Sampling and Grade Estimation Problems in the Goldfields of Nova Scotia

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ABSTRACT
The Nova Scotian gold deposits are found mainly hosted by quartz veins within metasediments of the Cambrian-Ordovician Meguma Group. A high percentage of the gold is free and coarse.

This paper describes:

1. A comparison between pulp metallic assay treatment and straight fire assay treatment.

2. The determination of grade using the highly skewed sample population.

Serious errors in grade estimation can, and do, occur if the skewed nature of the grade distribution is not taken into account.

Introduction
Gold exploration in Nova Scotia has been particularly active over the last few years. Favourable geology, a history of gold production and flow-through financing have all contributed to making the 1984-1987 period a new high-water mark with respect to exploration dollars spent in the Province.

The recorded historical gold production from the province is 1.58 million ounces; 98.1% came from deposits situated in the Cambrian-Ordovician Meguma Group. The remaining 2.9% came from the Stirling Deposit hosted by the Precambrian Forchu Group, the Gays River Paleo©placer and Recent beach and river placers.

The Meguma Group is approximately 12,000 meters thick and is composed of two formations, a lower coarse grained metagreywacke (Goldenville Formation) and an upper thin bedded, metasiltstone (Halifax Formation). The Meguma Group was folded into Northeast trending folds during the Acadian orogeny. The axial planes of many of the folds are faulted and are steep to over turned. Graves and Zentilli report that the Goldenville Halifax transition zone played an important role in the concentration of metal, including gold, and that the majority of gold deposits occur within this transition zone (Graves and Zentilli, 1988).

Gold is found almost exclusively with quartz veining. The veins can be parallel to bedding or cleavage or can crosscut bedding. A particular category of bedding parallel veins exhibiting a pseudo laminated texture appears to be the most favourable of the vein types. Due to the massive nature of the metagreywacke, the majority of veins developed within the more ductile argillaceous horizons. Another important gold host are veins within structurally controlled dilation zones. These zones exhibit multiple veining, usually plunging along the limbs of the anticline. The gold mineralization in the quartz veins can be quite coarse, with many sightings of visible gold often present within ore grade veins of a deposit. The coarse nature of the gold has given rise to sampling, assay and grade estimation difficulties. The proper interpretation of analytical data early in the exploration program, especially with the Meguma deposits, can help in focusing the exploration effort required to make a mine.

Sampling
To help overcome the coarse gold problem, several exploration techniques can be recommended.
Drilling Programs
with NQ rather than BQ core is recommended. The entire core sample should be assayed (i.e. no splitting), after detailed logging and colour photography so that the largest sample possible is assayed. A pulp metallic assay procedure is highly recommended, particularly when visible gold is noted. The pulp metallic method involves screening at 80 or 150 mesh after the entire sample has been crushed to á¬á inch (6.4mm). The coarse fraction and fine fraction are weighed and assayed separately, then arithmetically recombined to give a head assay value (Bamwoya, et al., 1987). Figure 1 illustrates the concentration of gold in the plus 80 mesh fraction of 250 samples from NovaGold Resources Inc's Fifteen Mile Stream deposit. The coarse fraction averages only 2.17% of the sample weight, yet contains almost 20% of the indicated gold.

Many companies will use standard assay procedure on all samples, then use the pulp metallic procedure on those samples with visible gold or samples that assay over 1 gram per tonne. Other companies will use pulp metallic assaying on all samples. Figure 2 illustrates the results obtained from both pulp metallics and regular fire assaying on the same samples. These samples were also taken from the NovaGold Resources Fifteen Mile Stream Property and the analytical work was done by ChemLab Inc. of Saint John. Figure 2 shows that regular fire assay work can give very misleading results, assuming that the pulp metallic procedure returns the valid assay.

Using the Assay Data for Grade Estimation

Exactly how to use the assay data is often a touchy subject during the drilling phase of an exploration program. Most explorationists realize that the grade of a sample is not apt to be representative of the grade of the block of ground extending half way to all adjacent sample points. However, cutting the grade is recognized as being arbitrary; many explorationists feel that the actual grade of the sample at a point should be used. Geostatistical grade estimation could use all of the sample data, but this method is often hampered by insufficient sample data during the exploration phase of a property.

One simple technique that can be used to evaluate a the vein or deposit is to construct a histogram of sample values. Equal sample lengths and widths must be used to make the histogram representative of the grade. The histogram illustrates at a glance if the population is normal or log-normal.

For most ore deposits, the distribution of assay values is log normal, not normal (David, 1977). This is almost universally true for lode gold deposits. The histogram of assay values are skewed with the majority of values being near the ordinate axis and the remainder extending in a long thin tail, often to very high numbers. Table 1 is the sample data from vein G of the NovaGold Fifteen Mile Stream deposit, plus a "nugget" value. This table is included to illustrate the quality of data that results when the correct sample population is used to obtain an estimated average grade. This vein has rich sections and lean sections. When all values are considered, an arithmetic average of 11.79 g/t is obtained. The log normal average is 1.74, and $e^{1.74}$ yields 5.74 g/t. Note that the arithmetic average is considerably biased by the nugget value. Without the "nugget", the arithmetic average is 7.28 g/t, 4.51 g/t less than with the nugget. The log normal averaging, without the nugget is 5.05 g/t, only 0.69 g/t less than with the nugget. Cutting values (nugget included) is seen as being too conservative if head values are cut (3.53 g/t) and too optimistic (7.80 g/t) if values are cut after dilution. Cutting has very little effect on the average taken using log normal values (5.05 g/t and 5.31 g/t).

A Case History

A.C.A. Howe International Limited advised on the exploration and sampling of the NovaGold Resources Inc.'s Fifteen Mile Stream property from its inception. The property is located in Halifax County, within the Liscomb Game Sanctuary. NovaGold began exploration of the property in June of 1985 and by late 1987 had drilled 56 NQ core holes for a total of 9,100 meters. Based upon encouraging drill results, the company applied for, and received, permission to bulk sample.

The company stripped the overburden from an area about 150 meters by 300 meters. The rock surface was cleaned off with high pressure water, geologically mapped at 1:100 scale, and detail sampled. Each vein was surveyed, and one meter long samples were taken along the vein rather than across the vein. From each metre of vein about 2 kilograms of sample was obtained. The samples were sent to ChemLab in Saint John, New Brunswick.

Sample results were plotted on the 1:100 scale plan map and colour coded, after diluting to 10 centimeters to standardize the width”• of the sample. The intervening, rock between the veins, was not assigned any gold value as continuous sampling indicated that the gold is almost entirely carried by the veins.

The grade distribution of all the samples taken on the property (740) is illustrated by the histogram in Figure 3. In this figure, the percent frequency of values vs. sample value[(assay * 1 meter * vein width)/0.10 meter] was plotted. Figure 4 is the same data, except that the natural log of the sample value (Ln(value)) was plotted. The natural log of the value data was also plotted on probability paper (Figure 5); a straight line can be drawn through the points, confirming that the sample population is log normal.

The average grade of all the samples was found by finding the fiftieth percentile of the Ln (value) distribution and raising e, the base of the natural logarithms, to the power of this value.

Using the log normal distribution, the average value of all of the samples was found to be 1.00 gm/t.   If the sample values had been simply added and then divided by the total number of samples (740), the result is an average indicated grade of 7.77 gm/t.

Following mapping and sampling, the veins and waste rock were mined by Nova Construction using open pit methods. The waste rock was drilled, blasted and excavated. The vein material was mined as cleanly as possible. A large flat steel plate was placed at the base of the pit wall. The vein material was chipped from the bedrock using a large hammer attached to the excavator boom. The vein material was then excavated and hauled from the pit, dumped and sorted both by hand and with a small backhoe. The vein material was then sent to Seabright's Gays River Regional Mill for processing. Approximately 4,300 tonnes of material was processed, and the average head grade of the bulk sample was found to be 2 gm/tonne. Given the low average value of the bulk sample, NovaGold has subsequently assigned a low priority to the property.

Had the bulk sampling continued to a second and third lift, sufficient sample data would have been available for a more definitive geostatistical examination of the deposit. Even so, a realistic estimate of the grade of the deposit was possible using the histogram of the natural log of the sample value.

Conclusion

The coarse nature of the gold in the Meguma deposits requires that special attention be placed upon sampling, assay in and grade estimation. Sampling along the strike of the vein, when possible, is recommended after delineation drilling. This will maximize the weight of the sample and also yield valuable information about the distribution of gold in the vein. Pulp metallic assay procedures will ¬ensure that nuggets will overly influence the assay of the sample. The construction of a sample value histogram using the assay value and the natural log of the sample value is highly recommended. These procedures assist in a more realistic grade determination of a Meguma gold deposit during the early stages of exploration.

Acknowledgments

The authors wish to thank NovaGold Resources Inc. for permission to use data from the companies Fifteen Mile Stream property.

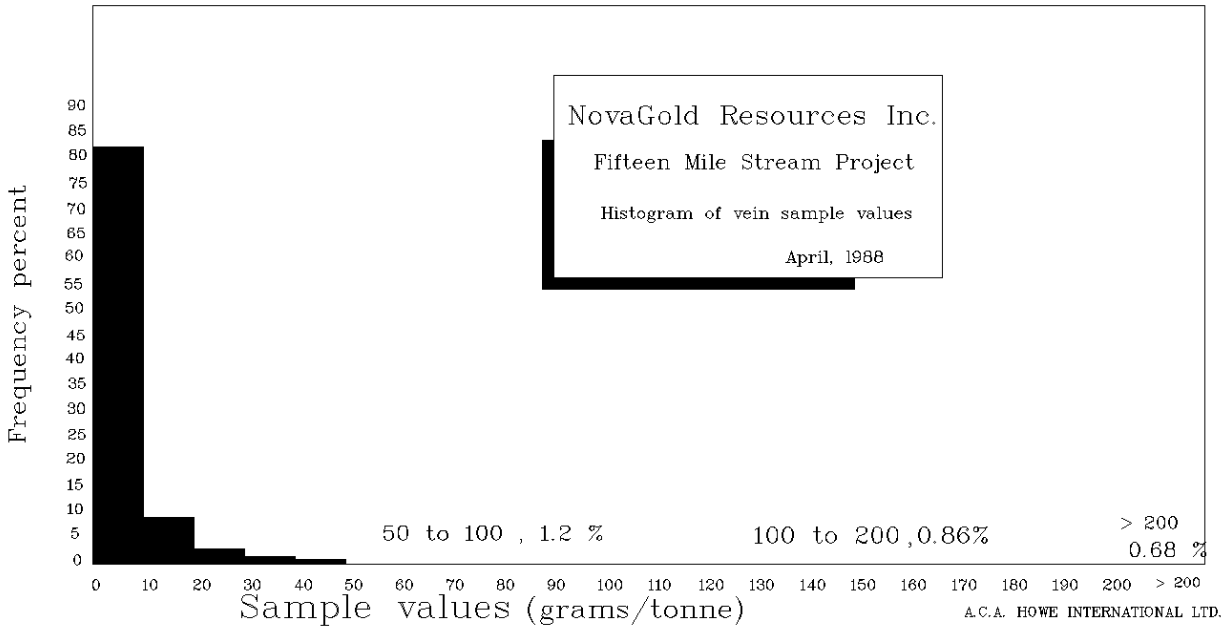

Figure 1 Samples plotted using grade value

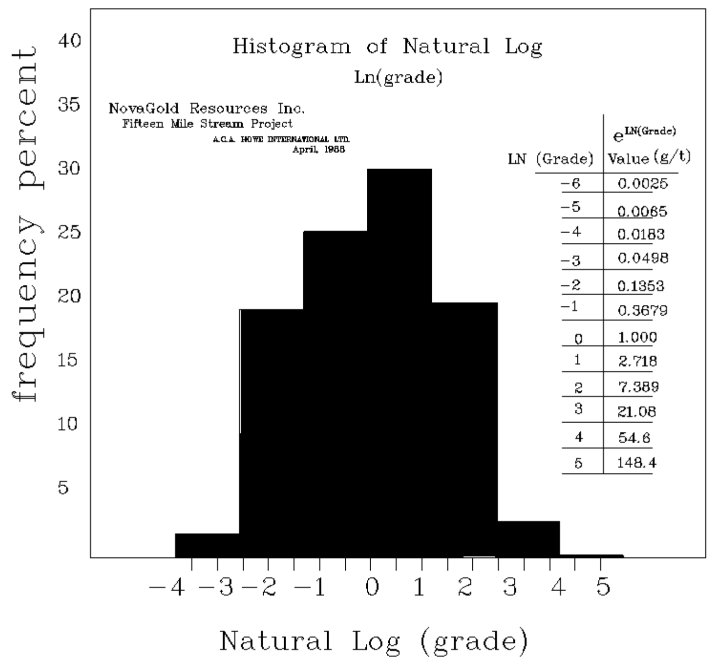

Figure 2 Samples plotted using natural logarithm of the grade (Ln (grade value, g/t))

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NovaGold Resources, Bulk Sample Assay Values 1988 - Fifteen Mile Stream												
Assay No.	+80, grams	- 80, grams	Total, grams	WT %, +80	WT %, -80	Au g/t +80	Au g/t -80	Au g/t Head	%AU, -80	% AU, +80	INITIAL FIRE ASSAY, g/t	Sceened Metalics Assay g/t
CS1 - 1	53.70	3242.00	3295.70	1.63%	98.37%	1.18	0.63	0.639	96.99	3.01		2.99
CS1 -2	7.20	1288.00	1295.20	0.56%	99.44%	0.63	0.18	0.183	98.08	1.92		1.91
CS1 - 3	4.20	2600.00	2604.20	0.16%	99.84%	3.28	1.28	1.283	99.59	0.41		0.41
CS1-4	34.80	1069.00	1103.80	3.15%	96.85%	66.50	1.59	3.636	42.35	57.65		57.62
CS1-5	43.20	530.00	573.20	7.54%	92.46%	1.72	0.36	0.462	71.97	28.03		27.95
CS1-6												0.00
												0.00
K-2	15.20	3265.00	3280.20	0.46%	99.54%	1302.63	10.30	16.288	62.94	37.06		37.05
K-3	56.20	4053.00	4109.20	1.37%	98.63%	491.64	16.50	22.998	70.76	29.24		29.22
K-4	100.80	3195.00	3295.80	3.06%	96.94%	39.81	2.97	4.097	70.28	29.72		29.69
K-5	33.30	6940.00	6973.30	0.48%	99.52%	1290.00	13.60	19.695	68.72	31.28		31.27
K-6	47.10	4368.00	4415.10	1.07%	98.93%	156.05	9.90	11.459	85.47	14.53	24.00	14.52
k-18	60.30	1396.00	1456.30	4.14%	95.86%	5.33	1.03	1.208	81.73	18.27	0.66	18.23
k-19	39.00	1840.00	1879.00	2.08%	97.92%	96.54	3.71	5.637	64.45	35.55	1.74	35.53
k-20	62.40	1458.00	1520.40	4.10%	95.90%	266.83	29	38.761	71.75	28.25	20.70	28.21
k-21	80.30	1535.00	1615.30	4.97%	95.03%	4.63	1.25	1.418	83.77	16.23	0.93	16.18
k-22	21.50	1657.00	1678.50	1.28%	98.72%	106.05	15.25	16.413	91.72	8.28	18.40	8.26
k-23	24.80	1536.00	1560.80	1.59%	98.41%	1451.61	93	114.587	79.87	20.13	163.00	20.11
k-24	59.10	2854.00	2913.10	2.03%	97.97%	746.19	49.35	63.487	76.16	23.84	153.00	23.82
k-25	114.60	1685.00	1799.60	6.37%	93.63%	223.56	34.75	46.774	69.56	30.44	30.00	30.37
k-26	79.80	1161.00	1240.80	6.43%	93.57%	28.76	2.415	4.109	54.99	45.01	1.48	44.95
k-27	60.20	4000.00	4060.20	1.48%	98.52%	100.17	4.14	5.564	73.31	26.69	1.79	26.68
k-28	21.30	1194.00	1215.30	1.75%	98.25%	307.04	16.1	21.199	74.62	25.38	13.10	25.37
k-29	27.50	815.00	842.50	3.26%	96.74%	220.36	14.75	21.461	66.48	33.52	44.90	33.48
k-30	45.40	1277.00	1322.40	3.43%	96.57%	289.43	23.95	33.064	69.95	30.05	45.30	30.02
k-31	11.50	2771.00	2782.50	0.41%	99.59%	657.39	21.15	23.780	88.57	11.43	105.00	11.42
k-32	71.60	1109.00	1180.60	6.06%	93.94%	7.43	2.485	2.785	83.82	16.18	0.95	16.12
k-33	78.20	2192.00	2270.20	3.44%	96.56%	303.84	22.25	31.950	67.24	32.76	24.40	32.72
k-34	30.90	2629.00	2659.90	1.16%	98.84%	42.91	2.595	3.063	83.73	16.27	0.68	16.26
k-35	57.70	2303.00	2360.70	2.44%	97.56%	411.27	21.8	31.319	67.90	32.10	6.53	32.07
k-36	15.20	3553.00	3568.20	0.43%	99.57%	384.87	2.005	3.636	54.91	45.09	0.22	45.09
k-37	10.00	959.00	969.00	1.03%	98.97%	7.08	0.48	0.548	86.67	13.33	0.41	13.32
k-38	45.80	1997.00	2042.80	2.24%	97.76%	2042.8	188.84	230.406	80.12	19.88	4.19	19.86
k-39	18.80	889.00	907.80	2.07%	97.93%	0.29	8.06	7.899	99.92	0.08	4.19	0.06
k-40	28.90	2000.00	2028.90	1.42%	98.58%	35.71	1.165	1.657	69.30	30.70	1.89	30.68
k-41	17.10	1692.00	1709.10	1.00%	99.00%	294.74	1.38	4.315	31.66	68.34	0.27	68.33
k-42	32.60	1251.00	1283.60	2.54%	97.46%	0.02	0.74	0.722	99.93	0.07	0.07	0.04
k-43	48.00	551.00	599.00	8.01%	91.99%	0.09	0.605	0.564	98.72	1.28	0.98	1.20
k-44	48.40	502.00	550.40	8.79%	91.21%	1.7	0.695	0.783	80.92	19.08	0.58	19.00
k-45	24.70	1053.00	1077.70	2.29%	97.71%	0.01	0.025	0.025	99.07	0.93	0.01	0.91
k-46	54.50	1368.00	1422.50	3.83%	96.17%	2.72	0.14	0.239	56.37	43.63	0.01	43.59
k-47	25.90	1956.00	1981.90	1.31%	98.69%	32.43	0.18	0.601	29.54	70.46	0.04	70.45
k-48	23.70	2043.00	2066.70	1.15%	98.85%	1.32	0.075	0.089	83.04	16.96	211.00	16.94
k-49	5.20	2021.00	2026.20	0.26%	99.74%	7.44	0.51	0.528	96.38	3.62	0.67	3.62
k-50	81.20	1610.00	1691.20	4.80%	95.20%	429.16	47	65.349	68.47	31.53	51.80	31.48
k-51	17.40	1500.00	1517.40	1.15%	98.85%	9.81	1.21	1.309	91.40	8.60	0.27	8.58
k-52	12.10	1246.00	1258.10	0.96%	99.04%	22.07	2.55	2.738	92.25	7.75	0.16	7.74
k-53	8.90	867.00	875.90	1.02%	98.98%	875.9	7.58	16.403	45.74	54.26	0.01	54.25
L-2	14.80	1651.00	1665.80	0.89%	99.11%	2.66	0.32	0.341	93.07	6.93		6.93
L-3	16.30	1656.00	1672.30	0.97%	99.03%	30.56	0.95	1.239	75.95	24.05		24.04
L-4	33.90	2195.00	2228.90	1.52%	98.48%	1.17	0.24	0.254	93.00	7.00		6.99
L-5	32.70	946.00	978.70	3.34%	96.66%	1.53	0.15	0.196	73.93	26.07		26.03
L-6	53.00	1045.00	1098.00	4.83%	95.17%	2.96	2.155	2.194	93.49	6.51	0.94	6.46
L-7	43.80	855.00	898.80	4.87%	95.13%	2.14	0.625	0.699	85.08	14.92	0.01	14.87
L-22	20.80	1820.00	1840.80	1.13%	98.87%	0.06	0.055	0.055	98.77	1.23	0.01	1.22
L-23	34.20	1599.00	1633.20	2.09%	97.91%	70	3.38	4.775	69.30	30.70	0.66	30.68
L-24	67.20	1487.00	1554.20	4.32%	95.68%	45.4	3.62	5.426	63.83	36.17	0.52	36.13
L-25	15.90	1042.00	1057.90	1.50%	98.50%	4.36	0.255	0.317	79.31	20.69	0.14	20.68
L-26	61.00	1080.00	1141.00	5.35%	94.65%	0.05	0.135	0.130	97.95	2.05	0.01	2.00
L-27	97.20	1283.00	1380.20	7.04%	92.96%	0.22	0.215	0.215	92.81	7.19	0.02	7.12
L-28	6.80	1763.00	1769.80	0.38%	99.62%	15.79	1.395	1.450	95.82	4.18	0.04	4.18
L-29	64.10	1637.00	1701.10	3.77%	96.23%	0.11	0.09	0.091	95.43	4.57	0.01	4.53
L-30	59.00	2520.00	2579.00	2.29%	97.71%	19.88	0.34	0.787	42.21	57.79	0.01	57.76
L-31	50.60	1483.00	1533.60	3.30%	96.70%	28.81	1.64	2.536	62.52	37.48	0.83	37.44
L-32	23.70	1300.00	1323.70	1.79%	98.21%	5.7	0.41	0.505	79.78	20.22	0.11	20.20
l-33	20.60	1452.00	1472.60	1.40%	98.60%	30.44	3.33	3.709	88.52	11.48	1.635	11.47
L-34	28.10	1094.00	1122.10	2.50%	97.50%	27.86	2.55	3.184	78.09	21.91	0.33	21.89
L-35	43.00	3546.00	3589.00	1.20%	98.80%	155.23	3.16	4.982	62.67	37.33	2.89	37.32
L-36	25.50	1200.00	1225.50	2.08%	97.92%	3.31	0.46	0.519	86.74	13.26	0.21	13.24
L-37	12.60	2477.00	2489.60	0.51%	99.49%	7.76	0.575	0.611	93.58	6.42	0.34	6.42
L-38	3.10	2131.00	2134.10	0.15%	99.85%	26.23	2.355	2.390	98.41	1.59	0.01	1.59
L-39	27.10	1739.00	1766.10	1.53%	98.47%	2.2	0.265	0.295	88.54	11.46	0.01	11.44
L-40	52.10	2889.00	2941.10	1.77%	98.23%	63.63	1.6	2.699	58.23	41.77	0.11	41.75
L-41	0.16	2710.00	2710.16	0.01%	99.99%	176.25	1.87	1.880	99.45	0.55	0.42	0.55
L-42	39.40	1809.00	1848.40	2.13%	97.87%	0.05	0.025	0.026	95.83	4.17	0.04	4.15
L-43	2.30	2093.00	2095.30	0.11%	99.89%	0.26	0.025	0.025	98.87	1.13	0.01	1.13
L-44	20.10	1728.00	1748.10	1.15%	98.85%	0.07	0.035	0.035	97.73	2.27	0.01	2.26
L-45	33.50	2189.00	2222.50	1.51%	98.49%	22.57	0.425	0.759	55.17	44.83	0.01	44.82
L-46	98.30	2912.00	3010.30	3.27%	96.73%	0.06	0.06	0.060	96.73	3.27	0.02	3.23
L-47	45.00	1035.00	1080.00	4.17%	95.83%	0.08	0.07	0.070	95.27	4.73	0.01	4.69
L-48	23.60	1392.00	1415.60	1.67%	98.33%	0.05	0.065	0.065	98.71	1.29	0.01	1.27
L-49	51.10	3492.00	3543.10	1.44%	98.56%	0.05	0.05	0.050	98.56	1.44	0.02	1.43
L-50	60.40	3403.00	3463.40	1.74%	98.26%	0.06	0.05	0.050	97.91	2.09	0.01	2.07
L-51A	90.10	2373.00	2463.10	3.66%	96.34%	0.1	0.08	0.081	95.47	4.53	0.07	4.49
L-51B	22.60	1946.00	1968.60	1.15%	98.85%	118.14	2.135	3.467	60.88	39.12		39.11
L-52	8.20	1151.00	1159.20	0.71%	99.29%	1.94	0.075	0.088	84.44	15.56	0.01	15.55
L-53	92.80	1498.00	1590.80	5.83%	94.17%	0.06	0.06	0.060	94.17	5.83	0.01	5.78
L-54	3.80	2790.00	2793.80	0.14%	99.86%	2194.74	21.7	24.656	87.89	12.11	15.7	12.11
L-55	61.20	1859.00	1920.20	3.19%	96.81%	46.18	15.4	16.381	91.01	8.99	4.06	8.95
L-56	13.30	1105.00	1118.30	1.19%	98.81%	0.68	0.095	0.102	92.07	7.93	0.23	7.92
L-57	30.40	3007.00	3037.40	1.00%	99.00%	174.67	3.93	5.639	69.00	31.00	0.01	30.99
L-58	25.00	2916.00	2941.00	0.85%	99.15%	126	3.515	4.556	76.49	23.51	0.03	23.50
L-59	22.20	2907.00	2929.20	0.76%	99.24%	240.54	3.735	5.530	67.03	32.97	0.01	32.96
L-60	56.60	2158.00	2214.60	2.56%	97.44%	41.4	3.6	4.566	76.83	23.17	1.61	23.15
L-61	33.40	1980.00	2013.40	1.66%	98.34%	5.06	5.06	5.060	98.34	1.66	0.27	1.64
L-62	91.50	1600.00	1691.50	5.41%	94.59%	35.57	1.52	3.362	42.77	57.23	5.1	57.18
L-63	8.40	2020.00	2028.40	0.41%	99.59%	109.29	3.76	4.197	89.22	10.78	16.5	10.78
L-64	47.20	2066.00	2113.20	2.23%	97.77%	7.72	0.145	0.314	45.12	54.88	0.11	54.86
L-65	23.30	1620.00	1643.30	1.42%	98.58%	56.52	3.985	4.730	83.06	16.94	0.56	16.93
L-66a	49.90	2932.00	2981.90	1.67%	98.33%	58.98	0.69	1.665	40.74	59.26	0.01	59.25
L-66B	13.00	2330.00	2343.00	0.55%	99.45%	4.57	10.4	10.368	99.76	0.24	29.7	0.24
L-67	6.90	2447.00	2453.90	0.28%	99.72%	208.7	15.5	16.043	96.34	3.66	5.18	3.66
L-68	4.10	2777.00	2781.10	0.15%	99.85%	0.59	0.045	0.046	98.10	1.90	0.07	1.90
L-69	59.30	1731.00	1790.30	3.31%	96.69%	11.79	0.86	1.222	68.04	31.96	0.01	31.92
L-70	118.40	2400.00	2518.40	4.70%	95.30%	0.04	0.055	0.054	96.54	3.46	0.01	3.42
L-71	65.00	1565.00	1630.00	3.99%	96.01%	0.03	0.035	0.035	96.56	3.44	0.01	3.40
L-72	5.50	2367.00	2372.50	0.23%	99.77%	2.07	0.105	0.110	95.62	4.38	0.01	4.38
L-73	92.90	2141.00	2233.90	4.16%	95.84%	0.04	0.09	0.088	98.11	1.89	0.01	1.85
L-74	24.80	2513.00	2537.80	0.98%	99.02%	27.43	0.72	0.981	72.68	27.32	0.01	27.31
L-75	54.50	2638.00	2692.50	2.02%	97.98%	27.43	1.885	2.402	76.89	23.11	0.455	23.09
L-76	71.20	2005.00	2076.20	3.43%	96.57%	156.66	6.785	11.925	54.95	45.05	0.01	45.02
L-77	78.20	1013.00	1091.20	7.17%	92.83%	20.59	0.51	1.949	24.29	75.71	0.01	75.64
L-78	23.00	2160.00	2183.00	1.05%	98.95%	6.98	1.525	1.582	95.35	4.65	0.18	4.64
M-1	27.90	621.00	648.90	4.30%	95.70%	4.57	0.42	0.598	67.17	32.83	0.01	32.79
M-2	25.30	1015.00	1040.30	2.43%	97.57%	3.79	0.24	0.326	71.76	28.24	0.08	28.22
M-3	29.30	709.00	738.30	3.97%	96.03%	0.11	0.12	0.120	96.35	3.65	0.01	3.61
M-4	71.30	915.00	986.30	7.23%	92.77%	2.21	0.145	0.294	45.71	54.29	0.01	54.22

NovaGold Resources, Bulk Sample Assay Values 1988 - Fifteen Mile Stream

Assay No.	+80, grams	- 80, grams	Total, grams	WT %, +80	WT %, -80	Au g/t +80	Au g/t -80	Au g/t Head	%AU, -80	% AU, +80	INITIAL FIRE ASSAY, g/t	Sceened Metalics Assay g/t
M-5	65.10	848.00	913.10	7.13%	92.87%	0.08	0.18	0.173	96.70	3.30	0.04	3.23
M-6	12.00	66.00	78.00	15.38%	84.62%	0.01	0.06	0.052	97.06	2.94	0.04	2.79
M-7a	8.40	2129.00	2137.40	0.39%	99.61%	7.36	0.315	0.343	91.56	8.44	0.01	8.44
M-7b	65.70	1445.00	1510.70	4.35%	95.65%	11.82	1.985	2.413	78.69	21.31	2.13	21.26
M-8a	31.00	1713.00	1744.00	1.78%	98.22%	0.16	0.065	0.067	95.74	4.26	0.12	4.25
M-8b	7.40	2141.00	2148.40	0.34%	99.66%	0.28	0.285	0.285	99.66	0.34	0.55	0.33
M-9	6.30	1497.00	1503.30	0.42%	99.58%	0.38	0.13	0.131	98.78	1.22	0.28	1.21
M-10	11.30	3557.00	3568.30	0.32%	99.68%	0.27	0.14	0.140	99.39	0.61	0.09	0.61
M-11	65.20	469.00	534.20	12.21%	87.79%	0.04	0.115	0.106	95.39	4.61	0.08	4.49
M-12	46.40	1213.00	1259.40	3.68%	96.32%	22.66	0.18	1.008	17.20	82.80	0.04	82.77
M-13	1.50	909.00	910.50	0.16%	99.84%	2.8	0.07	0.074	93.81	6.19	0.03	6.19
M-14	5.90	700.00	705.90	0.84%	99.16%	0.81	0.095	0.101	93.30	6.70	0.01	6.70
M-15	3.80	1616.00	1619.80	0.23%	99.77%	0.79	0.05	0.052	96.42	3.58	13.6	3.58
M-16	11.80	2895.00	2906.80	0.41%	99.59%	0.08	0.01	0.010	96.84	3.16	0.13	3.15
M-17	17.50	1954.00	1971.50	0.89%	99.11%	1.47	0.075	0.087	85.07	14.93	0.07	14.92
M-18	43.60	2357.00	2400.60	1.82%	98.18%	0.03	0.06	0.059	99.08	0.92	0.45	0.90
M-19	44.30	3243.00	3287.30	1.35%	98.65%	145.53	8.43	10.278	80.92	19.08	25.3	19.07
M-20	64.60	1088.00	1152.60	5.60%	94.40%	87.43	2.975	7.708	36.43	63.57	0.26	63.51
M-21	23.70	1460.00	1483.70	1.60%	98.40%	0.2	0.37	0.367	99.13	0.87	0.2	0.85
M-22	11.70	1314.00	1325.70	0.88%	99.12%	15.85	0.75	0.883	84.16	15.84	0.08	15.83
M-24	43.50	1579.00	1622.50	2.68%	97.32%	60.28	0.385	1.991	18.82	81.18	0.01	81.15
M-25	14.90	2324.00	2338.90	0.64%	99.36%	0.22	0.145	0.145	99.04	0.96	0.01	0.96
M-26	113.10	1780.00	1893.10	5.97%	94.03%	0.06	0.685	0.648	99.45	0.55	0.93	0.49
M-27	13.70	1200.00	1213.70	1.13%	98.87%	3.96	0.25	0.292	84.69	15.31	0.27	15.30
M-28	56.10	1219.00	1275.10	4.40%	95.60%	0.4	0.095	0.108	83.77	16.23	0.07	16.19
M-29	85.00	1289.00	1374.00	6.19%	93.81%	1.82	0.1	0.206	45.45	54.55	0.07	54.49
M-30	62.70	2200.00	2262.70	2.77%	97.23%	0.88	0.19	0.209	88.34	11.66	0.01	11.63
M-31	1.10	729.00	730.10	0.15%	99.85%	1.09	0.29	0.291	99.44	0.56	0.01	0.56
M-32	31.00	2779.00	2810.00	1.10%	98.90%	0.01	0.16	0.158	99.93	0.07	0.05	0.06
M-33	102.50	2003.00	2105.50	4.87%	95.13%	1.8	0.125	0.207	57.57	42.43	0.01	42.38
M-34	22.60	3779.00	3801.60	0.59%	99.41%	0.05	0.385	0.383	99.92	0.08	0.07	0.07
M-35	26.10	1125.00	1151.10	2.27%	97.73%	0.24	1.685	1.652	99.67	0.33	0.15	0.31
M-36	44.40	1829.00	1873.40	2.37%	97.63%	2.98	0.38	0.442	84.01	15.99	0.03	15.97
M-37	58.10	3621.00	3679.10	1.58%	98.42%	11.24	0.56	0.729	75.64	24.36	0.03	24.34
M-38	80.30	3970.00	4050.30	1.98%	98.02%	22.15	3.125	3.502	87.46	12.54	0.27	12.52
M-39	24.10	2150.00	2174.10	1.11%	98.89%	0.25	0.31	0.309	99.10	0.90	0.01	0.88
M-40	38.70	1241.00	1279.70	3.02%	96.98%	4.98	0.655	0.786	80.83	19.17	1	19.14
M-41	15.80	1332.00	1347.80	1.17%	98.83%	0.36	1.09	1.081	99.61	0.39	1.15	0.38
M-42	34.60	1213.00	1247.60	2.77%	97.23%	0.41	0.195	0.201	94.34	5.66	0.06	5.63
M-43	41.00	1100.00	1141.00	3.59%	96.41%	7.6	0.18	0.447	38.85	61.15	0.01	61.11
M-44	33.30	2127.00	2160.30	1.54%	98.46%	1.34	1.07	1.074	98.08	1.92	0.8	1.91
M-45	74.70	1895.00	1969.70	3.79%	96.21%	0.18	0.14	0.142	95.18	4.82	0.03	4.79
G-1	9.10	1407.00	1416.10	0.64%	99.36%	540.66	21.60	24.936	86.07	13.93		13.93
G-2	82.80	1485.00	1567.80	5.28%	94.72%	62.71	6.09	9.080	63.53	36.47		36.42
G-3	68.10	1622.00	1690.10	4.03%	95.97%	122.33	9.30	13.854	64.42	35.58		35.54
G-4	24.60	2069.00	2093.60	1.18%	98.82%	28.13	4.74	5.015	93.41	6.59		6.58
G-5	74.60	1520.00	1594.60	4.68%	95.32%	56.11	3.72	6.171	57.46	42.54		42.49
G-6	83.70	1230.00	1313.70	6.37%	93.63%	21.40	6.80	7.730	82.36	17.64		17.57
G-7	41.50	1224.00	1265.50	3.28%	96.72%	1.35	0.75	0.770	94.25	5.75		5.72
G-8	75.70	1175.00	1250.70	6.05%	93.95%	135.60	12.20	19.669	58.27	41.73		41.67
G-9	62.80	1084.00	1146.80	5.48%	94.52%	16.35	1.97	2.757	67.53	32.47		32.42
G-10	4.60	673.00	677.60	0.68%	99.32%	150.00	8.60	9.560	89.35	10.65		10.64
G-11	80.20	1334.00	1414.20	5.67%	94.33%	60.41	11.20	13.991	75.51	24.49		24.43
G-12	51.00	1091.00	1142.00	4.47%	95.53%	131.76	17.10	22.221	73.52	26.48		26.44
G-13	36.00	494.00	530.00	6.79%	93.21%	255.33	24.00	39.713	56.33	43.67		43.60
G-14	90.90	284.00	374.90	24.25%	75.75%	52.17	7.60	18.407	31.28	68.72		68.48
G-15	15.50	780.00	795.50	1.95%	98.05%	30.00	5.73	6.203	90.58	9.42		9.40