



**Sudbury
Soils
Study** | **Étude
des sols
sudburois**

metals • health • environment
métaux • santé • environnement

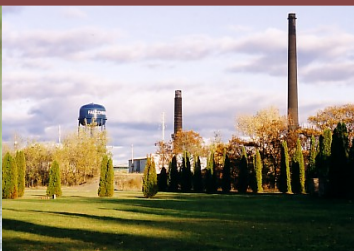


Sudbury Soils Study: Volume 2

Human Health Risk Assessment (HHRA)

Results

Sudbury • May 13, 2008
Copper Cliff • May 14, 2008
Falconbridge • May 15, 2008



PUBLIC BRIEFING: May 2008



Volume 2: Human Health Risk Assessment (HHRA) Results

City of Greater Sudbury

Dr. Stephen Monet

Introductions

Ontario Ministry of
Environment (MOE)

Brian Cameron

Background
Sudbury Soils Study

Sudbury Area Risk
Assessment (SARA)

Dr. Christopher Wren

HHRA Results

Vale Inco
Xstrata Nickel

Fred Stanford
Mike Romaniuk

Environmental
Management

Sudbury & District Health
Unit

Dr. Penny Sutcliffe

Medical Officer of Health
Perspective

QUESTIONS

Public Comment Period: May 19 through July 31, 2008



Study Partners

City of Greater Sudbury

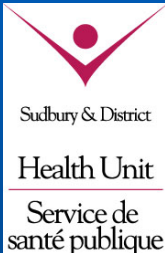
Ontario Ministry of the Environment

Sudbury & District Health Unit

Health Canada (First Nations & Inuit Health)

Vale Inco

Xstrata Nickel



Sudbury Area Risk Assessment Group

SARA is an independent affiliation of Ontario-based firms specializing in risk assessment and environmental science.

- Gartner Lee Limited
- Intrinsic Environmental Sciences Inc.
- Rowan Williams Davis and Irwin Inc
- SGS Lakefield
- Goss Gilroy Inc.
- Dr. Lesbia Smith, MD

Study Advisors and Observers

Ronald W. Brecher, Ph.D, C.Chem, DABT

Independent Scientific Advisor on Human Health

Franco Mariotti, Staff Scientist, Science North

Independent Process Observer

John Hogenbirk, Chair

Public Advisory Committee (PAC)

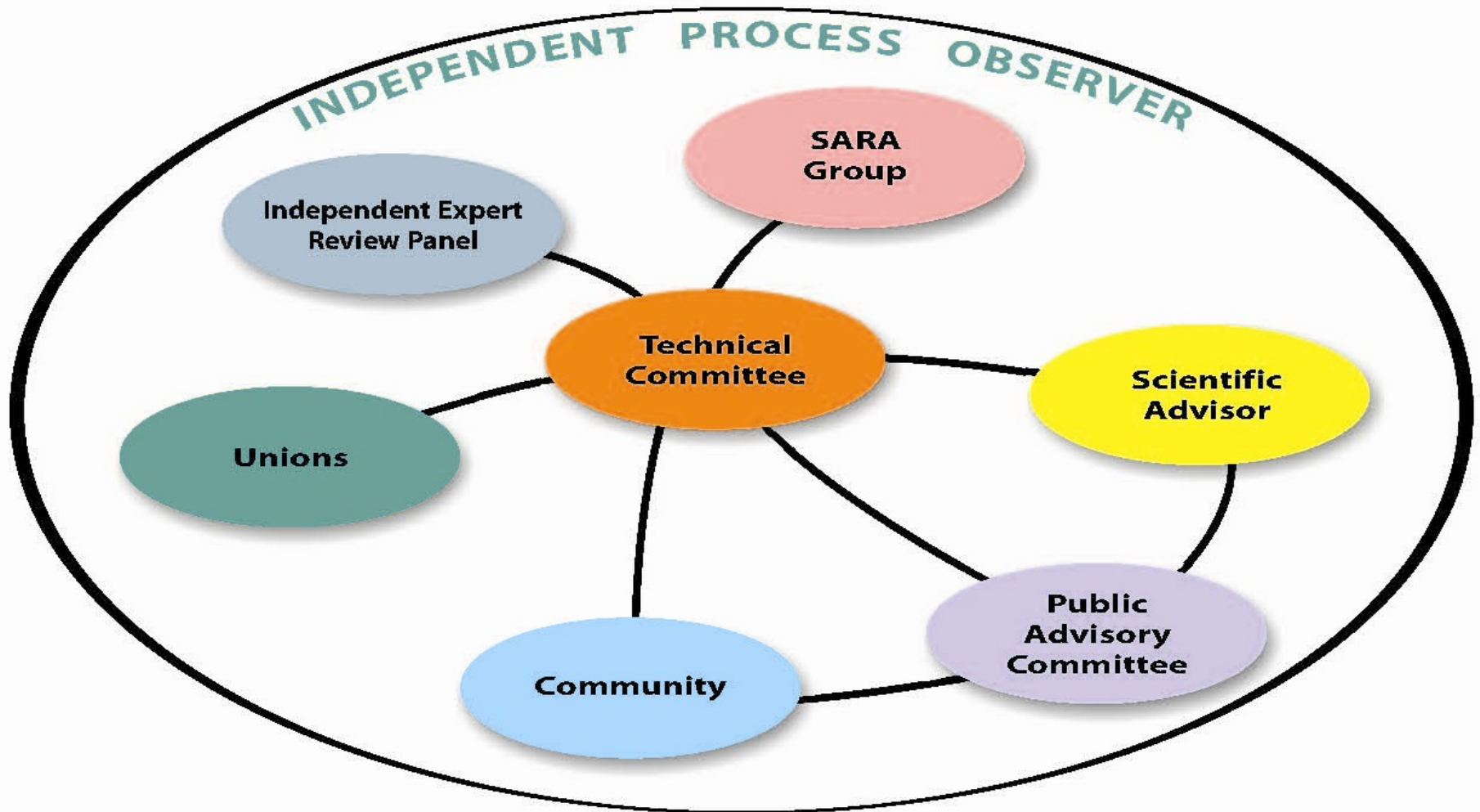


Sudbury Soils Study

- Volume 1: Background and Study Organization
- Volume 2: Human Health Risk Assessment (HHRA)
- Volume 3: Ecological Risk Assessment (ERA)



Multi-Stakeholder Process



Background: Sudbury Soils Study

Brian Cameron

District Manager

Sudbury District Office

Ontario Ministry of the Environment



Ontario Ministry of the Environment

In 2001, the Ontario Ministry of the Environment (MOE) reviewed historical data for soils in the Greater Sudbury area

Two recommendations:

1. Do a comprehensive soil survey to fill data gaps
2. Conduct a human health and ecological risk assessment



2001 Soil Survey

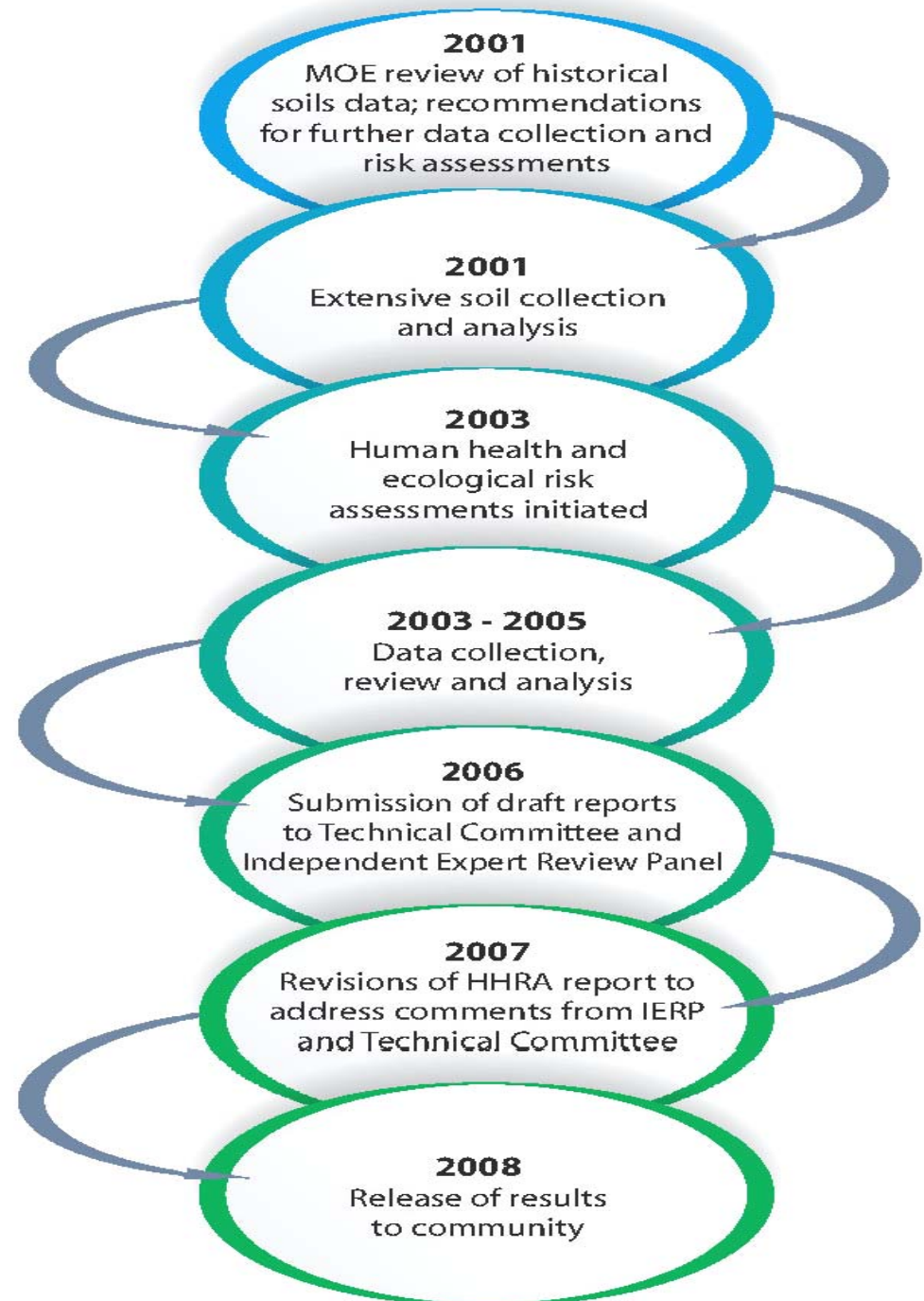
- Almost 8,500 soil samples were collected and analyzed for 20 elements
- 10% of all residential properties were sampled
- Soil from all schools, parks, beaches and daycares
- Results were provided to property owners in 2003

These data form the basis for this study



Sudbury Soils Study: Background

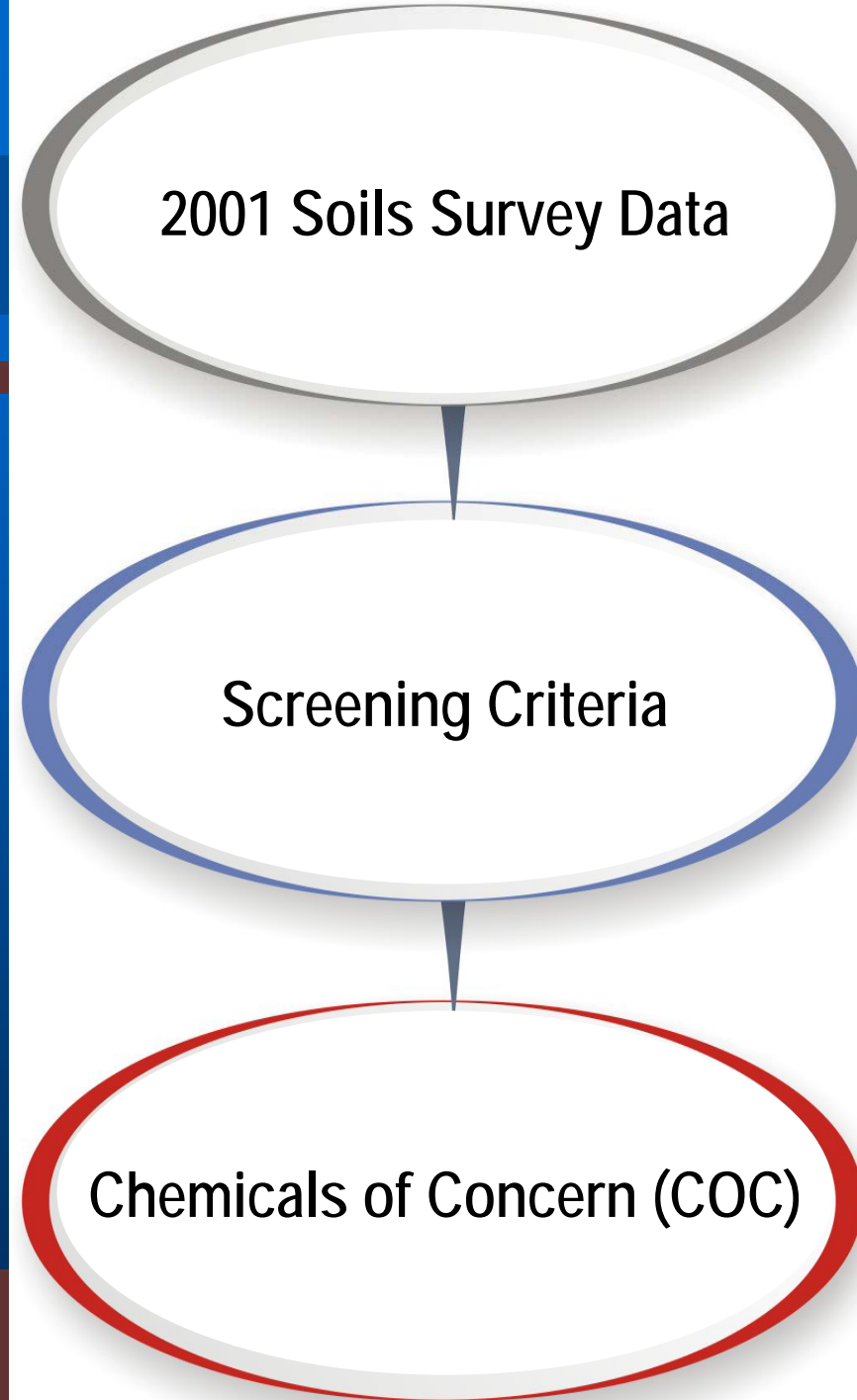
- Soil Survey conducted in 2001-2003
- Risk assessment began in 2003
- Independent Expert Review Panel in 2006



Sudbury Soils Study: Background

Chemicals of Concern (COC):

- **Arsenic**
- **Cobalt**
- **Copper**
- **Lead**
- **Nickel**
- **Selenium**



Human Health Risk Assessment

Dr. Christopher Wren

Project Director

Sudbury Area Risk Assessment (SARA) Group

Dr. Glenn Ferguson

Mr. Elliot Sigal

Senior Toxicologists



Presentation Overview

- Purpose of the human health risk assessment
- Scope of the Sudbury study
- Results and Conclusions
- Next Steps



Human Health Risk Assessment: Purpose

Evaluate current potential health risks from exposure to metals in the environment originating from local mining, smelting and refining operations

- Focus on environmental exposures to residents in the Greater Sudbury area
- Results of the risk assessment will be used for risk management



What is 'risk' ?

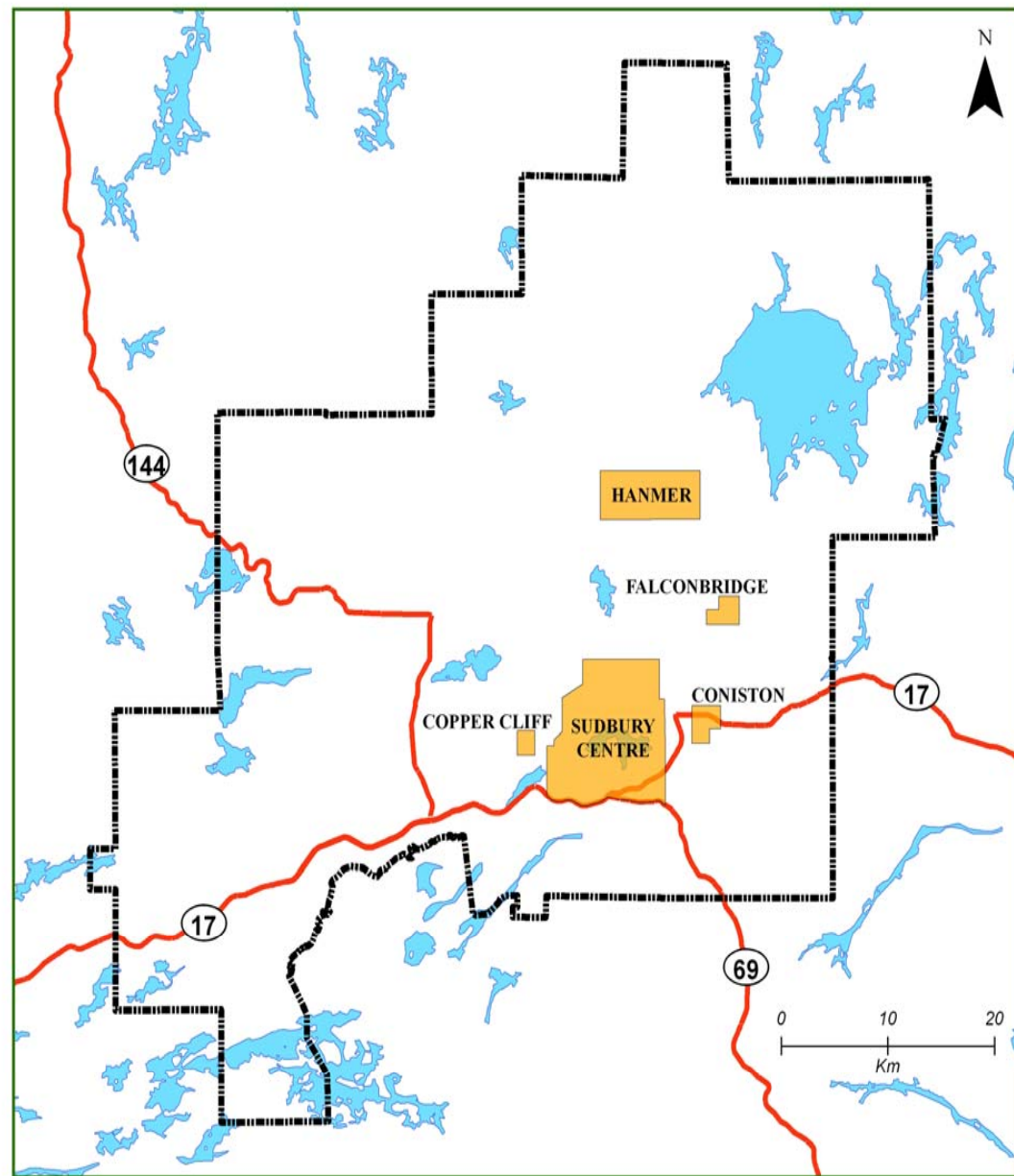
- *Risk* refers to the chance or likelihood that a particular event will occur
- *Human health risk assessment* uses models to estimate the theoretical risk that a population may experience health effects as a result from exposure to particular chemicals in the environment



Scope of the HHRA

Communities of Interest:

- **Sudbury Centre**
- **Falconbridge**
- **Coniston**
- **Copper Cliff**
- **Hanmer** (Comparison site)



Results also compared with a *Typical Ontario Resident*



Scope of the HHRA

- 14,000+ samples analyzed
- 6 chemicals of concern (COC)
- Three exposure routes (ingestion, dermal, inhalation)
- Multiple sources of potential exposure
 - soil, air, dust, water, food sources
- Cancer and non-cancer end-points (potential health effects)



Scope of the HHRA

... CONTINUED

- **Two exposure levels** (average and reasonable maximum)
- **Both genders**
- **Five life stages** (infant, toddler, child, adolescent, adult)
- **Lifetime exposure**
- **General population**
- **Sub-population** (hunters/anglers/First Nations)
- **5 Communities of Interest**

The study evaluated over 300 combinations of exposure and receptors



Falconbridge Arsenic Exposure Study (2003 – 2005)

	Falconbridge	Hanmer
Mean Soil As (ppm)	79	4.0
# Houses	148	129
# People	369	321
Mean Urinary As (ug/L)	7.1	7.2



Detailed Exposure Assessment

DERMAL ABSORPTION (skin contact)

- Soil and dust

INHALATION (breathing)

- Indoor and outdoor air

INGESTION (swallowing)

- Locally grown foods
- Supermarket foods
- Local fish and game
- Drinking water
- Soil and dust

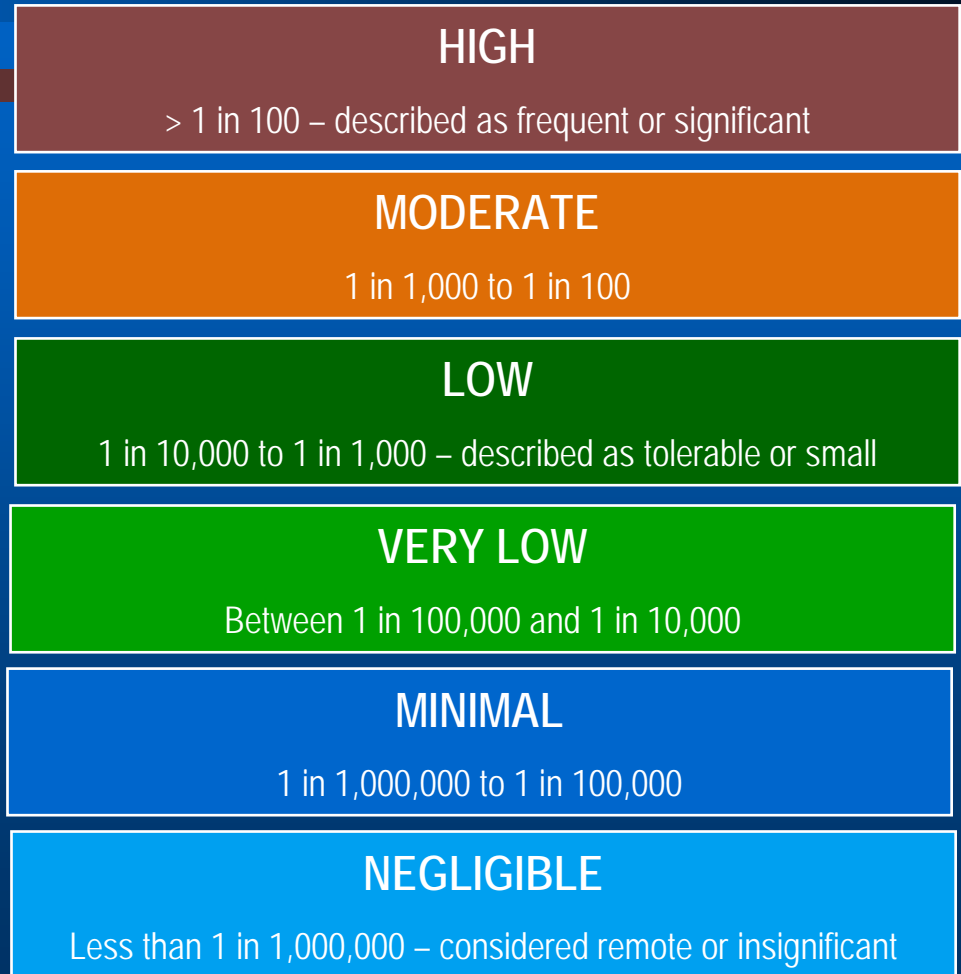


Risk Perspective

Unacceptable Risk

Total exposures for residents are compared to benchmarks set by regulatory agencies to be protective of human health to estimate relative level of risk

Acceptable Risk



HHRA Conclusions

1. Based on current conditions, the HHRA predicted little risk of health effects on Sudbury area residents associated with metals in the environment.
2. There were no unacceptable health risks predicted for exposure to four of the six Chemicals of Concern (COC):
 - ✓ arsenic
 - ✓ cobalt
 - ✓ copper
 - ✓ selenium

No further action required for these Chemicals of Concern



HHRA Conclusions: Lead

3. Risk calculated for typical exposures to lead in the environment throughout the Greater Sudbury area are within acceptable benchmarks for protection of human health.

Levels of lead found in some soil samples indicate a potential risk of health effects for young children in localized areas within these communities:

- Copper Cliff
- Falconbridge
- Coniston
- Sudbury Centre

Lead levels are similar to other older urban communities in Ontario



Lead: Sampling Results

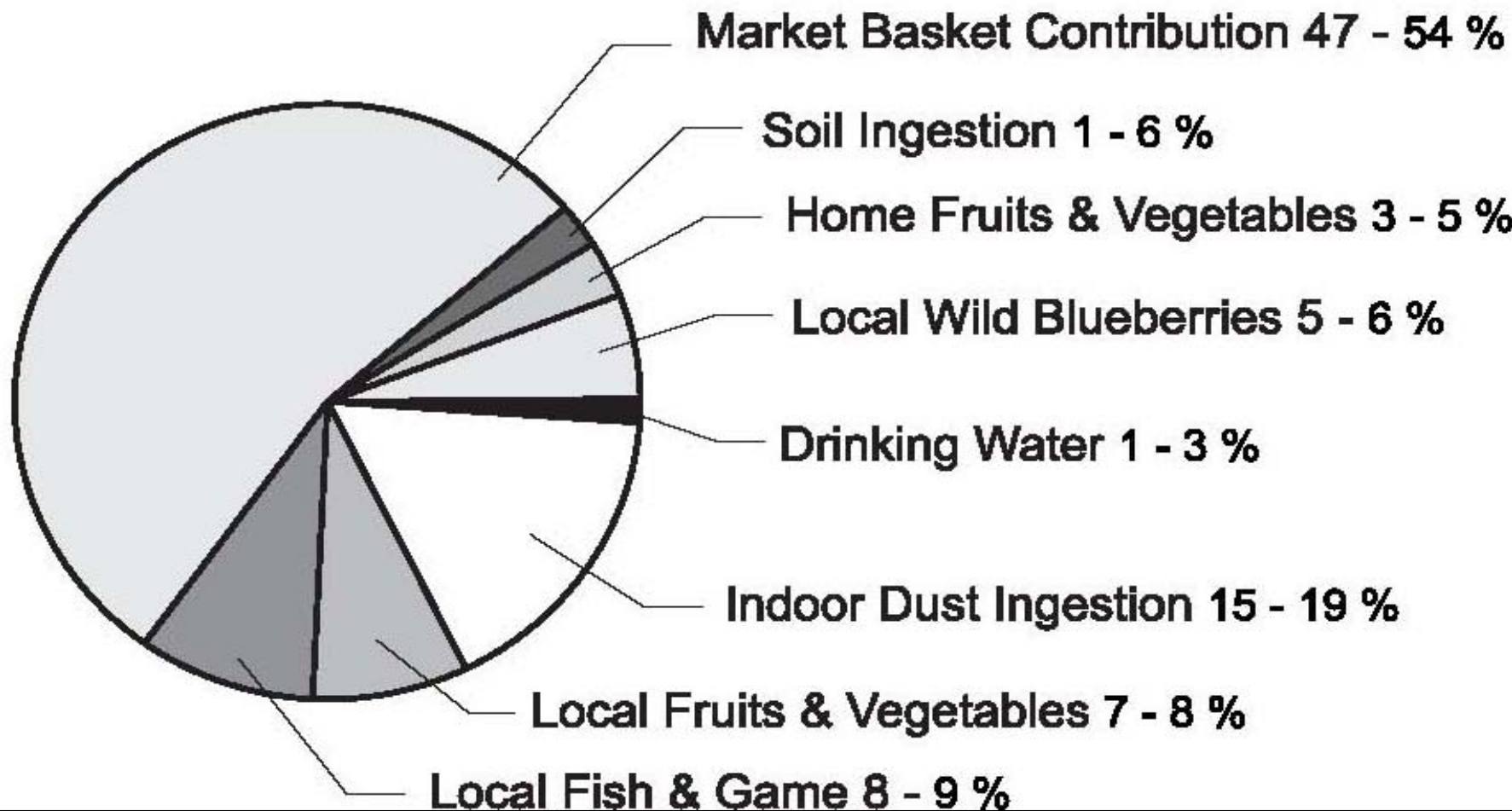
Sampled properties exceeding Soil Risk Management Level (SRML)

Community of Interest	Total # of properties sampled	Properties with lead of 400 ppm and over	Properties with lead above 400 ppm at 0-5cm soil depth
Copper Cliff	82	6	2
Coniston	85	1	1
Falconbridge	91	1	0
Sudbury Centre	295	1	0
Total Properties	553	9	3

9 properties (less than 2 %) **did not meet the SRML** (400 ppm) for Sudbury soils
Property owners were notified of individual results by MOE in 2003



Lead: Sources of exposure (Toddlers)



Primary source of lead exposure is supermarket foods



HHRA Conclusions: Nickel

4. No unacceptable risk was predicted for exposure to nickel via soil, food or drinking water.

The HHRA study calculated a minimal risk of respiratory inflammation from lifetime exposures to airborne nickel in two areas:

- Copper Cliff
- Western portion of Sudbury Centre



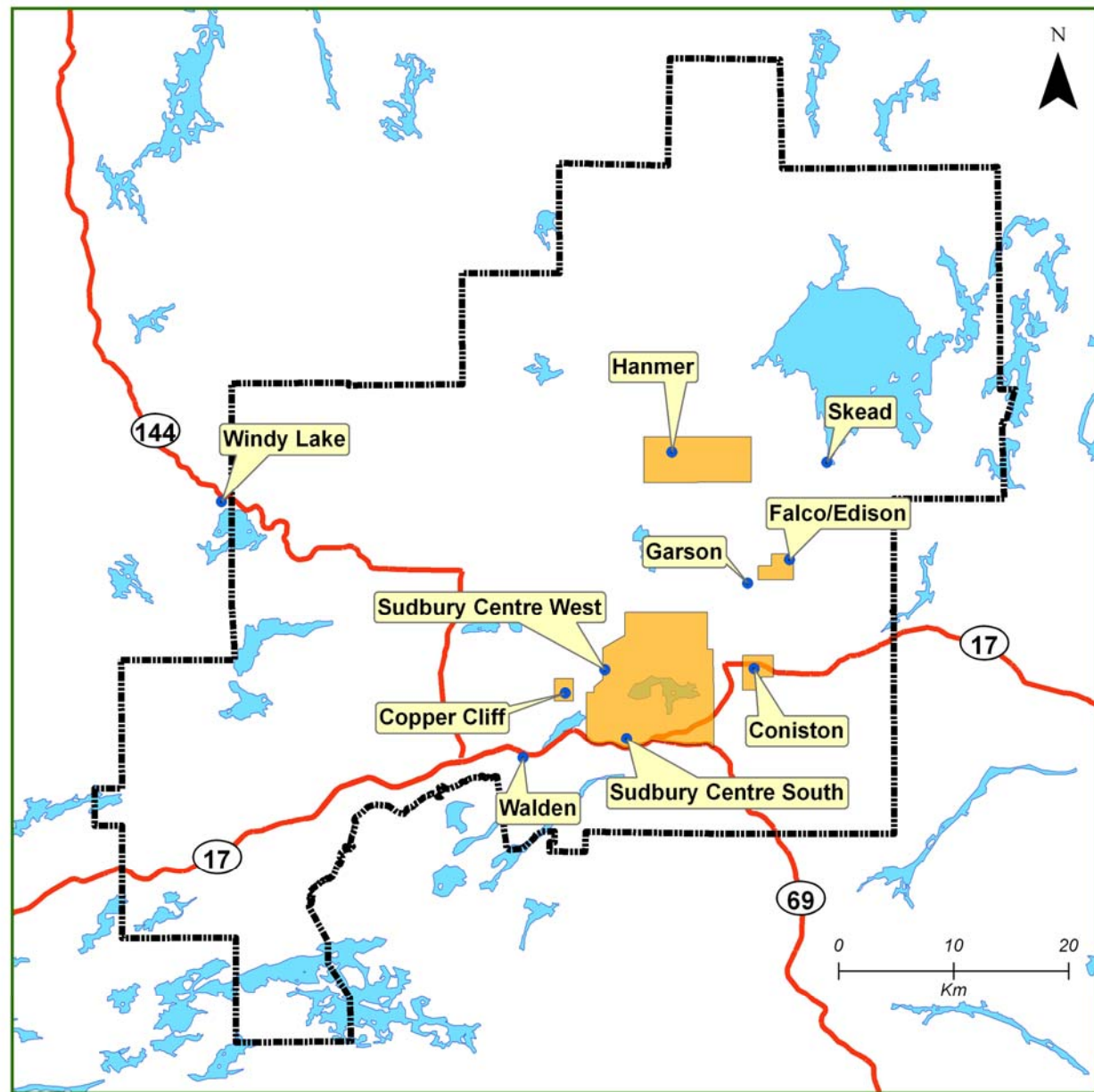
Nickel conclusion continued:

- Respiratory inflammation has been linked to the promotion of respiratory cancer caused by other agents, and some chemical forms of nickel are considered carcinogens
 - Health effects from nickel inhalation based on workplace exposures; animal studies

Based on the conservative approaches used in the study, it is unlikely that any additional respiratory cancers will result from nickel exposure over the 70-year lifespan considered in the HHRA



Location of Air Monitoring Stations



HHRA Conclusions

5. Anglers, hunters and First Nations people (who may consume more local fish and wild game than the general population) are at no greater risk of health effects due to metal exposures in the environment.



Risk Perspective

Minimal: conduct of normal life is not generally affected as long as precautions are taken to minimize exposure

Negligible: while still important to identify, risks in this range would be of little concern for normal living

Risk identified in the HHRA are within the *Minimal* and *Negligible* risk range



HIGH > 1 in 100 – described as frequent or significant
MODERATE 1 in 1,000 to 1 in 100
LOW 1 in 10,000 to 1 in 1,000 – described as tolerable or small
VERY LOW Between 1 in 100,000 and 1 in 10,000
MINIMAL 1 in 1,000,000 to 1 in 100,000
NEGLIGIBLE Less than 1 in 1,000,000 – considered remote or insignificant

HHRA results will inform future risk management decisions in Greater Sudbury



Next Steps

- HHRA available for public review:
 - HHRA Technical Report
 - HHRA Summary Report
 - HHRA Results Newsletter
- Public comment period
- Volume 3: Ecological Risk Assessment report
 - Results expected in Fall 2008



Environmental Management



Fred Stanford
President,
Ontario Operations



Mike Romaniuk
Vice-President,
Sudbury Operations



Public Health Perspectives

Perspectives de la santé publique

Dr. Penny Sutcliffe

Medical Officer of Health/Médecin hygiéniste

Sudbury & District Health Unit/Service de santé publique de
Sudbury et du district

- Roles and responsibilities
- Sudbury under a microscope



Sudbury & District

Health Unit

Service de
santé publique



Public Health Perspectives

Perspectives de la santé publique

Bottom line:

- *Generally*, metal contaminants associated with the mining, smelting and refining operations are not currently present in the environment at levels that pose an unacceptable risk to human health

Areas for improvement:

- Nickel in air
- Lead in soil



Sudbury & District

Health Unit

Service de
santé publique



HHRA Public Comment Period

May 19 to July 31, 2008

MAIL

Sudbury Soils Study Public Comments

c/o Gartner Lee Limited, 512 Woolwich St., Suite 2
Guelph, ON N1H 3X7

FAX

(519) 763-1668

EMAIL

comments@sudburysoilsstudy.com

INTERNET

www.sudburysoilsstudy.com

Comments and responses will be published as an Appendix to the final
HHRA Technical Report



Risk Management Steering Committee

- Risk Management Information package
 - To be distributed to residents in the Greater Sudbury Area
- Information phone line:

1-866-315-0228





**Sudbury
Soils
Study** | **Étude
des sols
sudburois**

metals • health • environment
métaux • santé • environnement



Sudbury Soils Study: Volume II

Human Health Risk Assessment (HHRA)

Results

Sudbury, ON • May 13, 2008

Copper Cliff, ON • May 14, 2008

Falconbridge, ON • May 15, 2008

