considered elevated or impacted as compared to a similar landscape without the occurrence of lead/zinc mineralization.

3.3 Potential Future Land Use

It is our understanding that the Government of Nunavut (GN), in conjunction with the mine owner, is investigating potential alternative land use scenarios for the site. Furthermore it was understood that some future land use scenarios could potentially involve the removal of all existing housing units at the townsite. However, it is possible that the existing bunkhouse, cafeteria, office, medical building and the hotel might remain in use on site as part of a potential future site use.

Any decision on future or alternative land use for the Nanisivik townsite must account for the metal levels currently present within the soil, the potential metal levels in the future, the type and severity, including the time component of the exposure to existing and the predicted future levels.

4.0 PROGRAM METHODOLOGY

4.1 Soil Sampling Program

A total of 132 soil samples were collected and submitted for metal analyses of which 109 samples were collected from surface soils representative of the borrow pad located at the townsite, 13 samples were representative of soil profile samples collected from soil probes located within the townsite, and 10 samples were representative of soil profile samples collected from two soil probes at potential control sites. These two potential control sites were located north of the antenna farm, and at Kilometer 9 on the road to the airport (Figure 2).

Soil sampling occurred over a four day period between June 9 to 12. EBA personnel from the Yellowknife office were mobilized to the site and completed the field portion of the sampling program.

4.1.1 Sampling Grid

A sampling grid was established for use as a reference tool for locating soil sampling and assisting in the data analyses. The grid system was based on two of the main roads in the community as the X and Y-axes, and parallel to as many roads as practical located within the townsite. This system resulted in an oblique grid shape as compared to True North, with dimensions of approximately 45 m x 50 m. The X-axis was labeled from 000 to 1200 starting in the northeast and trending to the southwest, with the Y axis labeled from 0 to 90, starting in the northwest and trending towards the southeast.

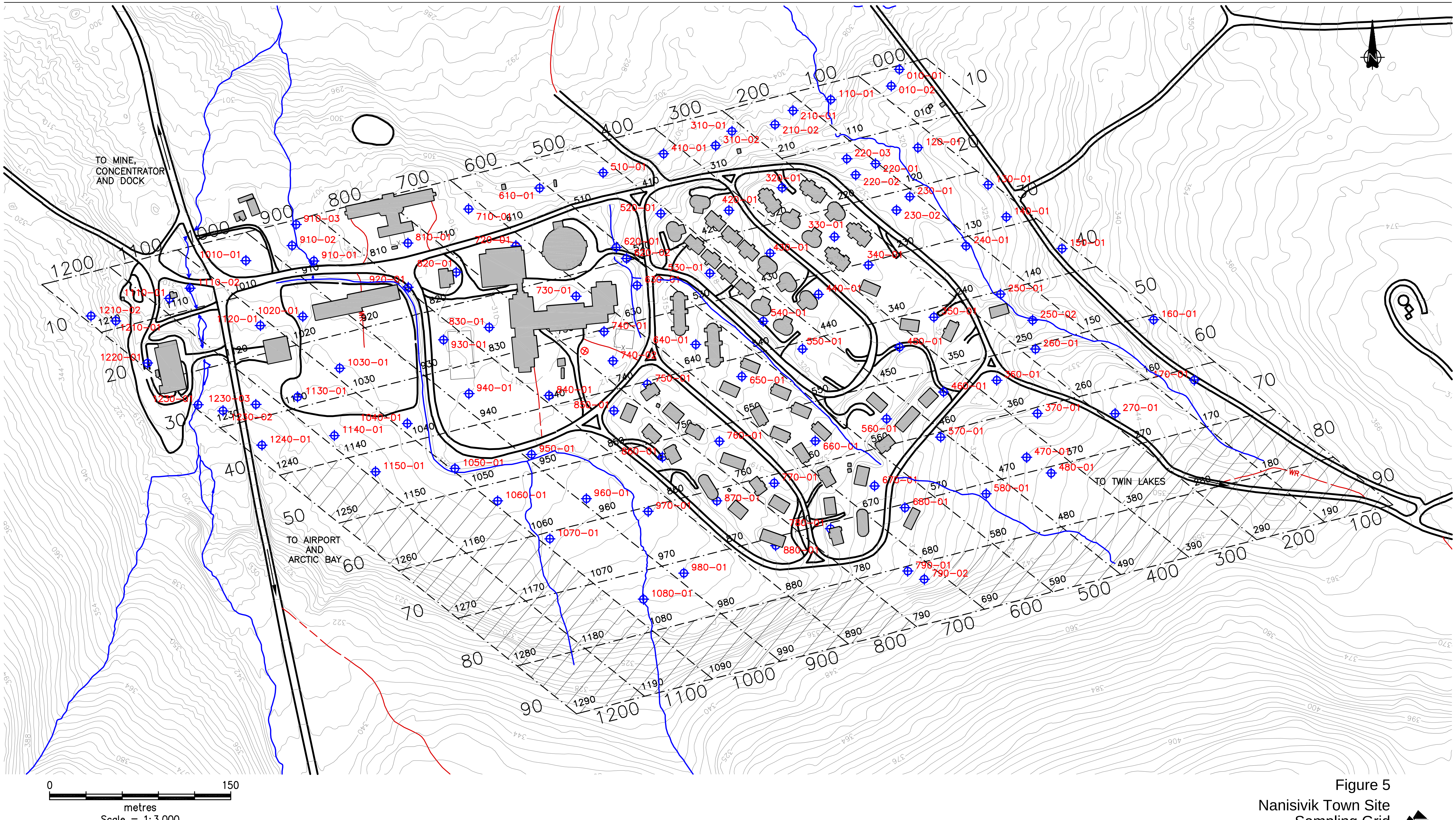


Figure 5
Nanisivik Town Site
Sampling Grid

FIG-5-Grid.dwg

When using a grid-based sampling system, it is common to take a sample at each intersection of the grid lines. This approach was considered in this case, however the possibility that grid points would fall inside a building or other inaccessible location was deemed to present problems with this proposed approach. Additionally, it was considered that there could be variability of soil types within a relatively short distance of the grid intersection points and this issue could pose potential problems.

It was therefore decided to use a modified approach in which at least one sample would be taken within the area of each grid cell. Where warranted, more than one sample was collected in a grid square, for example, if there was a marked difference observed in the soil type present within a grid cell.

Each grid cell was given a unique identification number relative to the X and Y axis. For example, grid square 1290 referred to the most westerly based grid square along the X axis as well as the most southerly based square based on the Y axis. Soil samples were subsequently labeled according to the grid in which the sample was collected. A detailed plan of the sampling grid is presented as Figure 5.

Sample locations were marked on a plan utilizing the developed grid based system with visual reference to buildings and other landmarks and recorded by a handheld GPS unit. Photographs of the majority of the sample sites were also taken to record actual site conditions, with the photographs presented in Appendix B.

4.1.2 Sampling Procedures

Surface samples were taken with a stainless steel hand trowel, purchased new for this project. The trowel was washed and rinsed with de-ionized water prior to first use. It was cleaned with a clean, disposable industrial paper towel and de-ionized water and rinsed with deionized water between samples,

Care was taken to avoid contact with the soil sample. Sample bags were labeled prior to placing the sample in them. Disposable latex gloves were worn while sampling. The gloves were discarded after each sample was taken. The sample identification number comprised the grid cell ID number, plus the sample number within the grid cell. The sample was not allowed to contact anything other than the trowel and the inside of the sample bag.

In addition to the surface sample or samples taken in each grid square, profile or soil probe samples were taken at four locations throughout the town site. These samples were identified on the basis of the grid square ID number plus a P after the number to indicate a profile sample. These samples were collected utilizing a 0.05 metre diameter hand-operated 'dutch auger'. Samples were collected at the following sampling intervals; 0 -0.05 metres; 0.05 – 0.10 mm, and at additional 0.05 or 0.1 metre increments to auger refusal.

Auger refusal varied from 0.2 to 0.3 metres below surface grade. Generally auger refusal was due to the occurrence of large diameter rock fill and/or the presence of frozen ground. Samples were removed from the auger with the stainless steel trowel and placed in sample bags.

Samples were placed in coolers and shipped to EnviroTest Laboratories (ETL) in Edmonton for analysis. Chain-of custody forms were completed and included in the coolers with the samples. Samples remained in the custody of EBA personnel until transferred to First Air Cargo in Iqaluit for shipment to ETL facilities located in Edmonton, Alberta.

Soil probe sample depths were limited by the occurrence of frozen ground. There was little variation in soil within that depth range. Three soil probes were taken within the built-up portion of the townsite (Figure 5). The soil profile at these three locations consisted of shale fill with particle sizes ranging in diameter from 0.019 m to 0.035 m. The fourth soil probe was situated in an area adjacent to the road to the airport, presumed to be representative of natural ground conditions. The soil at this location consisted of a brown silt containing small stones and minor organic material.

4.1.3 Quality Assurance/Quality Control

A quality assurance/quality control was implemented by the project team, which consisted of the use of field split samples and/or blind duplicates and duplicate samples. This program was in addition to the laboratory's own internal QA/QC program number.

Three of the total of 132 samples were 'split' or blind duplicates and included samples 220-3 and 220-4; samples 710-1 and 710-2 and samples 820-1and 820-2. Each of these split samples was given it's own, unique sample number and are identified as split samples with the use of the letter S in table 1. They were not identified to the laboratory as split samples.

Additionally, two samples were collected as duplicate samples and were identified as such to the laboratory. These samples were labeled using the same sample number but using the letter A and B after each sample number. The samples included 1010-01A and 1010-01B; and, 740-01A and 740-01B.

Inquires were made with the laboratory with regards to implementing a series of travel blanks to ensure cross contamination was not encountered within the samples during transport from the field location to the laboratory. The conclusion the team arrived at was such measures were not required as long as reasonable precautions were implemented to minimize the possibility of cross contamination (i.e. securing sampling containers, maintaining the chain of custody).

Additionally as further co-ordination with the owner's agent, Lorax Environmental, one sample was split and was analyzed by both laboratories utilized by both consultants (i.e.

ETL used by EBA and ALS Laboratories of Vancouver B.C utilized by Lorax). This soil sample was labeled Sample 130-01.

As EBA and Lorax implemented and utilized differing analytical procedures, it was agreed that ten soil samples collected by both consulting firms from similar locations would be analyzed by their selected laboratory by the other consultants preferred methods. At the time of report preparation, EBA had not been advised of the laboratory results that had been received by Lorax. Of those samples taken by EBA and analyzed by both procedures, results between the two procedures are broadly comparable, with neither procedure producing consistently higher or lower results.

4.2 Background Sample Site Selection

Two sites were selected for collection of potential background soil samples for use as a baseline. Some of the criteria used for site selection consisted of the following:

- Topographically up-gradient of the townsite and mine;
- Up-wind of the mine; and,
- Accessibility.

Wind direction and velocity data were not available at the time of sample selection. Comments from mine personnel indicated that the wind direction was variable at the Nanisivik townsite, and the wind could originate from any direction. On this basis, EBA personnel selected two differing locations, one situated topographically upgradient of the townsite on the hill north of the antenna farm, and the other site located topographically upgradient of the townsite along the road to Arctic Bay.

A potential background site was selected at the ridge situated to the north of the antennae farm, approximately 1200 m northwest of the town site and 800 m west of the mill. This site is identified on the site plan as CON1P**.** At this location a soil probe was augered to refusal at 0.350 metres depth below surface grade. Discreet soil samples were subsequently collected from 0 – 0.05 m; 0.05 – 0.100 m; 0.100 – 0.150 m; 0.150 – 0.200 m; 0.200 – 0.300 m; and 0.300 – 0.350 m.

There was concern that the background samples collected from this site could potentially be affected by wind-blown material from the landfill, since solid waste is periodically burned at the landfill. The sample site was located approximately 500 m to the north of the landfill.

A second background sample site was selected along the road to Arctic Bay and the airport approximately three kilometres from the townsite. It was located near the Km 9 milepost and approximately 50 metres west of the road outside the influence of the roadbed. It was situated approximately 2300 m from the tailings pond. This site was identified on the site plan as CON2P. A soil probe was augered to refusal at 250 mm. Discreet samples were taken from 0 – 50 mm, 50 – 100 mm, and 100 – 200 mm. It was possible that the background samples from this site would be affected by windblown tailings originating from the tailings pond and by road dust.

The purpose in collecting the background soil samples was to identify naturally occurring levels of metals within the soil. However it must be noted that during the site selection of the background sites, no consideration was given to potential differences of metal concentrations within the soil due to differences in the underlying bedrock.

4.3 Analytical Procedures

Based upon discussions with the laboratory ETL, and internal technical resources within EBA, it was requested that the soil samples be analyzed for metals using US EPA (approved) Method 3051. This method is for the Microwave-Assisted Acid Digestion of Sediments, Sludges, Soils and Oils. In summary, this method provides for digestion in 10 mL of concentrated nitric acid for 10 minutes using microwave heating. The sample and acid are placed in a fluorocarbon microwave vessel, which is capped and heated in a microwave unit. The vessel is allowed to cool and the contents are filtered, centrifuged or allowed to settle and analyzed. This digestion method procedure was selected on the basis of defensibility, as it is a standard known procedure, with flexibility in providing the analytical results requested and the lowest method detection levels.

One change was implemented in the sample digestion protocol due to the site specific characteristics encountered at Nanisivik. This change was the decision to increase the sample sieve size to 5 mm where as the sample procedure called for a maximum size of 2mm. This was done to ensure that acceptable amounts of soil were available to analyze due to the coarse grain size of the samples collected in the field. This change was implemented following discussions with the laboratory after reaching the conclusion the change in the sieve size would not impact the validity and defensibility of the laboratory procedure.

The samples were subsequently analyzed by inductively-coupled plasma-mass spectroscopy (ICP-MS) methods to determine the metal levels. The use of the ICP-MS methods associated with the EPA Procedure 3051 was concluded as the preferred method, as it offers the most precise and reproducible results, with the lowest detection limits. Samples were analyzed for trace metals and total major metals. Soil salinity measurements, were not obtained. A complete summary of the analytical results obtained from ETL and the parameters analyzed are presented in Appendix C.

5.0 ANALYTICAL RESULTS

5.1 General

A total of 132 soil samples were collected from the Nanisivik townsite and subsequently submitted for metal analyses at ETL. The soil samples collected were representative of the existing surface soil conditions at the Nanisivik town site as of early June 2002 with exception of the soil samples collected from the four profile sample locations, and the two potential control sites.

A summary table, Table 1, was prepared which depicts the concentrations of zinc, lead, cadmium, and copper in the surface samples analyzed. This table was prepared for simplistic purposes to deal specifically with those metals considered to be potential concerns in the Nanisivik environment. A complete set of analytical data is presented in Appendix C, with the received analytical sheets received from the laboratory.

Table 1 also highlights the detection limits for these parameters and the Canadian Council of Ministers for the Environment (CCME) Guideline for the Protection of Environmental and Human Health for residential sites. The CCME guideline for industrial sites is also depicted for comparison purposes. It was decided that for initial purposes, comparison against the CCME criteria for residential sites was deemed the most appropriate as the samples were collected from a residential setting. Comparison against differing guidelines would also be appropriate, upon selection the future end use of the townsite or the development of site specific remediation criteria for the various metal parameters to account for the naturally enriched or elevated levels of lead and zinc that occur at the Nanisivik site due to the presence of the zinc-lead ore body.

Table 1- Metal Analyses Summary (Cu, Cd, Pb and Zn)
Nanisvik Town Site Soil Samples (mg/kg)

Sample	Date	Time	Depth (m)	Cu	Cd	Pb	Zn
Detection Limit				**2**	**0.5**	**5**	**10**
CCME - PE&HH (industrial)				**91**	**27**	**600**	**380**
CCME - PE&HH (residential)				**63**	**10**	**140**	**200**
010-01	2002-06-10	11:54	0-0.05	20	4.3	**174**	**1 780**
010-02	2002-06-10	12:00	0-0.05	19	6.4	**156**	**1 770**
110-01	2002-06-10	12:08	0-0.05	15	5.8	127	**1 770**
120-01	2002-06-11	10:51	0-0.05	20	9.9	**665**	**2 410**
130-01	2002-06-11	10:51	0-0.05	18	**15.5**	**169**	**3 100**
140-01	2002-06-11	10:44	0-0.05	22	2.9	**247**	**980**
150-01	2002-06-11	12:36	0-0.05	16	4.7	**209**	**1 280**
160-01	2002-06-11	10:36	0-0.05	42	9.9	**274**	**2 570**
170-01	2002-06-11	10:28	0-0.05	**128**	6.4	**242**	**4 690**
210-01	2002-06-10	12:15	0-0.05	22	**27.6**	**226**	**20 400**
210-02	2002-06-10	12:20	0-0.05	**108**	**40.5**	**561**	**38 500**
220-01	2002-06-11	10:58	0-0.05	27	9.4	**195**	**2 370**
220-02	2002-06-11	11:02	0-0.05	25	6.3	**158**	**4 940**
220-03	2002-06-11	11:06	0-0.05	**74**	**47.6**	**483**	**29 000**
220-04	2002-06-11	11:06	0-0.05	**68**	**50.2**	**393**	**29 100**
230-01	2002-06-11	12:23	0-0.05	43	**38.9**	**297**	**27 500**

Sample	Date	Time	Depth (m)	Cu	Cd	Pb	Zn
Detection Limit				**2**	**0.5**	**5**	**10**
CCME - PE&HH (industrial)				**91**	**27**	**600**	**380**
CCME - PE&HH (residential)				**63**	**10**	**140**	**200**
230-02	2002-06-11	12:36	0-0.05	30	**11.5**	**162**	**6 250**
240-01	2002-06-11	12:31	0-0.05	25	7.2	**240**	**4 100**
250-01	2002-06-11	12:40	0-0.05	**71**	**10.4**	**457**	**3 580**
250-02	2002-06-11	12:36	0-0.05	**107**	**22.2**	**618**	**12 900**
260-01	2002-06-11	12:40	0-0.05	41	2.5	94	**1 120**
270-01	2002-06-11	10:23	0-0.05	20	9.0	**172**	**2 800**
310-01	2002-06-10	12:35	0-0.05	30	4.6	**192**	**1 630**
310-02	2002-06-10	12:35	0-0.05	26	8.8	**243**	**1 890**
320-01	2002-06-11	09:34	0-0.05	49	3.7	**230**	**1 170**
330-01	2002-06-11	09:39	0-0.05	54	3.8	**249**	**1 220**
340-01	2002-06-11	09:43	0-0.05	45	1.5	84	**450**
350-01	2002-06-11	09:57	0-0.05	45	0.7	58	**260**
360-01	2002-06-11	09:51	0-0.05	43	**10.5**	**217**	**3 220**
370-01	2002-06-11	09:56	0-0.05	53	3.0	114	**1 150**
410-01	2002-06-10	12:45	0-0.05	42	4.7	**244**	**1 390**
420-01	2002-06-11	09:10	0-0.05	25	**13.0**	**416**	**3 880**
430-01	2002-06-11	09:06	0-0.05	22	2.5	80	**840**
440-01	2002-06-11	09:02	0-0.05	30	6.3	**286**	**2 010**
450-01	2002-06-11	08:58	0-0.05	41	9.2	**2 720**	**2 860**
460-01	2002-06-11	08:52	0-0.05	59	6.5	**308**	**2 100**
470-01	2002-06-11	08:42	0-0.05	**107**	1.3	93	**570**
480-01	2002-06-11	08:47	0-0.05	28	**13.6**	**288**	**4 540**
510-01	2002-06-10	13:05	0-0.05	34	0.6	22	**220**
520-01	2002-06-11	08:07	0-0.05	19	4.0	**164**	**1 150**
530-01	2002-06-11	08:16	0-0.05	28	**31.1**	**1 380**	**9 780**
540-01	2002-06-11	08:20	0-0.05	27	4.4	**178**	**1 630**
550-01	2002-06-11	08:24	0-0.05	35	0.8	84	**330**
560-01	2002-06-11	08:28	0-0.05	45	2.1	95	**600**
570-01	2002-06-11	08:36	0-0.05	**65**	8.5	**678**	**2 800**
580-01	2002-06-11	08:36	0-0.05	**153**	3.1	**403**	**1 170**
610-01	2002-06-10	12:10	0-0.05	46	3.3	89	**1 030**
620-01	2002-06-10	20:21	0-0.05	26	**29.7**	**347**	**9 380**
620-02	2002-06-10	20:24	0-0.05	57	**10.3**	**466**	**3 350**
630-01	2002-06-10	20:16	0-0.05	26	3.7	**184**	**1 180**
640-01	2002-06-10	20:12	0-0.05	29	7.0	**352**	**2 560**
650-01	2002-06-10	20:08	0-0.05	30	1.0	68	**310**
660-01	2002-06-10	20:03	0-0.05	26	2.1	129	**680**
670-01	2002-06-10	19:57	0-0.05	31	7.4	**249**	**2 340**
680-01	2002-06-10	19:51	0-0.05	**79**	3.8	**448**	**1 580**
710-01	2002-06-10	13:15	0-0.05	22	**13.9**	**266**	**3 960**
710-02	2002-06-10	13:20	0-0.05	33	**29.4**	**392**	**12 600**
720-01	2002-06-10	19:12	0-0.05	30	**15.9**	**382**	**4 430**
730-01	2002-06-10	19:15	0-0.05	26	**11.7**	**507**	**3 790**
740-01A	2002-06-10	19:19	0-0.05	17	2.7	139	**820**
740-01B	2002-06-10	19:19	0-0.05	18	2.8	**145**	**910**
740-02	2002-06-10	19:23	0-0.05	8	0.5	**141**	**210**
750-01	2002-06-10	19:27	0-0.05	35	1.5	88	**480**
760-01	2002-06-10	19:31	0-0.05	38	6.4	**219**	**1 910**
770-01	2002-06-10	19:35	0-0.05	41	3.9	**162**	**1 310**
780-01	2002-06-10	19:39	0-0.05	43	3.6	**162**	**1 160**
790-01	2002-06-10	19:43	0-0.05	27	1.6	61	**580**
790-02	2002-06-10	19:43	0-0.05	23	0.7	126	**330**
810-01	2002-06-10	13:25	0-0.05	29	**12.8**	**460**	**2 070**
820-01	2002-06-10	19:00	0-0.05	31	**10.1**	**281**	**3 420**

Sample	Date	Time	Depth (m)	Cu	Cd	Pb	Zn
Detection Limit				**2**	**0.5**	**5**	**10**
CCME - PE&HH (industrial)				**91**	**27**	**600**	**380**
CCME - PE&HH (residential)				**63**	**10**	**140**	**200**
820-02	2002-06-10	19:00	0-0.05	35	7.6	**231**	**2 410**
830-01	2002-06-10	18:54	0-0.05	30	4.7	**209**	**1 280**
840-01	2002-06-10	18:49	0-0.05	23	4.2	**344**	**1 410**
850-01	2002-06-10	18:44		27	2.2	62	**640**
860-01	2002-06-10	18:38	0-0.05	31	0.9	23	**370**
870-01	2002-06-10	18:34	0-0.05	34	0.7	125	**240**
880-01	2002-06-10	18:29	0-0.05	27	0.6	47	**210**
910-01	2002-06-10	13:25	0-0.05	47	6.7	**180**	**2 750**
910-02	2002-06-10	13:45	0-0.05	41	5.7	**198**	**1 810**
910-03	2002-06-10	13:50	0-0.05	22	0.8	31	**440**
920-01	2002-06-10	17:37	0-0.05	35	1.5	22	**480**
930-01	2002-06-10	17:43	0-0.05	26	**10.6**	**451**	**3 630**
940-01	2002-06-10	17:47	0-0.05	27	0.7	29	**220**
950-01	2002-06-10	17:53	0-0.05	56	1.2	**197**	**400**
960-01	2002-06-10	17:58	0-0.05	44	3.7	**262**	**840**
970-01	2002-06-10	18:22	0-0.05	51	<0.5	44	**210**
980-01	2002-06-10	18:16	0-0.05	29	0.8	123	**370**
1010-01A	2002-06-10	14:05	0-0.05	33	**11.0**	**203**	**3 860**
1010-01B	2002-06-10	14:05	0-0.05	38	**11.1**	**255**	**4 000**
1020-01	2002-06-10	15:01	0-0.05	**166**	4.0	**177**	**1 180**
1030-01	2002-06-10	14:55	0-0.05	37	<0.5	24	110
1040-01	2002-06-11	13:05	0-0.05	**85**	**11.3**	**159**	**4 180**
1050-01	2002-06-11	13:11	0-0.05	26	5.0	92	**1 840**
1060-01	2002-06-11	13:16	0-0.05	43	1.3	69	**510**
1070-01	2002-06-11	13:20	0-0.05	56	3.9	**155**	**1 400**
1080-01	2002-06-10	18:05	0-0.05	40	0.8	91	**240**
1110-01	2002-06-10	14:10	0-0.05	39	4.6	**245**	**1 450**
1110-02	2002-06-10	14:10	0-0.05	33	1.2	104	**450**
1120-01	2002-06-10	15:07	0-0.05	29	4.5	**168**	**1 180**
1130-01	2002-06-10	14:48	0-0.05	23	<0.5	15	90
1140-01	2002-06-11	13:28	0-0.05	28	1.1	118	**330**
1150-01	2002-06-11	13:25	0-0.05	21	0.8	25	**220**
1210-01	2002-06-10	14:22	0-0.05	35	<0.5	27	140
1210-02	2002-06-10	14:20	0-0.05	26	0.5	35	160
1220-01	2002-06-10	12:30	0-0.05	25	0.6	19	**200**
1230-01	2002-06-10	12:32	0-0.05	48	3.8	**221**	**1 210**
1230-02	2002-06-10	14:32	0-0.05	24	1.4	62	**520**
1230-03	2002-06-10	14:45	0-0.05	36	<0.5	17	90
1240-01	2002-06-11	13:31	0-0.05	23	3.8	**169**	**1 120**

Range	Upper value	**166**	**50.2**	**2 720**	**38 500**
	Lower value	15	<0.5	17	90
# samples at or above residential criteria		12	24	72	106
% samples at or above residential criteria		11%	22%	66%	97%
# samples below detection limit		0	5	0	0
% samples below detection limit		0%	5%	0%	0%
Mean 109	samples	39.3	7.4	**271**	**3 769**
Mode		26.0	0.8	**162**	**220**
Median		31.0	4.2	**178**	**1 280**
Standard deviation		26.2	9.6	303	6 212

Sample	Date	Time	Depth (m)	Cu	Cd	Pb	Zn
Detection Limit				**2**	**0.5**	**5**	**10**
CCME - PE&HH (industrial)				**91**	**27**	**600**	**380**
CCME - PE&HH (residential)				**63**	**10**	**140**	**200**
CON1P	2002-06-11		0-0.05	16	<0.5	14	60
CON1P	2002-06-11		0.05-0.10	15	<0.5	11	60
CON1P	2002-06-11		0.10-0.15	16	<0.5	13	70
CON1P	2002-06-11		0.15-0.20	15	<0.5	11	60
CON1P	2002-06-11		0.20-0.25	14	<0.5	9	40
CON1P	2002-06-11		0.25-0.30	14	<0.5	7	40
CON1P	2002-06-11		0.30-0.35	15	<0.5	8	40
CON2P	2002-06-11		0-0.05	27	<0.5	9	90
CON2P	2002-06-11		0.05-0.10	23	<0.5	7	30
CON2P	2002-06-11		0.10-0.20	25	<0.5	6	60
870P3	2002-06-11		0-0.05	34	<0.5	16	130
870P3	2002-06-11		0.05-0.10	45	0.7	23	**210**
870P3	2002-06-11		0.10-0.15	48	<0.5	21	120
910P1	2002-06-11		0-0.05	**74**	3.1	75	**1 170**
910P1	2002-06-11		0.50-0.1	47	3.6	64	**1 330**
910P1	2002-06-11		0.1-0.15	**75**	1.8	52	**670**
910P1	2002-06-11		0.15-0.20	44	2.0	48	**750**
1240P2	2002-06-11		0-0.05	22	0.9	29	**270**
1240P2	2002-06-11		0.05-0.10	32	<0.5	12	60
1240P2	2002-06-11		0.10-0.15	31	<0.5	10	60
650P4	2002-06-11		0-0.05	35	1.5	136	**500**
650P4	2002-06-11		0.05-0.10	46	1.3	103	**430**
650P4	2002-06-11		0.10-0.15	39	1.0	64	**340**

Note: Results in **boldface** indicate concentrations that exceed the CCME Guidelines for the Protection of Environmental and Human Health for residential land use.

It must be noted that for the purposes of this report no attempt was made to differentiate between metal sources of a natural origin (i.e. on the basis of geology) versus an anthropogenic origin and that the resultant elevated metal levels were attributed solely to anthropogenic sources. The exception to this understanding was with the potential background sites. It was assumed for the purposes of this study, that the metals levels identified within the soil samples collected from the two potential background sites were representative of natural conditions and that if in a comparison the townsite soil samples contained elevated metal levels, those levels identified were due to impacts caused by an anthropgenic sources or processes. Additionally there was no attempt made to differentiate between metal distribution in soils on the basis of bedrock geology. It is acknowledged that further investigative work must be undertaken to fully understand the source and distribution of the metal levels within the surface soils and to further identify and differentiate potential sources. However based on site observations, it can be reasonably concluded that the townsite borrow pad, derived from a shale borrow source, does not naturally contain enriched or elevated levels of zinc, lead, cadmium and copper.

5.2 Site Remediation Criteria

In 1991, the Canadian Council of Ministers of the Environment published a set of interim soils quality criterion for various contaminants including zinc, lead, cadmium, and arsenic. The remediation criteria or SQG in the interim guidelines document for the various metal contaminants varied for each individual contaminant dependent upon land use, (i.e. for agricultural land versus commercial and industrial land). Based on advances in toxicology studies, etc during the 1990's, it was CCME's opinion that these criteria were not scientifically defensible. Therefore, the interim criterion for each identified contaminant was updated to include current toxicological data and the Recommended Canadian Soil Quality Guidelines were published in March 1997. The new guidelines were based on the lowest values for human health and environmental protection.

The CCME Recommended Soil Quality Guidelines published in 1997 recognized that in some areas of Canada, the 1997 recommended CCME guidelines for various metals for all land use options are lower than the naturally occurring background levels. Under these conditions, the development of site or region specific guidelines, incorporating the local/regional background arsenic concentrations is recommended.

The development of the site - or region - specific guidelines would be completed on a risk-based approach, assessing both human health risk and qualitative environmental health assessment. Health risk assessment refers to the technical, scientific assessment of the nature and magnitude of risk and uses a factual base to define the health of effects of exposure of individuals or populations to hazardous contaminants and situations. Risk is defined as the probability of an adverse event. One can also describe risk with the following expression.

Risk = Severity of event (Hazard) x Exposure

All relevant health endpoints, both cancer and non-cancer, must be assessed. The quality of the assessment is governed to a large degree by the quality of the toxicological and exposure information that goes into it and the professional judgment of those who conduct the assessment. Uncertainty is inherent in the process.

The goal of a human health/environmental health risk assessment would be to predict potential adverse effects and when appropriate, to measure existing adverse effects of chemical contaminants on humans and the biota, on or near a site or facility, and to determine levels of those chemicals in the environment that would not be expected to adversely affect the human health or biota. Field observations are suggested as a supplement to the predictive human health/ecological risk evaluation when contamination is present and has been present for a period of time sufficient to have caused an adverse human health/ecological impact.

Such a scenario should be envisaged for the Nanisivik site, as it is acknowledged that naturally occurring levels of zinc and lead due occur within the Nanisivik environment. Implementation of a risk-based approach will ensure the metal distribution across the town site will be taken in context of the entire site and just not as a stand-alone entity.

The natural occurrence of zinc and lead within the environment at Nanisivik highlights the fact that the use of the CCME guidelines as a comparison tool or guide may not be applicable and as such site specific remediation criteria must be developed which would evaluate the unique characteristics of the Nanisivik mine site within an overall site context.

5.3 Metal Distribution Evaluation

The analytical results obtained from the soil samples collected from the townsite were evaluated spatially, both in the overall aerial extent of metal levels within the townsite and within the vertical soil profile at the four soil probe locations and the two background soil locations. Analytical results were modeled using a geostatistical-based modeling program referred to as "SURFER". This program constructs a model of the distribution based on sample concentrations versus sample location across a site. The resulting plots depicts the spatial distribution of the metals modeled and presents a contour plot. For the purposes of this study only zinc (Zn), lead (Pb), cadmium (Cd), and copper (Cu) distributions were modeled. The SURFER distribution plots are presented in Figures 6 to 9 respectively. Within each plot the levels for each metal parameter were compared to the CCME Criteria for residential land use.

Generally the metal distribution plots depict surface soils metal levels that have been impacted (i.e. displaying elevated metal levels in excess of CCME criteria). The plots identify coincidental patterns with elevated concentration of metals (i.e. zinc, lead, cadmium) within two to three separate anomalies (i.e. discrete patterns of elevated metal levels) of the identified area along a creek bed at the eastern end of the town. This creek is a small tributary to the Twin Lakes Creek, which drains from the WTDA. Situated within the creek valley is the potable water line for the town (Figure 2). The cause of the identified metal anomalies are unknown and may be related to historical tailings spills which occurred within the confines of the creek valley, or to concentration of metals within the creek valley due to water borne transport or other mechanisms.

Additionally, several other discrete surface anomalies were identified which displayed strong correlation with the zinc and lead plots, concentrated in the northern section of the townsite in the vicinity of the bunkhouse, the cafeteria, the main office building and several houses.

Approximately 97% of the surface samples (106 out of 109 samples) contained concentrations of zinc in soil above the CCME Guidelines for the Protection of

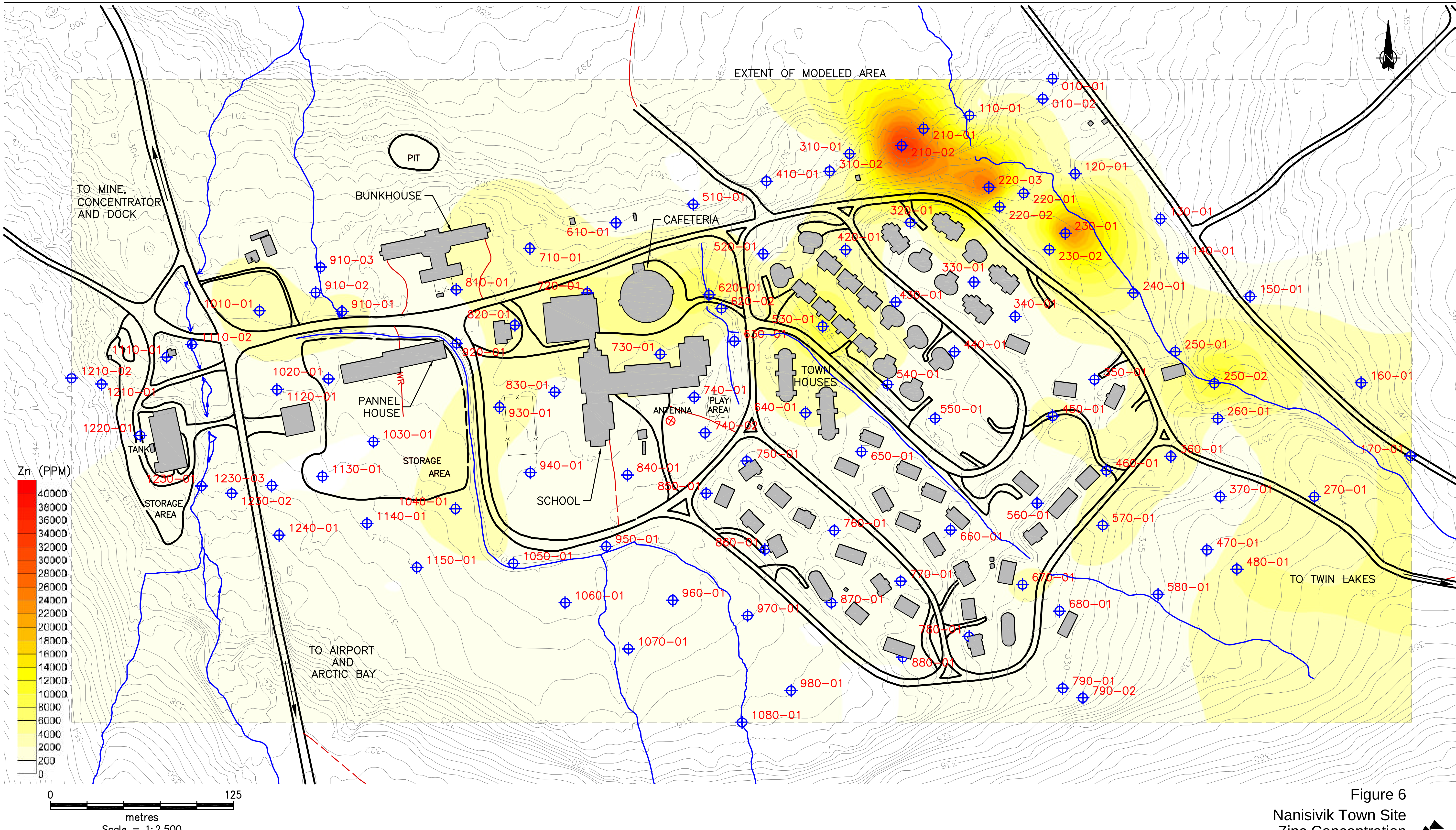
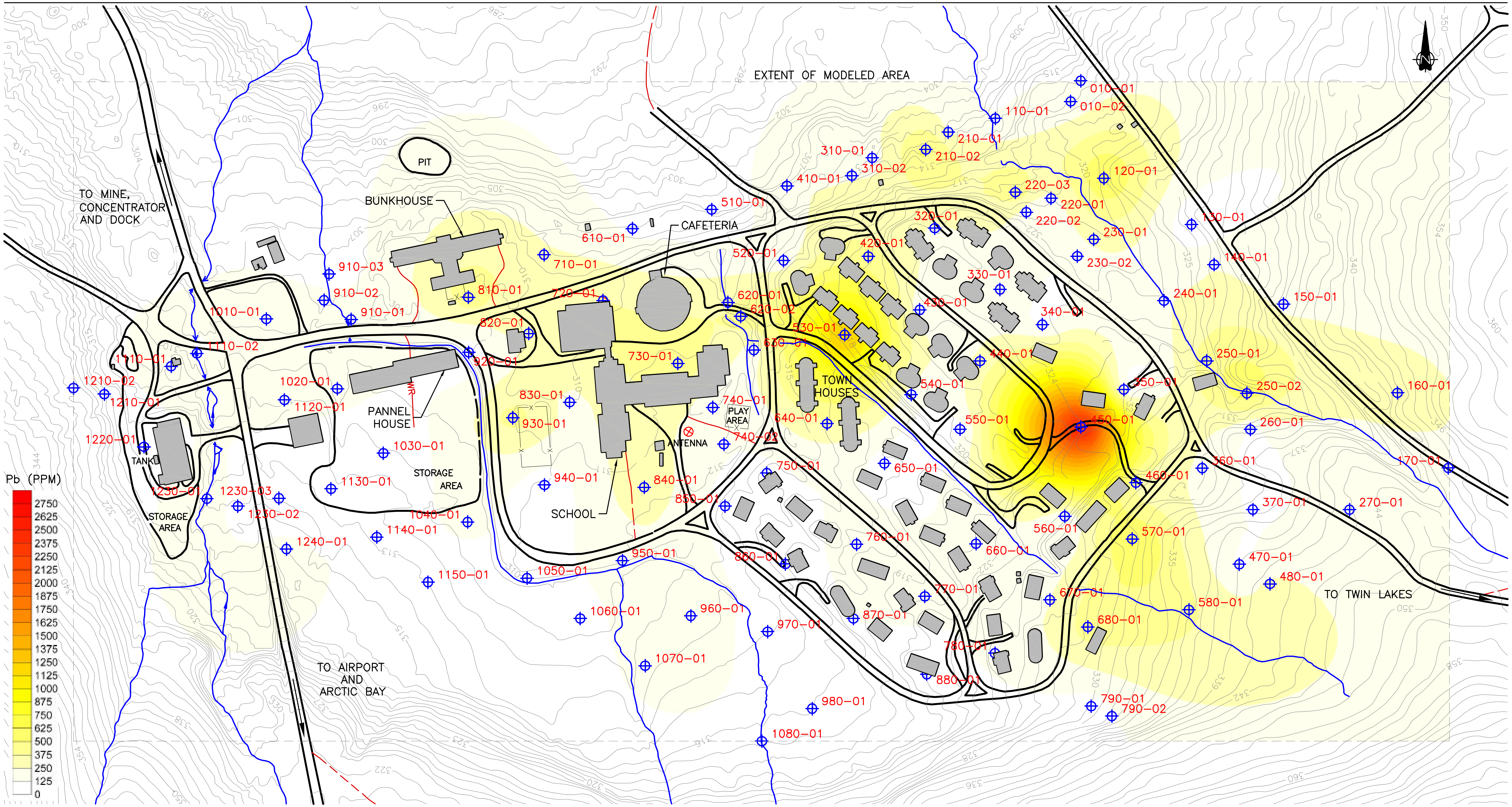


Figure 6
Nanisivik Town Site
Zinc Concentration

FIG6-Zn.dwg



0 125
metres
Scale = 1:2,500

Figure 7
Nanisivik Town Site
Lead Concentration

FIG7-Pb.dwg

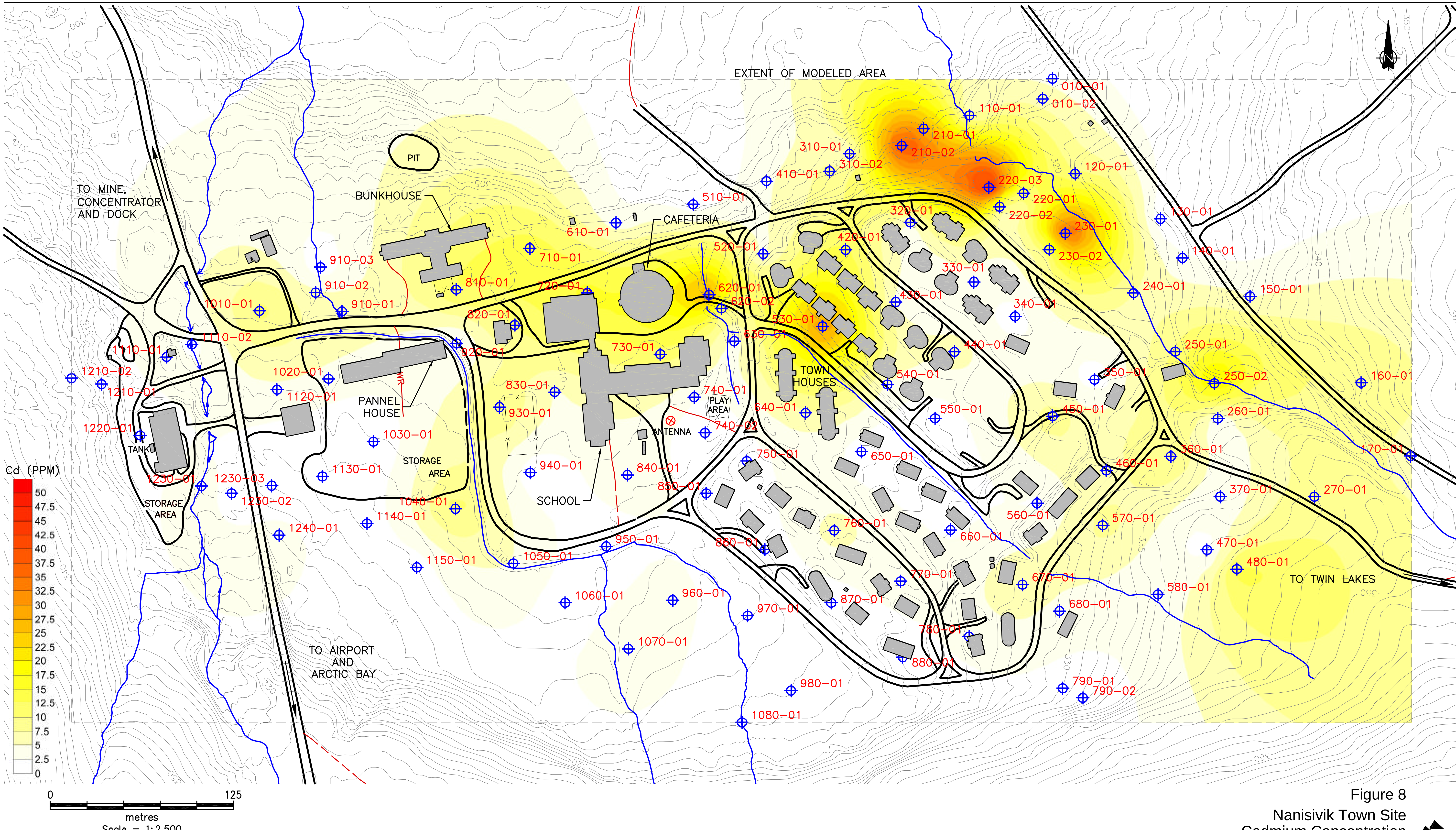


Figure 8
Nanisivik Town Site
Cadmium Concentration

FIG8-Cd.dwg

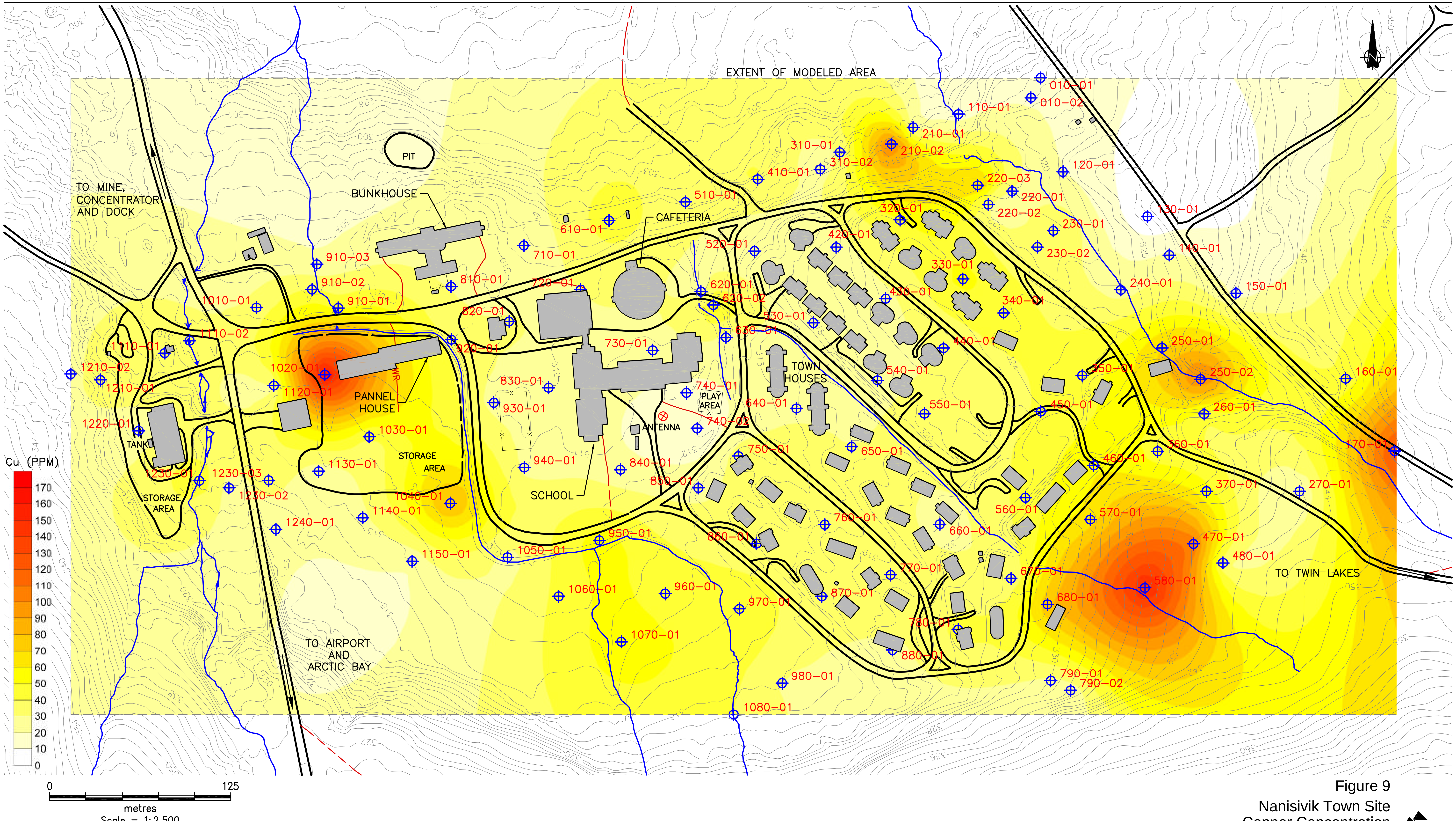
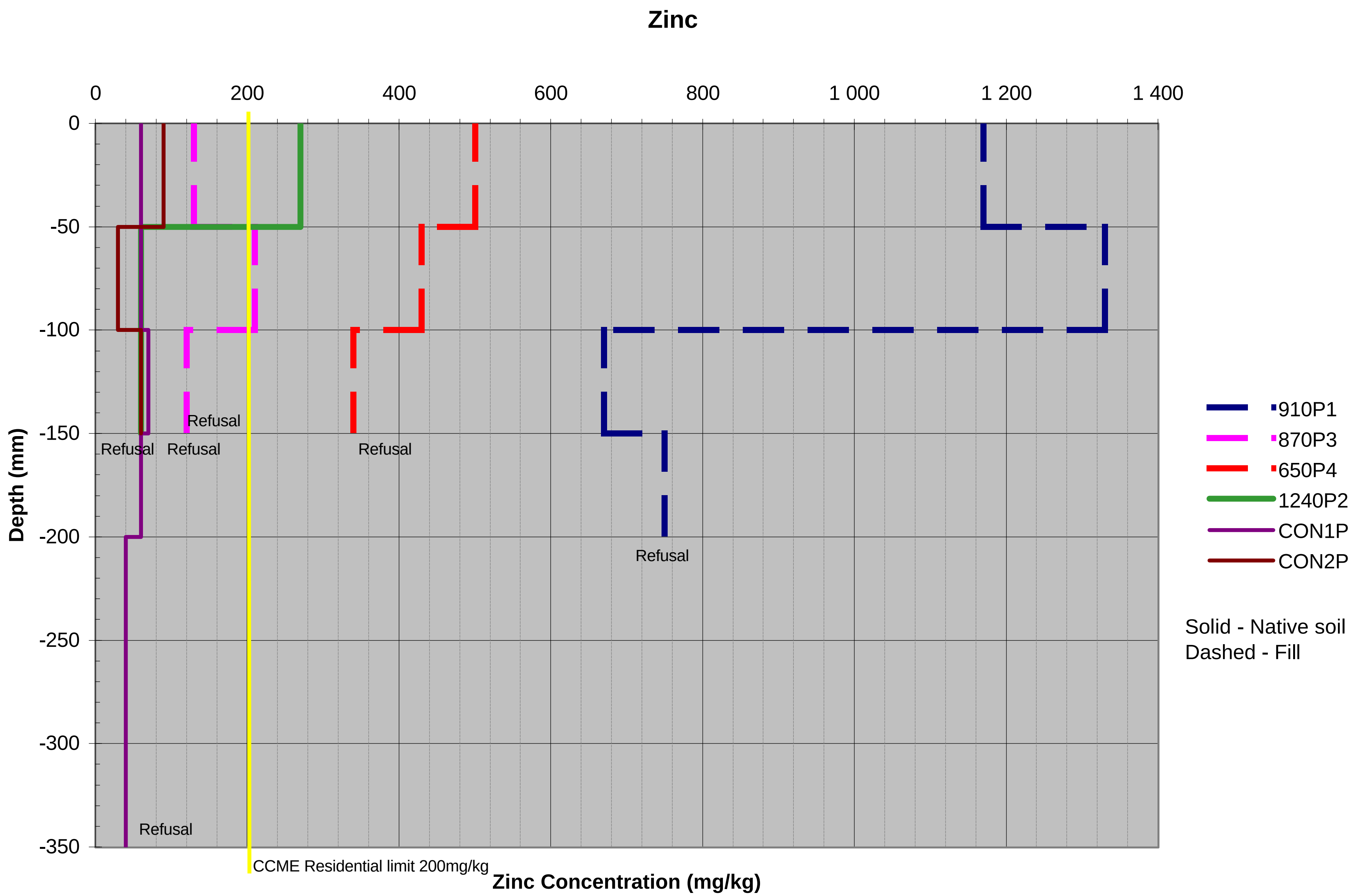
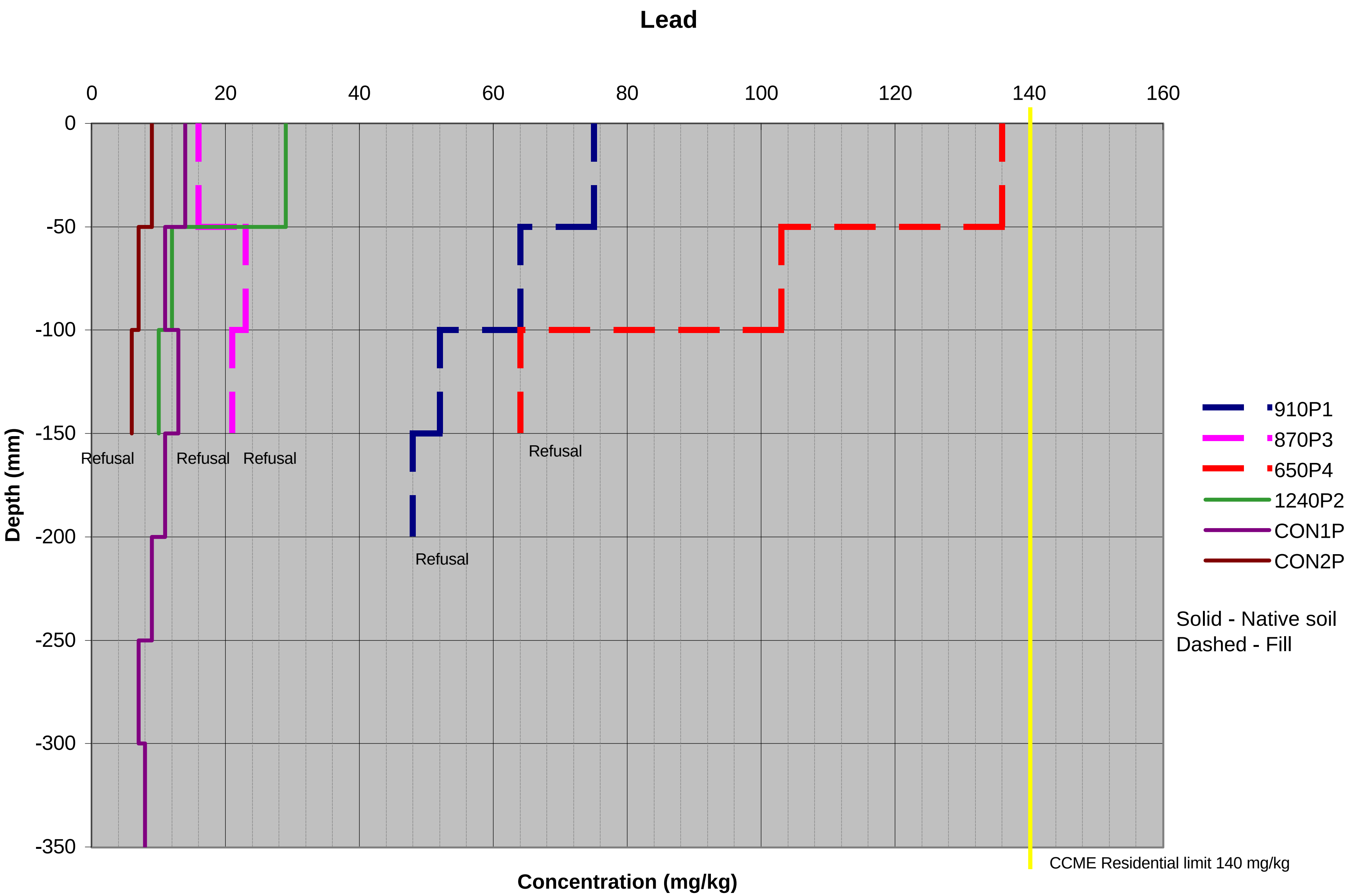
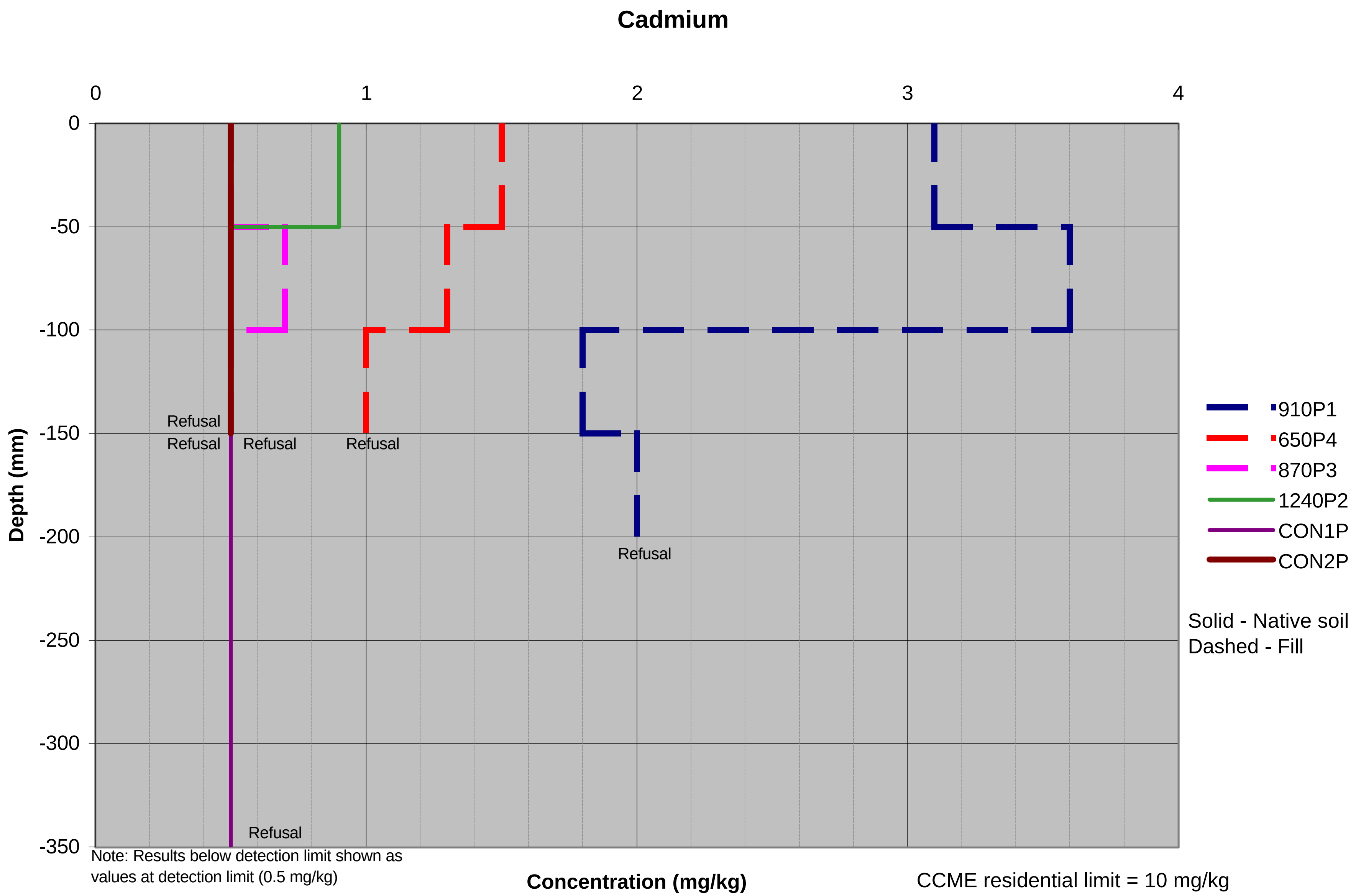


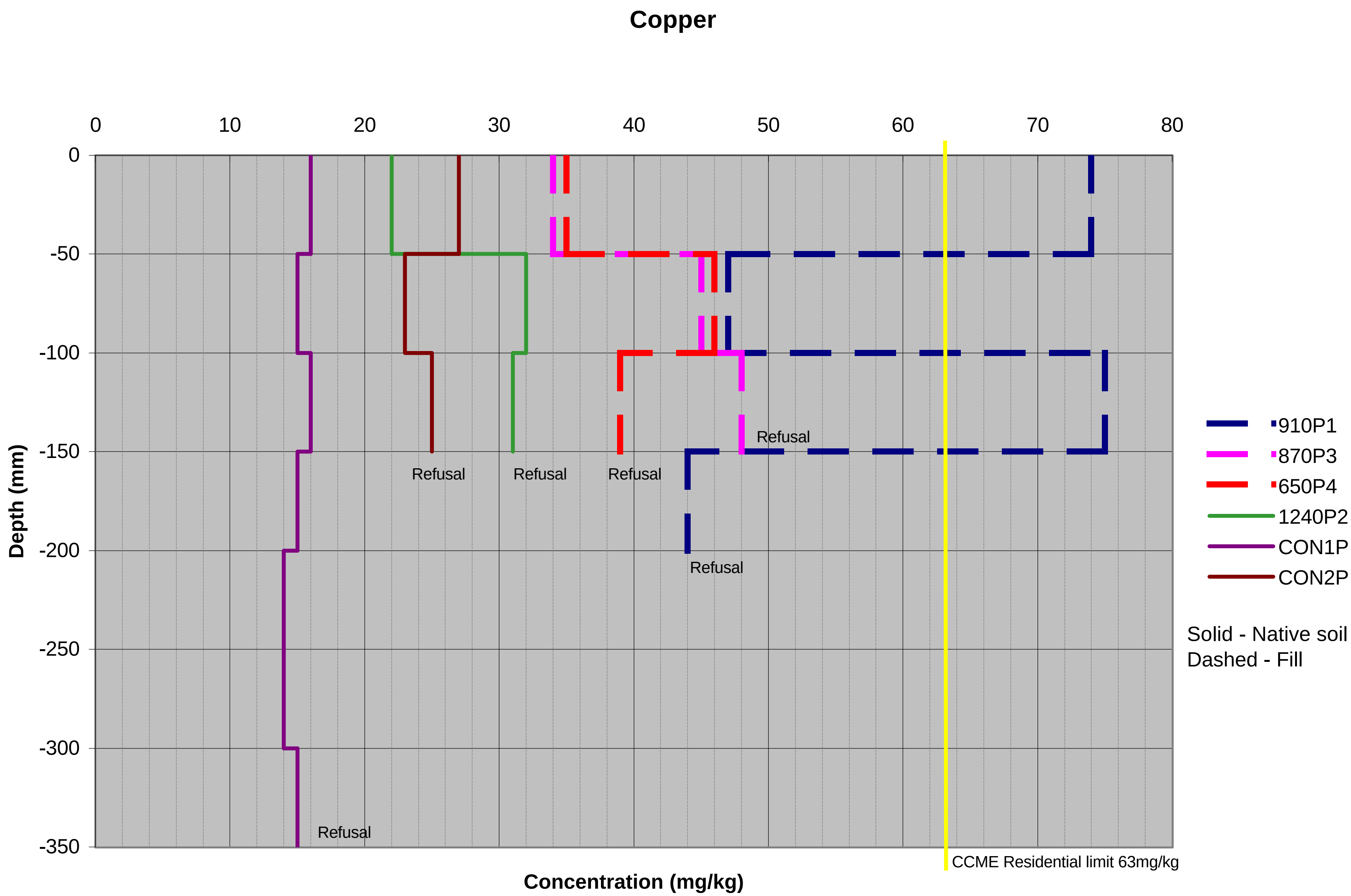
Figure 9
Nanisivik Town Site
Copper Concentration

FIG9-Cu.dwg


Zinc
0
200
400
600
800
1 000
1 200
1 400
0
-50
-100
-150
-200
-250
-300
-350
Depth (mm)
Refusal
Refusal
Refusal
Refusal
Refusal
Refusal
CCME Residential limit 200mg/kg
Zinc Concentration (mg/kg)
910P1
870P3
650P4
1240P2
CON1P
CON2P
Solid - Native soil
Dashed - Fill


Lead
0
20
40
60
80
100
120
140
160
0
-50
-100
-150
-200
-250
-300
-350
Depth (mm)
Refusal
Refusal
Refusal
Refusal
Refusal
910P1
870P3
650P4
1240P2
CON1P
CON2P
Solid - Native soil
Dashed - Fill
CCME Residential limit 140 mg/kg
Concentration (mg/kg)


Cadmium
0
1
2
3
4
0
-50
-100
-150
-200
-250
-300
-350
Depth (mm)
Refusal
Refusal
Refusal
Refusal
Refusal
Refusal
910P1
650P4
870P3
1240P2
CON1P
CON2P
Solid - Native soil
Dashed - Fill
Note: Results below detection limit shown as values at detection limit (0.5 mg/kg)
Concentration (mg/kg)
CCME residential limit = 10 mg/kg


Copper
0
10
20
30
40
50
60
70
80
0
-50
-100
-150
-200
-250
-300
-350
Depth (mm)
Concentration (mg/kg)
Refusal
Refusal
Refusal
Refusal
Refusal
Refusal
Refusal
CCME Residential limit 63mg/kg
910P1
870P3
650P4
1240P2
CON1P
CON2P
Solid - Native soil
Dashed - Fill

Environmental and Human Health for residential sites. The heaviest concentrations of zinc were identified in the northeast corner of the townsite near the toe of the slope at the bend in the main road and near the creek bottom in this area and east of the townsite. Concentrations of zinc in this area average approximately 28 900mg/kg. However, zinc concentrations in the soil samples exceeded CCME criteria throughout the townsite. The concentration of zinc in the soil is generally higher near the surface than at depth. A plot of zinc concentrations in soil samples throughout the townsite is presented in Figure 6, with Figure 10 depicting the variation of the zinc concentration with depth in the soil probes.

Approximately 64% of the samples (70 out of 109) contain concentrations of lead in soil above the CCME Guidelines for the Protection of Environmental and Human Health for residential sites. The heaviest concentrations of lead occurred within sample 450-01, collected from the eastern area of the townsite. There is another localized ‘hotspot’ or anomaly located at sample location 530-01, the reason for which is unknown. The concentration of lead in the soil is generally greater near the surface than at depth. A plot of lead concentrations in soil samples throughout the townsite is presented in Figure 7 with Figure 11 depicting the variation of the lead concentration with depth in the soil probes.

Approximately 23% of the samples (25 out of 109) contained concentrations of cadmium in soil above the CCME Guidelines for the Protection of Environmental and Human Health for residential sites. The heaviest concentrations of cadmium are in the northeast corner of the townsite near the toe of the slope at the bend in the main road and near the creek bottom in this area and east of the townsite. It is interesting to note that the locations of heaviest concentrations of cadmium coincide closely with those for zinc. The concentration of cadmium in the soil is generally greater near the surface than at depth. A plot of cadmium concentrations in soil samples throughout the townsite is presented in Figure 8 with Figure 12 depicting the variation of the cadmium concentration with depth in the soil probes.

Approximately 11% of the samples (12 out of 109) contain concentrations of copper in soil above the CCME Guidelines for the Protection of Environmental and Human Health for residential sites. The heaviest concentrations of copper are in the southeast corner of the townsite. There is another localized concentration of copper in the creek bottom near the west end of the Pamco residential building. There are also a few localized areas of increased concentration in the creek bottom east of the townsite. A plot of copper concentrations in soil samples throughout the townsite is presented in Figure 9 with Figure 13 depicting the variation of the copper concentration with depth in the soil probes.

A comparison of the metal levels contained with background sample sites versus the soil profile locations and the metal levels contained within the surface samples collected from the town site, indicate that overall, the background sample sites contain lower metal concentrations at surface and exhibit less variability with depth. Average values for each specific sample site are presented in Table 2.

Table 2: Comparison of Background Soil Sample Sites vs. Soil Probe and Town Site Sample Locations (mg/kg

Sample	Date	Time	Depth (m)	Cu	Cd	Pb	Zn
Detection Limit				**2**	**0.5**	**5**	**10**
CCME - PE&HH (industrial)				**91**	**27**	**600**	**380**
CCME - PE&HH (residential)				**63**	**10**	**140**	**200**
CON1P	2002-06-11		0-0.05	16	<0.5	14	60
CON1P	2002-06-11		0.05-0.10	15	<0.5	11	60
CON1P	2002-06-11		0.10-0.15	16	<0.5	13	70
CON1P	2002-06-11		0.15-0.20	15	<0.5	11	60
CON1P	2002-06-11		0.20-0.25	14	<0.5	9	40
CON1P	2002-06-11		0.25-0.30	14	<0.5	7	40
CON1P	2002-06-11		0.30-0.35	15	<0.5	8	40
Average				15	<0.5	10.4	52.8
CON2P	2002-06-11		0-0.05	27	<0.5	9	90
CON2P	2002-06-11		0.05-0.10	23	<0.5	7	30
CON2P	2002-06-11		0.10-0.20	25	<0.5	6	60
Average				25	<0.5	7	60
870P3	2002-06-11		0-0.05	34	<0.5	16	130
870P3	2002-06-11		0.05-0.10	45	0.7	23	**210**
870P3	2002-06-11		0.10-0.15	48	<0.5	21	120
Average				42	0.7	20	153
910P1	2002-06-11		0-0.05	**74**	3.1	75	**1,170**
910P1	2002-06-11		0.05-0.10	47	3.6	64	**1,330**
910P1	2002-06-11		0.10-0.15	**75**	1.8	52	**670**
910P1	2002-06-11		0.15-0.20	44	2.0	48	**750**
Average				60	2.6	35	**980**
1240P2	2002-06-11		0-0.05	22	0.9	29	**270**
1240P2	2002-06-11		0.05-0.10	32	<0.5	12	60
1240P2	2002-06-11		0.10-0.15	31	<0.5	10	60
Average				28	0.9	17	130
650P4	2002-06-11		0-0.05	35	1.5	136	**500**
650P4	2002-06-11		0.05-0.10	46	1.3	103	**430**
650P4	2002-06-11		0.10-0.15	39	1.0	64	**340**
Average				40	1.3	101	**423**

To further assist in the evaluation of the vertical distribution, graphical plots depicting the vertical distribution of Zn, Pb, Cd, and Cu within the four soil probe locations (i.e. profile locations) and two potential background soil sample locations were prepared and are presented in Figures 10 to 13 respectively.

In general, based on the comparison of the average values from the profile samples versus the background soil samples an enrichment of metals is highlighted in the upper

0.1 metres of surface soil within the four soil probe locations, of which three soil probes (Samples 910P1, 870P3, and 650P4) are considered to be representative of fill material and the fourth soil probe location (Sample 1240P2) was determined to be representative of naturally occurring soils. This decrease in metal levels with depth is very evident in the Zn, Pb, and Cu plots.

It was concluded that at least initially, without evaluating the effects of bedrock geology, the samples collected from these two background samples sites were indicative of natural soil conditions and were representative of natural soil conditions. Additionally metal level variability within the profile plots for the two potential background sites (CON1P and CON2P) was minor to non-existent, and additionally the average metal values were significantly less than those contained within the surface samples collected from the townsite, including the four soil profile locations.

Enrichment is evident in the surface soil samples within three of the four soil profile sample locations, and in the surface samples collected from the townsite, as compared to the background soil sample sites. This leads to the conclusion that the majority of the surface area located within the vicinity of the townsite is impacted by elevated metal concentrations, and that the impact is caused from anthropogenic sources and not natural sources.

There are several potential anthropogenic sources that may be responsible for the metal impacts identified within the townsite. The one potential source, that is most often cited, is the blowing of dust from the tailings into the townsite area from the WTDA. Additionally, it is possible that dust from the concentrate loading process originating from the dock area or from dust from concentrate generated at the mill site could potentially be sources. An additional source and one that is more probable is that the impacted metal levels identified within the townsite site were the result of dust deposition due to entrapment of concentrate dust within the tire treads of the vehicles that use the site. Such an occurrence would explain the predominance of the metal anomalies within the vicinity of the cafeteria and the office building, both areas that are frequented by heavy traffic flows. All of these scenarios will need further evaluation in order to ascertain which source is the more probable.

Snow clearing and deposition of snow impacted by metal laden dust within the creek valley along the western edge of the townsite offers a plausible explanation as to the occurrence of the metal anomalies identified in this location.

It is conceivable, that with the onset of reclamation activities at the site and until which time the source is removed or reclaimed, metal levels within the soil will remain in excess of CCME criteria for residential land use for some time following which there should be a noticeable decrease. Any identified decrease within the metal loads of the surface soils would be attributed to the removal of the source and the cessation of further deposition, natural attenuation caused by the washing of the surface soils by rain and snow, with the flushing of the metals into the local watercourses, with final deposition within the sediments of Strathcona Sound.

Alternatively, other remedial methods could be employed to reduce the metals such as chemically binding the soil to prevent metal leaching or physically covering the soils with non-impacted fill material.

6.0 HUMAN HEALTH RISK ASSESSMENT

ETL Laboratories of Edmonton, Alberta conducted an initial human health risk assessment of the identified metal levels within the soil samples collected from the Nanisivik townsite at the request of EBA. This assessment was restricted to an independent evaluation of the degree of potential human health risks currently existing at the townsite as identified by the metal levels identified in the recent soil program. It did not attempt to assess the environmental risks that may be present. The assessment also concentrated solely on the potential risks posed independently by each metal parameter taken in isolation and did not assess the synergistic effects of the metal parameters.

It is also acknowledged that this initial human health risk assessment was based only on an evaluation of the recently collected soil samples and did not factor into its evaluation the over all site distribution of metals within the soil or any other analytical data set that may be available. However the initial evaluation did provide valuable insight into the existing potential hazards, as they currently exist, associated with the surface soils at the Nanisivik Town Site. The full text of the report prepared by ETL is located in Appendix C.

The metal concentrations identified in the soil samples collected at the Nanisivik town site follow a pattern consistent with areas affected by zinc mining. The soils had very high concentrations of zinc and elevated concentrations of lead and cadmium. The concentration of these metals at this site correlate well as demonstrated in Figures 14 and 15. Two samples that contained extremely high concentrations of lead (430-01 and 530-01) which did not correlate with the concentrations of zinc and cadmium were not included in these plots. The concentrations of these metals were above some or all of the CCME Soil Guidelines in most of the samples analyzed.

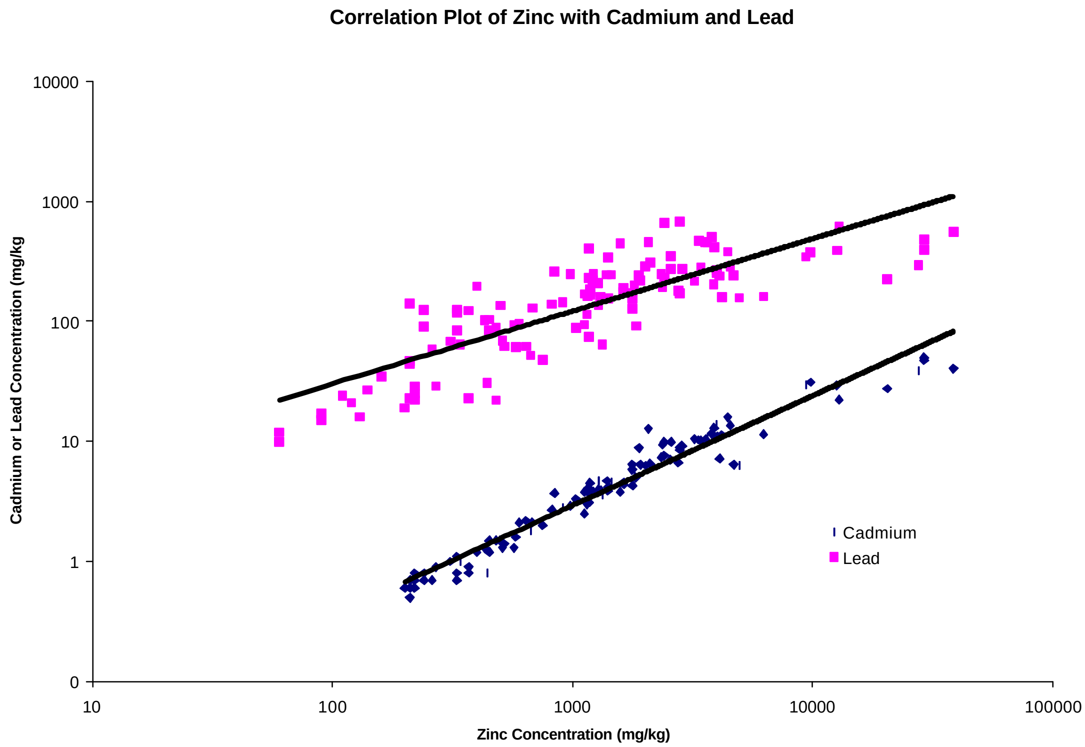


Figure 14. Correlation plots of zinc with cadmium and lead.

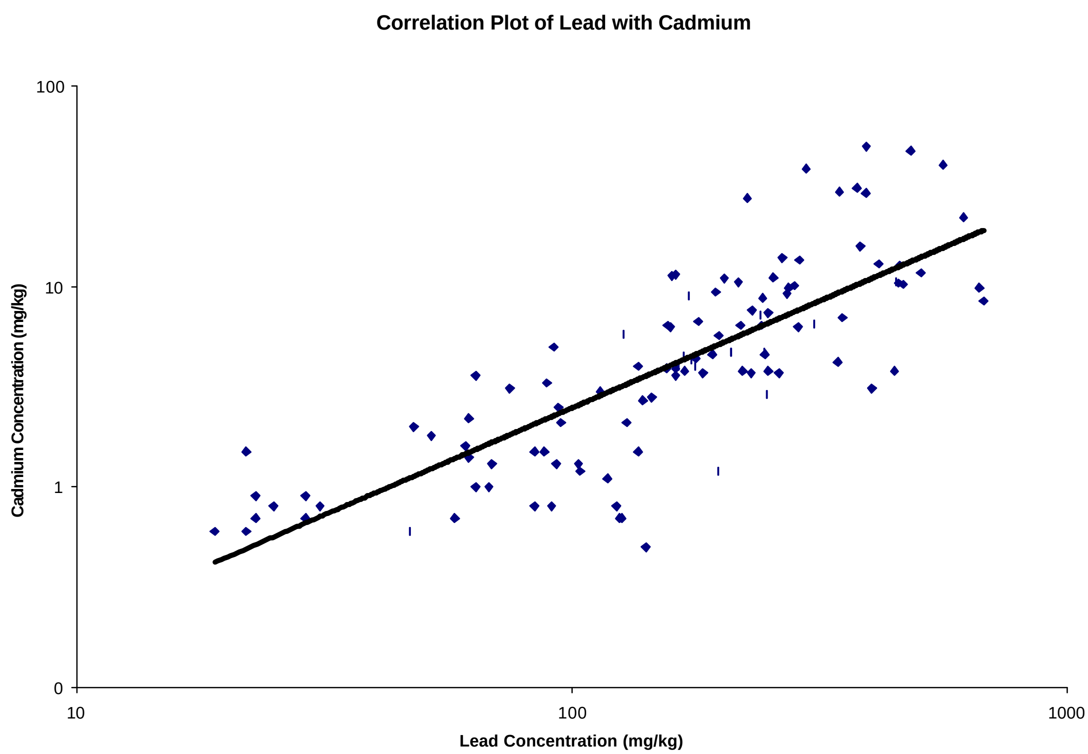


Figure 15. Correlation plot of lead with cadmium

6.1 CCME Soil Guidelines

CCME Soil Quality Guidelines have been developed to protect specific sensitive ecological receptors and human health based on land use. They have been derived using reported toxicological data and estimates of exposure, to humans and to ecological receptors, based on land use. The lowest contaminant concentration required to protect human health, or sensitive ecological receptors, is used as the guideline. Generally guidelines for agricultural land use protect ecological receptors and guidelines for other land uses protect human health. Assumptions used in the estimation of human exposure to soil are based on typical Canadian climates and lifestyles based in southern Canada and may not be applicable to the high arctic due to inherent differences. It is not clear what adjustments should be made to apply these guidelines to the Nanisivik site, although such adjustments would be considered in the development of site specific remediation criteria. Table 3 lists the CCME Soil Quality Guidelines of metals found on the site by land use.

Table 3: CCME Guidelines for Metals in Soil

Metal	**CCME Remediation Guidelines For Soil (mg/kg) by Land Use**			
	Agricultural	Residential/ Parkland	Commercial	Industrial
Cadmium	1.4	10	22	22
Copper	63	63	91	91
Lead	70	140	260	600
Zinc	200	200	360	360

CCME Canadian Environmental Quality Guidelines 1999, Section 7.

The surface soils at the Nanisivik townsite site are considered toxic. Cadmium, lead and zinc are present in the soil at concentrations that suggest some hazard to the environment and to human health. The extent to which they will produce adverse effects to humans will be determined by exposure, and exposure will depend on the use of the site.

The concentration of zinc in 80% of the soil samples exceeded all CCME guidelines (Table 4). Only 8% of the samples were below CCME guidelines. The CCME lead guidelines for commercial land use was exceeded in 25% of the samples, and the CCME residential land use guidelines was exceeded in an additional 32% of the samples. The CCME cadmium guidelines for commercial land use, was exceeded in 8.4% of the samples, and the CCME residential land use guidelines was exceeded in an additional 13% of the samples. The mean Zn concentration at the site (average of all samples, 3200 mg/kg) exceeded all CCME guidelines. The average lead concentration at the site (220 mg/kg) is marginally below (95% CI) the commercial land use guidelines. The mean Cd concentration at the site (average of all samples, 7.6 mg/kg) did not exceed the CCME residential land use guidelines (>99.9% CI) but the cadmium soil concentration exceeded the CCME residential or commercial land use guidelines in about 21% of the samples analyzed.

Table 4: Soil Samples from the Nanisivik Mine Exceeding CCME Guidelines

Metal	Number of Sample Exceeding CCME Guidelines		
	Residential/ Parkland[a]	Commercial	Total
Cadmium	16	11	27
Copper	8	6	14
Lead	44	31	75
Zinc	16	104	120

[a]Includes only samples exceeding residential guidelines and less than commercial
128 samples analyzed

In addition to these metals, soils with arsenic concentrations exceeding CCME guidelines were found. These samples were taken within a streambed running through the site along the eastern edge.

The toxic effects of each of these metals must also be taken into account in assessing the actual hazard to human health. While the concentrations of zinc in the soil are very high and exceed all CCME guidelines, the human health effects are almost benign when contrasted with the toxic effects of lead and cadmium. Note that it is likely that zinc does pose a significant threat to the environment.

6.2 Toxic Effects of Zinc

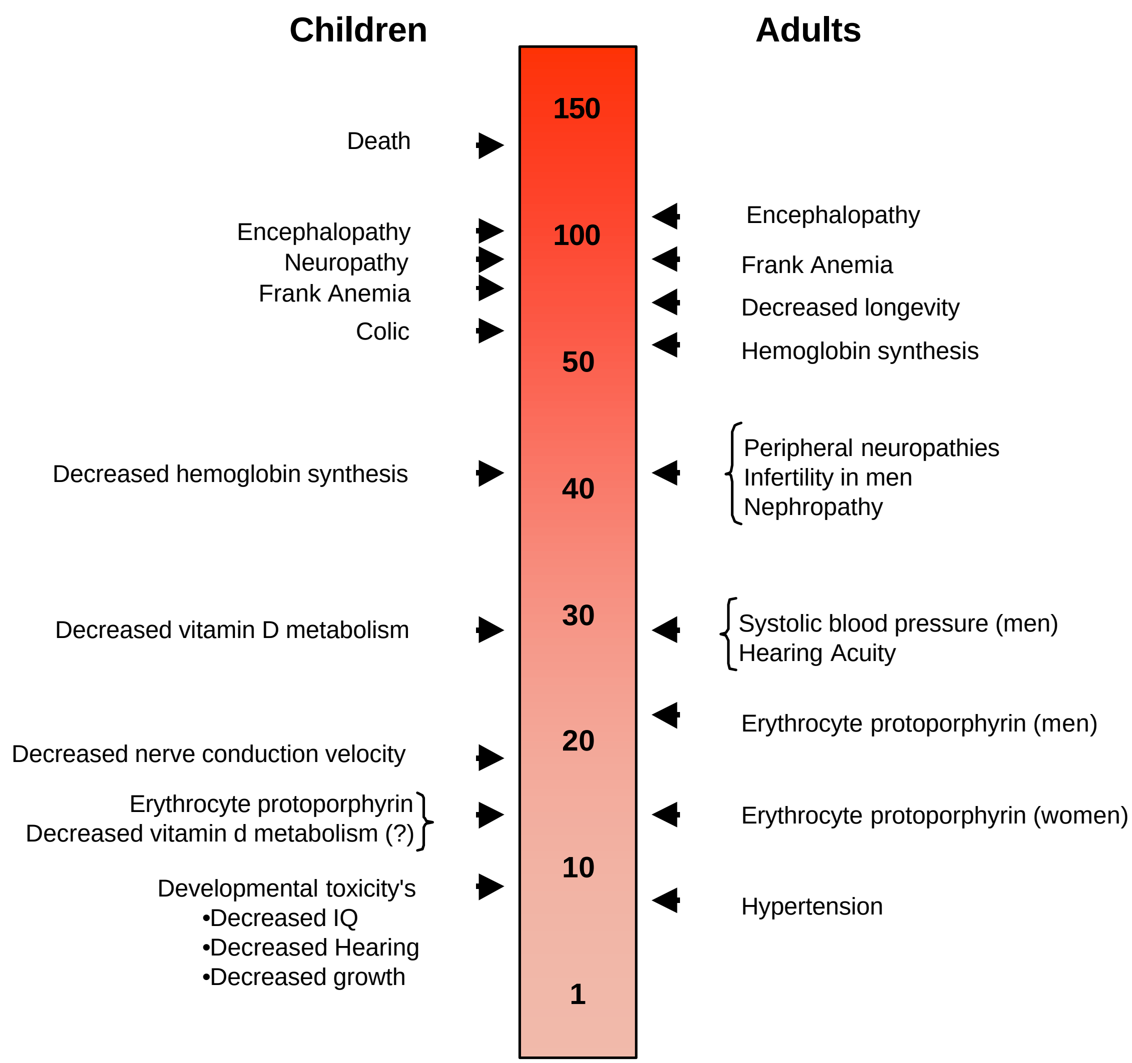
Zinc is an essential nutrient with recommended daily allowances of 15 mg/day for men and 12 mg/day for women. Zinc is lethal at very high doses. In acute animal toxicity studies the LD 50 of zinc was over 200 mg/kg. Doses, well below this in man, will result in abdominal pain and nausea. Intense inhalation of zinc oxide will result in metal fume fever – characterized by elevated body temperature, nausea and headaches. High daily doses of zinc (1 mg/kg/day) over a 10-week period did result in a decrease in erythrocyte superoxide dismutase activity in healthy women. The EPA RfD of 0.3 mg/kg/day for zinc is based on this effect.

6.3 Toxic Effects of Lead

The toxic effects of lead are summarized in Figure 16 which depicts the toxic effects and the blood concentration of lead at which these effects start to occur. The toxic effects that result from acute exposures are:

- Nausea, vomiting and abdominal pain;
- Kidney damage (reversible);
- Damage to the central and peripheral nervous systems.

Lead - Toxic Effects



Blood concentration mg Pb/dl

Figure 16

Chronic exposure to lead will result in additional permanent toxic effects:

- Inhibition of hemoglobin synthesis (lead induced anemia);
- Irreversible damage to the central and peripheral nervous systems;
- Irreversible kidney damage (promotion of renal tumors in animals).
- Sterility in men and suppression of testicular endocrine functions
- Neonatal mortality
- Hypertension – increase in systolic blood pressure.

The CCME Soil Quality Guidelines for lead are set to keep concentrations of lead in blood under 10 ug/dl – the concentration associated with adverse developmental effects in children (Figure 16). This is likely to be a very conservative concentration, affording more protection than necessary, considering the intended land use of the site. Exposure of visitors to soil would be limited although concentrations of lead in blood of people working at the site should be monitored annually.

6.4 Toxic Effects of Cadmium

The toxic effects of cadmium occur at very low doses. EPA reference dose (RfD) for cadmium, the maximum safe daily intact is 0.005 mg/kg/day, for cadmium in water. The toxicity of cadmium is enhanced by its accumulation in kidneys and liver and its very long half-life – as high as 30 years. Chronic exposure to cadmium will result in:

- Adverse effects to lungs including chronic obstructive pulmonary disease and emphysema;
- Kidney damage – chronic renal tubular disease resulting in proteinuria, aminoaciduria, glucosuria and decreased reabsorption of phosphate;
- Damage of skeletal system (Itia-Itia) resulting in osteomalacia and osteoporosis;
- Hypertension – increase in systolic blood pressure; and
- Lung and prostrate cancer.

Human health related soil guidelines for cadmium are based on lifetime exposures. The limited exposure of visitors and workers at the site suggest that the soil guideline is extremely conservative. A risk assessment, or at least a comprehensive exposure assessment would be required to develop appropriate soil concentrations for protection of human health.

7.0 SUMMARY AND CONCLUSIONS

EBA Engineering Consultants Ltd. (EBA) completed a soil sampling of the surface soils situated at the Nanisivik Townsite within the parcel of land referred to as the "Block Transfer", and associated with the Nanisivik Mine. Preliminary preparations to undertake the project were initiated on May 30, 2002 following a telephone conversation with a Government of Nunavut (GN) representative. Approval to proceed was received from GN on June 5, 2002 and the project was initiated in accordance with a letter prepared by EBA on May 31, 2002, which outlined a "generalized" Terms of Reference

The objective of the sampling program was to determine the existing inorganic (i.e. metal) loads within the surficial soils situated throughout the townsite in order that a determination on the potential health risks associated with any future alternate use of the town site could be completed.

A total of 132 soil samples were collected and submitted for laboratory analyses of inorganic components (i.e. metals). The samples were collected throughout the townsite and located on a grid based system. Each soil sample location was further surveyed utilizing a hand held GPS instrument. Samples were collected from the upper 0.05 metres of the soil profile with the samples stored in laboratory supplied containers and/or bags. Two background soil sample locations situated topographically upgradient and presumably up wind of both the mine and townsite were also established and sampled for comparison purposes. For the purposes of this investigation, legal sampling protocols were not implemented.

Analytical results were evaluated spatially, both horizontally and vertically, based on the four soil probe locations and the two background soil sample sites. Metal analyses were modeled using a geostatistical based modeling program. This program constructed a model of the distribution based on sample concentrations versus sample location across a site. The resulting plots depicted the spatial distribution of the metals modeled and presented a contour plot. For the purposes of this study only zinc (Zn), lead (Pb), cadmium (Cd), copper (Cu) distributions were modeled. Additionally, vertical distribution plots were prepared to depict metal levels with depth for the four soil profile locations located throughout the townsite and the two background soil sample sites.

The analytical results identified impacted surface soils located within the confines of the townsite resulting from anthropogenic (man-induced) sources. Generally the metal distribution plots depicted coincidental patterns with elevated concentrations of metal confined to two or three separate major anomalies identified within a creek bed at the eastern portion of the townsite. Additionally several other discrete surface anomalies were identified scattered throughout the town site. The metal levels generally exceeded the CCME criteria for residential land use.

A comparison of the metal levels contained within the background sample sites versus the soil profile locations and the metal levels contained within the surface samples collected from the town site, indicated that overall, the background sample sites contain lower metal concentrations at surface and exhibit less variability with depth. On this basis it was concluded that the metal levels contained within the background soil samples are probably indicative of naturally occurring background levels.

Several potential anthropogenic sources for the metals were identified, all of which require further evaluation in future studies. The potential sources of metal contamination include concentrate dust entrapped in vehicle tires, wind-blown concentrate dust from the mill or dock, and wind-blown dust deposition from the tailings area.

An evaluation of the human health risks associated with the identified metal levels was completed by ETL. They determined that the metal levels identified within the surface soils at the townsite would normally be considered toxic. This conclusion has not considered the local climate or environment where surface soils are immobilized for two thirds of the year. The metal concentrations found in the soil samples collected at the Nanisivik town site followed a pattern consistent with areas affected by zinc mining. The soils had very high concentrations of zinc and elevated concentrations of lead and cadmium. The concentration of these metals at this site correlated well with each other as demonstrated in correlation plots of concentrations of these metals in soil. Two samples with extremely high concentrations of lead (430-01 and 530-01) that did not correlate with the concentrations of zinc and cadmium were not included in the plots.

The data contained within this report will provide useful information for the owners of the mine site and the GN representatives to fully evaluate the extent of metal impacts situated throughout the mine site and should be used to supplement any ongoing studies that the mine operators may currently have initiated at the mine site.

The natural occurrence of zinc and lead within the environment in frequent outcrops at Nanisivik highlights may preclude the direct use of the CCME guidelines as comparison tools or guides Development of site remediation criteria must also take into account the future land use together with the local natural and climatic environment.

8.0 LIMITATIONS OF LIABILITY

Conclusions presented in this report are based on a Soil Sampling Program of the Nanisivik Townsite, Nanisivik Mine, owned and operated by CanZinco as described in Section 2.0. This report has been prepared for the use of the Department of Sustainable Development, Government of Nunavut and authorized parties for the specific application described in Section 2.0 of this report. It has been prepared in accordance with generally accepted geo-environmental engineering practices. No other warranty is made, either expressed or implied.

9.0 CLOSURE

We trust that the information contained in this report meets your requirements at this time. Should you have any questions, please contact either of the undersigned at your convenience.

Respectfully submitted,
EBA ENGINEERING CONSULTANTS LTD.

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Attachments