30	5	16	230	1600	5	13	42	2	32	4
152696	11	0.94	290	<4	3.6	14	9	440	2000	3	11	31	4	48	4
152697	3	0.35	140	<4	0.12	9	19	160	2200	4	25	24	5	17	6
152698	11	0.55	290	<4	4.0	5	<2	190	970	2	8	16	4	36	<2
152699	6	0.32	210	<4	0.09	9	25	450	3700	5	69	37	4	20	7
152699	18	1.9	690	<4	0.84	<4	24	890	3600	8	9	75	11	110	<2
152691	8	0.56	200	<4	3.3	11	5	94	790	1	4	13	2	27	3
152692	9	3.9	1300	<4	0.36	<4	520	230	3100	9	<2	84	9	120	9
152693	12	1.0	420	<4	0.44	<4	30	340	2900	10	15	52	5	48	<2
152694	4	0.23	130	<4	0.53	9	16	61	590	2	17	14	2	21	5
152695	6	0.37	130	<4	0.93	11	30	110	1300	3	40	22	3	19	7
152696	13	1.1	260	8	0.13	14	50	660	3500	16	12	110	3	220	7
152697	5	0.55	190	<4	3.8	<4	8	200	1000	2	4	13	1	25	<2
152698	5	0.63	180	<4	4.2	<4	4	270	660	1	6	17	2	36	<2
152699	2	0.12	21	<4	0.48	4	4	53	530	1	4	12	1	8	<2
152701	7	0.34	250	<4	2.5	16	5	310	960	3	15	16	7	21	5
152702	8	0.68	230	<4	3.9	9	4	96	600	1	<2	8	<1	16	2
152703	2	<0.05	66	4	4.3	7	3	100	58	<1	6	2	1	3	2
152704	12	0.69	330	<4	2.9	9	4	280	1200	5	12	24	2	26	4
152705	7	0.41	110	5	3.2	<4	4	110	300	1	<2	11	<1	15	<2
152706	8	4.5	1600	<4	2.3	<4	99	230	4400	29	5	240	11	130	<2
152707	9	0.58	260	<4	3.6	5	4	350	1500	2	17	19	8	37	2
152708	10	0.71	400	<4	3.0	6	4	330	1700	5	10	28	7	37	5
152709	3	0.33	58	<4	0.17	4	8	280	1500	5	5	48	1	17	<2
152710	3	0.09	24	<4	0.47	7	3	35	450	1	10	5	1	5	2
152711	6	0.23	25	<4	0.10	7	17	180	2200	4	55	26	5	31	8

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CHEMICAL ANALYSIS--LITTLE WILLOW FORMATION (continued)

SECTION 3 OF 3

LITTLE WILLOW QUADRANGLE			
DP SAMPLE NUMBER	K (%)	SR (PPM)	CE (PPM)
152683	0.14	5	<10
152684	2.6	32	12
152685	2.0	24	40
152686	0.97	110	20
152687	2.4	21	58
152688	0.00	130	47
152689	1.8	21	94
152690	2.8	86	61
152691	0.98	150	<10
152692	0.05	10	52
152693	2.0	43	62
152694	1.7	29	36
152695	1.8	14	48
152696	3.3	74	32
152697	0.72	140	<10
152698	0.22	160	40
152699	3.1	37	22
152701	2.0	230	79
152702	0.70	190	<10
152703	0.18	93	<10
152704	0.97	140	27
152705	0.44	71	<10
152706	0.18	120	13
152707	0.77	140	110
152708	0.62	220	41
152709	2.2	28	14
152710	1.9	50	17
152711	1.6	14	53

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CHEMICAL ANALYSIS--ANTELOPE ISLAND (continued)

ANTELOPE ISLAND QUADRANGLE										SECTION 1 OF 3						
OR SAMPLE	C. O. F.	SAMPLE	NUMBER													
NUMBER	ST	LAT	LONG	I. TY	REP	U	U-NT	AL	9	BA	BE	CA	CC	CR	CU	FE
						(PPM)	(PPM)	(%)	(PPM)	(PPM)	(PPM)	(%)	(PPM)	(PPM)	(PPM)	(%)
153065	40-40.952	-112.234	-3-92-			1.7	4.0	5.5	<10	1600	3	0.75	<4	2	6	3.3
153067	40-40.953	-112.232	-3-92-			2.9	5.0	4.7	<10	1300	2	0.64	<4	8	10	2.5
153068	40-40.952	-112.226	-3-92-			21.	25.	5.4	<10	1700	4	0.45	<4	5	10	2.4
153069	40-40.952	-112.223	-3-92-			1.4	4.5	5.7	<10	1400	3	1.0	<4	3	8	4.7
153070	40-40.954	-112.218	-3-92-			5.7	10.	8.2	<10	1800	3	0.08	6	2	2	4.5
153071	40-40.954	-112.218	-3-92-			66.	76.	7.8	<10	2300	7	0.05	5	2	6	3.9
153072	40-40.955	-112.216	-3-92-			1.7	5.0	11.	<10	690	4	0.20	22	160	<2	5.5
153073	40-40.956	-112.213	-3-92-			2.2	4.1	6.2	<10	1700	4	0.41	<4	9	6	3.9
153074	40-40.954	-112.213	-3-92-			4.0	5.2	6.0	<10	1300	5	1.2	<4	3	10	4.0
153075	40-40.959	-112.213	-3-92-			8.3	10.	5.8	<10	1400	3	0.22	<4	2	5	2.4
153076	40-40.961	-112.214	-3-92-			6.0	9.8	5.8	<10	470	2	0.14	5	23	34	4.6
153077	40-40.956	-112.215	-3-92-A			910.	900.	7.8	<10	180	4	0.24	44	54	110	12.
153078	40-40.956	-112.215	-3-92-B			4300.	4400.	7.1	<10	200	1	0.23	43	61	690	14.
153079	40-40.956	-112.215	-3-92-C			1100.	1200.	7.5	<10	190	2	0.39	35	44	350	10.
153080	40-40.952	-112.193	-3-92-			82.	56.	3.9	<10	150	1	0.11	<4	<1	6	32.
153081	40-40.923	-112.225	-3-92-			4.5	4.6	5.7	<10	1500	4	0.73	<4	11	8	3.3
153082	40-40.924	-112.214	-3-92-			0.74	3.1	6.4	10	1200	6	0.61	<4	13	10	4.5
153083	40-40.926	-112.209	-3-92-			2.1	3.9	5.7	<10	1500	3	0.82	<4	11	7	3.6
153084	40-40.925	-112.203	-3-92-			1.5	4.0	5.6	<10	900	5	0.99	<4	11	9	4.5
153085	40-40.923	-112.194	-3-92-			2.6	5.7	8.3	<10	100	2	0.23	8	13	6	5.5
153086	40-40.913	-112.197	-3-92-			18.	21.	6.4	<10	380	1	0.87	19	100	49	3.9
153087	40-40.899	-112.194	-3-92-			1.7	3.9	5.2	<10	1300	4	1.5	4	7	19	6.9
153088	40-40.896	-112.196	-3-92-			12.	14.	6.8	<10	1800	2	0.36	<4	3	8	2.0
153089	40-40.893	-112.194	-3-92-			8.5	8.8	7.0	<10	1300	3	0.61	<4	3	3	1.7
153090	40-40.883	-112.192	-3-92-			2.8	5.9	6.1	<10	930	5	0.97	5	3	81	3.1
153091	40-40.882	-112.193	-3-92-			2.5	3.9	5.8	<10	930	4	1.0	<4	19	30	2.0
153092	40-40.876	-112.182	-3-92-			2.1	3.8	5.8	<10	1100	4	1.1	<4	3	15	4.0
153093	40-40.871	-112.184	-3-92-			5.1	5.1	6.0	<10	120	3	0.12	<4	1	10	0.68
153094	40-40.864	-112.183	-3-92-			3.8	8.4	11.	<10	910	2	0.74	25	240	28	5.1
153095	40-40.862	-112.183	-3-92-			4.9	7.9	6.7	<10	1300	2	0.81	<4	3	3	2.1
153096	40-40.861	-112.182	-3-92-			6.8	11.	6.7	<10	920	2	0.93	<4	11	3	2.0

CHEMICAL ANALYSIS--ANTELOPE ISLAND (continued)

DR SAMPLE NUMBER	ANTELOPE ISLAND QUADRANGLE										SECTION 2 OF 3				
	II (PPM)	MG (%)	MN (PPM)	MO (PPM)	NA (%)	NB (PPM)	NI (PPM)	P (PPM)	TI (PPM)	SC (PPM)	TH (PPM)	V (PPM)	Y (PPM)	ZN (PPM)	ZR (PPM)
153065	1	0.05	760	<4	1.9	24	<2	200	1600	5	26	2	100	160	7
153067	7	0.29	600	<4	1.6	26	8	450	1100	4	23	9	63	190	9
153068	2	0.08	600	<4	2.0	36	2	170	1300	5	27	4	97	170	16
153069	5	0.18	1100	<4	2.1	39	2	730	3000	9	26	8	97	130	13
153070	16	1.8	450	<4	0.18	44	2	350	1900	7	20	37	31	85	120
153071	8	0.94	340	<4	0.18	35	3	370	810	7	52	28	56	56	180
153072	27	1.9	330	<4	1.6	<4	70	280	3500	37	3	160	11	87	14
153073	5	0.23	700	4	1.7	49	3	420	2000	9	25	10	130	96	14
153074	7	0.20	880	<4	2.0	44	2	590	2600	8	22	9	110	130	12
153075	7	0.34	390	<4	1.9	35	<2	410	1100	7	25	10	67	46	37
153076	19	1.1	550	<4	2.2	38	13	480	2300	8	62	31	26	100	44
153077	44	4.4	2100	<4	1.4	<4	72	730	7400	33	7	530	89	260	28
153078	45	4.4	3200	<4	0.90	<4	70	690	8500	43	40	530	170	270	31
153079	35	3.6	1500	<4	1.7	<4	54	580	6200	23	17	410	72	220	32
153080	3	0.09	440	17	1.0	120	2	46	3500	2	220	40	38	180	72
153081	3	0.06	590	<4	1.9	44	<2	240	1700	4	23	4	120	100	20
153082	19	0.20	1300	<4	1.5	39	<2	790	3900	11	11	8	100	160	11
153083	6	0.10	600	<4	2.0	38	<2	380	2300	6	22	6	76	130	9
153084	8	0.28	860	<4	2.5	35	<2	580	3100	9	24	8	100	160	17
153085	32	2.9	530	<4	3.6	39	6	720	2400	10	23	82	32	76	60
153086	25	1.1	540	<4	1.4	20	47	170	4000	12	7	110	20	93	14
153087	7	0.35	1200	<4	1.5	45	4	920	4600	13	31	15	140	170	15
153088	11	0.27	310	<4	2.4	22	<2	430	1700	3	58	17	19	56	34
153089	6	0.21	700	<4	2.6	29	2	380	1500	2	55	16	15	40	38
153090	12	0.56	520	<4	2.2	49	5	780	2400	10	23	9	98	45	19
153091	6	0.35	400	<4	2.1	29	5	270	1100	5	11	25	61	50	8
153092	11	0.23	1000	<4	1.8	44	2	600	2400	9	24	7	110	190	8
153093	5	0.31	160	<4	4.8	57	2	170	250	1	5	3	15	22	3
153094	19	2.2	540	<4	1.4	4	100	290	5400	22	19	180	21	94	4
153095	3	0.05	100	<4	1.7	<4	<2	190	1300	5	200	9	25	54	20
153096	8	0.32	150	<4	1.8	22	2	150	1900	7	210	9	32	49	23

CHEMICAL ANALYSIS--ANTELOPE ISLAND
(continued)

SECTION 3 OF 3

OR SAMPLE NUMBER	ANTELOPE K (%)	ISLAND SR (PPM)	QUADRANGLE CE (PPM)
153065	3.2	50	260
153067	2.7	90	160
153068	3.1	43	230
153069	2.7	77	220
153070	5.4	21	420
153071	6.0	23	160
153072	3.3	30	50
153073	3.5	64	230
153074	2.5	78	200
153075	2.9	57	230
153076	1.7	32	230
153077	0.79	32	29
153078	0.58	40	150
153079	0.84	51	31
153080	2.5	10	<10
153081	3.1	64	250
153082	3.2	78	150
153083	2.6	100	210
153084	1.6	140	220
153085	0.87	15	190
153086	1.5	100	54
153087	2.0	93	310
153088	1.0	73	250
153089	3.2	130	150
153090	2.6	100	200
153091	2.6	110	90
153092	2.3	93	200
153093	0.38	26	15
153094	2.6	100	130
153095	3.5	120	1400
153096	3.0	130	1600

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EXPLANATION

PHANEROZOIC ROCKS

Tg	Tertiary gravels
Tbp	Browns Park Formation
Tu	Tertiary rocks
Ku	Cretaceous rocks
Ju	Jurassic rocks
Jru	Jurassic and Triassic rocks
Pu	Pennsylvanian rocks
Mu	Mississippian rocks
Cu	Cambrian rocks

PRECAMBRIAN ROCKS

Unita Mountain Group

Yug

Red Creek Quartzite

ru
ruq rup rumq rmp rlmq rlp rlq rm

ru - Red Creek Quartzite undivided
ruq - upper quartzite
rup - upper pelite
rumq - upper middle quartzite
rmp - middle pelite
rlmq - lower middle quartzite
rlp - lower pelite
rlq - lower quartzite
rm - quartz-mylonite

O-Wi-Yu-Kuts Complex

oc

Granitic and quartzofeldspathic gneisses

Epidiorite

epi

Epidiorite of uncertain age

SYMBOLS

- Thrust fault, teeth on up-thrown side
- Fault
- Contact
- Anticline
- Overturned anticline

SCALE 1:48,000

GEOLOGIC MAP OF RED CREEK QUARTZITE UTAH AND COLORADO

Geology: Hansen, 1965
Graft, Sears and Holden,
this report

Location of Plate I

- NOTES:
- All contacts are approximately located.
 - Amphibolites, intruded at ~1.6 by.b.p., are not shown.

— E X P L A N A T I O N —

	Quaternary deposits		Faults, approximately located dashed where covered. Thrust faults, teeth on up-thrown side.
	Quaternary deposits and Tertiary rocks		
	Tertiary rocks		Contacts, approximately located.
	Mesozoic rocks		
	Paleozoic rocks		Precambrian shear zone.
	Precambrian Z metasedimentary rocks		
	Precambrian Y Big Cottonwood Formation		
	Precambrian X Formation of Facer Creek		
	Precambrian X? Little Willow Formation		
	Precambrian X? Antelope Island gneisses		
	Precambrian W Farmington Canyon Complex		

GEOLOGY —
Modified from Stokes, 1963; Sorensen and Crittenden, 1976;
Graff, Sears and Holden, this report

*GEOLOGY OF THE SESSIONS
MOUNTAINS AREA*

EXPLANATION

- Q Quaternary deposits.
- T Tertiary and Quaternary units.
- P Other Phanerozoic rocks.

PRECAMBRIAN ROCKS

- Ap Pegmatite. Simple quartz-feldspar pegmatites.
- Asp Schist and pegmatite. Biotite, biotite-sillimanite and biotite-sillimanite-garnet schists and gneisses. Simple, white quartz-feldspar pegmatites.
- Aqs Quartzite and schist. Chiefly white, recrystallized quartzite with mica partings. Lesser amounts of biotite and biotite-sillimanite schists and gneisses.
- As Schist. Biotite and biotite-sillimanite schists and gneisses. Occasional quartzite layers, amphibolite lenses and dikes, and pegmatite dikes and sills.

- Fault, location approximate, dashed where covered or inferred.
- - - Contact, location approximate, dashed where covered or inferred.
- Dip and strike of bedding (rarely preserved); foliation or compositional layering, with bearing and plunge of lineation.

GEOLOGY: Bryant, 1979; Gruff, Sears and Holden, this report.

GEOCHEMICAL PLOTS
SESSIONS MOUNTAINS AREA
FARMINGTON CANYON COMPLEX

SCALE 1:24000
76 Samples plotted

GEOLOGY OF THE FACER CREEK AREA, UTAH

— EXPLANATION —

- Quaternary units
- Paleozoic rocks

PRECAMBRIAN ROCKS

- Precambrian Z rocks. Quartzites, feldspathic quartzites, volcanic breccias and conglomerates, siltstones, argillites, conglomerates, diamictites (boulder conglomerates), and purple slates.
- Precambrian X quartzites of Facer Creek. White, medium-grained, recrystallized, massive quartzites with lesser amounts of quartz-mica schists.
- Precambrian W Farmington Canyon Complex.

- Faults. Locations approximate, dashed where covered or inferred.
- Thrust faults. Locations approximate, dashed where covered or inferred. Teeth on the up-thrown side.
- Contacts. Locations approximate, dashed where covered or inferred.

Geology by:
Regional geology and cross-section generalized from
Sorensen and Crittenden, 1976; Graff, Sears, and
Holden, this report.

URANIUM PLOT

THORIUM PLOT

DATA FOR UNLABELED SAMPLE POINTS

CONC.	NUMBER	LAT.	LONG.
3.00	153001	41° 23'	111° 58'
8.00	153015	41° 25'	111° 59'
20.00	153020	41° 25'	111° 58'
13.00	153031	41° 24'	111° 59'
9.00	153032	41° 24'	111° 59'
28.00	153033	41° 24'	111° 59'
7.00	153038	41° 23'	111° 59'
10.00	153041	41° 25'	111° 60'
9.00	153043	41° 25'	111° 60'
20.00	153044	41° 25'	111° 60'
8.00	153045	41° 25'	111° 60'

Thorium

DATA FOR UNLABELED SAMPLE POINTS

CONC.	NUMBER	LAT.	LONG.
1.00	1530J1	41° 23'	111° 58'
0.60	153015	41° 25'	111° 59'
5.0	153020	41° 25'	111° 58'
4.10	153031	41° 24'	111° 59'
3.20	153032	41° 24'	111° 59'
55.70	153033	41° 24'	111° 59'
1.40	153038	41° 23'	111° 59'
1.70	153041	41° 25'	111° 60'
4.50	153043	41° 25'	111° 60'
8.20	153044	41° 25'	111° 60'
1.40	153045	41° 25'	111° 60'

Uranium

GEOCHEMICAL PLOTS FACER CREEK AREA

53 Samples plotted

RECONNAISSANCE GEOLOGIC MAP

OF ANTELOPE ISLAND,

GREAT SALT LAKE

ROCK UNITS

Quaternary deposits

Tertiary Wasatch Formation rubble

Precambrian Z and younger rocks

Precambrian granite gneiss with small bodies of pegmatite

Precambrian granite gneiss, pegmatite, amphibolite and other sheared and retrogressively metamorphosed gneisses and schists. Shearing occurs in discrete zones that are locally at high angles to the major shearzone seen in unit PCg.

Precambrian granite gneiss and metasediments which have been strongly sheared. Shear zone contains the only sillimanite-bearing rocks found during this brief reconnaissance.

Precambrian granite gneiss. Quartzofeldspathic gneiss with small "sweat" pegmatite veins, granitic textures, and locally contains pyroxene. Contains small amphibolite dikes and pods a few centimeters to a few meters thick

SCALE 1:48000

NOTES—

Locations of faults and contacts are approximate.

GA-1—GA-29 are sample locations.

Geology by Larsen, 1957; Bryant and Graff, 1980; and Graff, Sears and Holden, this report.

Location of Plate 5

DATA FOR UNLABELED SAMPLE POINTS

CONC.	NUMBER	LAT.	LONG.
36.00	152684	40° 36'	111° 47'
24.00	152687	40° 35'	111° 47'
16.00	152688	40° 35'	111° 47'
37.00	152689	40° 35'	111° 47'
75.00	152690	40° 35'	111° 47'
84.00	152692	40° 35'	111° 47'
112.00	152696	40° 36'	111° 47'
12.00	152699	40° 35'	111° 47'
11.00	152705	40° 35'	111° 47'
238.00	152706	40° 35'	111° 47'
48.00	152709	40° 35'	111° 47'
26.00	152711	40° 35'	111° 47'

Vanadium

DATA FOR UNLABELED SAMPLE POINTS

CONC.	NUMBER	LAT.	LONG.
7.00	152684	40° 36'	111° 47'
25.00	152687	40° 35'	111° 47'
8.00	152688	40° 35'	111° 47'
69.00	152689	40° 35'	111° 47'
9.00	152690	40° 35'	111° 47'
< 2.00	152692	40° 35'	111° 47'
12.00	152696	40° 36'	111° 47'
4.00	152699	40° 35'	111° 47'
< 2.00	152705	40° 35'	111° 47'
5.00	152706	40° 35'	111° 47'
5.00	152709	40° 35'	111° 47'
55.00	152711	40° 35'	111° 47'

Thorium

DATA FOR UNLABELED SAMPLE POINTS

CONC.	NUMBER	LAT.	LONG.
1.90	152684	40° 36'	111° 47'
7.00	152687	40° 35'	111° 47'
1.40	152688	40° 35'	111° 47'
10.60	152689	40° 35'	111° 47'
2.00	152690	40° 35'	111° 47'
0.60	152692	40° 35'	111° 47'
12.00	152696	40° 36'	111° 47'
1.00	152699	40° 35'	111° 47'
0.50	152705	40° 35'	111° 47'
0.60	152706	40° 35'	111° 47'
0.80	152709	40° 35'	111° 47'
21.50	152711	40° 35'	111° 47'

Uranium

**GEOCHEMICAL PLOTS
LITTLE WILLOW
FORMATION**