ACCEPTABLE LEVEL OF HUMAN HEALTH RISKS RESULTING FROM SMELTER CONTAMINANTS IN THE TRAIL AREA

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Prepared by Nelson Ames, MD, MHSc
Medical Health Officer
Kootenay Boundary Community Health Services Society

Kootenay Boundary Health
2nd Floor – 333 Victoria Street
Nelson, BC V1L 4K3

Phone: (250) 354-6300

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1. PURPOSE

This report fulfils the responsibility of the "local medical health officer" as outlined in Section 18 of the *Contaminated Sites Regulation* (BC Ministry of Environment, Lands and Parks, *Waste Management Act,* 1996). Under this section the proponent may decide not to use soil concentrations as the criteria for site remediation. A request can be made to the local MHO to provide an opinion to the Regional Waste Manager for Ministry of Environment Lands and Parks (MOELP) about the acceptable level of human health risk as a result of exposure to contaminates at the site. Furthermore, the MHO must facilitate a community consultation process in order to assess and take into account community opinion about acceptable risk.

On May 10, 2000 Mr. Doug Magoon, on behalf of the proponent, Cominco, wrote Mr. Rick Crozier, Regional Waste Manager of (MOELP), asking for application of risk based standards for remediation and requesting a decision under Section 18 of the regulation (Magoon, pers. comm., May 2000).

On May 17, 2000 Mr. Crozier wrote me as the local medical health officer requesting my involvement in facilitating "a public community based consultation process and providing (him) with a written recommendation regarding the acceptable level of human health risks resulting from smelter related contaminates in the Trail area." Furthermore, he was "seeking (my) advice about the adequacy of the Trail Community Lead Task Force public consultation process to meet (my) needs regarding public consultation in connection with this process." (Crozier, pers. comm., May 2000).

On June 13, 2000 I responded to Mr. Rick Crozier, MOELP, wherein I provided my opinion that the community consultation process underway at that time was satisfactory. Furthermore, I stated my willingness to fulfill my responsibilities under Section 18 of the *Contaminated Sites Regulation* (Ames, pers. comm., June 2000).

2. FACTORS CONSIDERED IN THE ASSESSMENT OF ACCEPTABLE RISK

The potential for risk to human health seems obvious when high concentrations and large amounts of heavy metals are found in the environment. However, the simple presence of heavy metals in the environment does not necessarily result in risks to human health. Risks to human health only occur if there are exposures to the heavy metals of concern. Exposure occurs when heavy metals are eaten (ingested), breathed (inhaled) or absorbed through the skin.

Acceptability of risk is a social, political and economic concept not a scientific or technical one. It is clear that experts and the public view risks quite differently. As defined by Sandman, Covello and others, risk is the sum of the technical risk or “hazard” to human health and the public view of the source of risk labeled “outrage” (Health Officers Council 1998).

Risk = Health Hazard + Perception of Risk (Outrage)

As outrage incorporates far more than the technical aspects of risk, in many cases it is far larger than the hazard. Technical solutions alone are unlikely to be successful in addressing the public concerns. Allowing communities to exercise some control and to hold officials and proponents accountable is a better approach. Consultation with the community helps to determine when outrage is likely to be an important factor. Consultation with the public is an essential part of determining which options are acceptable. The scale and scope of public consultation should be geared to the extent of expressed concern.

In determining what is an acceptable risk, I have taken the following factors into account:

2.1 Other Canadian Cancer Risk Standards

What are the other potential environmental health risks experienced by the Canadian population? The Canadian guideline for radon in indoor air calculates a risk of developing cancer after a lifetime exposure between 1 in 10 and 1 in 100. This means that between 1 in 10 and 1 in 100 individuals exposed to the guideline concentration of radon for a lifetime could develop lung cancer. The Canadian Drinking Water Guideline calculates a lifetime cancer risk of roughly 1 in 1,000 in the case of arsenic, down to 1 in 100,000 or 1 in 1,000,000 in the case of other proven and suspected cancer causing substances in drinking water. When comparing cancer risks from various sources, it is important to keep in mind that the background or baseline risk for developing cancer in British Columbia is about 1 in 3. That is, roughly one-third of B.C. residents will develop cancer at some point in the their life.

2.2 Estimated Intakes Exceeding Guideline Allowable Intakes

An example of a non-cancer environmental health exposure is the calculated hazard index (HI) for Canadian infants of 16.5 for the ingestion of dioxins and furans in breast milk (CEPA 1990).

2.3 Expected Number of Health Outcomes

Additional risk reduction may be of little practical significance if the estimated risk is below the point where one could not expect even a single case of illness in all residents at a site even after a lifetime exposure.

2.4 The Severity of Possible Health Outcomes

Fatal and irreversible disabling diseases should receive more attention than reversible and non-disabling conditions. For example, a 1 in 10 risk of lung cancer (generally fatal) is quite different than a 1 in 10 risk of non-melanotic skin cancer (easily treated and rarely fatal).

2.5 The Largest Contributions to Risk

It is important to direct effort at preventing cancer and other health impacts from environmental contamination. However, to have any meaningful impact we need to set priorities and deal with the largest sources of risk to human health. For example, the best estimates available indicate that about 30 percent of cancers are related to tobacco, 35 percent to diet and about 2 percent to various forms of pollution. (Harvard Report on Cancer Prevention 1996). Incremental reductions in small sources of risk will have very little or no impact in overall health.

2.6 Net Human Health Risks

The net human health risks associated with various remediation options should also be considered. This requires consideration of the risks to human health, not only from substances on the, site but also the risk posed from activities required by remediation. The risks associated with soil removal and replacement, for example, motor vehicle accidents, industrial injuries and exposures to the elements of concern should be taken into consideration.

2.7 Cost Benefit of Risk Reduction Options

Cost benefit of risk reduction options should be considered. This should include an examination of which remediation options, including doing nothing, optimizes the resources required to protect human health on the site.

3. WHAT IS KNOWN ABOUT HUMAN HEALTH RISK IN TRAIL

Exponent Environmental Group of Boulder, Colorado and Bellevue, Washington, under the direction of the Trail Lead Program performed a comprehensive human health risk assessment for smelter contaminates (Exponent, 3 volumes, 1997, 1998, 2000). Exponent is a leading international consultant in metals exposure and toxicity assessment.

Results of this human health risk assessment have been taken at face value. As far as I know, no formal peer review or Ministry (MOELP) review process has occurred. If subsequent concerns are raised about the validity and accuracy of the human health risk assessment then their impact on the recommendations at the end of this report should be revisited.

3.1 The Human Health Risk Assessment for Environmental Contaminants Other Than Lead

Aside from lead, arsenic and cadmium are the only other contaminants of concern. The possible health effects from too much arsenic and cadmium are summarized as follows:

Cadmium – kidney disease and lung cancer

Arsenic – skin, bladder and lung cancer

Estimated environmental cadmium exposures in Trail are well below the levels that have been associated with kidney disease. However, some heavy smokers (2 packs a day or more) who are exposed to much more cadmium from tobacco smoke than from local sources may have total cadmium exposures that may exceed tolerable daily intakes.

To quote the *Human Health Risk Assessment for Trail* by Exponent, "Calculated cancer risks are generally highest for inhalation exposures to arsenic. Overall, however, cancer risks are distributed fairly evenly across the exposure pathways, that is, there is little difference between risk calculated for inhalation, ingestion of soil and dust, and ingestion of homegrown produce. This suggests that all exposure pathways included in this risk assessment contribute nearly evenly to total risk." "Cancer risk estimates associated with exposure to arsenic are uniformly at least an order of magnitude higher than the cancer risk estimates for cadmium." (Exponent 2000, page 3.)

The theoretical lung cancer risk is the result of the combined exposure to inhaled cadmium and inhaled arsenic. **The estimated incremental lifetime lung cancer risk is about 15 in 100,000 in neighborhoods closest to the smelter**. This of course is a worst-case estimate that assumes that an individual lives in a neighborhood closest to the smelter for 75 years. This is not the estimated risk for an "average" resident for the City of Trail. This is in excess of the screening incremental lifetime cancer risk in the *Contaminated Sites Regulation* of 1 in 100,000.

Looking at this a different way, no more than one extra case of lung cancer would occur every 60 years or so in the current population of Trail. This compares to the current incidence rate of one case of lung cancer due to other causes every two to three months or about 300 cases of lung cancer over 60 years (Ferraro et al. 2000).

Ingested arsenic is estimated to result in an incremental lifetime cancer risk of 5 in 100,000 in neighborhoods closest to the smelter. This is in excess of the screening incremental lifetime cancer risk in the *Contaminated Sites Regulation* of 1 in 100,000. Applying this theoretical increment rate to the known population of Trail would result in an estimated additional case of cancer every 200 years or so.

A Stochastic risk assessment was not performed using the information available from the Trail community. Stochastic risk assessment is one where the distribution of risk estimates rather than point estimates of risks are calculated. Risk estimates presented in this format lend themselves to a more rigorous analysis of uncertainty and can provide information on the distribution of risk in the exposed population. High end and average risks can be inferred from these distributions. Over-estimates of exposure were used in this deterministic risk assessment (point estimates of risk). However, there is no estimate of the uncertainty of the risk calculation (distribution of risk) that would have come from a stochastic assessment. This makes exposure pathway-to-pathway risk comparisons difficult. The deterministic risk calculation could over estimate risk but there is no estimate of how much.

The Lead Task Force after consultation with Exponent, Ministry of Environment, Lands and Parks, Cominco and myself decided that, although desirable, this refinement would be time consuming, costly and not likely add significant new information. In particular the risk assessment consultant, Dr. Rosalind Schoof, did not feel that a stochastic analysis was warranted.

Several components of the deterministic human health risk assessment give rise to uncertainty in the final estimates of exposure and risk. To quote from the Exponent report, "…it is likely that the conservative nature of the exposure assumptions incorporated in this assessment causes the calculated estimates of exposure (and the associated risks) to be high by a factor of at least two for each exposure pathway." (Exponent 2000, page 42.)

To ensure protection of the public health, toxicity factors err toward overestimating risk (potentially by a substantial amount). "Based solely on the assumed residence time of 75 years, the estimates of cancer risk exceed the more standard estimates of reasonable maximum exposure by more than a factor of 2. Uncertainties associated with other exposure considerations such as soil ingestion rates, inhalation rates and produce concentrations of arsenic and cadmium, suggest that risks are overestimated possibly by another factor of 2." (Exponent 2000, page 4.) In particular, the dose response rate for arsenic is a good example of a conservative assumption that has likely led to an overestimation of human health risk. For assessing cancer risks the estimated upper bound estimates of uptake for the site are multiplied by the cancer slope factor to calculate the probability that an individual with reasonable maximum lifetime exposure will develop cancer due to that exposure. The Cancer Slope Factor for arsenic is currently under review by regulatory agencies and Dr. Rosalind Schoof is of the opinion that the arsenic CSF contributes to overestimates of risk for low dose exposures such as those occurring in Trail.

3.2 The Lead Health Risk

Local physicians have not reported lead poisoning signs or symptoms in any residents due to regular community exposure. Lower levels of lead exposure can cause subtle health effects but aren't measurable in individuals. Children under 5 and prenatal are most sensitive to lead according to CDC Atlanta. The blood lead level that is currently considered safe for children and pregnant women to protect unborn children is 10 μg/dL or less. Children under 5 years of age and particularly those from birth to 36 months of age are at greatest risk because they ingest more lead dust by putting their fingers and objects in their mouths. Also a higher proportion of the lead they ingest is absorbed into their blood stream when they are at a critical stage of rapid brain development. Blood lead levels that have been considered to be goals and targets by governments have been decreasing over the last 20 years.

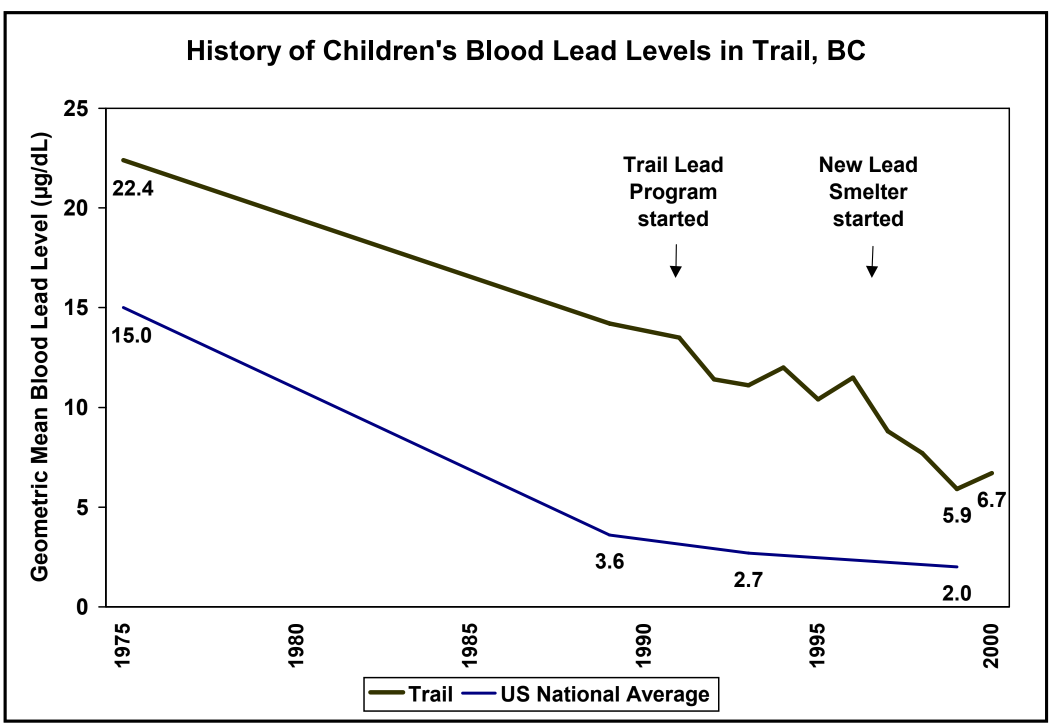
There is a large body of evidence supporting the relationship between the health effects of lead and blood lead levels. The best indicator of health risk from lead is the level of lead in a person's blood. The studies have found that on average children with blood lead levels of over 10 μg/dL tend to have slightly lower IQ scores and lower high school completion rates than children with lower blood lead levels. In Trail students' scores on standard exams and high school completion rates have historically been as high or higher than the provincial average. Other factors can have strong effects on children's school performance and learning. Some of these factors such as daycare, the school system, community and social supports and economic stability are known to have been favorable in Trail.

The Trail Lead Program has accumulated over 10 years worth of blood lead surveillance on children less than 6 years of age living in the community. An excellent summary of the community blood lead trends is found in the *Identification, Evaluation and Selection of Remedial Options* Report, January 2001, pages 38 – 50 (Hilts et al. 2001). The community blood lead testing has been performed annually for several reasons. Most importantly for the community it has allowed for the identification and follow-up of children with elevated or rising blood leads. It has allowed for definition of higher risk geographic areas. It provides a summary assessment of the community wide impact. Because blood lead information has been collected for over 10 years it has provided the basis for an analysis of the possible effect of different lead exposure reduction strategies.

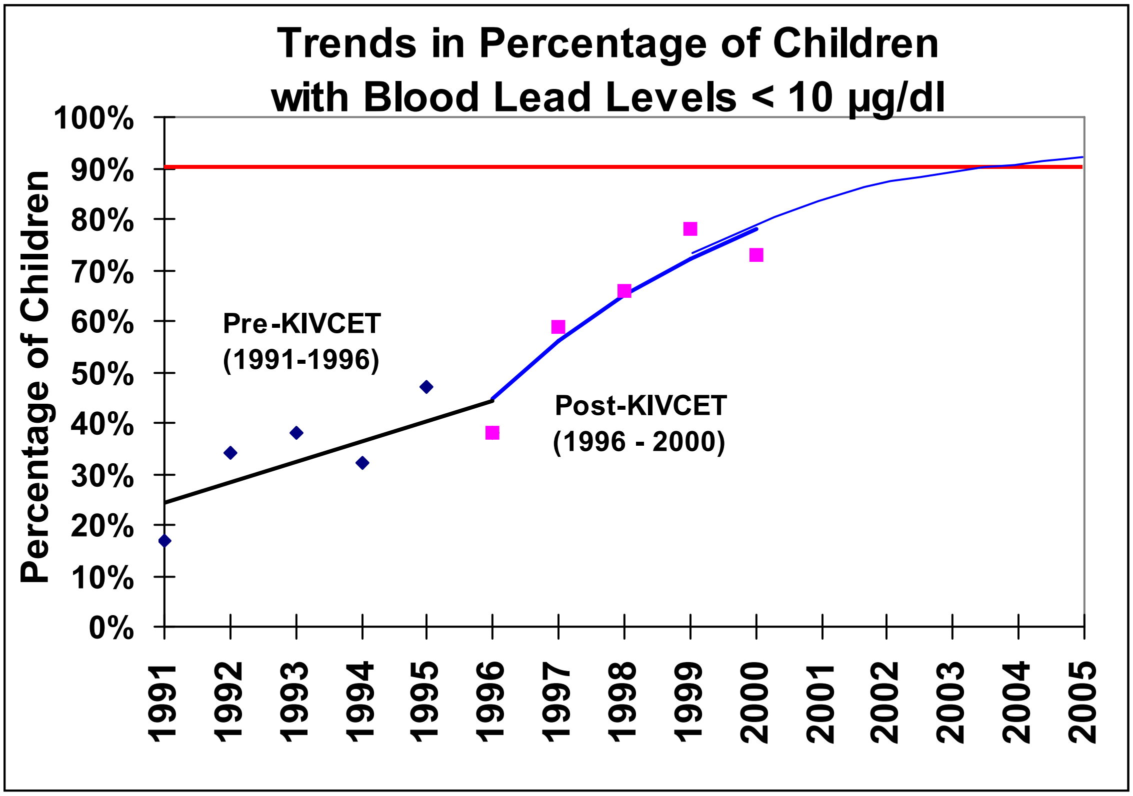
There has been an excellent effort at recruitment and participation in the blood lead testing clinics. On average 79% (range 75% to 85%) of children aged 6 to 72 months have participated in the blood lead testing clinics.

Quality control has been very good and the information has been shared with appropriate explanations to families and supporting health care professionals.

The geometric mean blood lead has dropped from 13.5 in 1991 to 6.7 in the year 2000. See figure below (Hilts pers. comm. April 2001).



Taking into the account the goal of the Trail Lead Program to have 90 percent of children less than 10 μg/dL the following figure shows the increasing percentage of children with blood lead levels less than 10 μg/dL over the last 10 years (Hilts et al. 2001, Figure 29, page 138).



Because of a concern for protecting pregnant women and their unborn babies from lead a blood lead survey of 48 infant mother pairs between 1993 – 1995, shortly after they gave birth, was done. Maternal levels were generally higher than infant (cord) levels. The average for mothers was 3.6 µg/dl and 3.3 ug/dl for newborns. 92% of newborns had lead levels < 5 µg/dl. The highest infant level was 7.8 µg/dl. 77% of mothers had lead levels < 5 μg/dl. The highest maternal level was 7.5 µg/dl. This group of mothers included 15 women who were born and raised in Trail some of whom likely had elevated blood leads in childhood. No studies to date have shown health effects below 10 μg/dL on unborn children.

Lead was not included in the Exponent, Human Health Risk Assessment for Trail. However, the Trail Lead Program used a different model to calculate a theoretical health risk, also known as a hazard index (HI). The Hazard Index (HI) is defined as the estimated daily intake from all sources divided by the tolerable daily intake.

$$\text{Hazard Index} = \frac{\text{Estimated Daily Intake From All Sources}}{\text{Tolerable Daily Intake}}$$

The IEUBK Model – the Integrated Exposure Uptake Biokinetic Model (IEUBK) – uses equations based on animal studies to simulate human biokinetics and allows prediction of blood lead levels when exposure information is available. "The uptake portion of the IEUBK model uses standard risk assessment techniques and may be used to calculate estimated daily uptake for input into the Hazard Index formula." (Hilts et al. 2001, page 55.) The Trail Lead Program ran this model in 1996 using the available Trail exposure data and determined that the estimated **Hazard Index for an "average" child is 0.56 and for a most exposed individual (95 percentile uptake) the Hazard Index was 1.5.**

Applying the exposure data available in the year 2000 after the reductions associated with the operation of the new smelter, the model significantly over-predicted the mean blood lead level in the community. It was therefore seen to be an overestimate of exposure and one that does not reflect the "real world knowledge" that exists for Trail.

I am assuming that the draft revision to Section 18.1 of *The Contaminated Sites Regulation* (Ministry of Environment, Lands and Parks, *Waste Management Act*, 1996) will be in effect. It states that "the site may be considered to be satisfactorily remediated if the risk to human health due to the exposure to the substance of concern at the site is less than or equal to a maximum value recommended by the Medical Health Officer for the wide area site and that the maximum value recommended by the Medical Health Officer pursuant to this section takes a form other than of a hazard index or a cancer risk." This facilitates the use of local knowledge about the actual exposures to the population at risk, i.e. blood lead levels, rather than the use of some calculated theoretical risk.

The Trail Lead Task Force after consultation with the community has established goals for blood lead in the Trail community that they find acceptable. Their stated goal is **at least 90 percent of children age 6 to 72 months in area 2 and 3 (neighborhoods closest to the smelter) should have blood lead levels less than 10 μg/dL by 2005. At least 99 percent of the same children should have blood levels less than 15 μg/dL by 2005**. It is estimated that about 5 percent of children in the USA are currently above 10 μg/dL (MMWR, Vol. 50, No.17, page 337). Population blood lead levels are not available for Canada.

3.3 Other Health Information

As it was unlikely to observe any health effects in the population of the Trail area (less than 10,000 people), the Lead Task Force decided early on not to spend limited resources on such studies.

However others have done a number of local health studies and reports since the beginning of the Lead Task Force in 1990. These studies include one done by Washington State Health in 1992 in Northport. This study was unable to make any link between health effects reported by some residents and the presence of heavy metals in the soil from previous smelter activity in North Port and more notably current activity in Trail (Washington State Department of Health 1994).

In 1992 the BC Cancer Agency examined the cancer mortality and incidence data for the Trail local health area. The study found no evidence of increased risk for any cancers that are known to be associated with exposure to the metals of concern in Trail (BC Cancer Agency 1992).

In 1994 the BC Ministry of Health examined the incidence of inflammatory bowel disease and chronic renal disease in the Trail local health area. The studies found that the hospitalization rate from inflammatory bowel disease was lower than expected in Trail and that the hospitalization and mortality from chronic renal disease was not significantly different from the rest of the Kootenay Boundary region (BC Ministry of Health 1994).

I think it is important to note that the power of these studies to detect increased health risk was hampered by the relatively small population in the Trail area.

Finally, the BC Cancer Agency in conjunction with the Worker's Compensation Board conducted a prostate cancer mortality study which gave no support to the hypothesis that the elevated mortality rate from prostate cancer in Trail between 1987 and 1995 was due to either employment at Cominco or occupational cadmium exposure at Cominco (Gallagher et al. 2000).

4. COMMUNITY CONSULTATION

Since the inception of the Trail Lead Task Force, public participation has been sought and maintained. The Task Force has always had at least 5 active community members. The Trail Lead Program has regularly sought advice by experts both by attending meetings in Canada, the US and Australia and by inviting experts to visit Trail on at least 3 occasions. Other smelter communities coming to grips with this complex challenge have regarded the staff of the Trail Lead Program as experts. While developing its detailed remedial options, the Task Force consulted with the community on a broader base in an effort to incorporate the public's long-term expectations for remedial activities. The *Contaminated Sites Regulation* requires the Medical Health Officer to participate in a specific community consultation when recommending locally acceptable risk levels.

For a complete summary of the community consultation process I refer you to a document entitled *Public Consultation Program*, *December 2000*, published by the Trail Lead Program. This document clearly outlines the methods and results of a seven month community consultation process that included numerous community meetings, stakeholder meetings and key informant interviews. As well, in May 2000, a number of international experts were invited to Trail to participate in a program review that included comments on acceptable risk and how to perpetuate the good work of the Trail Lead Program once it was dissolved.

I was a participant in the planning group that worked with Beck Circle Consulting to effect this community consultation process. I'm satisfied that the methodology was comprehensive and well adapted to the Trail community. The consultation process was flexible enough to allow for a change in the methodology during the consultation process. The opportunity to participate was well publicized. The purpose of the consultation was explained well, adequate opportunity was given for input, the health risks were clearly described and the remediation options were clearly communicated.

In summary, the community consultation process uncovered no significant outrage about environmental contamination and its impact on human health. There was an open discussion about health risks. The overwhelming majority of the community was heard to say that they found the current risk acceptable in the context of ongoing efforts to reduce exposures; in particular the remediation plan as outlined by the Task Force. Specifically, they supported ongoing monitoring of environmental and blood lead indicators of community health risk. They felt that further reductions in emissions from the Cominco plant would be the single most cost beneficial intervention. They were most concerned that the good work performed by the Trail Lead Program be continued by those responsible, that is, the City of Trail, Kootenay Boundary

Health and Cominco. Finally, they were concerned that there be ongoing accountability to the community for carrying out the remediation options by those responsible.

5. INTERNATIONAL STANDARDS, COMPARISONS AND EXPERT OPINION

In the BC Contaminated Sites Regulation, the default value for maximum acceptable increased lifetime cancer risk is 1 in 100,000. By comparison the Canadian Council of Ministers of the Environment (CCME) has adopted the position that site related risks arising from human exposures to carcinogenic chemicals should be remediated to levels within the range of 1 in 10,000 to 1 in 10,000,000 (CCME 1996). The US Environmental Protection Agency (US EPA) uses the 1 in 10, 000 to 1 in 1,000,000 risk range as a target range within which the agency strives to manage risk as part of the Super Fund Cleanup. The EPA generally uses the 1 in 10,000 risk level as an appropriate cutoff level for decisions on whether risk management action is required at a site (US EPA 1991). The implied risks discussed in **Sections 2.1 and 2.2** are well within these implied risks from government standards, guidelines and objectives.

A federal-provincial committee on environmental and occupational health has recommended that a community program to identify and reduce sources of lead exposure be considered if the proportion of children age 6 to 72 months with blood lead levels above 10 μg/dL is double that of the general population. Currently it is estimated that approximately 5 percent of U.S. children have blood lead levels over 10 μg/dL. There is no Canadian information on child blood lead levels. Average U.S. blood lead levels are likely higher than in Canada. Ray Copes consultant to the BC Ministry of Health estimates the BC average is around 2ug/dl and that it is unlikely that more than 2% preschoolers are above 10 ug/dl. The Trail Lead Program's long-term goal of having no more than 10 percent of the Trail children with blood lead levels over 10 μg/dL is based on the known U.S. information.

This is consistent with CDC Atlanta, Control and Prevention recommendations to public health agencies and physicians for lead. They suggest that if a significant number of children are in the range of 10 – 14 μg/dL that a community intervention be contemplated. As noted in the following table, average blood lead results for the Trail community compare favorably with a number of other communities with operating smelters and even some urban communities without point source exposure.

The following table shows a comparison with blood lead levels with other sites (Hilts pers. comm. April 2001).

City/Region	Country	Nature of site	Age of kids tested	Year	Average Blood Lead Level (µg/dL)
Santo Amaro	Brazil	Primary Pb smelter	1 to 9 yrs	1992	58.9
Berat	Albania	Secondary Pb smelter	<6 yrs	1997	15.0
Pribram	Czech. Rep.	Primary Pb smelter	6 to 12 yrs	1995	11.4
Port Pirie	Australia	Primary Pb smelter	9 mos to 5 yrs	1999	10.2
Boolaroo	Australia	Primary Pb smelter	1 to 4 yrs	2000	9.3
Trail	Canada	Primary Pb smelter	6 mos to 5 yrs	2000	6.7
Herculaneum	U.S.A.	Primary Pb smelter	6 mos to 6 yrs	2000	5.4
Vancouver	Canada	Urban	2 to 3 yrs	1989	5.3
Silver Valley	Idaho	Closed Pb smelter	9 mos to 9 yrs	2000	3.5
East Helena	U.S.A.	Primary Pb smelter	< 7yrs	1995-99	4.6
Hettstedt	Germany	Closed Pb smelter	5 to 14 yrs	1996	3.5
Nation-wide	U.S.A.	Urban/rural (NHANES)	1 to 5 yrs	1999	2.0

Comparing the incremental lifetime cancer risk of inhaling arsenic and cadmium in Trail, the lifetime cancer risk from breathing diesel exhaust in the Los Angeles area is estimated at about 1 in 10,000 (Copes, pers. comm. May 2001).

When the Trail Lead Program brought together several international experts on lead and other metals in May 2000, they reviewed the draft remediation plan options and health risks in the Human Health Risks Assessment (Ferraro et al. 2000, Appendix H). These outside experts were able to assist with setting priorities for which interventions would have the greatest impact on human health. Their opinions had a significant impact on the way in which the remediation options were subsequently presented to the community.

The key message I took away from the expert panel is that it is not feasible for a large and complex site such as Trail to draft a remediation plan that would be appropriate for all time. It was pointed out that new knowledge about best available control technologies for reducing emissions, health risks associated with various heavy metals and land use plans in the Trail community will change over time.

Therefore, an approach that takes into account these variables and information generated from ongoing monitoring of the environment and blood lead in the Trail community would be an appropriate course of action.

6. MEDICAL HEALTH OFFICER'S CONCLUSION AND RECOMMENDATIONS

After considering all this information, the current theoretical and known health risks from heavy metals' contamination in Trail are negligible in the short-term. Furthermore, health risks will not be significant in the long term if current efforts to reduce exposure continue and recommendations of the Task Force are addressed on a priority basis. In addition to the Task Force recommendations, there may be additional changes to the industrial and materials handling processes that could reduce exposure.

In reaching this conclusion, I have taken into account the known background risks and comparison risks experienced by people living in Trail. Using assumptions that are intended to overestimate risk, the worst-case estimate of the incremental number of adverse health outcomes is so small that they could never be detected in the Trail population over a lifetime.

The most severe possible health outcome would be from developing lung cancer due to inhaling cadmium and arsenic over a lifetime in Trail. The greatest contribution to this calculated lung cancer risk appears to be from inhaled arsenic. As noted previously in this report, these estimated risks are based on over estimates of exposure and compare favorably to risk estimates in other urban communities such as Los Angeles.

The community of Trail has been aware of and managing the human health risk associated with smelter contaminants for years. The establishment of the Trail Lead Task Force as a community body empowered by the provincial government has been instrumental in allowing this community to take charge of how this issue has been addressed. Outrage has not been an issue in Trail. The community consultation process showed that people feel like they have been consulted and trust that the Lead Task Force has held government agencies and Cominco accountable.

As a member of the Lead Task Force since its inception I am pleased with the successes of the Trail Lead Program and have confidence that the research, investigations and ongoing monitoring that the program has conducted have been credible to the community and peer review. Therefore when I review the *Identification, Evaluation and Selection of Remedial Options Report,* dated January 2001, I have confidence that it reflects a comprehensive analysis of the situation and has the support of the significant majority of the Trail population.

I support all the remediation recommendations filed by the Trail Lead Task Force. (See Section 9.2 of *Identification, Evaluation and Selection of Remedial Options.*) As there are finite resources to apply to remediation activities, in my opinion, the top priority is to further reduce lead and other metal emissions from the smelter. A second priority is to control the secondary movement of metals in surface dust as much as possible.

Lead is a historical issue of concern to the Trail community. It was the heavy metal first identified as a threat to human health for the whole community and is one that the community is most aware of and understands the best. It is my opinion that the lead health risk has decreased and is expected to decrease further. The best way to monitor the lead health risk in Trail is to continue the annual blood lead surveillance of children as outlined in the *Identification, Evaluation and Selection of Remedial Options*. To target those at greatest risk, **annual blood lead testing should be offered to all children 6 to 36 months. To assess the stated 2005 goal, a complete survey of all children 6 to 72 months should be conducted in 2005**. The results of this survey should be shared with the community starting with Trail Health and Environment Committee. They should be analyzed in the context of the knowledge available at that time about the relationship between blood lead and health. A different schedule of blood lead surveillance could be recommended and implemented. As the control of smelter contaminants improves along with other dust control measures, I am optimistic that the stated goals can be reached.

I am unaware of other community interventions that should be considered. I have followed the literature and attended the Symposium On Lead Remediation Effectiveness, May 22 – 26, 2000 in Coeur d'Alene, Idaho. Where soil replacement has been tried, the evidence has not supported any significant effect for this intervention. In my opinion, the net risk to human health could be a negative one. There is the real possibility of increased exposures to the metals of concern during the removal and replacement of the contaminated soil. For a community like Trail, soil replacement would be difficult and take several years. Secondly, it would take valuable resources away from the highest priority, to control emissions from the source.

Environmental health concerns secondary to smelter contaminants will likely be a continuing concern in Trail. If the stated goals for blood lead and the theoretical health risks from other metals don't improve, the remediation plan should be formally reviewed with local and outside experts using the best available evidence.

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