

Appendix 3.5. Analytical Techniques And Laboratories

A-3.5.1. Heavy Mineral Concentrates 1985, 1986 and 1987

The heavy mineral concentrates from the pebbly sand samples were analysed by Instrumental Neutron Activation (INAA) at Bondar-Clegg for the following elements:

1) Ag, As, Au, Ba, Cr, Ce, Co, Cs, Eu, Fe, Hf, Ir, La, Lu, Mo, Na, Ni, Rb, Sb, Sc, Se, Sm, Sn, Ta, Tb, Te, Th, U, W, Yb, Zn, Zr

2) Ba also by AAS at Bondar-Clegg in 1985 only

Detection limits for W in some 1987 samples are extremely high and variable compared with 1986. This occurs in samples where a high abundance of radioactive elements are found.

Table A-3.5.1(i) Detection Limits for INAA/AAS Analyses on Heavy Mineral Concentrates

Element	Units	Method	Detection Limit
Ag	ppm	INAA	5
As	ppm	INAA	1
Au	ppb	INAA	5
Ba	ppm	INAA	100
Ba	%	INAA	0.1 (1987)
Ba	%	AAS	0.01 (1985)
Br	ppm	INAA	5
Cd	ppm	INAA	10
Ce	ppm	INAA	10
Co	ppm	INAA	10
Cr	ppm	INAA	50
Cs	ppm	INAA	1
Eu	ppm	INAA	2
Fe	%	INAA	0.5
Hf	ppm	INAA	2
Ir	ppb	INAA	100
La	ppm	INAA	5
Lu	ppm	INAA	0.5
Mo	ppm	INAA	2
Na	%	INAA	0.05
Ni	ppm	INAA	50
Rb	ppm	INAA	10
Sb	ppm	INAA	0.2
Sc	ppm	INAA	0.5
Se	ppm	INAA	10
Sm	ppm	INAA	0.1
Sn	ppm	INAA	200
Ta	ppm	INAA	1
Tb	ppm	INAA	1
Te	ppm	INAA	20
Th	ppm	INAA	0.5
U	ppm	INAA	0.5

W	ppm	INAA	2
Yb	ppm	INAA	5
Zn	ppm	INAA	200
Zr	ppm	INAA	500
Mass	g	INAA	0.01

A-3.5.2. Stream Silts 1985, 1986 and 1987

The stream silts were analysed by several methods:

1) Instrumental Neutron Activation Analysis (INAA)

2) Inductively Coupled Plasma-Emission Spectrometry (ICP-ES)

3) Direct Current Plasma-Emission Spectrometry (DCP-ES)

4) Direct Current Arc-Emission Spectrometry (DCARC-ES)

5) Atomic Absorption Spectrometry (AAS) - hydride generation, graphite furnace, silica tube, airacetylene, cold vapour

6) X-Ray Fluorescence using pressed pellet (XRF)

7) Ion Selective Electrodes (ISE)

8) Gravimetric methods (GRAV)

A record of elements, technique and laboratory listed by year follows:

1985 Silt Samples

1) Ba, Co, Cr, Cu, Mo, Ni, W, Zn, Fe₂O₃(t), MnO, TiO₂ by ICP-ES at the Geological Survey of Canada (GSC)

2) Ag, Au (graphite furnace AAS), Cd, Co, Cu, Ni, Pb, Zn, by AAS at GSC

3) As, Sb, Se by hydride AAS at GSC

3) Sn by DCARC-ES at Xray Assay Laboratories (XRAL)

4) Th, U by INAA at XRAL

Table A-3.5.2(i) Detection Limits for 1985 Silt Analyses

Element	Units	Method	Detection Limit
Ba	ppm	ICP-ES	20
Co	ppm	ICP-ES	5

Cr	ppb	ICP-ES	10
Cu	ppm	ICP-ES	10
Mo	ppm	ICP-ES	0.4
Ni	ppm	ICP-ES	10
W	ppm	ICP-ES	1
Zn	ppm	ICP-ES	5
Fe ₂ O ₃ (t)	%	ICP-ES	0.1
MnO	%	ICP-ES	0.01
TiO ₂	%	ICP-ES	0.02
Ag	ppm	AAS	0.2
Au	ppb	GF-AAS	1.0
Cd	ppm	AAS	0.2
Co	ppm	AAS	2
Cu	ppb	AAS	2
Ni	ppm	AAS	2
Pb	ppm	AAS	2
Zn	ppm	AAS	2
As	ppm	Hyd-AAS	0.5
Sb	ppm	Hyd-AAS	0.5
Se	ppm	Hyd-AAS	0.5
Sn	ppm	DCARC-ES	3
Th	ppm	INAA	0.1
U	ppm	INAA	0.5

1986 Silt Samples:

1) Ag, As, Au, Ba, Cr, Cr, Ce, Co, Cr, Cs, Eu, Fe, Hf, Ir, La, Lu, Mo, Na, Ni, Rb, Sb, Sc, Se, Sm, Sn, Ta, Tb, Te, Th, U, W, Yb, Zn, Zr by INAA at Bondar-Clegg

2) Fe₂O₃(t), MnO, TiO₂, Ba, Be, Cd, Co, Cr, Cu, La, Ni, Pb, Sr, V, Yb, Zn by ICP-ES at GSC

3) As, Bi, Sb, Se, Te by hydride generation AAS at GSC

4) Nb, Rb, Sn, Th, U by XRF pellet at XRAL

Table A-3.5.2(ii) Detection limits for 1986 silt analyses

Element	Units	Method	Detection Limit
Ag	ppm	INAA	5
As	ppm	INAA	1
Au	ppb	INAA	5
Ba	ppm	INAA	100
Br	ppm	INAA	1
Cd	ppm	INAA	10
Ce	ppm	INAA	10
Co	ppm	INAA	10
Cr	ppm	INAA	50
Cs	ppm	INAA	1
Eu	ppm	INAA	2
Fe	%	INAA	0.5
Hf	ppm	INAA	2
Ir	ppb	INAA	100
La	ppm	INAA	5

Lu	ppm	INAA	0.5
Mo	ppm	INAA	2
Na	%	INAA	0.05
Ni	ppm	INAA	50
Rb	ppm	INAA	10
Sb	ppm	INAA	0.2
Sc	ppm	INAA	0.5
Se	ppm	INAA	10
Sm	ppm	INAA	0.1
Sn	ppm	INAA	200
Ta	ppm	INAA	1
Tb	ppm	INAA	1
Te	ppm	INAA	20
Th	ppm	INAA	0.5
U	ppm	INAA	0.5
W	ppm	INAA	2
Yb	ppm	INAA	5
Zn	ppm	INAA	200
Zr	ppm	INAA	500
Mass	g	INAA	0.01
Fe ₂ O ₃ (t)	%	ICP-ES	0.1
MnO	%	ICP-ES	0.01
TiO ₂	%	ICP-ES	0.2
Ba	ppm	ICP-ES	20
Be	ppm	ICP-ES	0.5
Cd	ppm	ICP-ES	0.5
Co	ppm	ICP-ES	5
Cr	ppm	ICP-ES	10
Cu	ppm	ICP-ES	10
La	ppm	ICP-ES	10
Ni	ppm	ICP-ES	10
Pb	ppm	ICP-ES	2
Sr	ppm	ICP-ES	1
V	ppm	ICP-ES	5
Yb	ppm	ICP-ES	0.5
Zn	ppm	ICP-ES	5
As	ppm	Hyd-AAS	1.0
Bi	ppm	Hyd-AAS	0.2
Sb	ppm	Hyd-AAS	0.2
Se	ppm	Hyd-AAS	0.2
Te	ppm	Hyd-AAS	0.2
Nb	ppm	XRF	2
Rb	ppm	XRF	2
Sn	ppm	XRF	2
Th	ppm	XRF	2
U	ppm	XRF	2

1987 Silt Samples:

1) Ag, As, Au, Ba, Cr, Cr, Ce, Co, Cr, Cs, Eu, Fe, Hf, Ir, La, Lu, Mo, Na, Ni, Rb, Sb, Sc, Se, Sm, Sn, Ta, Tb, Te, Th, U, W, Yb, Zn, Zr by INAA at Bondar-Clegg

2) Al₂O₃, CaO, Fe₂O₃(t), K₂O, MgO, MnO, Na₂O, P₂O₅, TiO₂, Ag, As, B, Ba, Be, Bi, Cd, Ce, Co, Cr, Cu, Ga, La, Li, Mo, Nb, Ni, Pb, Rb, Sb, Sc, Sn, Sr, Ta, Te, Tl, V, W, Y, Zn, Zr

by ICP-ES at Bondar-Clegg

3) Cd by AAS Se by Hyd-AAS at Bondar-Clegg

4) Nb, Rb, Sn, Th, U by XRF pellet at XRAL

Table A-3.5.2(iii) Detection limits for 1987 silt analyses

Element	Units	Method	Detection Limit
Ag	ppm	INAA	5
As	ppm	INAA	1
Au	ppb	INAA	5
Ba	ppm	INAA	100
Br	ppm	INAA	1
Cd	ppm	INAA	10
Ce	ppm	INAA	10
Co	ppm	INAA	10
Cr	ppm	INAA	50
Cs	ppm	INAA	1
Eu	ppm	INAA	2
Fe	%	INAA	0.5
Hf	ppm	INAA	2
Ir	ppb	INAA	100
La	ppm	INAA	5
Lu	ppm	INAA	0.5
Mo	ppm	INAA	2
Na	%	INAA	0.05
Ni	ppm	INAA	50
Rb	ppm	INAA	10
Sb	ppm	INAA	0.2
Sc	ppm	INAA	0.5
Se	ppm	INAA	10
Sm	ppm	INAA	0.1
Sn	ppm	INAA	200
Ta	ppm	INAA	1
Tb	ppm	INAA	1
Te	ppm	INAA	20
Th	ppm	INAA	0.5
U	ppm	INAA	0.5
W	ppm	INAA	2
Yb	ppm	INAA	5
Zn	ppm	INAA	200
Zr	ppm	INAA	500
Mass	g	INAA	0.01
Al ₂ O ₃	%	ICP-ES	0.001
CaO	%	ICP-ES	0.001
Fe ₂ O ₃ (t)	%	ICP-ES	0.01
K ₂ O	%	ICP-ES	0.001
MgO	%	ICP-ES	0.001
MnO	%	ICP-ES	0.001
Na ₂ O	%	ICP-ES	0.001
P ₂ O ₅	%	ICP-ES	0.002
TiO ₂	%	ICP-ES	0.001
Ag	ppm	ICP-ES	0.2
As	ppm	ICP-ES	5
B	ppm	ICP-ES	2
Ba	ppm	ICP-ES	1

Be	ppm	ICP-ES	0.5
Bi	ppm	ICP-ES	2
Cd	ppm	ICP-ES	1
Ce	ppm	ICP-ES	5
Co	ppm	ICP-ES	1
Cr	ppm	ICP-ES	1
Cu	ppm	ICP-ES	1
Ga	ppm	ICP-ES	2
La	ppm	ICP-ES	1
Li	ppm	ICP-ES	1
Mo	ppm	ICP-ES	1
Nb	ppm	ICP-ES	1
Ni	ppm	ICP-ES	1
Pb	ppm	ICP-ES	2
Rb	ppm	ICP-ES	200
Sb	ppm	ICP-ES	5
Sc	ppm	ICP-ES	1
Sn	ppm	ICP-ES	20
Sr	ppm	ICP-ES	1
Ta	ppm	ICP-ES	10
Te	ppm	ICP-ES	10
Tl	ppm	ICP-ES	10
V	ppm	ICP-ES	1
W	ppm	ICP-ES	10
Y	ppm	ICP-ES	1
Zn	ppm	ICP-ES	1
Zr	ppm	ICP-ES	1
Cd	ppm	AAS	0.2
Se	ppm	Hyd-AAS	0.1

A-3.5.3 Preparation of heavy mineral concentrates (HMC) from bulk stream silt samples

Stream silt samples used in the study were processed as follows. On the shaker table, 209 stream silt samples were passed. Heavy liquid separations were performed on 52 of the HMCs produced by tabling, as listed in Table A-3.2 (i). From 10 of these samples, gold was recuperated with batea. Heavy mineral point counts were conducted on 55 HMCs that were refined using methylene iodide.

Basic methods for preparing HMCs from silts are provided in the text; and illustrated in flow charts (Figs. A-3.5.x(i), (ii), (iii) and (iv)). Further background and minor details are provided here. The problems inherent in preparing fine-grained sediment samples for geochemical and visual analysis requires employment of different laboratory techniques from those used for coarser materials. The behavior of fine-grained sediments in fluids is the root of most of the

problems. It is therefore important to take into consideration the basic properties that effect the behaviour of fine-grained material before designing sample treatment procedures.

Silt stays in suspension longer than sand and is more easily displaced by fluid flow. Examples of the problems this can cause includes loss of sediment during decanting at various stages, poor classification on the shaker table, and poor separation in heavy liquids because of slow settling rates and influence of convection cells in the separatory funnel.

High suction-water (liquid) content, the result of capillary, osmotic, and surface effects, Williams (1979), also has important implications for sample preparation. Fine-grained sediment has a greater surface area which can be wetted. The increased wetted surface results in more liquid being bonded by molecular forces in very thin layers surrounding grains. Also the finely porous aspect of silts increases its effectiveness as a capillary media. These properties create numerous problems. For example, silt is much more difficult to dry (and ironically, more difficult to wet if dry); it is much more difficult to wash clean of heavy liquids, requiring more solvent and taking longer to drain; silt has a tendency to dry in gloms.

Single mineral grain work such as grain extraction, mineral identification, point counting, photography, and manipulation for X-ray, SEM, or microprobe work, is also hampered by the smallness of silt grains. It is difficult to move grains and easy to lose them. They are also more difficult to identify using a microscope.

A positive aspect of fine grained sediments is the reduction of the nugget affect. The more even distribution of gold, or other minerals of interest, means that there is a greater chance of consistent detection. It also means analyses are more precise and less susceptible to the vagaries of one or two grains of gold in the right or wrong split.

It is important to keep all these considerations in mind when devising methodologies for treating fine-grained

sediments. Ignoring them can result in serious inaccuracies in the results.

In sieving, although the sieve may be labelled 177 μm , it is the measure of a side of a square in the mesh. However the diagonal measure of the square is 260 μm , and therefore grains with two axes less or equal to 250 μm can find their way through the sieve. This is true for all sizes of sieves. Most stream silt samples were dry sieved in the initial preparation stage at the Geological Survey of Canada, using 177 μm (80 mesh) stainless steel sieves. At Consorminex, while preparing samples for tabling, the quality of sieving was checked, and in some cases some of the reserved silt material was added to bring the tabled samples to a relatively constant size.

Choice, basic use and adjustment parameters of the shaking table are described in the main text (section 4.2.2). The best separation and richest concentrates were obtained when the feed rate and amount of water introduced with it, were decreased compared with coarser sediments. Decreasing the amount of water used to create the water film over the deck also increases the recuperation of heavies and decreases the amount of fined grained heavies lost relative to the lights. Reducing the stroke length and increasing the speed of the stroke resulted in a better separation (Sivamohan and Forssberg 1985). Adjusting the length and speed of the stroke of deck are, however, tedious tasks requiring a great deal of patience. They should be attempted only with a sample that has a high percentage of heavy minerals. For this study, Consorminex used a fluvial silt sieved at 177 μm from stream sampled in the Grenville province. It was also found that lowering the elevation of the recuperation end of the table improved the separation.

Grain mounts were prepared from silt HMCs that were coned and quartered to produce a 0.25 g split for reference purposes and a <.05 g split for a permanent grain mount. Samples were coned and quartered over a piece of plate glass. Commercial microsplitters were not used because experience has shown that grains remain caught in the splitter. Even if the splitter is carefully cleaned, grains which

could contaminate other samples processed with the splitter, resist being dislodged. The grains were evenly distributed over a thin layer of Araldite 504 on a 1x2" glass slide and finished with a cover slip.

Stream silt heavy minerals were counted on 104 slides prepared as described above, and listed in Table A-3.2(i). A Zeiss stereoscopic microscope in tandem with a petrographic microscope were used to count 300 grains in each slide. Data were entered through a computer keyboard using software developed by Consorminex Inc. The system is preferable to conventional point counters (e.g. Swift Ltd.) because it allows a much greater number of mineral classifications to be used (52 in the current Consorminex Ltd programme as apposed to 12 for most Swift type counters), allows the operator to see entries and make corrections while counting, and records the data on floppy disks. Ten sand HMCs, processed in 1987, had already been counted in this way.

The resulting point counts allow statistical comparison of mineral distributions between silt and sand HMCs at 50 sites representing a wide range of provenance. The ten counts of sand HMCs already reported in Spirito et al. (1988) show significant differences related to provenance.

Gold grains were examined using a stereoscopic microscope and reflected light. Numerous communications among Spirito, Jefferson, Paré and in particular with R.N.W. DiLabio, helped to adapt the "classification of shapes and surface textures for gold grains from tills" developed by DiLabio (1989) to the particular needs of this study as well as other work being conducted by Consorminex Inc. The terms used are aimed at descriptions using the binocular microscope with reflected light. Where suitable, terms were added to the classification to describe grains. Other work being done for clients of Consorminex Inc. in the private sector, served as further examples of gold grains to be described and helped elaborate the descriptive scheme (Table A-3.2 (ii) employed in this study.

Gold grain dimensions, morphology, texture, and Cailleux roundness index were

recorded systematically (Tables A-3.2(iii), (iv) and (v)). A 35mm colour slide photograph was taken of the gold fraction of each sample. Gold grains are stored in microfossil holders at the GSC.

All gold grains were photographed using a Zeiss Stemi SR stereoscopic microscope fitted with a Zeiss MC 63 camera system. Kodak ectachrome tungsten 50 slide film was used.

Nahanni silt HMCs were sent to Bondar and Clegg Ltd., Ottawa for direct irradiation/neutron activation analysis (INAA). Gold (detection limit 5 ppb) + 33 elements (As, Ba, Br, Cd, Ce, Cs, Cr, Co, Eu, Hf, Ir, Fe, La, Lu, Mo, Ni, Ru, Sa, Sb, Sc, Se, Ag, Na, T a, Tb, Th, Sn, W, U, Y, Zn, Zr) were analyzed.

Table A-3.5.3(i) Silt HMC-mag standards for INAA analysis

Sample	HMC-mag equivalent (g)	Split 1 (g)	Split 2 (g)	New Sample number #	Surplus # (g)
86JPW68S	21.1	11.1	10	86JPW188S	
86JPW187S	25.9	10	10	86JPW70S	5.90b
86JPW210S	12.1	6.05	6.05	86JPW263S	
86JPW234S	12.2	6.1	6.1	86JPW16S	
86JPW237S	25.2	10	10	86JPW252S	5.20b
86JPW251S	20.95	10.45	10.5	86JPW236S	
86JPW262S	9.7	4.85	4.85	86JPW211S	
87JPW6S	10.8	5.4	5.4	87JPW235S	
87JPW19S	11.5	5.75	5.75	87JPW42S	
87JPW41S	10.8	5.4	5.4	87JPW20S	

Table A-3.5.3(ii). Sand HMC-mag standards for INAA analysis.

Source-->	HMC-mag	New	Split
sample	(g)	sample #	(g)
86JPW165H ^a	56.2	86-JPW-165-H	9.95
		86-JPW-25-H	6.25
		86-JPW-30-H	9.25
		86-JPW-299-H	9.05
		86-JPW-301-H	9.75
		86-JPW-321-H	5.1
		86-JPW-340-H	6.85
		86-JPW-129-H	8.3

86JPW129H ^b	19.9	86-JPW-129-H	8.3
		86-JPW-2-H	6.8
		86-JPW-12-H	4.8
86JPW96H ^c	22.8	86-JPW-96-H	4.5
		86-JPW-111-H	6.6
		86-JPW-199-H	2.75
		86-JPW-290-H	8.95

^a 3 of 5 INAA polycones used.

^b 2 of 3 INAA polycones used.

^c 2 of 3 INAA polycones used.

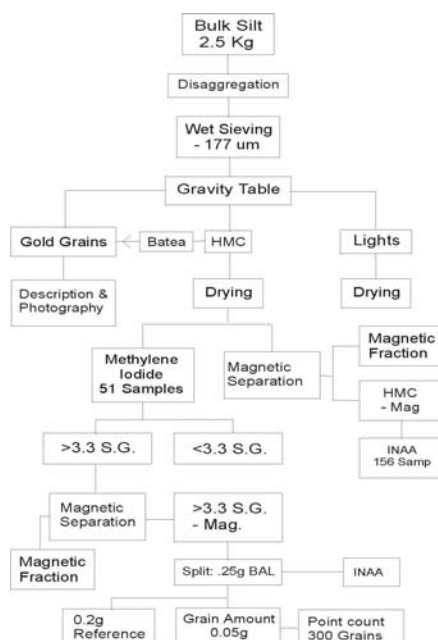


Figure A-3.5.3(i). Procedures used in preparing most HMCs from South Nahanni River silt samples

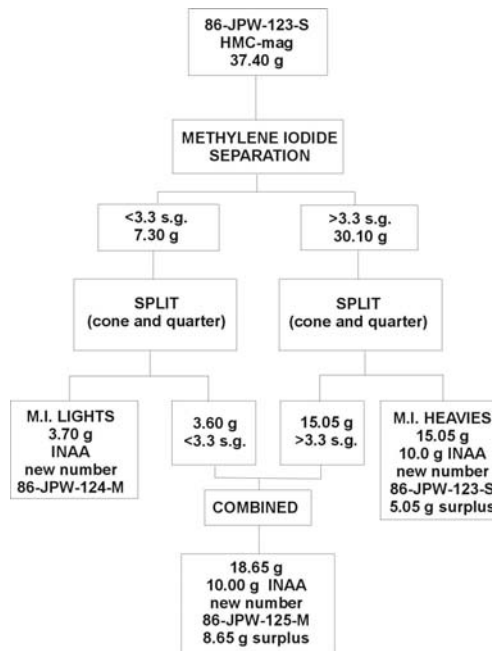


Figure A-3.5.3(ii). Preparation of standards for INAA from 86-JPW-123-S.

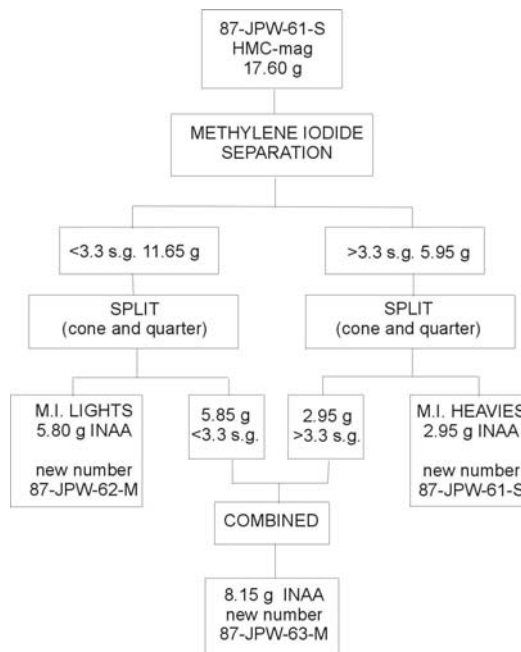


Figure A-3.5.3(iii). Preparation of standards for INAA from 87-JPW-61-S.

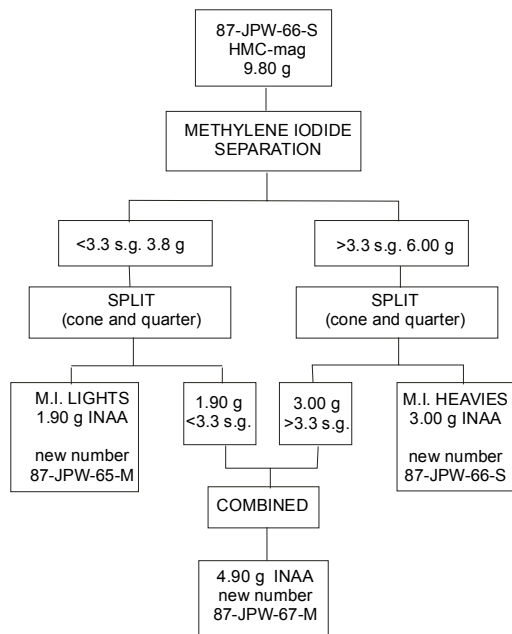


Figure A-3.5.3(iv). Preparation of standards for INAA from 87-JPW-66-S

Split 1: M.I. lights (<3.3 s.g.) new # = 87-JPW-65-M

Split 2: M.I. heavy (>3.3 s.g.) new # = 87-JPW-66-S

Split 3: HMC-mag, new number = 87-JPW-67-M

Table A-3.5.3(iii). HMC processing results from shaking table & methylene iodide (flow chart in Fig. A-3.5(i)).

Sample	Gross Weight (g)	>177 μ m (g)	HMC -mag (g)	>3.3 sg (g)	<3.3 sg (g)	MAG (g)	Lights (g)	Com-ments
85JPB31S	1700	0	2.05	--	--	<0.05	1700	
85JPB34S	375	0	2	--	--	0	375	
85JPB36S	200	0	1.95	--	--	0	200	
85JPB38S	650	0	1.8	--	--	0	650	
85JPB39S	750	0	6.35	--	--	0	750	
86JPW46S	350	0	8.25	0.5	7.75	0.05	350	
86JPW46H	--	--	8.4	1.75	6.65	0	--	
86JPW48S	1900	1659	16.15	--	--	0.05	225	
86JPW50S	1650	1559	16	--	--	0.05	75	
86JPW53S	2050	873	27.05	--	--	0.05	1150	
86JPW55S	3000	1234	16.05	1.7	14.35	0.2	1750	8.75ga
86JPW55H	--	--	2.85	1.85	0.95	0.05	--	
86JPW56S	4425	2622	27.75	--	--	0.2	1775	
86JPW57S	2250	1372	27.95	--	--	0.4	850	
86JPW61S	3100	1454	6.2	0.45	5.75	0.05	1640	
86JPW61H	--	--	8.2	0.6	7.6	0	--	
86JPW67S	3000	2021	4.35	0.05	4.3	<0.05	975	B
86JPW67H	--	--	5.55	0.55	4.95	<0.05	--	
86JPW68S	2575	1254	21.1	0.8	20.25	0.05	1300	E
86JPW68H	--	--	1.55	0.7	0.8	<0.05	--	
86JPW69S	2625	1225	25.45	3.35	22.1	0.05	1375	8.70ga
86JPW69H	--	--	22.7	10.65	12	0.05	--	8.95ga
86JPW72S	1950	1247	27.75	--	--	0.05	675	
86JPW73S	1450	826	24.35	2.7	21.65	0.05	600	7.10ga
86JPW73H	--	--	12.3	5.85	6.4	<0.05	--	6.80ga
86JPW74S	1275	939	11.25	1	10.25	0.05	325	7.10ga
86JPW74H	--	--	12.85	3.2	9.6	0.05	--	6.00ga
87JPW77S	1600	1107	17.75	--	--	0	475	
86JPW79S	2350	1345	5.05	0.1	4.95	0.05	1000	
86JPW79H	--	--	10.85	1.8	9	<0.05	--	
86JPW80S	1950	744	5.7	0.2	5.5	<0.05	1200	
86JPW80H	--	--	12.9	1.05	11.85	0	--	6.00ga
86JPW84S	1700	1028	21.7	1	20.7	0.05	650	8.30ga
86JPW84H	--	--	10	2.3	7.65	<0.05	--	
86JPW85S	1975	905	19.55	--	--	0.6	1050	
86JPW88S	1450	644	30.65	--	--	0.3	775	
86JPW90S	2375	1249	25.8	--	--	0.2	1100	
86JPW96S	1275	963	11.65	--	--	0.05	300	
86JPW105S	700	468	6.65	0.2	6.45	0.05	225	
86JPW105H	--	--	20.95	0.2	20.75	0	--	9.75ga
86JPW113S	2400	1120	30.35	--	--	0	1250	
86JPW116S	2425	1270	28.55	--	--	1.1	1125	
86JPW117S	2725	1531	18.95	--	--	0.1	1175	
86JPW121S	2775	2049	25.55	--	--	0.1	700	
86JPW122S	2275	1586	14.3	--	--	0.1	675	
86JPW123S	2575	1520	37.4	30.1	7.3	4.55	1025	F
86JPW123H	--	--	21.45	17.55	3.85	0.05	--	8.30ga
86JPW124S	2100	1379	21.35	--	--	0.1	700	
86JPW125S	3300	2197	27.9	--	--	7.4	1075	1 VG
86JPW126S	1700	1438	12.1	--	--	0.1	250	

Table A-3.5.3(iii). HMC processing results from shaking table & methylene iodide (flow chart in Fig. A-3.5(i)).

Sample	Gross Weight (g)	>177 μ m (g)	HMC -mag (g)	>3.3 sg (g)	<3.3 sg (g)	MAG (g)	Lights (g)	Com-ments
86JPW127S	5150	3135	28.9	--	--	11.15	1975	
86JPW128S	2950	2529	20.55	--	--	7.15	400	
86JPW129S	13225	--	--	--	--	--	--	test sample
86JPW130S	3125	2298	26.9	--	--	0.35	800	
86JPW131S	2600	1526	23.75	--	--	0.05	1050	
86JPW133S	1600	1366	9.05	0.7	8.35	0.05	225	
86JPW133H	--	--	13.6	1	12.55	<0.05	--	6.60ga
86JPW136S	825	650	25.5	--	--	0	150	
86JPW140S	2625	1898	26.55	--	--	0	700	
86JPW143S	2650	2039	11.5	--	--	0	600	
86JPW145S	2225	1716	8.7	0.25	8.45	<0.05	500	
86JPW145H	--	--	18.7	2.15	16.5	0.05	--	6.05ga
86JPW149S	1475	1154	21.2	--	--	0.05	300	
86JPW159S	1225	838	11.6	--	--	0	375	
86JPW160S	1400	687	12.85	--	--	0.05	700	
86JPW163S	3500	1797	28.2	--	--	0	1675	
86JPW165S	33150	--	6.4	1.1	5.3	0.05	--	test sample
86JPW166S	2375	741	9.05	--	--	0.05	1625	
86JPW167S	3050	2436	14.5	--	--	0	600	
86JPW168S	2825	1462	13	--	--	0	1350	
86JPW169S	2925	2238	12.45	--	--	0	675	
86JPW170S	3125	1787	13.1	--	--	0	1325	
86JPW171S	2250	684	15.9	--	--	0	1550	
86JPW172S	3450	2213	12.3	--	--	0	1225	
86JPW173S	2950	1500	24.75	--	--	0	1425	
86JPW174S	3125	2276	23.85	--	--	0	825	
86JPW175S	1750	1106	18.65	--	--	0	625	
86JPW176S	2775	1216	9.25	--	--	0.05	1550	
86JPW177S	3000	2650	25.35	--	--	0	325	
86JPW178S	2475	1607	18.5	--	--	0.05	850	
86JPW179S	2275	1443	7.85	--	--	0.05	825	
86JPW180S	3000	1974	25.55	--	--	0	1000	
86JPW181S	2800	2138	12.5	--	--	0	650	
86JPW182S	2250	1333	16.95	--	--	0	900	
86JPW183S	3000	1763	11.65	--	--	0	1225	
86JPW184S	2725	2183	15.6	--	--	0.05	525	
86JPW185S	2625	1433	17.35	--	--	0.05	1175	
86JPW186S	2475	1554	20.6	--	--	0	900	
86JPW187S	4025	2349	25.9	4.05	21.85	0.05	1650	E
86JPW187H	--	--	32.9	16.85	16	<0.05	--	9.25ga
86JPW188S	2625	1274	26.15	--	--	0.05	1325	
86JPW190S	2450	1463	11.8	--	--	0.05	975	
86JPW191S	2925	1685	14.8	--	--	0	1225	
86JPW192S	2400	1316	8.7	--	--	0.05	1075	
86JPW193S	1950	1191	9.3	--	--	0	750	
86JPW194S	2900	1841	9.1	--	--	0	1050	
86JPW195S	2725	1190	10.1	--	--	0	1525	
86JPW196S	2300	1143	7	--	--	0.05	1150	
86JPW197S	2400	1742	7.85	--	--	0	650	
86JPW198S	1625	1171	3.65	--	--	0	450	

Table A-3.5.3(iii). HMC processing results from shaking table & methylene iodide (flow chart in Fig. A-3.5(i)).

Sample	Gross Weight (g)	>177 μ m (g)	HMC -mag (g)	>3.3 sg (g)	<3.3 sg (g)	MAG (g)	Lights (g)	Com-ments
86JPW199S	2775	1463	11.6	--	--	0	1300	
86JPW200S	2925	1488	11.9	0.45	11.45	<0.05	1425	7.40ga
86JPW200H	--	--	2.85	2	0.85	0	--	
86JPW201S	1900	682	17.85	--	--	0	1200	
86JPW203S	2875	1263	12.3	--	--	0	1600	
86JPW204S	1700	1317	8	--	--	0.05	375	
86JPW205S	3000	986	14.2	2.75	11.45	0.25	2000	9.00ga
86JPW205H	--	--	14.75	13.5	1.2	<0.05	--	7.35ga
86JPW207S	2375	2068	6.85	0.05	6.8	<0.05	300	B
86JPW207H	--	--	3.6	1.7	1.85	<0.05	--	
86JPW208S	2400	892	8.05	--	--	0.05	1500	
86JPW210S	2625	1563	12.1	2.55	9.55	0.2	1050	E
86JPW210H	--	--	22.55	18.25	3.65	0.65	--	9.70ga
86JPW211S	2450	902	20.7	--	--	1.9	1525	
86JPW212S	1725	1163	12.2	0.7	11.5	0.1	550	8.35ga
86JPW212H	--	--	23.1	19.1	3.95	0.05	--	8.00ga
86JPW213S	2850	1444	5.85	0.45	5.4	0.05	1400	
86JPW213H	--	--	3.25	2.3	0.9	0.05	--	
86JPW215S	3725	2406	19.1	--	--	1.4	1300	
86JPW216S	2300	1136	13.6	--	--	0.05	1150	
86JPW217S	2500	1266	9.35	0.05	9.3	<0.05	1225	B
86JPW217H	--	--	2.5	0.05	2.4	<0.05	--	B
86JPW218S	2100	866	8.7	--	--	0.05	1225	
86JPW221S	2200	739	10.75	--	--	0	1450	
86JPW222S	2450	966	8.5	--	--	0.05	1475	
86JPW223S	3225	1616	8.75	--	--	0.05	1600	
86JPW224S	2100	768	8.3	--	--	0	1325	
86JPW225S	1800	788	11.4	--	--	0.4	1000	
86JPW230S	1650	988	12.2	--	--	0.1	650	
86JPW231S	3000	1190	9.8	--	--	0	1800	
86JPW233S	2525	1048	26.85	--	--	0	1450	
86JPW234S	2250	1138	12.25	0.2	12.05	0.05	1100	E
86JPW234H	--	--	5.6	1.45	4.1	<0.05	--	
86JPW235S	3250	1703	21.05	--	--	0.5	1525	
86JPW236S	3250	1700	24.55	--	--	0.6	1525	
86JPW237S	2575	1500	25.2	5.75	19.45	1.8	1050	1 VG, e
86JPW237H	--	--	30.6	17.85	12.7	0.05	--	9.30ga
86JPW238S	3100	2037	12.8	3.85	8.95	0.85	1050	7.55ga
86JPW238H	--	--	23.7	14.95	8.6	0.15	--	8.60ga
86JPW239S	2100	979	20.55	--	--	0.2	1100	2 VG
86JPW240S	2400	887	12.6	--	--	0.5	1500	
86JPW241S	2900	1392	8.3	3.1	5.2	0.1	1500	
86JPW241H	--	--	31.65	25.85	5.75	<0.05	--	8.30ga
86JPW242S	2000	686	13.85	--	--	0.4	1300	7 VG
86JPW243S	1800	951	23.35	--	--	0.7	825	6 VG
86JPW244S	2775	1629	20.4	--	--	0.4	1125	17 VG
86JPW246S	1875	952	22.6	--	--	0.1	900	
86JPW249S	2100	872	27.95	--	--	0	1200	11 VG
86JPW250S	2800	1487	12.45	--	--	0.15	1300	
86JPW251S	2650	1579	20.95	1.7	19.25	0.15	1050	E

Table A-3.5.3(iii). HMC processing results from shaking table & methylene iodide (flow chart in Fig. A-3.5(i)).

Sample	Gross Weight (g)	>177 μ m (g)	HMC -mag (g)	>3.3 sg (g)	<3.3 sg (g)	MAG (g)	Lights (g)	Com-ments
86JPW251H	--	--	15.7	11.05	4.45	0.2	--	9.35ga
86JPW258S	2375	2120	5.45	0.45	5	<0.05	250	
86JPW258H	--	--	7.35	1.25	6.05	<0.05	--	
86JPW261S	3025	1691	8.55	--	--	0	1325	
86JPW262S	2850	2065	9.75	0.45	9.3	<0.05	775	E
86JPW262H	--	--	4.5	0.05	4.45	0	--	B
86JPW265S	2425	1584	16.35	--	--	0	825	
86JPW267S	2450	1359	16.05	--	--	0	1075	
86JPW268S	2150	1270	5.35	0.8	4.55	<0.05	875	
86JPW268H	--	--	15.2	7.9	7.25	<0.05	--	7.55ga
86JPW273S	2275	1159	16.4	2.6	13.8	0.5	1100	9.00ga
86JPW273H	--	--	--	12.45	--	0	--	12.45ga, C
86JPW274S	5000	3162	13	--	--	0.45	1825	
86JPW275S	2725	1290	9.7	--	--	0.05	1425	
86JPW276S	3300	1887	13.3	--	--	0.05	1400	3 VG
86JPW277S	3500	792	8.35	--	--	0.05	2700	
86JPW278S	800	782	2.6	--	--	0	15	
86JPW279S	2300	1505	20.1	--	--	0	775	2 VG
86JPW283S	2150	2074	16.45	--	--	0.2	60	
86JPW283H	--	--	1.7	0.75	0.9	<0.05	--	
86JPW284S	2675	1566	9.2	0.95	8.25	0.1	1100	
86JPW284H	--	--	3.75	1.5	2.2	<0.05	--	
87JPW1S	325	283	7.35	--	--	0	35	
87JPW3S	800	659	16.5	--	--	0	125	
87JPW4S	450	368	6.8	--	--	0	75	
87JPW5S	1400	812	13.4	2.3	11.1	<0.05	575	8.50ga
87JPW5H	--	--	--	--	--	--	--	D
87JPW6S	1925	1189	10.85	1.8	9.05	0.2	725	E
87JPW6H	--	--	--	--	--	--	--	D
87JPW7S	1925	1491	8.9	0.15	8.75	<0.05	425	
87JPW7H	--	--	--	1.65	--	0.05	--	1.65ga, c
87JPW8S	575	535	5.4	--	--	0	35	
87JPW11S	1375	893	6.55	--	--	0.15	475	
87JPW12S	2400	1353	21.6	--	--	0.05	1025	
87JPW14S	1400	814	10.5	--	--	0.2	575	
87JPW15S	2650	2027	23.3	--	--	0.05	600	
87JPW16S	2650	1694	30.75	--	--	0.15	925	
87JPW17S	975	763	12	--	--	0	200	
87JPW18S	2300	1133	17.5	--	--	0	1150	
87JPW19S	1050	389	11.5	1	10.5	<0.05	650	E
87JPW19H	--	--	2.4	1.9	0.5	0	--	
87JPW20S	1650	983	16.7	--	--	0.1	650	
87JPW21S	1500	932	17.95	--	--	0.15	550	
87JPW22S	1375	811	13.65	--	--	0.1	550	
87JPW23S	650	390	9.5	--	--	0.05	250	
87JPW24S	450	296	5.45	0.2	5.25	<0.05	150	
87JPW24H	--	--	3.9	3.15	0.7	<0.05	--	
87JPW26S	2100	1072	27.5	--	--	0.05	1000	
87JPW30S	500	420	4.85	--	--	0.05	75	
87JPW31S	1650	941	8.75	--	--	0.25	700	

Table A-3.5.3(iii). HMC processing results from shaking table & methylene iodide (flow chart in Fig. A-3.5(i)).

Sample	Gross Weight (g)	>177 μ m (g)	HMC -mag (g)	>3.3 sg (g)	<3.3 sg (g)	MAG (g)	Lights (g)	Com-ments
87JPW32S	3050	2309	15.85	--	--	0.1	725	
87JPW33S	3000	2506	19.15	--	--	0.1	475	
87JPW34S	2225	1912	13	--	--	0.1	300	
87JPW35S	3200	2579	20.55	--	--	0.15	600	
87JPW36S	2500	1881	18.85	--	--	0.25	600	
87JPW37S	3100	1679	21.6	--	--	0.6	1400	
87JPW38S	2500	1886	13.4	--	--	0.15	600	
87JPW39S	2450	1878	22.15	--	--	0.2	550	
87JPW40S	2500	1567	8.3	1.8	6.5	0.1	925	
87JPW40H	--	--	7.65	2.85	4.8	0	--	
87JPW41S	2950	2089	10.85	1.35	9.5	1.85	850	E
87JPW41H	--	--	12.55	7.25	5.05	0.25	--	7.60ga
87JPW42S	1550	1039	10.55	--	--	0.05	500	
87JPW43S	1500	1319	6.35	--	--	0.05	175	
87JPW44S	550	446	4	--	--	0	100	
87JPW45S	2200	1269	6.2	0.45	5.75	0.15	925	
87JPW45H	--	--	3.15	1.15	1.95	<0.05	--	
87JPW46S	2500	1642	8.15	0.8	7.35	<0.05	850	
87JPW46H	--	--	5.75	3.4	2.35	0	--	
87JPW47S	2550	2037	13.15	--	--	0	500	
87JPW48S	1550	1142	8.45	--	--	0	400	
87JPW49S	2625	1415	9.6	8.1	1.5	0	1200	
87JPW49H	--	--	7.5	5.5	1.95	<0.05	--	
87JPW50S	3325	3117	8.35	--	--	0	200	
87JPW51S	3050	1589	10.6	1.4	9.2	<0.05	1450	7.00ga
87JPW51H	--	--	--	--	--	--	--	D
87JPW52S	2050	1796	4.25	--	--	0	250	
87JPW53S	2050	1513	11.95	--	--	0	525	
87JPW54S	2725	2085	14.95	--	--	0	625	
87JPW55S	1925	1069	6.4	--	--	0	850	
87JPW56S	1925	1292	8.15	0.7	7.45	<0.05	625	
87JPW56H	--	--	2.2	1.25	0.95	0	--	
87JPW57S	2450	1791	9.25	--	--	0	650	
87JPW58S	3150	2968	6.95	--	--	0.1	175	
87JPW59S	2825	1460	14.55	--	--	0.45	1350	
87JPW60S	2525	1603	21.9	--	--	0.55	900	1 VG
87JPW61S	3500	2132	17.55	5.9	11.65	0.65	1350	F
87JPW61H	--	--	--	--	--	--	--	D
87JPW62S	3075	2313	11.85	--	--	0.45	750	
87JPW63S	3100	1963	11.05	--	--	0.7	1125	
87JPW64S	2525	1763	10.6	--	--	1.25	750	
87JPW65S	2550	1763	11.8	--	--	0.75	775	
87JPW66S	3025	1865	9.8	6	3.8	1.45	1150	F
87JPW66H	--	--	--	--	--	--	--	D
87JPW67S	2850	2141	8.5	--	--	0.1	700	
87JPW68S	3175	1342	8.35	1.7	6.65	0.1	1825	
87JPW68H	--	--	10.8	9.1	1.65	0.05	--	10.55ga.
87JPW69S	2150	1694	5.55	--	--	0.05	450	
87JPW70S	2400	1195	4.7	0.65	4.05	0.05	1200	
87JPW70H	--	--	--	--	--	--	--	D

Table A-3.5.3(iii). HMC processing results from shaking table & methylene iodide (flow chart in Fig. A-3.5(i)).

Sample	Gross Weight (g)	>177 μ m (g)	HMC -mag (g)	>3.3 sg (g)	<3.3 sg (g)	MAG (g)	Lights (g)	Com-ments
87JPW71S	2850	1667	8.3	--	--	0.15	1175	
87JPW72S	2800	1287	12.85	--	--	0.3	1500	
87JPW73S	2700	1466	9	--	--	0.2	1225	
87JPW74S	3100	2618	7.25	--	--	0	475	
87JPW75S	3100	2263	11.75	--	--	0	825	
87JPW76S	2725	1114	10.65	0.8	9.85	0.05	1600	
87JPW76H	--	--	--	--	--	--	--	D
87JPW77S	2075	1091	9	--	--	0	975	
87JPW83S	2400	1596	4.2	--	--	0	800	
87JPW84S	2350	1639	11.2	--	--	0	700	

NOTES:

- "XX-JPW-XX-S" = bulk silt submitted 1989.
- "XX-JPW-XX-H" = HMC with magnetic fraction removed from sands tabled in 1988.
- For samples where weight of >177 μ m fraction equals zero, these samples were sieved before being sent to Consorminex Inc.
- "VG" = Visible gold.
- All samples were submitted for INAA unless otherwise indicated.
- Methylene iodide separation:
 - All samples separated using methylene iodide were counted (refer to count data).
 - After the heavy mineral grains were mounted, the >3.3 s.g. and the <3.3 s.g. fractions were recombined for INAA.
- Comments:
 - ga When combined weights of >3.3 s.g. and <3.3 s.g. fractions exceeded 10.00 g, only a split was submitted for INAA (x.xx ga). Balance kept for reference purposes.
 - B Sufficient >3.3 s.g. fraction for grain mount only; < 3.3 s.g. fraction submitted for INAA.
 - C 1988 sand HMCs 86-JPW-273-H and 87-JPW-7-H were combined in error during M.I. processing. Although each heavy (>3.3 s.g.) fraction was recuperated separately, the light (<3.3 s.g.) fractions were mixed and can no longer be separated. Therefore only the heavy fractions (>3.3 s.g.) were submitted for INAA and the combined lights (total wt.= 12.70 g.) returned to GSC.
 - D sands mounted in 1988.
 - E refer to Table A-3.5.x(i) or (ii).
 - F refer to Figures A-3.5.x (ii), (iii) and (iv) respectively.