



ABRIDGEMENT

"It Starts with the Kids!"

SEPTEMBER 9, 2014



Foreword

September 9, 2014

Chairing the Trail Area Health & Environment Committee (THEC) goes with the job of Mayor. It always has since the Task Force began 25 years ago, created as a community-led initiative comprising the Company (Cominco, Teck Cominco and now Teck), the government Health and Environment agencies, parents and other community representatives, all working together to deal with the issue of lead in our community. It has been a remarkable success. The spirit of cooperation, openness and trust amongst all the participants while dealing effectively with such a sensitive issue has been outstanding. It has been one of the most rewarding experiences of my public life.

I am pleased to present the third edition of our community program, now called the Trail Area Health & Environment Program (THEP). It is certainly the most comprehensive and inclusive version: broader in scope, more encompassing in its application, yet more tightly integrated. It addresses the most recent advances in scientific research on lead, which is ever more stringent. The goal posts keep moving, but so do we. We were ambitious with our goals when we began back in 1989; we met them, and we'll meet our new goals. It's what we do, together. Teck has a major role to play in this; control of fugitive dust from its operations is a key part of this program, an essential contributor to achieving those goals. Teck has done an outstanding job in reducing process emissions; we are counting on them to do the same with fugitive emissions.

This Program also explores the broader opportunities for enhancing childhood development. This is a great new initiative. A child's early development is dependent on many factors. Communities generally should do more to support children and families in these critical years when their capacity to succeed and thrive is being determined. Here's where Trail can show the way. Our new plan describes not only how we will continue to prevent children's lead exposure and further reduce levels of lead in the local environment, but also how we will grow our efforts to work with the community on the broad variety of factors that contribute to children's positive development. We have an enthusiastic core community group, including THEC, keen to champion this vision of a community that cares for its kids and supports the families that nurture them. Through this broader approach, we can make a much stronger contribution to our children's development than through focusing solely on lead. Our business is far more than lead: it's raising the champions of tomorrow!

Finally, I want to express my sincere appreciation and thanks to everyone who has contributed to this Program. We have a great team and it has produced an outstanding Program, incorporating a wealth of knowledge and 25 years of experience. That team includes the community, so important; it's our Program and together we will all make it happen.

Mayor Dieter Bogs
Chair, Trail Area Health & Environment Committee

TRAIL AREA HEALTH & ENVIRONMENT PROGRAM – ABRIDGED VERSION

NOTE TO READERS

This document is an abridged version of the Trail Area Health & Environment Program (THEP) document approved by the Trail Area Health & Environment Committee (THEC) on September 9, 2014 and signed by all THEC members. This abridgement is a shortened and reorganized version that highlights information of greatest interest to the general public. Readers who prefer greater detail or who want to review the references and bibliography can access the THEP document on the website at <http://www.thep.ca>, under Resources, Reports or directly by following this link: http://www.thep.ca/upload/resources/80/THEP_FINAL_Sept_9_2014_With_THEC_signatures_FINAL_original.pdf

TABLE OF CONTENTS

DEDICATION TO GRAHAM KENYON.....	1
OVERVIEW	3
PURPOSE AND GOALS	5
ORGANIZATION.....	7
PROGRAM	8
AIR QUALITY.....	10
FAMILY HEALTH	14
HOME & GARDEN.....	17
PARKS & WILDLANDS.....	19
PROPERTY DEVELOPMENT	21
COMMUNITY ENGAGEMENT	22
PROGRAM EVALUATION AND CONTINUOUS IMPROVEMENT	23
HISTORY AND RATIONALE.....	24
APPENDIX - REGULATORY ASPECTS OF THE THEP.....	28

PHOTO CREDITS

	Page
Kenyon Family	1
Larry Doell	12, 18, 22
THEP	15, 27
David DeRosa	19
Steve Hilts	20
Brian Findlow	23

DEDICATION TO GRAHAM KENYON



1937-2015

Graham Kenyon was a Founding Father of the health and environment program and dedicated volunteer community representative on the THEC. He was actively involved in making a positive difference right up to the last days of his life. Graham was a consistent champion of a collaborative, innovative, community-based approach to reducing the impacts of smelter metals in the community. He was passionate about improving the well-being of children. Graham wrote the first draft of this Abridgement: here are some of his views on the health and environment program that he wrote as part of that draft.

The issue of addressing the consequence of lead in the community is not just a regulatory matter between the company and the government. The community itself is a key stakeholder in this process; it always has been. At the end of the day, the THEP and the programs within it must meet the approval of the community.

Community leadership and participation is enshrined in the organization of the THEC and is reinforced through ongoing outreach, engagement and consultation. Parents have participated actively in the organization from the outset. All of the THEC partners are acutely aware that parents and families are ultimately why we are all here. It's where the buck stops; it's where our accountability rests. The THEC is the vehicle by which we will achieve our goals and vision; the community is the driver; citizens, especially parents, keep us on the right road.

Engaging families and the wider public is essential to the success of the THEP. Our immediate clients are the parents of young children participating directly in our Healthy Families Healthy Homes Program offered to all young families and expecting families. This is the front line where the complexities of our program meet the concerns of parents and the community for the health and well-being of their children. Trust and confidence must be earned through competence, empathy, clear and honest communication, advice, support and professional advocacy. Over the past 25 years and generations of families, we have earned that trust and confidence.

A tremendous amount of attention and scientific research has been devoted to lead health issues over the past 50 years, particularly in the US. Extensive and complex studies of large populations of young children exposed to lead dust found an association between measured blood lead levels and indicators of early childhood development. The more recent studies indicate that some effects are measurable in populations of children at very low blood lead levels, suggesting that there is no level at which one could be assured of no effects. Based on these research results, the US CDC fundamentally changed its policy on lead, urging greater efforts to prevent exposure.

The good news is that this community has, for a long time, had expertise in understanding the health risks from lead and what can be done to minimize them, and has had the resources to do it. By the time the US CDC changed its policy on lead, smelter stack emissions had declined by over 90% and children's blood lead levels in the community were one-third of the 1989 levels. Current blood leads in Trail are one-third of what the North American average was in the 1970s.

While our program had always had a focus on prevention, we also decided to make several key modifications to sharpen that focus. These included Teck's major projects to reduce fugitive emissions, the Healthy Families Healthy Homes Program, and increased integration of wider ecological and regulatory aspects. In making these program choices, we commissioned a comprehensive literature review to assess the effectiveness of programs at similar sites world-wide. The studies give credence to our approach that combines emissions reduction, education, case management and localized exposure reduction linked with a comprehensive monitoring system for both environmental indicators and blood lead sampling.

The scientific information about the effects of low levels of lead on IQ prompted a second literature review to identify factors other than blood lead that influence early childhood development and strategies we might employ to greater advantage as part of a broader focus on children's well-being. This review was most encouraging, identifying many other factors with a far greater positive impact on children's development than the negative impact of lead. This supports the broader THEP strategy of encompassing family health and early childhood development in its broadest sense in collaboration with other organizations working in this field.

What may not be evident from our program description and organizational diagram is the remarkable enthusiasm, energy, caring and cooperation that infuses this program, and which makes it so unique. The "Trail Program" is well known internationally as a model of effective cooperation in a field that is often embroiled in conflict and litigation. Many technical, government and community people from all over the world have visited Trail to learn about our model. Our approach is recognized as an effective and efficient collaborative model for protecting community health and the environment. In 2011, THEC was honoured with the BC Premier's Award for Partnership Excellence in recognition of the success of this unique, collaborative approach. This is a Program we can all be proud of.

Writing this document has been like painting the Forth Bridge in Scotland; by the time you get to one end, it's time to start over again. In other words, there is no such thing as final. We have a great program, but to retain its value and credibility it must be continually updated. We will be reviewing our blood lead goals with the community in 2016. Air quality objectives are due for review in 2018. Ongoing regulatory discussions may lead to more changes and public consultation.

With our continual drive for improvement, one thing will remain constant - our commitment to the children of our community. Our children are our future and our highest priority; that is what this is all about, and that will never change.

OVERVIEW

Trail, British Columbia has been the site of a major lead and zinc smelting facility for over 100 years. What began as an addition to local mines has evolved into one of the largest, most efficient and cleanest lead-zinc and by-product smelters in the world. While the goal was always to recover as much metal as possible from ore, due to the limits of technology, lead and other metals have been emitted into the air. Both stack and fugitive emissions (e.g., dust that escapes from buildings, stockpiles, roadways and other activities on site) have caused metals to be deposited in dust in the Trail area.

People, plants and animals can be exposed to these metals in dust, air and soil. If exposures to metals are high enough, there can be a risk of health or ecological effects. Young children are most vulnerable to the effects of lead exposure. At the children's blood lead levels we see today in Trail, any effects would likely be subtle and not measurable in individual children.

The Trail Area Health & Environment Program (THEP) is a comprehensive integrated program that has evolved since 1988 to improve the Trail area environment, and promote and protect the health of the community related to smelter operations. The goal of the THEP is to reduce exposure to lead and other smelter metals in the community on a continual improvement basis. This includes meeting objectives for lower children's blood lead levels and reduced levels of lead and arsenic in the community air.

The Trail Area Health & Environment Committee (THEC) is responsible for the THEP. The THEC is a unique partnership between the City of Trail, Teck, the BC Ministry of Environment, Interior Health and the community itself. The THEC was established in 2001 with similar structure and purpose to the Trail Community Lead Task Force (Task Force) that preceded it. The Task Force was formed to address issues identified in the 1989 UBC Trail Lead Study and to design a program to reduce children's blood lead levels. For the first ten years, the THEP was known as the Trail Lead Program.

From the start, a community-driven approach was taken to address community priorities. This community approach has guided the program for over 25 years and is exemplified by the participation of community members on the THEC, regular public engagement and consultation, and a collaborative style of working with families and local organizations. The THEC's collaborative approach has been recognized internationally as an effective model for protecting health and the environment; the THEC received a Premier's Award for Partnership in 2011.

The THEP is currently guided by the following purposes:

- Further reduce children's blood lead levels to meet objectives acceptable to the community ;
- Further reduce smelter emissions to achieve air quality objectives acceptable to the community;
- Continue using the latest scientific research, evidence of effectiveness and a systematic best practices approach in setting Program objectives and adaptive management of the Program;
- Maintain effective monitoring systems for blood lead levels and environmental indicators;

-
- Offer education, counselling, family in-home visits, home and yard assessments and home renovation support to complement emissions reduction;
 - Support children's healthy development through partnerships and by emphasizing early childhood development in family in-home visits and communications;
 - Support the development of business and industrial property by clarifying responsibilities and facilitating remediation of smelter metals as required by environmental legislation;
 - Support the rehabilitation and conservation of wildlands via the Lower Columbia Ecosystem Management Program;
 - Maintain regular open, honest, two-way communication with the community and stakeholders: inform, educate, advise, listen, and uphold trust and confidence; and,
 - Meet the requirements of the Ministry of Environment Contaminated Sites Regulation (CSR) by addressing metal levels in soil that exceed standards.

The THEP forms the basis for Teck's submission to the Ministry of Environment for approval of a wide area remediation plan under the CSR. However, the THEP goes beyond the CSR's focus on soil to address the main pathway for human health risks in Trail, hand-to-mouth ingestion of fugitive dust by toddlers. In addition, the THEP integrates activities that uphold the vision of a community with healthy children and families, a clean environment and thriving economy.

The THEC supports the Trail Area Health & Environment Program described in this document. The THEC believes the THEP combines all of the elements necessary to protect and enhance health and the environment in the Trail area, based on over 25 years of past experience, extensive research and consultation with community residents, and in light of the most recent conclusions of the Canadian and US health agencies with respect to lead exposure risks.

Continual improvement means that the THEP and this document will evolve in future as new information, technologies and community priorities change. The THEC will continue to be motivated by a commitment to the children of our community; that will never change.

PURPOSE AND GOALS

Vision

A community with healthy children and families, a clean environment and thriving economy.

Mission

THEC promotes a healthy environment through a comprehensive integrated program that successfully achieves our goals for air quality and children's blood lead levels, and promotes the health of the community.

Values

Health – The bottom line is the health of people and the ecosystem: program resources are targeted to preventing health risks, promoting children and family health, and sustaining a healthy environment.

Community Led – The community drives decision-making about the THEP. Community members participate in the THEC; program goals and activities are reviewed by the community through regular public consultation.

Partnership – THEC uses a partnership approach to decision-making and has been recognized for the effectiveness of its collaborative multi-stakeholder model.

Science-based – The THEP is developed based on scientific research, evidence of effectiveness and a systematic approach to innovation of new best practices.

Accountability – THEC is accountable to the community, its partners and stakeholders through transparent decision-making, responsive and timely programming, and pro-active public communication and consultation.

Trustworthy – THEC is open, honest and transparent in its actions and communication with the public and with each other as partners on the Committee.

Overall Goal

The THEP's programs and activities work together towards an overall goal to:

Reduce exposure to lead and other smelter metals in the community on a continual improvement basis

Objectives

To achieve this goal, the THEP set near-term objectives approved by public consultation in 2010:

1. an average blood lead level of 4 µg/dL for children aged 6 months to 36 months in Trail and Rivervale by 2015;
2. at least 95% of children aged 6 months to 36 months in Trail and Rivervale with blood lead levels below 10 µg/dL by 2015¹;
3. an annual average of lead in community air² of 0.20 µg/m³ or lower³ by 2018;
4. an annual average of arsenic in community air⁴ of 0.01 µg/m³ or lower⁵ by 2018;
5. a minimum of 75% of children aged 6 months to 36 months in Trail and Rivervale participate in blood lead testing clinics each year;
6. all home renovators in Trail and Rivervale, and renovators of pre-1976 homes throughout Greater Trail use the Home Renovation Support Program;
7. at least 75% participation in the Healthy Families Healthy Homes Program each year.

¹ Although 10 µg/dL is no longer the international "level of concern", this objective was established in 2010 and was approved by the community through public consultation.

² Measured as total suspended particulate at the Butler Park station.

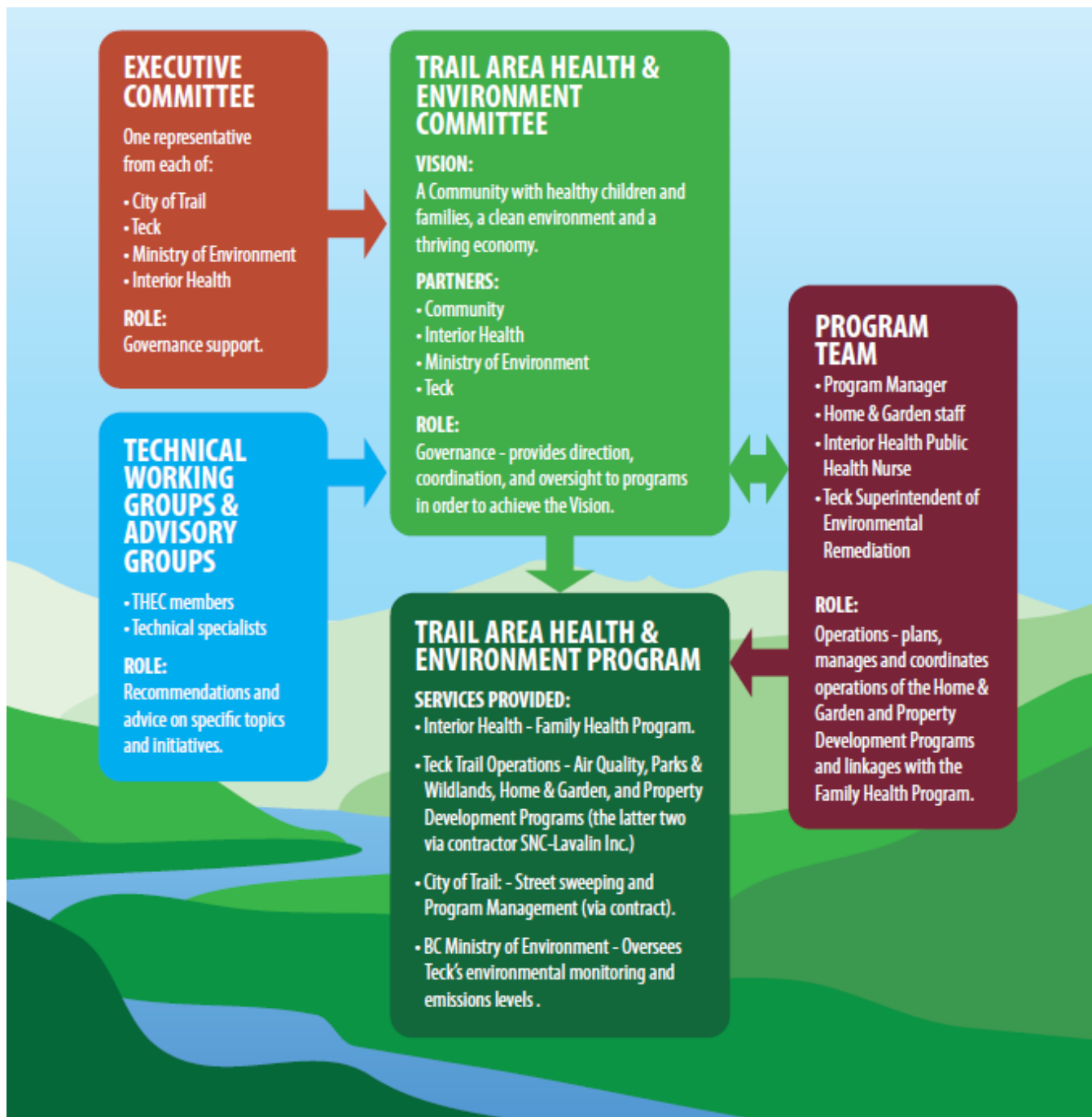
³ The objective for lead was based on the Ontario 30-day Ambient Air Quality Criterion (OMOE, 2007) of 0.2 µg/m³ for lead and its compounds. This value was the most current and stringent guideline in Canada when the objective was set, and remains the criterion in Ontario (OMOE, 2012).

⁴ Measured as inhalable (PM₁₀) particulate at the Butler Park station.

⁵ The objective for arsenic was based on the annual average Alberta Ambient Air Quality Objective (Alberta, 2005) of 0.01 µg/m³. This value was the most current and stringent guideline in Canada when the target was set. Alberta reviewed this objective in 2013 and it remains unchanged.

ORGANIZATION

The organization and roles of the THEC, its sub-committees and THEP program delivery partners are summarized in the following organizational diagram.

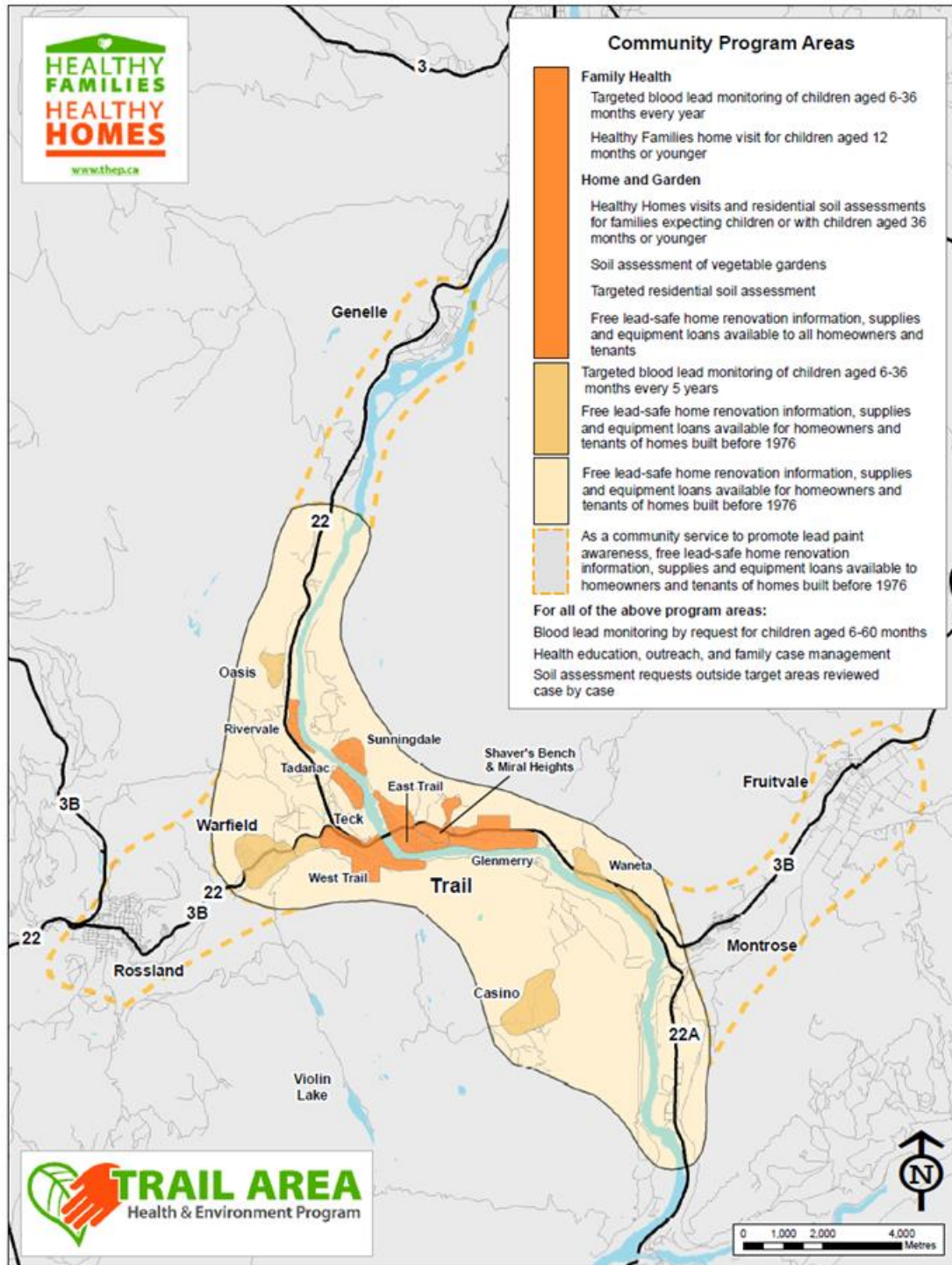


PROGRAM

The Trail Area Health & Environment Program has five components: Air Quality; Family Health; Home & Garden; Property Development; Parks & Wildlands. These components work together to create an effective response to the identified risks and achieve our goals and objectives.



The following map shows the geographic areas where the different programs and activities are offered. After that, each program component is described in detail.

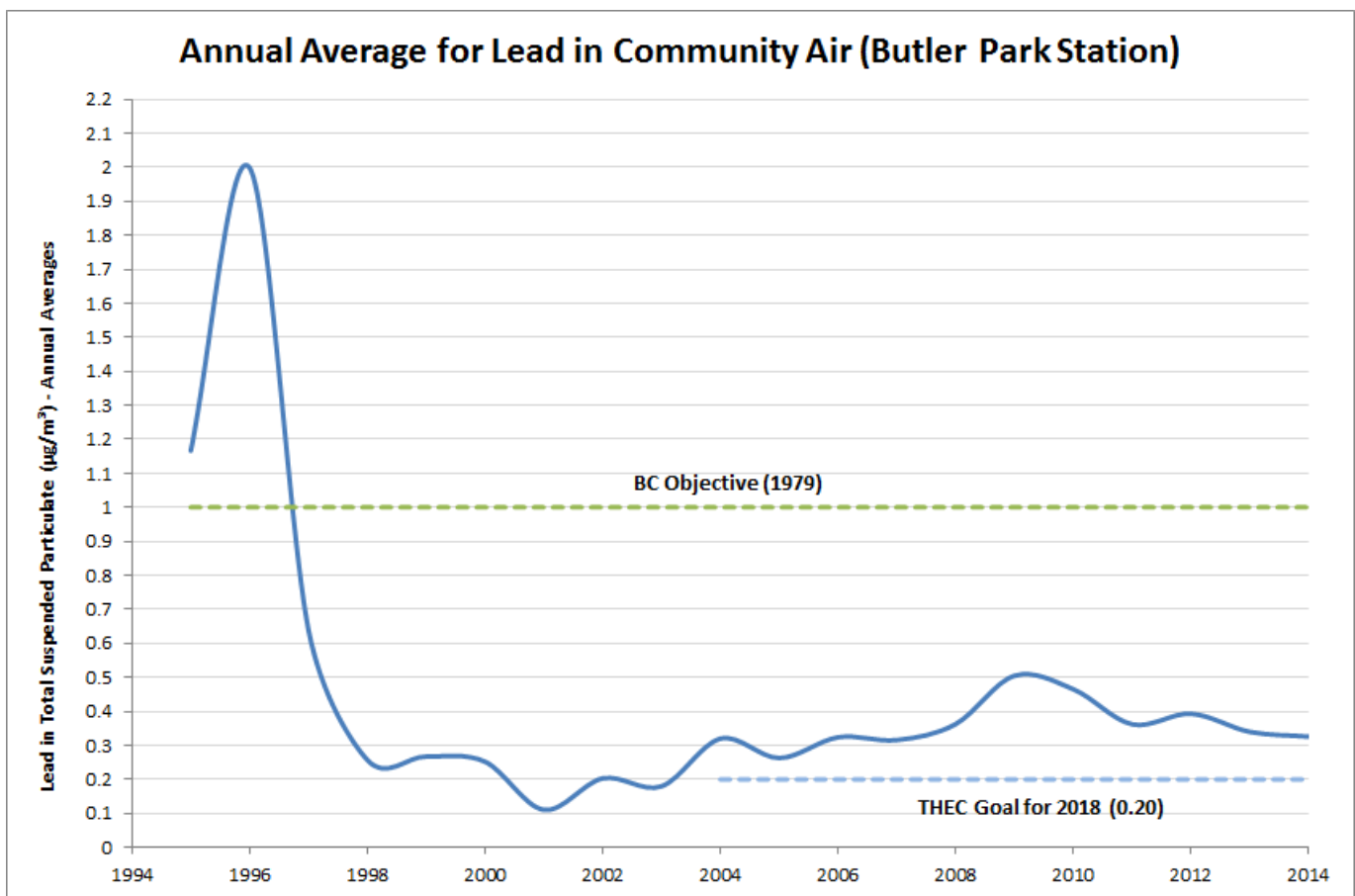


AIR QUALITY

Air Quality Program Goal

The goal of the Air Quality Program is continuous improvement in air quality. Reducing emissions, primarily fugitive emissions, is the single most effective way to further reduce children's blood lead levels.

The level of lead in community air has averaged around $0.35 \mu\text{g}/\text{m}^3$ (micrograms per cubic meter of air) in recent years and arsenic levels in community air are around $0.015 \mu\text{g}/\text{m}^3$. The goal of the THEC is for continuous improvement of these levels. Progress in reducing lead emissions is illustrated in the graph below for lead levels in community air.



Main Approaches

- **Upgrading Technology to Reduce Emissions**

Teck Trail Operations has long been at the forefront of industrial environmental protection. Technology upgrades to reduce stack emissions have been the primary source of air quality improvements to date and have achieved significant results. Starting in 1977, the Trail Modernization Program invested over \$1.5 billion in technology upgrades, transforming much of Teck Trail Operations and achieving a 99.5% reduction in stack emissions. This effort culminated with the KIVCET smelter installation in 1997, which also brought about significant declines in children's blood lead levels. Stack emissions have continued to decline; currently stack lead emissions are about 0.5 tonnes/year, down from 6.8 tonnes/year in 2000 and far below the pre-KIVCET days.

- **Reducing Fugitive Emissions On-Site**

Teck Trail Operations recognizes that fugitive emissions are a major source of lead and arsenic emissions; reducing these emissions is the best opportunity to achieve the 2018 air quality objectives. Fugitive emissions escape from buildings, stockpiles, trucks, roads and outdoor areas where open mixing and handling of materials take place; as well, they are affected by wind. They cannot be directly measured, but can be estimated or modeled by various techniques. In 2013, Trail Operation's fugitive lead emissions were estimated at be about 45 tonnes per year, a number that needs to drop by at least 50% to achieve the 2018 air quality objectives. Fugitive emissions are now the primary focus of emissions reduction.

Teck Trail Operations has a 5-year plan to reduce fugitive dust, focusing on four areas:

1. Enclosing outdoor stockpiles and materials handling areas that generate dust. One building was completed in 2013; two larger structures that could potentially achieve the 50% reduction in fugitive emissions are in the engineering and feasibility stages.
2. Reducing emissions from roads and buildings. Truck wheel washes and increased use of vacuum sweeper trucks and road cleaning will address the roads source. Projects are being developed to reduce emissions that escape from inside and on top of various buildings on-site.
3. Employee awareness and training. All employees have received presentations on fugitive dust and their roles in reducing it. This supports timely response to air monitoring alarms and consistent dust abatement and housekeeping practices to minimize dust.
4. Evaluation and Continuous Improvement. Trail Operations uses a Plan-Do-Check management system to determine if the various investments achieve their predicted reductions in metal levels measured in community air: the ultimate objective. This offers a structured approach to project review and potential modification to improve results.

- **Optimizing Air Emissions Control Equipment**

Trail Operations has systemized Control Plans in place to monitor, maintain and ensure optimal performance of all of its air emissions control equipment. Most important are the baghouses, (large volume air filters); Control Plans are also in place for other pollution abatement equipment such as Scrubbers, Cyclones, and Electrostatic Precipitators.

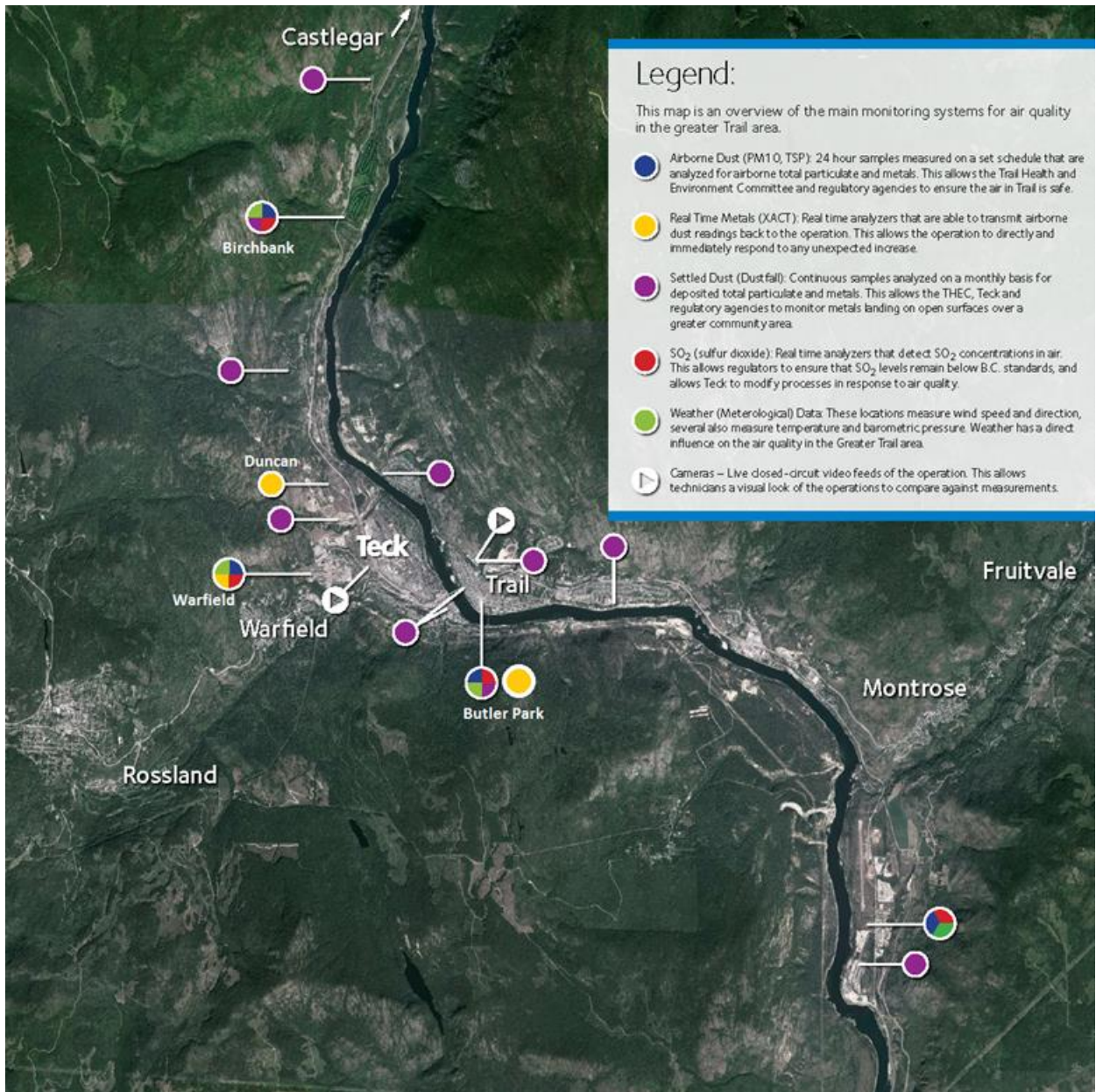
- **Dust Suppression in the Community**

In collaboration with Teck, the City of Trail and the BC Ministry of Transportation road contractor perform street cleaning to control dust in summertime in Trail and Rivervale, respectively. In Trail, dust suppressant solution is applied to unpaved alleys each June.

- **Air Quality Monitoring**

Monitoring provides critical information to ensure safe smelter operations and support performance evaluation and improvement. Monitoring involves direct sampling to measure the quantity of metals, gases and dust emitted to the atmosphere. Community air quality is measured through a network of dust and sulphur dioxide gas sampling stations (see map), providing immediate, short-term and longer-term information about the effect of the smelter on air quality and progress towards the 2018 objectives. Monitoring data is analyzed by Teck Trail’s environmental staff and reported to the Ministry of Environment and the THEC.





Community Air Quality Monitoring Locations

FAMILY HEALTH

Family Health Program Goals

The overall goal of the Family Health Program is to reduce health risks from exposure to lead and smelter metals within the context of children's healthy development and an engaged community. This includes preventing young children's and pregnant women's lead exposure, engaging the community in understanding and addressing health risks, and enhancing the well-being of young children and their families.

Main Approaches

Family and Caregiver Education and Engagement

Education and engagement of parents, expectant parents, young children and health & social service providers is done through community health presentations, participation in events, hand-washing displays and distribution of family health educational materials.

Healthy Families Home Visits

Healthy Family home visits are offered pro-actively to every family in the target areas of Trail and Rivervale with a child 12 months of age or younger. Visits offer education, advice, a brief in-home visual review to determine the need for referral to the Home & Garden program, and provision of information to strengthen children's healthy development and prevent lead exposure. Discussion may include topics such as nutrition, hand washing, and opportunities for strengthening early childhood health and development.

Monitoring of Children's Blood Lead Levels

Voluntary blood lead testing for children aged 6-36 months in Trail and Rivervale takes place each fall after maximum summer exposure conditions are known to occur. This is the main monitoring and evaluation process conducted annually to identify children and families requiring case management and to track progress toward the children's blood lead objectives.

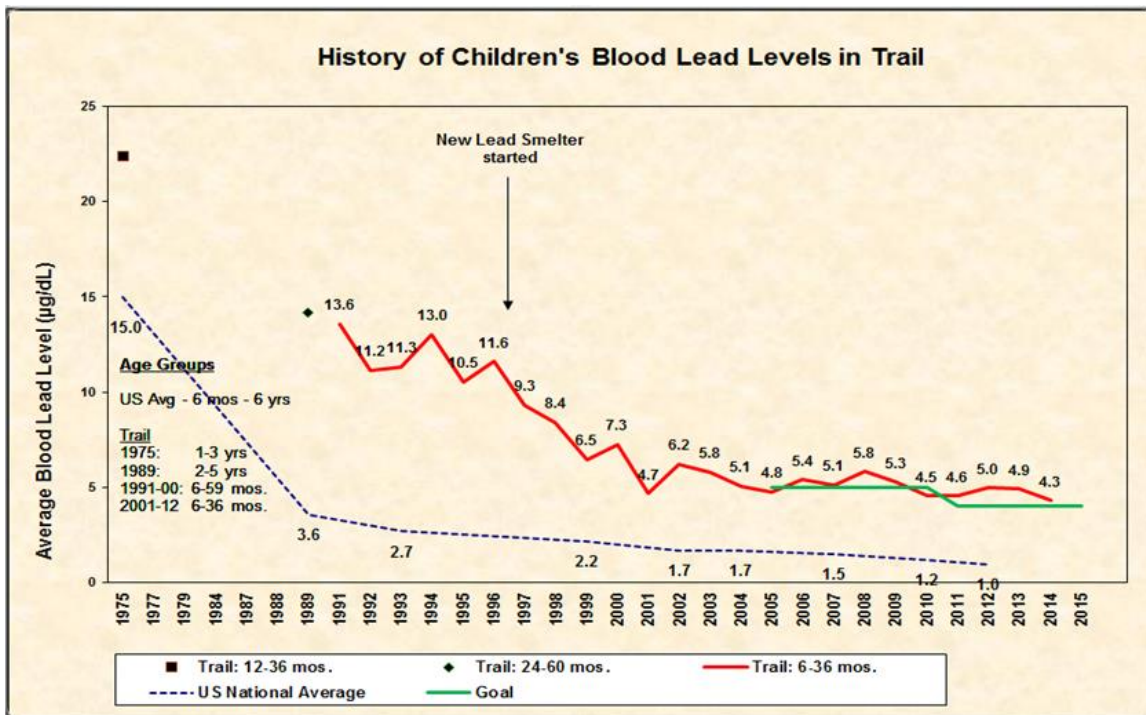
In addition to the target group of children aged 6-36 months from Trail and Rivervale, children anywhere in Greater Trail are accepted for testing up to age 5. In particular, young children new to the community or living in homes currently or recently renovated are encouraged to attend. Every 5 years, starting in 2013, targeted voluntary testing is offered to children aged 3-36 months over a wider area that includes Warfield, Oasis, Casino and Waneta.

Typically, about 190 children are tested annually with about 120 of them from the target group. The participation rate for the target group has been between 72 and 74% in the last few years, just below the 75% objective for clinic participation.



An annual winter follow-up clinic is held each February to monitor children receiving case management and target children who were under 6 months of age at the time of the previous fall clinic. Research shows that blood lead levels are lower at this time of year.

The graph below shows the long-term trend in children's blood lead levels in Trail. Note that children's blood lead levels decreased significantly after the KIVCET smelter was installed in 1997. One of the goals is to have a community average for children's blood lead levels of 4.0 $\mu\text{g}/\text{dL}$ by 2015. In 2014, the average was 4.3 $\mu\text{g}/\text{dL}$. Another goal is to have 95 % of children's blood lead levels below 10 $\mu\text{g}/\text{dL}$ by 2015. In 2014, 88% of children's levels were below 10 $\mu\text{g}/\text{dL}$ and in 2013, 93% were below 10 $\mu\text{g}/\text{dL}$. There may be slight variation year to year due to the small number of samples at these levels.



Family Case Management

Case management is offered to families when children’s blood lead levels are:

- 10 µg/dL or higher for children age 12 – 36 months;
- 7 µg/dL or higher for children age 6 – 12 months; or,
- Where there is an increase of 3 µg/dL or more between two successive fall clinics.

The support for families to reduce lead exposure includes two case management home visits: one by an Interior Health Public Health RN, and one by the Home & Garden team, to identify the most probable source or pathways of exposure and determine appropriate support and follow-up.

Case management children are monitored until they test below 10 µg/dL at a fall clinic or the family chooses not to continue testing. Children with blood lead levels of 15 µg/dL or higher are referred to a family physician for a retest within a specified time period.

Community Collaboration on Early Childhood Development

The Public Health RN, as with all Public Health RNs, participates in a variety of collaborative strategies to improve children’s healthy development in Trail and the Lower Columbia Region.

Community Outreach and Communication

The Public Health RN places priority on communication and collaboration between Interior Health and other sectors of the community to achieve goals. The Family Health Program is emphasized in all of the THEP main communication strategies, including the community newsletter, website, radio ads, brochures, displays, events and media releases.

HOME & GARDEN

Home & Garden Goals

The goals of the Home & Garden Program are to prevent and reduce health risks from exposure to lead and smelter metals in the home and yard environment. The focus is on preventing lead exposure for young children and pregnant women; communicating with expectant families, families with young children, and other residents about potential health risks; and promoting lead-safe practices for the home, yard and garden.

Main Approaches

Healthy Homes Program

The Healthy Homes Program is part of the Health Families Healthy Homes Program (HFHH); Interior Health delivers the Healthy Families component and the Home & Garden Team delivers the Healthy Homes component. HFHH is an extension of the long-standing family case management program but takes a preventative, population-wide approach by offering home visits to all expectant families and families with young children in Trail and Rivervale.

The Healthy Homes program is centred on an in-home visit offered to expectant families and families with children 36 months or age or younger (who have not previously had a visit). The purpose of the visit is to identify the best opportunities to prevent lead exposure and promote a healthy and safe home environment.

The visits include a visual review of the home and yard, a review of soil assessment results (where available), education, information, and advice on home health and safety. Visits conclude with a discussion of each family's top opportunities to reduce lead exposure. Families may be offered equipment and supplies for reducing dust in the home and yard; lead-safe home renovation supplies; and/or yard improvement or remediation, based on soil and yard review results.

Residential Soil Assessment

Residential soil assessment includes yard soil assessment (e.g., of grassed areas, bare soil and flower gardens) and vegetable garden soil assessment. Priority is given to families receiving case management, expectant families, families with children aged 36 months or younger, residents requesting vegetable garden testing, and residents of identified city blocks close to the smelter where soil metal levels may exceed Remediation Action Levels. These Action Levels relate to Ministry of Environment standards. For more details and annual summaries of soil assessment results, see the Appendix on Regulatory Aspects of THEP. Homes or properties in Trail and Rivervale where children spend substantial time may also qualify. Other requests are considered case-by-case.

Residential Soil Remediation and Yard Improvement Work

Residential yards and vegetable gardens are prioritized for remediation and/or yard improvement work to prevent or minimize health risks. The main health risks from lead in soil are related to young children's exposure; as long as soil is well covered, the health risks are negligible.

Yard improvement work is offered in situations where an expectant family or family with children 36 months or younger is present on the property and where there is bare soil or poor ground cover. Yard improvement work covers bare soil and improves ground cover, based on soil assessment results and a visual assessment of ground conditions and property use.

Residential properties qualify for remediation in the yard or vegetable garden where soil assessment results exceed Remediation Action Levels. This work is intended to manage risks related to soil on residential properties where soil assessment shows levels of smelter metals above the Action Levels.

Home Renovation Support Program

The Home Renovation Support Program (HRSP) offers information, advice, free lead-safety supplies and HEPA shop vacuum loans to home owners and tenants doing home renovation and construction projects in Trail and Rivervale. The same supports are offered throughout Greater Trail to home owners and tenants renovating pre-1976 homes where lead paint may be an issue. HRSP brochures are attached to Building Permits and BC One Call requests in the Trail area to encourage all renovators to carry out lead-safe home renovation practices. A more detailed educational program with Lead Safe Home Renovation tips and demonstrations is planned for 2015.



Soil Assessment and Remediation in the Community

Public areas such as playgrounds, school yards, parks, picnic areas and sports fields may be assessed on a case-by-case basis or upon request, if there are concerns. The need for and type of remediation is determined based on the same Action Levels that apply to residential properties.

Monitoring

The Home & Garden Program maintains an extensive database recording and tracking Healthy Home visits and reports, soil assessments, yard improvement and remediation work, and HRSP requests. The Home & Garden Program also conducts a Long Term Soil Study that monitors metal levels in soil and produce from remediated yards and gardens; the purpose is to evaluate the effectiveness of soil remediation in the presence of an operating smelter.

PARKS & WILDLANDS

Parks & Wildlands Program Goal

The goal of the Parks & Wildlands Program is to reduce human and ecological exposures to and risks from lead and other smelter metals by planting and greening in the City of Trail and addressing impacts to ecosystems in the Lower Columbia River Valley.

Main Approaches

Community greening

Community greening projects have been carried out since 1992 on the smelter site, in Trail, and in the buffer zone between the smelter and town. The purpose is to suppress dust in the community by re-vegetating bare soil areas especially on dry windy sites. Teck and the City of Trail jointly review community greening projects each year; projects are ranked based on criteria for dust control, sustainability, aesthetics, erosion control and biodiversity. A contractor does the planting and is responsible for the first year's watering. Plant survival of 50% or more after two years is considered success. A recent THEP initiative focuses on buffer zones around the smelter site whereby Teck funds top projects in consultation with community groups, such as Communities in Bloom and the Tadanac Community Association, who carry out plantings to improve aesthetics and suppress dust.



Lower Columbia Ecosystem Management Program

The Lower Columbia Ecosystem Management Program (LCEMP) is a collaborative initiative between Teck, government, and other stakeholders to assess, rehabilitate, conserve and enhance wildland ecosystems within the Lower Columbia River Valley. LCEMP meets Teck's regulatory requirements under the BC Contaminated Sites Regulation to remediate and rehabilitate areas that have been affected by metals from smelter emissions. Areas potentially affected were identified in an Ecological Risk Assessment concluded in 2011, and are generally located along the Columbia River Valley between Waneta and Genelle (see Ecological Risk Assessment map in the Appendix).

Teck will be developing remediation and restoration strategies for the areas of potential impact. In situations where the land is inaccessible or where remediation is infeasible or unlikely to succeed, alternative restoration or conservation activities may be considered in other areas within and beyond the Ecological Risk Assessment area of interest. This would create opportunities for additional conservation gains by encouraging collaboration with other area stakeholders and landowners to identify and implement activities that result in the greatest environmental benefit.

The LCEMP is included as a part of the THEP; however, it has its own Steering Committee to advise and oversee program development, implementation and performance monitoring.



PROPERTY DEVELOPMENT

Property Development Program Goal

The goal of the Property Development Program is to facilitate new development or redevelopment of lands affected by smelter metals. The program remediates metals in surface soil, or other contaminated media, to risk-based standards so that a Certificate of Compliance may be obtained for the property under the BC Contaminated Sites Regulation (CSR).

The Property Development Program (PDP) is designed to facilitate commercial, industrial and new residential property development within the Community Program Area⁶ so that a Certificate of Compliance may be obtained under the CSR. The PDP provides the structure whereby property owners and developers work with Teck through our Community Program Office to ensure the necessary assessment, planning and remediation of smelter metals appropriate for the site and development. The PDP exists as a separate program from the Home & Garden Program because new developments/redevelopments typically involve significant excavation and movement of soil, and potentially new fill, creating a specific opportunity to address soil contamination on the property.

The PDP is triggered where new development or demolition on a Trail area property is proposed, and remediation is required in order to obtain approval of the City or the Approving Officer for any of the following: subdivision, rezoning, development or variance permit, soil removal permit, or demolition permit. Other properties will be considered case-by-case, and all Trail area developers are encouraged to contact the Community Program Office early in the process to determine what's needed for the property in question.

⁶ The geographic area where the PDP applies is roughly the coloured (non grey) area on the Community Program Area map. As this is only approximate, we encourage all developers to contact the Community Program Office at 1319 Bay Avenue early in the development process to determine if smelter metals need to be remediated.

COMMUNITY ENGAGEMENT

Community Engagement Goals

The goals of Community Engagement are to earn public trust and confidence; involve citizens, particularly parents, in the governance of the THEC; receive guidance from the public about their concerns and views; inform residents about health risks, programs and opportunities to address risks; and engender a sense of ownership, of working together towards a common goal.

Community engagement is fundamental to the functioning of the THEC and the THEP; it is what makes the THEP unique and is key to its success. The THEC is accountable to the community, and wants to continue to earn and build on the trust shown to it and the Task Force in the past.

Several approaches are used to communicate with and involve the community; research has found that programs are more successful when program recipients, allied community groups, and their communities are actively engaged. Highlights of these approaches are:

- The THEC is a sub-Committee of Trail City Council and is chaired by the Mayor of Trail; 11 of 16 seats are held by the community, either elected officials or local residents.
- Meetings of the THEC are open to the public and media; minutes are posted on the website.
- The THEC has held two major public consultations to receive guidance from residents on its air quality and health objectives and the acceptability of its program and activities.
- The THEC and THEP use every opportunity to engage parents and caregivers of young children in governance, and in giving advice and feedback on programs.
- The THEP collaborates with many community organizations to support children's healthy development and promote lead exposure reduction.
- THEP has an accessible storefront Community Program Office, located at 1319 Bay Avenue in downtown Trail, where people can get information or sign up for programs.



PROGRAM EVALUATION AND CONTINUOUS IMPROVEMENT

Program evaluation and continuous improvement are integral to the Trail Area Health & Environment Program. High standards are maintained through quality control monitoring, professional development, literature reviews, and adaptive management. Also, the THEC, as a committee, regularly assesses monitoring results and makes recommendations for follow-up. The blood lead objectives are set to be renewed after the results of the 2015 Fall Blood Lead Clinic are reviewed and accepted, and air quality objectives are due for review in 2018. This will require public consultation, which is targeted to coincide with consultations needed for Ministry of Environment approval of the THEP as a Wide Area Remediation Plan. The THEP document is to be updated every 5 years; in the interim, updates to programs or objectives will be documented and implemented as needed.

Given that THEP is a comprehensive and integrated program, it is not possible to measure the contribution of each individual Program component to overall THEP success. That being said, emissions reduction makes by far the biggest contribution to improving air quality and reducing people's exposure to lead in the community. Currently, the Fugitive Dust Reduction Program is recognized as the greatest opportunity to further reduce emissions.

The ultimate measure of the success of the THEP is to uphold the vision of a community with healthy children and families, a clean environment and thriving economy. This is difficult to measure, with all the factors that influence health, the environment and the economy. As such, the THEP integrates activities that contribute to children's healthy development, ecological rehabilitation, and economic growth.



HISTORY AND RATIONALE

A Brief History

It began in the spring of 1988 with a few soil samples and follow-up sampling of children's blood lead levels. Those initial tests showed children with blood lead levels above the standard of the day. At about the same time, the City of Trail established the Trail Lead Study Liaison Committee chaired by Councillor Gord DeRosa. This led to a 1989 study, designed and carried out by Dr. Clyde Hertzman and colleagues at the University of British Columbia with report back in mid-1990.

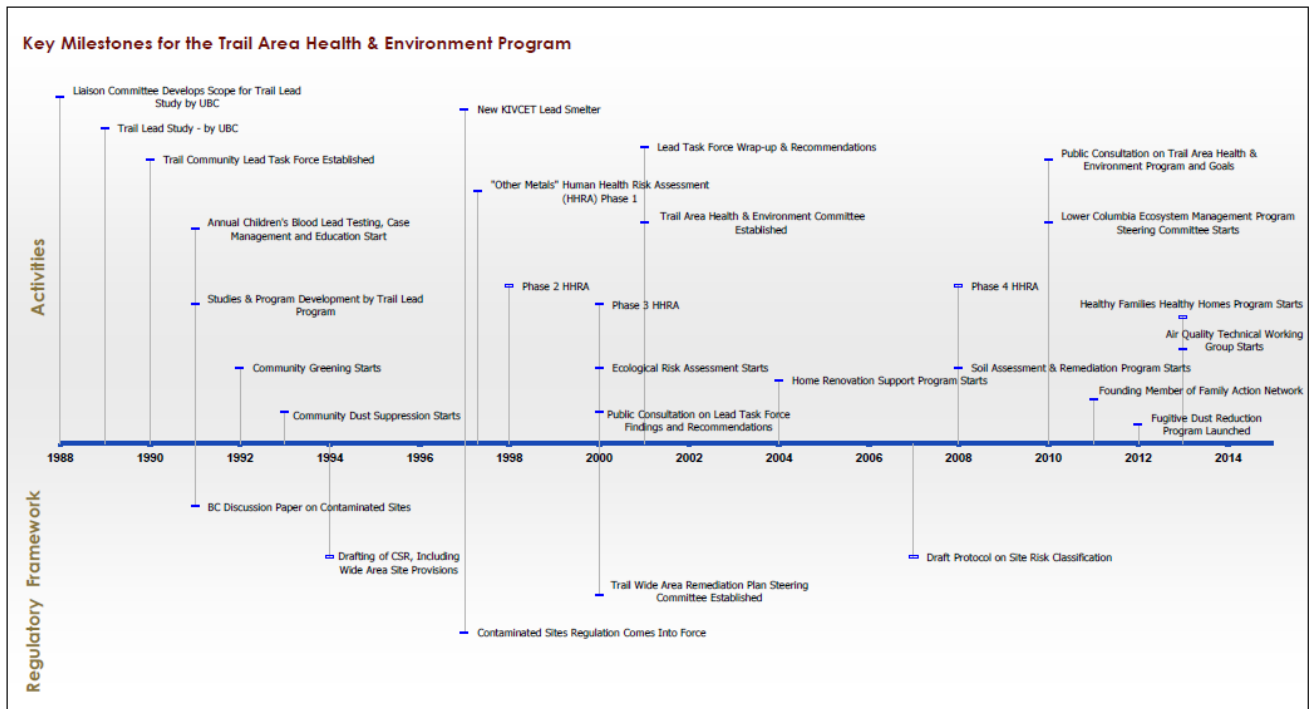
The UBC study concluded that work needed to be done; the question was how. The concept of a community-led Task Force emerged where all parties would sit at the same table – government agencies, the company and community, with the Mayor as Chair – working together, sharing information and making decisions together. This was a bold new approach to problem-solving.

The first meeting of the Trail Community Lead Task Force was held on July 30 1990, chaired by Trail Mayor, Marc Marcolin. The priorities were to reduce smelter emissions; set up blood lead monitoring programs based on the UBC study; design a case management program for families where children had elevated blood lead levels; set goals based on the latest science on lead exposure and health effects; and carry out local research to determine the main exposure pathways in Trail.

Installation of the KIVCET smelter in 1997 brought about significant reductions in stack emissions. Meanwhile, the Task Force's research identified the main human exposure pathways and health risks so that a remedial action plan could be developed with recommendations to reduce health risks. The Task Force recommended that the Program continue as it had been developed, with the addition of goals for lower emissions and children's blood lead levels, a program to address potential exposure from home renovations and excavation, and increased public reporting.

British Columbia environmental regulations were being developed during the early years of the Program: the Contaminated Sites Regulation came into force in 1997, including the requirement to consider ecological as well as human health effects. In 2000, local studies began to assess the effects of historical smelter emissions on the environment of the Lower Columbia River valley. The Ecological Risk Assessment concluded that priority actions be taken to restore plant communities and that, in doing so, wildlife habitat would be enhanced. In 2010, a Steering Committee formed to oversee restoration planning and activities via the Lower Columbia Ecosystem Management Program.

The accompanying chart shows key milestones over the 25 year history of the program.



Key Milestones in the History of the THEP

Rationale for the THEP: Issues and Strategies

Lead is the main human health issue related to smelter emissions in Trail. Young children are known to be particularly vulnerable to the effects of lead. Studies of large groups (populations) of pre-school aged children show that negative developmental, behavioural, and health effects can occur at low levels of lead exposure. At the levels we currently see in Trail, these effects would be subtle and likely not be measurable or noticeable in individual children.

The initial goal for children’s blood lead levels was to reduce the community average for pre-school aged children to 5 µg/dL from 13.5 µg/dL, the average measured during the 1989 University of British Columbia study. This goal was achieved in 2005 and new goals have been set since then, most recently in 2010, to reduce the community average to 4 µg/dL.

The Task Force and THEP have also investigated health risks from other smelter metals. Four phases of “human health risk assessment” were conducted between 1997 and 2008. This assessment examined the potential health risks of eight metals: antimony, arsenic, cadmium, mercury, selenium, thallium, tin and zinc. The human health risk assessment concluded that no imminent health risks were posed by these other metals, and that the THEP should continue its focus on lead (in part due to the association between lead levels and levels of other metals).

During the 2010 public consultation, the THEC began to look at how to incorporate additional best practices related to early childhood development (ECD) and family engagement. ECD research shows that the early years of life are crucial to a person's life-long health and well-being. The THEC noted that there could be more important factors than lead exposure impacting young children's health, and that the THEP might benefit from a broader approach. This has become a defining feature of the THEC's vision to achieve the new blood lead goal of 4 µg/dL, and spurred the THEC to become a founding member of the Family Action Network, a coalition dedicated to family-friendly development in the Lower Columbia region.

In 2012, the US Centers for Disease Control and Prevention (US CDC) and Health Canada recommended fundamental changes in policies and strategies regarding young children's lead exposure. 10 µg/dL was no longer seen as a threshold 'level of concern' for young children's blood lead levels. The CDC recommended greater emphasis on exposure prevention and set a 'reference level'⁷, currently 5 µg/dL, to identify children with lead exposure outside the typical range. Health Canada set a risk management objective for lead of "reducing exposure to the extent practicable". Following this guidance, the THEC decided to pro-actively offer in-home visits to all young families in the target area to boost THEP's exposure prevention activities.

The THEC now recognizes that reduction of fugitive emissions is the main opportunity to further decrease exposures, and Teck Trail Operations has a Fugitive Dust Reduction Program aimed at achieving THEC's air quality objectives by 2018.

In 2013, the THEC conducted two literature reviews to update knowledge of what other researchers and communities have learned about lead exposure reduction, and ways to improve child and family well-being.

The first review examined the effectiveness of programs at other mining and smelting sites to reduce children's blood lead levels. Research showed that emissions reduction has the greatest impact on reducing blood lead and needs to be part of any exposure reduction program; education and home & yard exposure reduction may play a supporting role within an overall strategy that includes emissions reduction. Soil remediation is a factor that can address blood lead, but will likely have only a modest effect, particularly while the smelter is operating. A better opportunity is to ensure good ground cover outdoors to help reduce dust getting into the home.

The second review identified the factors other than blood lead that influence early childhood development, and looked at the effectiveness of ECD strategies including family in-home visits, community collaboration, and health equity. Research identified numerous factors, many of which offered potential for constructive action, including policies, programs, community development and "environmental" change (e.g., affordable housing). Home-visiting programs were shown to be potentially effective, especially where part of a high-quality system of support for child and family health and well-being such as exists in the Trail area.

⁷ The 97.5 percentile of the blood lead level distribution for US children aged 1 to 5 years.

The broader approach to ECD is supported by a 2014 study from Port Pirie, a smelter site in Australia. This study followed participants over three decades from childhood into adulthood, concluding that “minimizing lead exposure in combination with improving other important early childhood factors such as parent-child interactions may be the best way to improve developmental outcomes”.

All of these recent reports, reviews and recommendations support the THEC’s programming choices and emphasis, which also incorporate public input provided by community consultation.

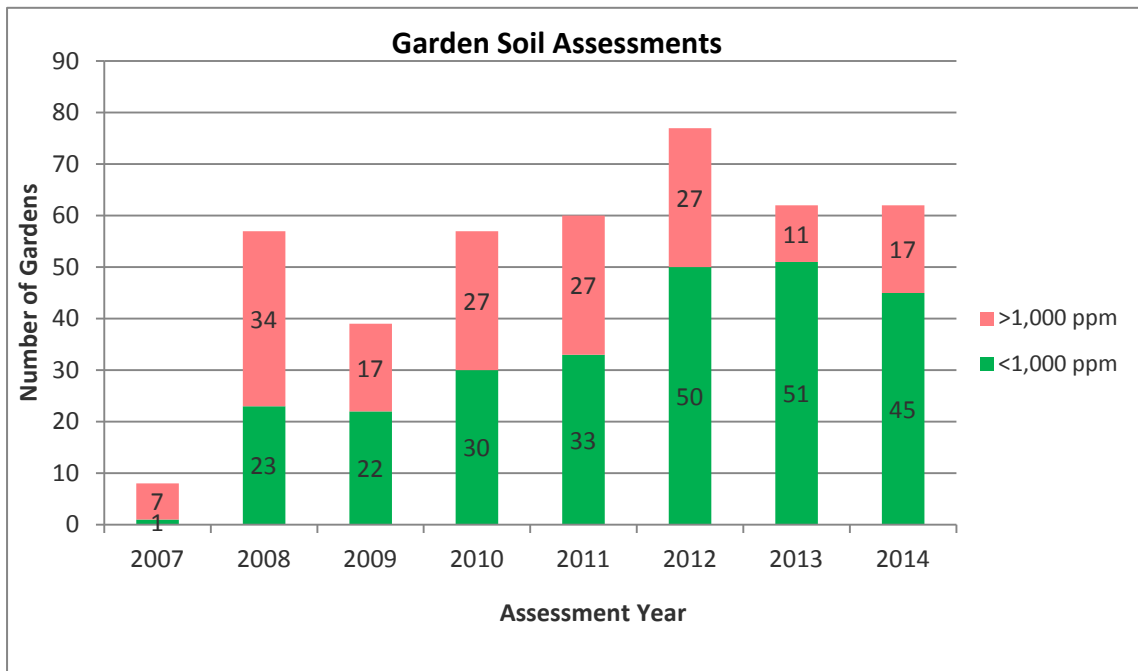
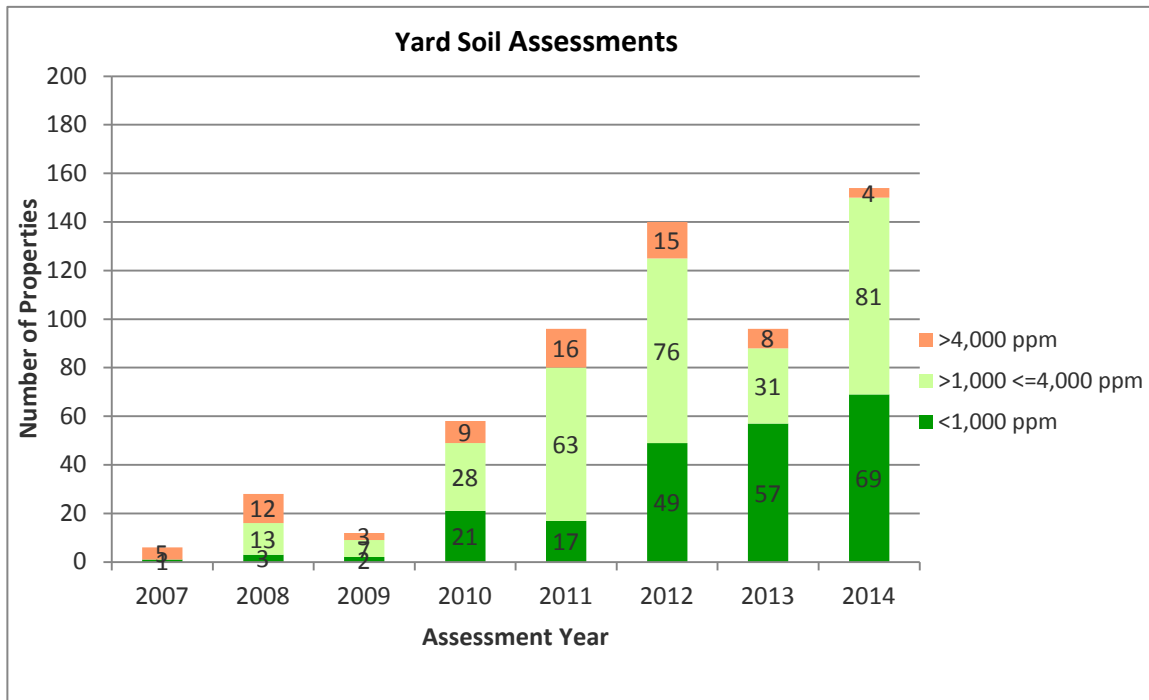


APPENDIX - REGULATORY ASPECTS OF THE THEP

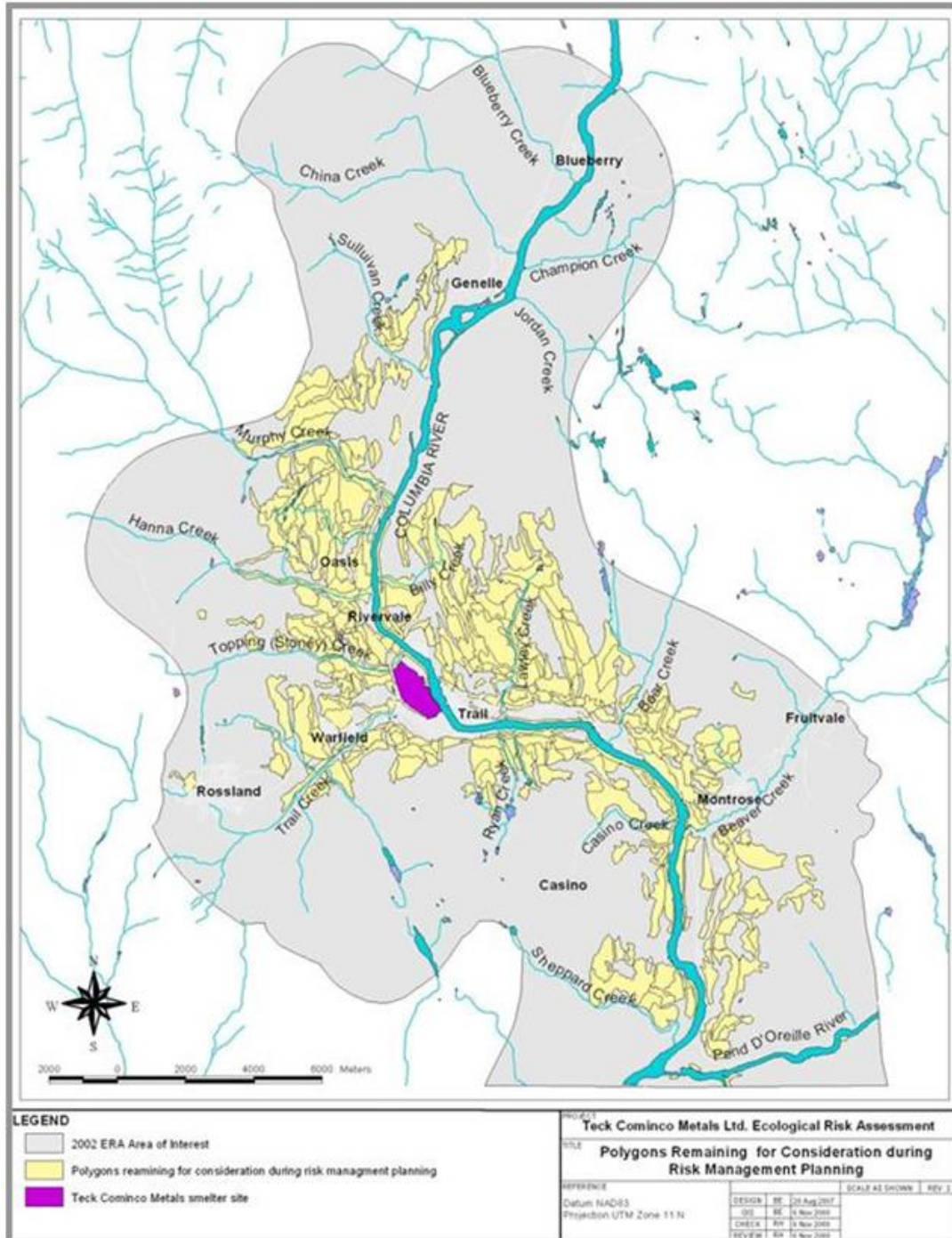
Teck Trail Operations is a very large complex industrial facility and is subject to a variety of legislative and regulatory requirements. The BC Ministry of Environment (MoE) *Environmental Management Act* is particularly important, including the Waste Discharge Regulation (WDR), and Contaminated Sites Regulation (CSR) that have force under this Act. The WDR governs the way the MoE authorizes the introduction of waste into the environment in a manner that will not cause pollution. This is generally done through Permits with limits and conditions applying to emissions to the air, effluent discharges to water, and waste materials to land. The CSR governs the standards for identifying, assessing and remediating contaminated sites, including procedures for determining responsibility and approvals for acceptable remediation.

The CSR focus is soil contamination, and provides numerical and risk-based standards for a variety of contaminants to prevent harmful effects on human health and the environment. However, experience at Trail as well as other active smelter sites indicates that soil contamination is a relatively minor contributor to blood lead levels. The CSR allows for the application of risk-based standards (e.g. blood lead levels rather than soil lead levels) for wide area remediation plans based on the recommendation of a Medical Health Officer. The THEP describes the programs necessary to address risks at a community-wide level.

In terms of residential soil assessment and remediation (described in the Home & Garden section), the THEP applies Remediation Action Levels as thresholds to trigger soil remediation. These Action Levels correspond to the Upper Cap Concentrations set out in Protocol 11 of the CSR. For residential yards, the Action Level is 4,000 parts per million (ppm or mg/kg) lead in soil. For vegetable gardens, the Action Level is 1,000 ppm of lead. The following figures show the results of soil testing in Trail and Rivervale since 2007. Where the landowner has agreed, those yards with > 4,000 ppm lead and gardens with >1,000 ppm lead have been remediated.

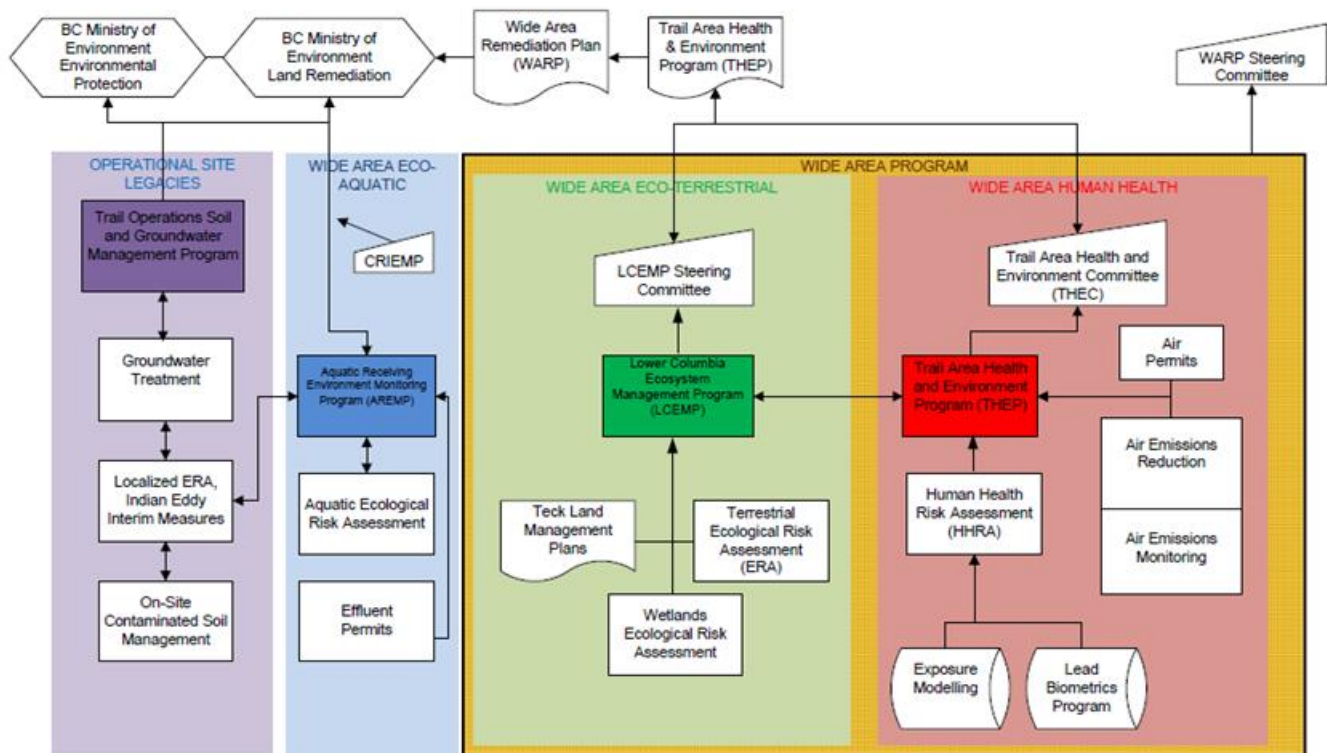


The map below shows the Ecological Risk Assessment Area of Interest in grey and the areas potentially affected by historical smelter emissions in yellow. Ecological impacts from smelter emissions have been ruled out for the grey and white areas.



Impacted Areas Based on the Ecological Risk Assessment

The diagram below illustrates the relationship of the THEP as a Wide Area Remediation Plan with Teck's other programs and related activities, as well as with the BC Ministry of the Environment. As required by the CSR, risk assessments for both human health and the environment have been completed over the years as the THEP has developed. The Human Health Risk Assessment addressed lead and other metals released from the smelter. The Ecological Risk Assessment addressed both aquatic and land-based effects of smelter emissions. The Aquatic ERA did not identify wide-scale effects from historical operations, but the Columbia River continues to be monitored through the Aquatic Receiving Environment Monitoring Program (AREMP) as a Permit requirement for Trail Operations' ongoing effluent discharge.



Organizational Relationship between the THEP, other Teck Programs and Activities, and the BC Ministry of Environment