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HUNTERS POINT
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22 October 1998

Ms. Valerie Heusinkveld
California Environmental Protection Agency
Department of Toxic Substances
700 Heinz Avenue
Berkeley, CA 94710

Subj: CALCULATION OF BACKGROUND NICKEL LEVELS

Dear Ms. Heusinkveld:

The technical memorandum, per encl (1), is submitted for your review. After encountering numerous hits of nickel during the Hunters Point Shipyard (HPS) Parcel B remedial action, the Navy and Tetra Tech EMI, the Navy's CLEAN contractor, conducted a study to determine if the nickel is naturally occurring. After looking at bore hole data collected during the HPS remedial investigations, serpentinite bedrock samples, and soil samples from a Parcel B excavation, we believe that method of calculating background levels needs revision. As suggested by Dr. Frampton in his 13 October 1998 memo to you, per encl (2), we propose a new nickel regression equation based on cobalt be developed and used to determine ambient concentrations of nickel across the shipyard. This equation is currently being developed and will be forwarded on once it is completed.

Please review the memorandum and respond with any comments by 30 October 1998.

If you have any questions regarding this letter, please contact Ms. Jil Finnegan, Code 702P3, at (650) 244-2554.

Original Signed by:
RICHARD E. POWELL
Lead RPM, West Bay Team
By direction

Encl: (1) Proposed Nickel Screening and Implementation Plan
(2) Background Concentrations of Nickel at HPS memo from Dr. Frampton

Copies to (w/encl):
U.S. Environmental Protection Agency (Attn: Ms. Claire Trombadore)
Regional Water Quality Control Board (Attn: Mr. David Leland)
City and County of San Francisco (Attn: Ms. Amy Brownell)
Tetra Tech EMI (Attn: Mr. Tom Shoff)
IT Corporation (Attn: Mr. Don Marini)

Blind copies to (w/encl):
622, 6221, 702P3, 09MN
HPS CSO (Attn: Mr. David Quichocho)
SF Bay ROICC (Attn: Ms. Tanya Nakhimovski)
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Introduction

Screening and implementation alternatives were developed to evaluate the presence of contaminant versus naturally occurring nickel at Hunters Point Shipyard (HPS). Sandblast grit, although suggested to be a major potential source of human nickel contamination, has been shown to have very low nickel concentrations (average of 79 mg/kg for untreated grit and 54 mg/kg for treated grit), and cannot account for the higher nickel concentrations measured in soils at HPS. Other known potential sources of nickel contamination are the pickling and plate yard (IR-09, Parcel D) and the battery and electroplating shop (IR-10, Parcel B). There are no high nickel concentrations spatially associated with either the pickling and plate yard or the battery and electroplating shop. Thus, there are no known sources of nickel contamination that can account for the high nickel concentrations that are comparatively common at HPS. In contrast, naturally-occurring nickel in serpentinite bedrock at HPS has measured values as high as 6,340 mg/kg. The screening and implementation alternatives developed account for the high values of nickel and serpentinite, and the common occurrence of serpentinite in natural soils and fill, but allow for the possibility of unknown releases. Any nickel contaminant releases would be expected to have taken place at the ground surface. As such, nickel concentrations would be expected to decrease downward from the ground surface. If the nickel is associated with plating solutions, nickel to cobalt ratios are expected to be higher than natural values, because cobalt is not expected to be a constituent of plating solutions.

Proposed Screening and Implementation Plan

Serpentinite has cobalt as well as high nickel concentrations, so regressions of nickel on cobalt based on serpentinite can be used to evaluate the possibility of contamination. Using the 90 sample data set provided to the California Department of Toxic Substance Control (DTSC) for the remediation area 18-1 nickel assessment (see Table 1), the Navy proposes to calculate a sample-specific ambient level of 95 percent upper confident limit (UCL) based on the nickel to cobalt regression for each remediation area that has nickel identified as a chemical of potential concern (COPC). If the nickel concentration is less than the calculated ambient level, nickel will be dropped as a COPC for that given remediation area. If the sample exceeds the screening

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criteria based on the nickel to cobalt serpentinite regression, then the site will be evaluated as to whether nickel concentration decreases downward from the ground surface, suggesting a surface release. If such a variation of concentration with depth is present, then the high nickel concentrations may be associated with contamination and the material will be excavated. If the variation of nickel with depth is indeterminate, then the sample will be evaluated for evidence of whether the soil contains weathered serpentinite or natural serpentinite-derived soils. If the sample does not appear to contain weathered serpentinite or serpentinite-derived natural soil, then it is probable that the high nickel concentration is due to contamination and the material will be excavated.

Table 1
Summary of Cobalt/Nickel Analytical Results for Serrpentinite

Station ID	Cobalt (mg/kg)	Nickel (mg/kg)
IR46B036	75.8	1560
IR46B035	95	2310
IR26B039	66.5	1310
IR26B038	98.5	1820
IR26B033	62	1350
IR26B026	63	1300
IR26B023	82.6	1500
IR25MW15A2	76.6	1750
IR23B010	20.4	401
IR23B010	63.7	1460
IR20MW11A	184	5580
IR20B016	86	2090
IR20B016	92.6	1380
IR20B015	90.9	1570
IR20B015	61.4	1430
IR20B014	74.4	1410
IR20B012	107	2440
IR20B005	109	2170
IR20B005	70	1600
IR20B004	87.7	2020
IR20B003	94.8	1880
IR20B002	72.1	1460
IR18B031	131	3670
IR18B026	108	2300
IR18B026	71.3	1650
IR07B044A	174	3420
IR06B018	157	2600
IR58B020	105	2400
IR58B020	89.6	2060
IR58B019	106	1930
IR58B019	71.1	1480
IR58B019	69.5	1540
IR58B014	111	2450
IR58B016	192	3740
IR58B016	95.6	2000
IR58B016	69.8	1860
IR28B266	114	1840
IR28B179	83.7	1760
IR28B179	111	1630
IR28B179	115	2520
IR28B174	95.7	2040
IR28B174	104	2070
IR28B174	147	2860
IR28B174	142	2520
IR28B118	83.8	1790

Table 1
Summary of Cobalt/Nickel Analytical Results for Serrpentinite

Station ID	Cobalt (mg/kg)	Nickel (mg/kg)
IR28B102	103	2460
IR28B104	62	1130
IR28B094	102	3180
IR27B004	80	1480
IR27B004	53.8	1050
IR37B013	98.4	1830
IR37B013	82.4	1450
IR37B011	87.7	1470
IR37B011	92.2	1780
IR37B011	78	1700
IR33B060A	59.7	1960
IR09B030	62.7	1040
IR09B030	78.6	1560
IR09B028	89	1740
IR09B028	79.4	1270
IR09B007	138	2610
IR09B004	96.6	1240
IR09B003	201	4320
IR09B003	90.4	1820
IR09B003	119	2290
IR33B079	79.9	1700
IR56B032	112	2240
IR56B035	110	1590
IR56B028	93.4	1470
IR56B029	58	1600
IR56B024	97	1750
IR56B007	101	903
WHP1	80.4	1700
WHP2	84	2150
WHP3	88.2	2380
WHP4	94.3	2170
WHP5	73.3	1670
IR09B006	383	6340
IR09B006	153	3230
IR09B006	91.8	2140
1		1980
2		2050
3		1970
4		1880
5		2100
6		2010
7		2180
8		2370
9		1880
10		1950

DRAFT

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To Jil Finnegan | From Valerie Heusinkveld
Co. | Co.
Dept. | Phone # (510) 540-3844
Fax # | Fax #

To: Valerie Heusinkveld

From: Jim Frampton

Subject: Background Concentrations of Nickel at Hunte

By previous agreement (letter from Mr. Cyrus Shabahari to Mr. Richard Powell, dated September 25, 1995), nickel concentrations in fill material at Hunters Point Naval Shipyard (HPNS) were to be considered above "ambient levels" if values exceeded critical values of nickel which were to be defined as a linear function of magnesium concentrations in fill material.

At Site IR 18-1, it was found that based upon the regression equation calculated by PRC Environmental (August 17, 1995) that nickel concentrations greatly exceeded critical levels. It was hypothesized by Dr. Wakabayashi, representing Tetra Tech, that the observed high Nis to Mg ratios were a consequence of weathering of serpentinite bedrock and not due to anthropogenic sources of nickel at Site IR 18-1. I was contacted regarding the regression method used as it was based upon my earlier recommendations (memoranda to Cyrus Shabahari, dated January 19, 1994, August 31, 1994, and October 14, 1994). At the time, it was assumed that the fill material largely consisted of excavated bedrock of both serpentinite and associated Franciscan non-serpentinite rocks. The basis for my recommendation was that it is well known that the trace elements Ni, Co, and Cr are enriched in serpentinite rocks relative to other rock types due to isomorphic substitution of Ni and Co for Mg in serpentinite minerals and that chromite is associated with serpentinite minerals. In support of this reasoning, it was found that Ni and Co concentrations in HPNS fill material not likely to be contaminated were highly correlated with Mg concentrations. The ratio of Ni to Mg is also almost identical to the ratio of about 0.1 that has been reported in the literature for ultramafic rocks.

Although the above relationship is expected to hold for serpentinite rocks, it may not be true for soils developed over serpentinite parent materials. In time, it would be expected that Mg as well as other exchangeable cations would leach from these soils while Ni and Co would be retained in association with oxides of iron and manganese. This is confirmed in a review of the chemistry of "serpentine" soils.

Based upon Boring logs from Site 18 where much excavation had taken place as well as my post-excavation observations of the site, it appeared that material excavated was unconsolidated material over serpentinite bedrock. At the south end of the excavation, the unconsolidated material appeared to be a deep soil with a distinct A horizon of about 18 inches. The Munsell color was 10YR 3/1 (dry) and 10YR 2/1 (moist). Below this horizon were several feet of lighter colored soil (10YR 4/4 (dry) and 10YR 3/4 (moist)). Unfortunately, I was denied access to the excavation area and therefore could not conduct a more extensive description of the soil profile. Although I initially believed that this soil was developed from serpentinite bedrock, upon further reflection, the soil profile was not typical of "serpentine" soils. However, moderately high Ni and Co levels suggested that this soil was of mixed origin. The soil surface slopes northward toward the bay and becomes buried under fill material.

To determine whether or not high Ni to Mg ratios indicated contamination, I evaluated the relationship of Ni to Co in HPNS bedrock, fills material and soils. Ni to Co ratios are less likely

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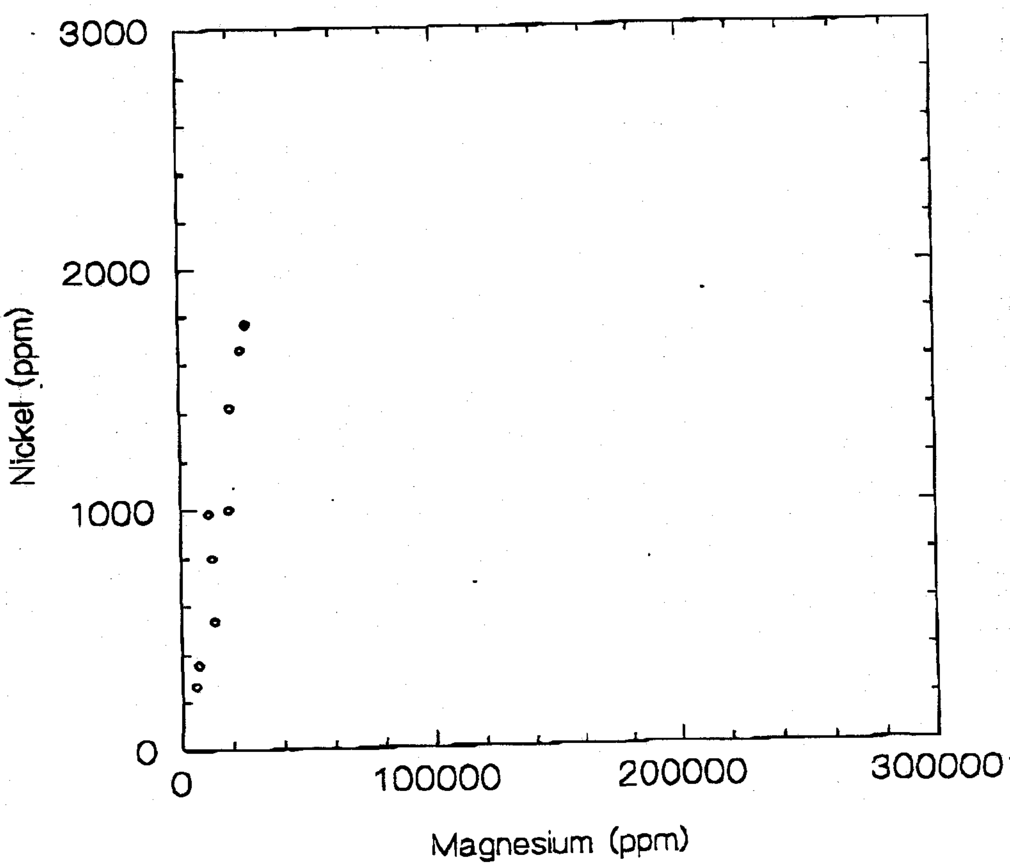
to vary with weathering processes and the Ni to Co ratio in local serpentinite rocks is fairly constant. . Nickel concentrations were found to be highly correlated to Co levels, and the regression equation was nearly the same for all samples taken at HPNS. At lower concentrations at HPNS, Ni to Co ratios decreased. However, this was mostly evident in samples containing less than 300 ppm Ni.

For visual confirmation of my observations, I have attached several scatter plots with Ni and Co as the variables of interest. It is evident that the points plotted for Borings 30, 31, 37, and 38 at Site 18-1 overlap points plotted for Site IR 4 (Scrap Yard). Similarly, plots of post excavation Ni and Co concentrations also overlap points plotted for the Scrap Yard.

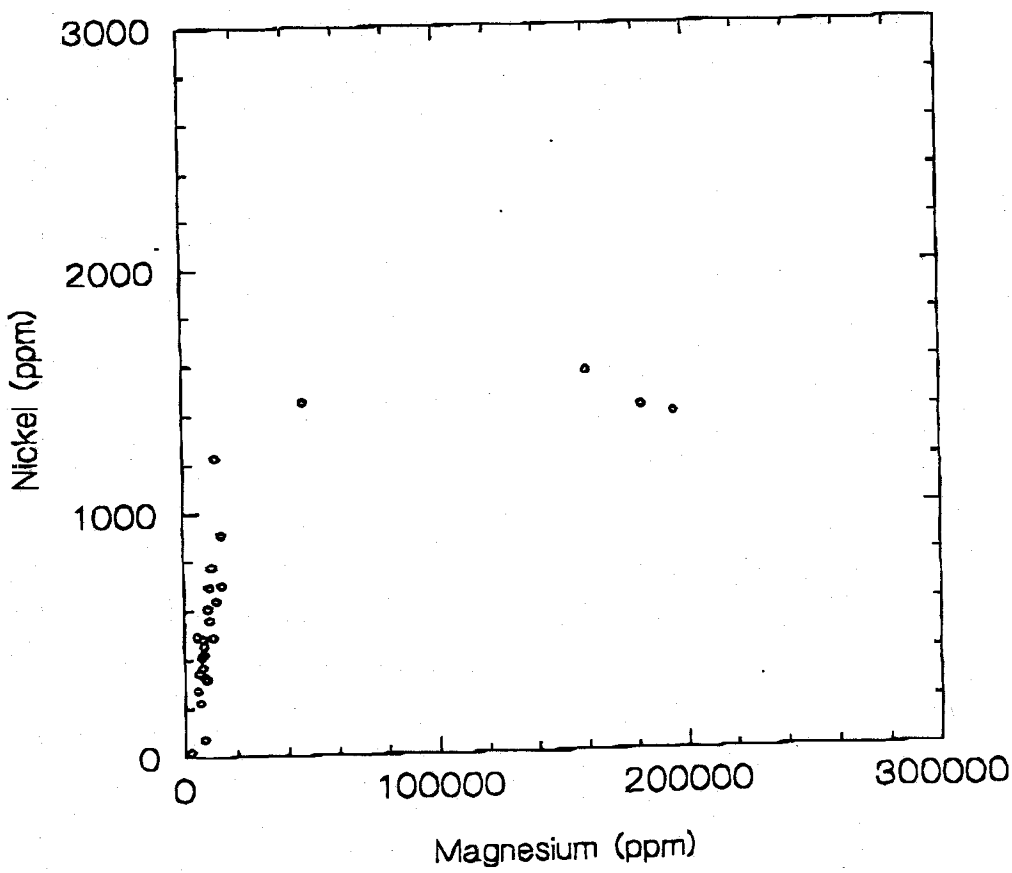
It is therefore my conclusion that high Ni to Mg ratios in Borings 30, 31, 37, and 38, and in post excavation samples are due primarily to leaching of soil Mg. This is confirmed by the constancy of the Ni to Co ratios from serpentinite bedrock to soil. Hence, there is no evidence that high Ni concentrations at the excavation area are due to anthropogenic sources.

Site IR 18-1: Excavation

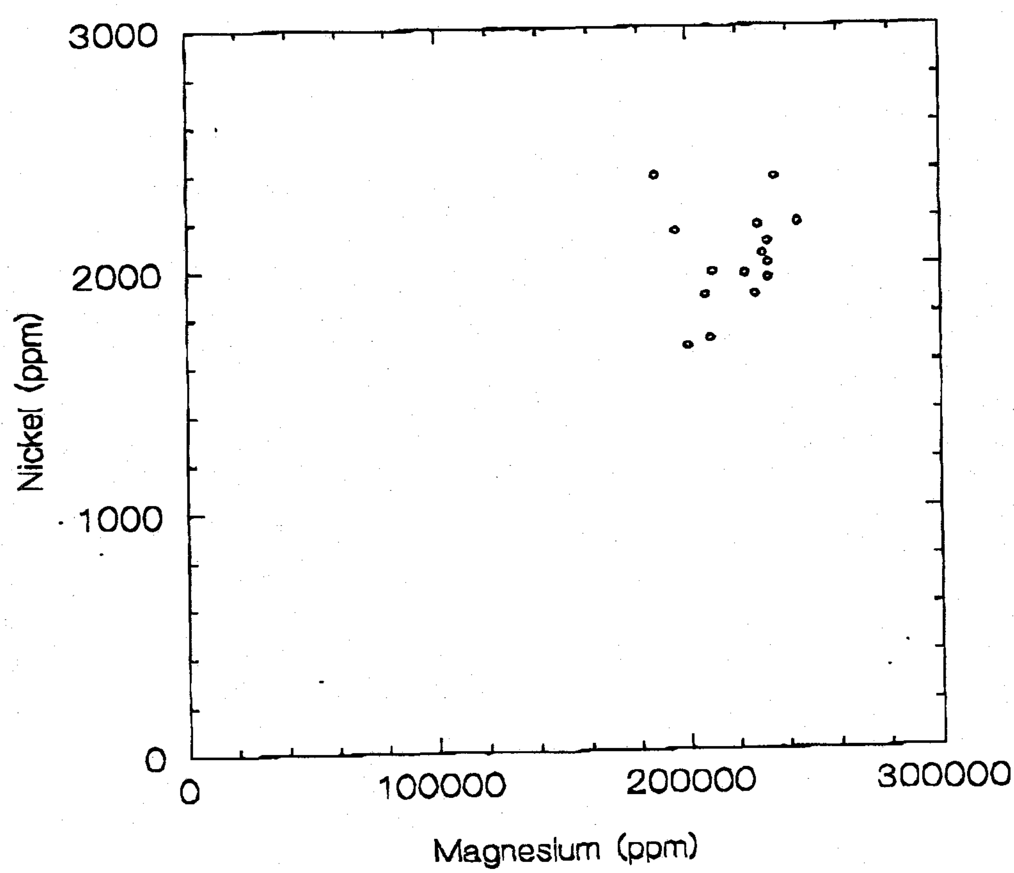


10/1/98

Site IR 18-1: (Borings 31,32,37 and 38)



Serpentinite Outcrops



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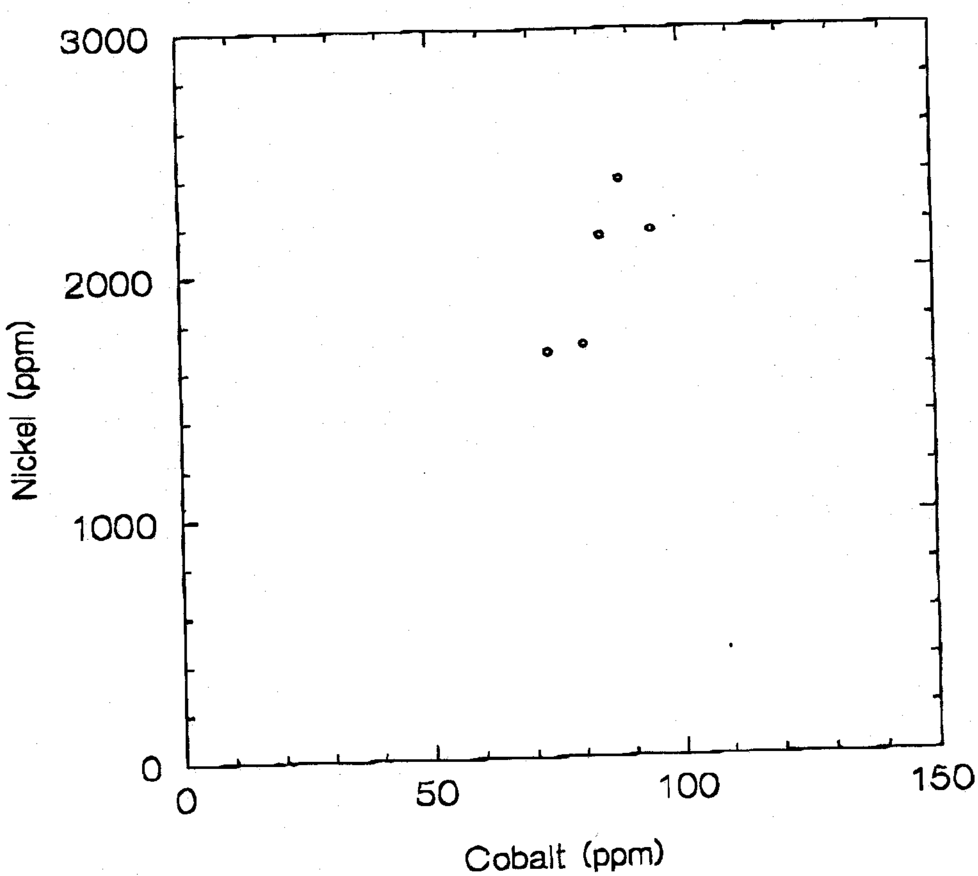
Serpentinite Outcrops (WHP 1-5)



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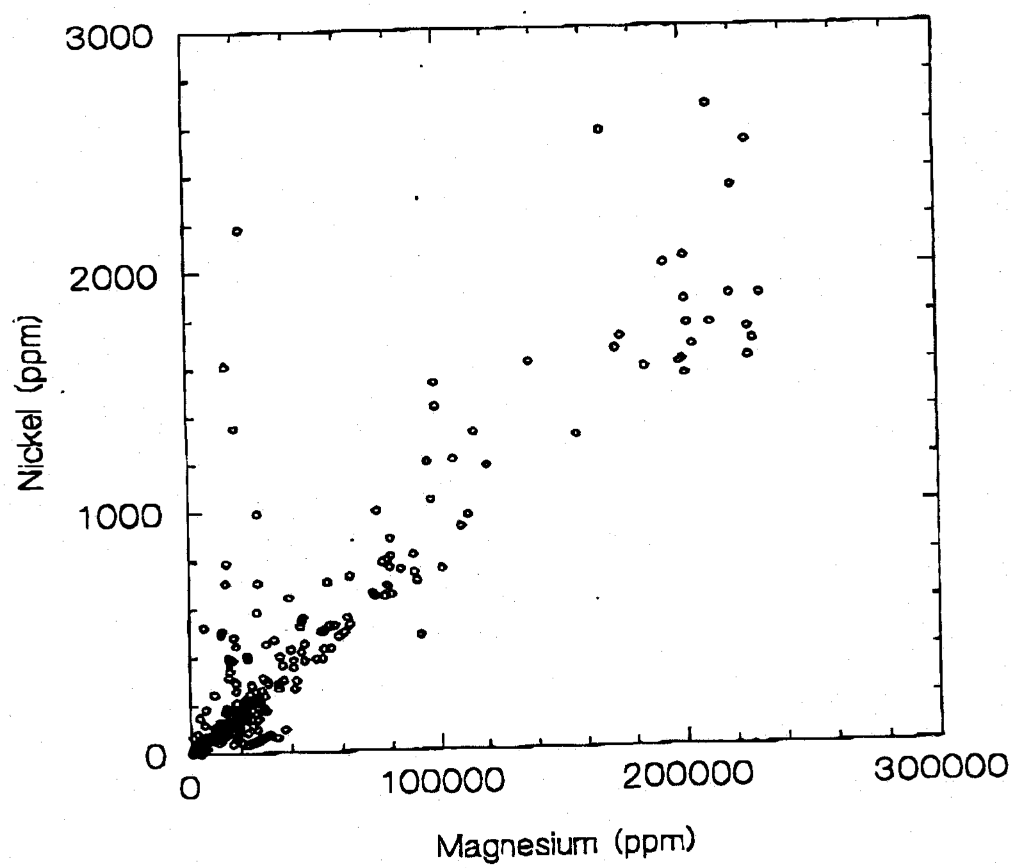
Site IR-2: Bay Fill Area



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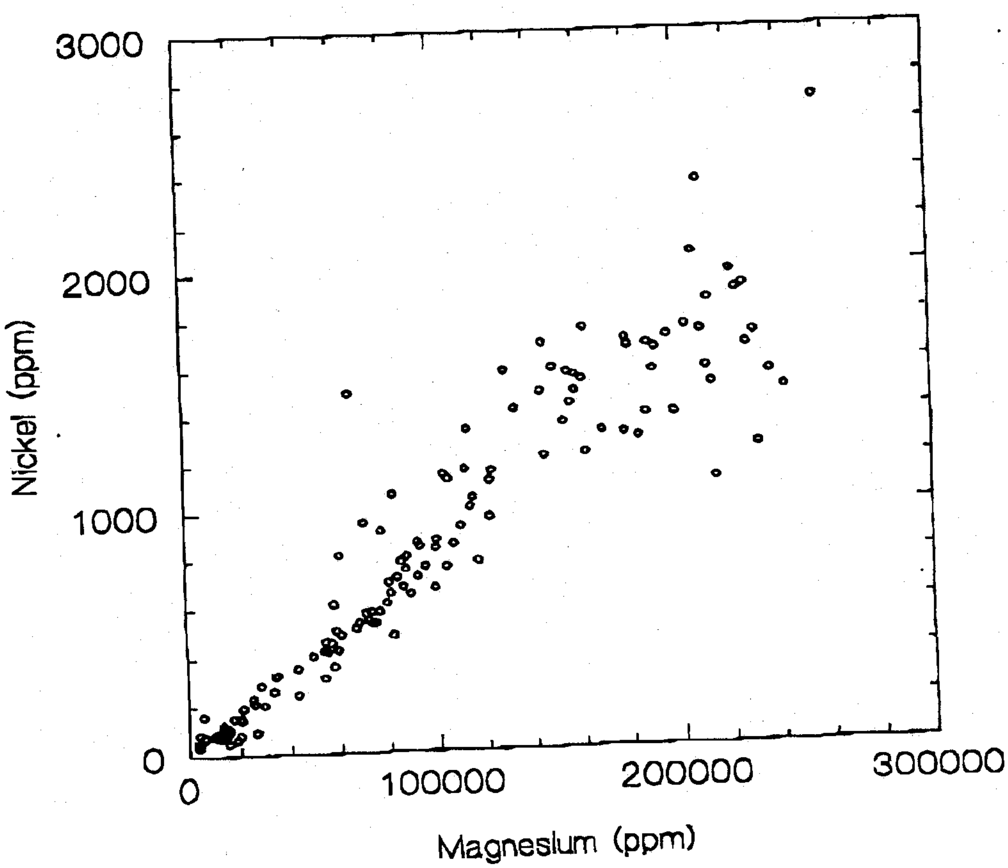
Site IR-4: Scrap Yard



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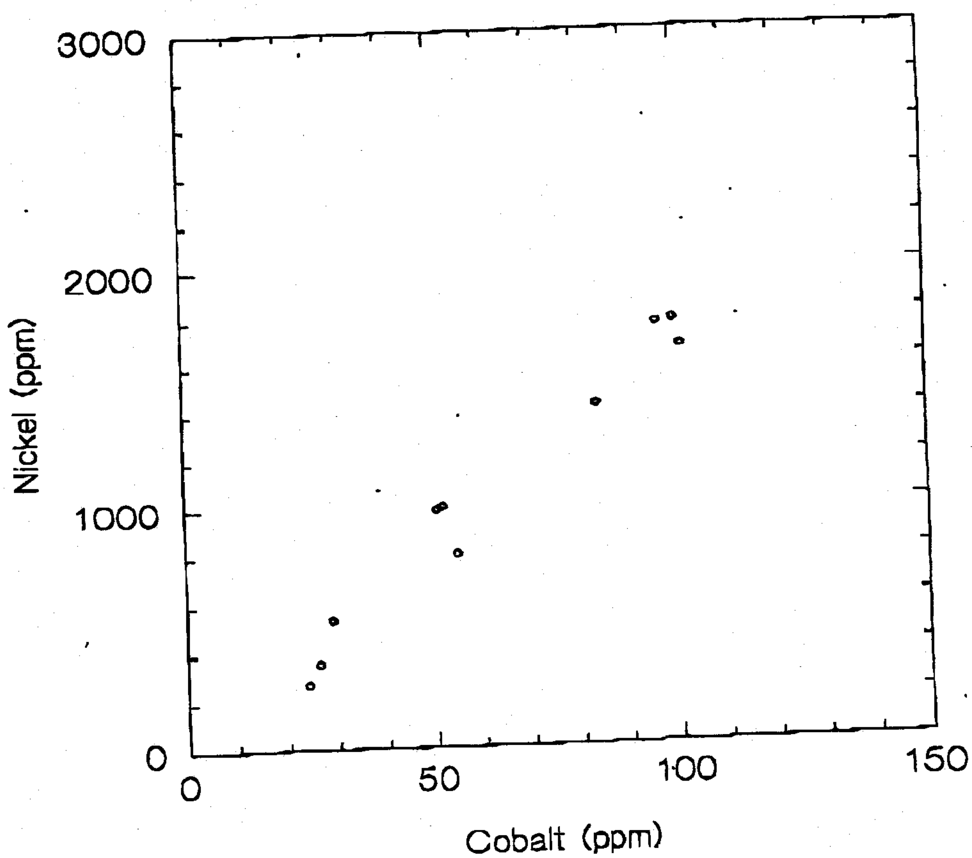
Site 18-1: Post-excavation



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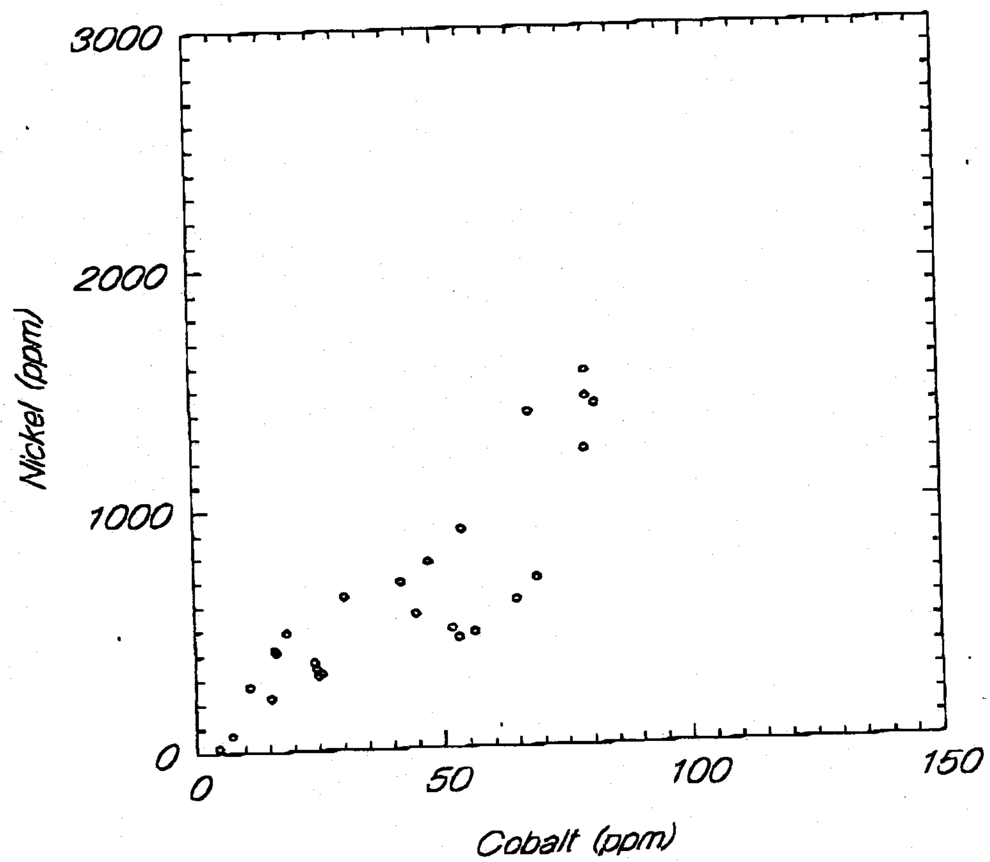
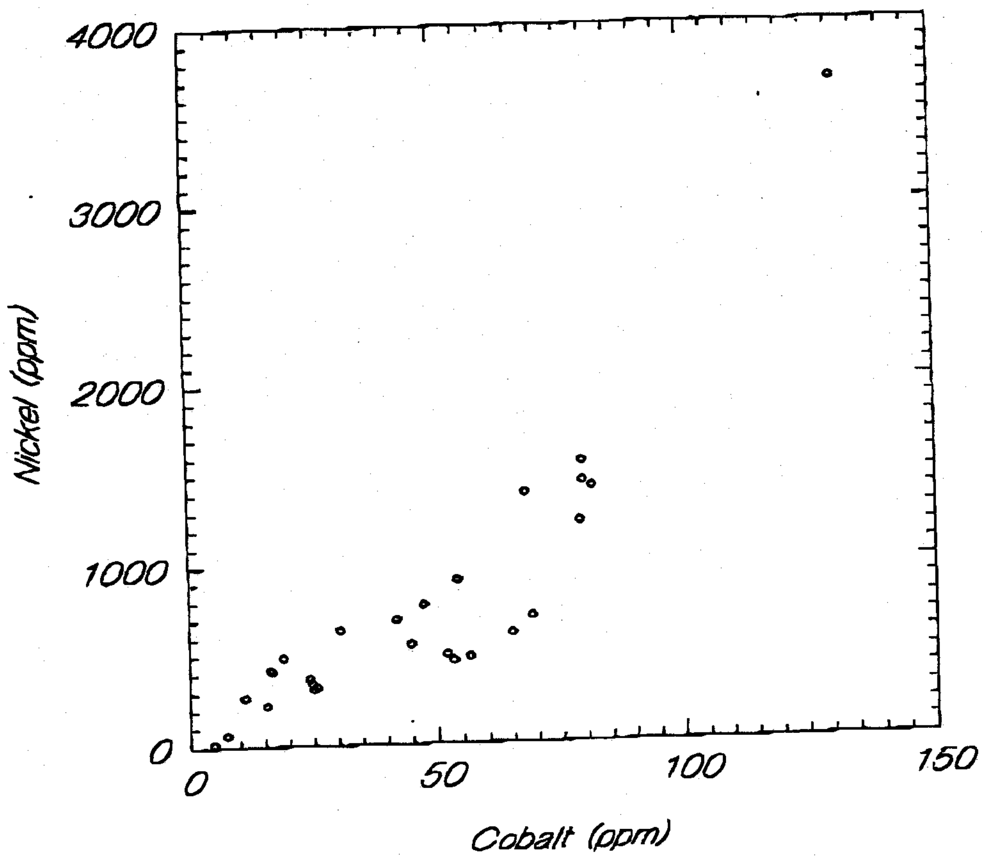
Site IR 18-1: Borings 30, 31, 37, and 38



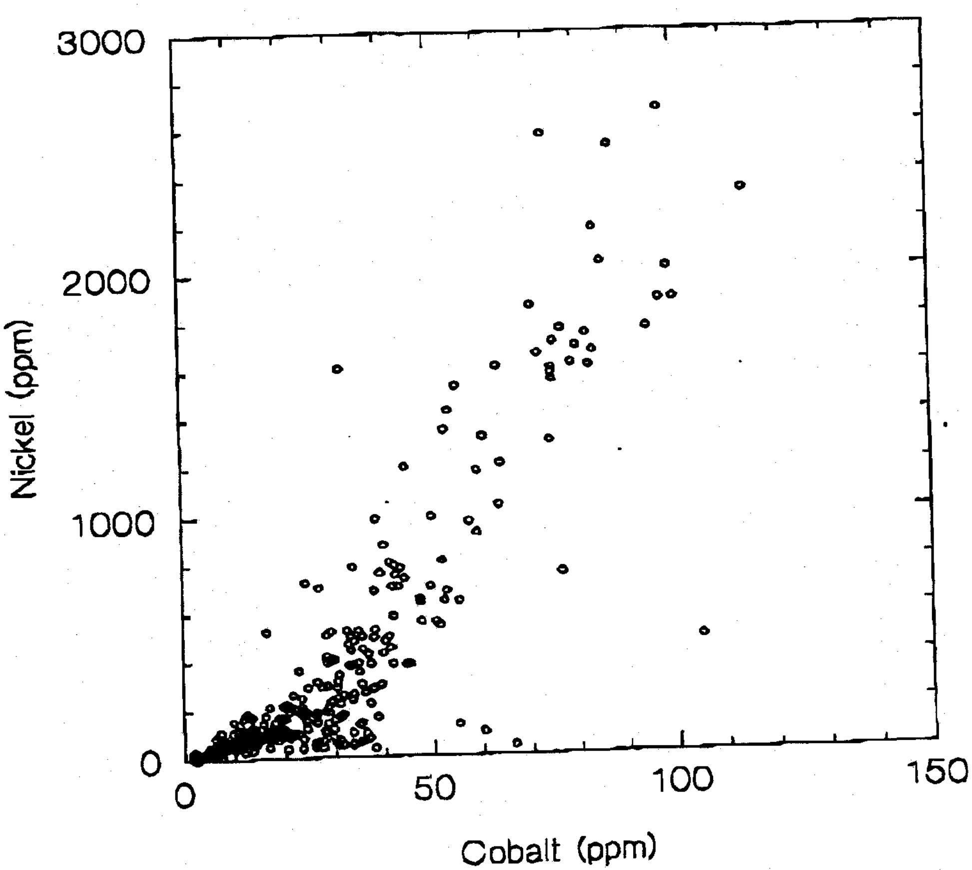
10/7/98

Site IR 18-1: Borings 30, 31, 37, and 38



10/7/98

Site IR-2: Bay Fill Area



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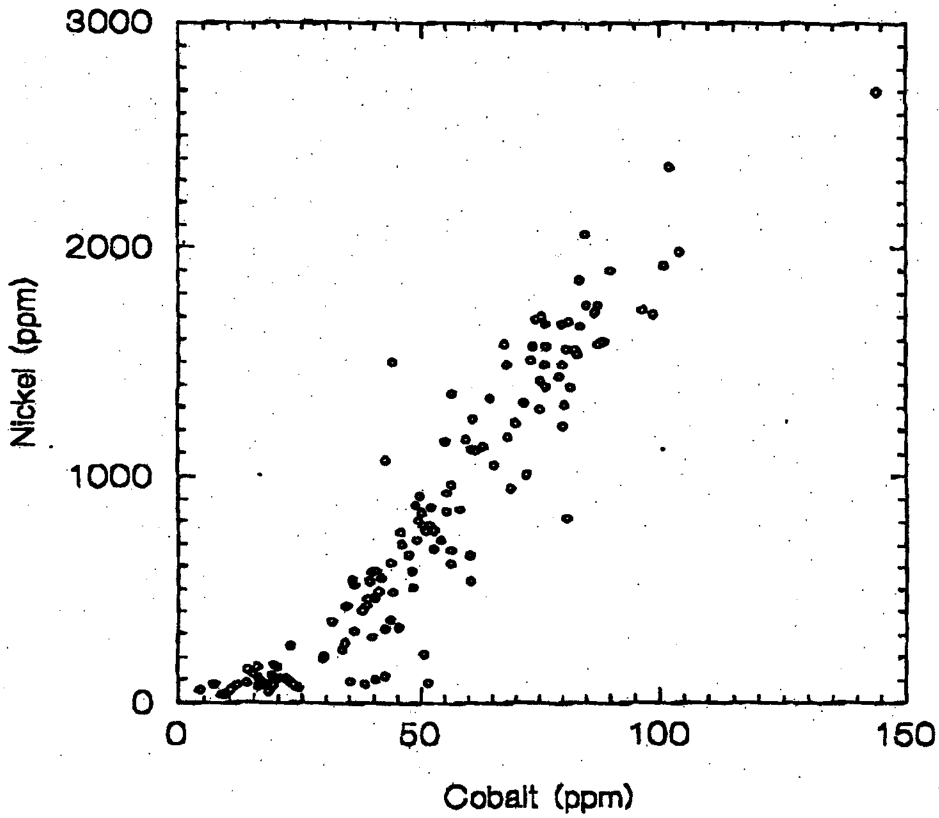
Site IR-4: Scrap Yard



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