



## All About...Boron (B) and Molybdenum (Mo)

### Introduction

The US Environmental Protection Agency (USEPA), Northern Indiana Public Service Company (NIPSCO) and Brown Inc. (Brown) have agreed to conduct an investigation of the nature and occurrence of coal combustion by-products. This investigation includes a study of boron and molybdenum in groundwater as they are related to coal combustion by-products. This update focuses on information about boron and molybdenum. Previous Pines Updates containing additional information have been mailed to the community, and are available on our website (see text box on the back page).

### Where did the Boron and Molybdenum come from?

One of the purposes of the investigation is to evaluate the presence of these elements in the environment in the Pines Area of Investigation. Boron and molybdenum are naturally present in groundwater and soil, and they can also be present in the environment from human activities.

Some amounts of one or both of them are typically present in coal combustion by-products. Coal combustion by-products have been used in the Town of Pines as fill or roadbed material, and were also disposed at Yard 520, a permitted Restricted Waste Facility. Yard 520 was authorized by IDEM to accept these products.



### What is Boron? Is it harmful to me?

Boron is the fifth element on the

periodic table and naturally occurs in the environment. Boron is widely distributed in nature. It is found in soils, rocks, oceans and surface water, and in the atmosphere. It is also present at high concentrations in "black shales," which are shale deposits with high organic content (such as are present in the bedrock beneath the Pines Area of Investigation). It is estimated that more boron is released into the environment by the natural breakdown of soil and rocks than from man-made sources. Boron can also be present in food, beverages, and drinking water.

Boron is often found combined with oxygen to form compounds called borates. Borates are used extensively in the making of glass. They are also used in fire retardants, leather tanning, photographic materials, cosmetics, eye washes, soaps and cleaners, and for high-energy fuel. Some pesticides and some wood preservatives also contain borates. Boron is also typically present in coal combustion by-products. Annually, about 300,000 tons of boron are used in commerce.

Boron is an essential nutrient for plants, and is found in many fruits and vegetables. Because plants need boron to grow, it is an ingredient in fertilizers. Although it is not officially identified as an essential human nutrient, its beneficial effects are widely recognized, and boron is often included in daily multiple vitamins for humans. Many foods contain boron, including various fruits, vegetables and nuts, which are naturally rich in boron. Common foods in our diet with the highest amounts of boron are avocados, peanut butter, peanuts, prune juice,

grape juice, chocolate powder, wine, pecans, granola raisin cereal, and raisin bran cereal.

Boron has not been shown to be toxic to humans at low concentrations, and in fact boron supplements have been found to be beneficial to postmenopausal women. However, it is noted that animal studies indicate that boron at very high concentrations can cause certain types of health effects in animals.

### What is Molybdenum? Is it harmful to me?

Molybdenum is a naturally occurring metal that is generally found in nature compounded with other substances. Further, molybdenum naturally accumulates in poorly drained soils and soils with high organic content (for example, peat bogs and wetlands). It is also present at high concentrations in "black shales," which are shale deposits with high organic content (such as are present in the bedrock beneath the Pines Area of Investigation). Molybdenum can also accumulate in sewage sludge.



Molybdenum can enter the environment from the natural breakdown of ores containing it, or from water containing the metal (e.g., ocean water). It is also typically present in coal combustion by-products. In industry, the dust and other fine particles produced in refining or shaping metal alloys containing molybdenum steel are the most notable sources.

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Molybdenum is considered an essential trace element for living beings. Molybdenum is essential for certain plants (e.g., legumes), and is often a component of fertilizers. It is required in the enzyme systems of several animals, including humans.

***Is there a concern about being exposed to these constituents in my shower?***

Some residents have expressed a concern about being exposed to boron and molybdenum in their shower water. As stated by the Agency for Toxic Substances and Disease Registry (ATSDR) at a recent public meeting, "...these metals are not absorbed through the skin. So, if you're bathing in the water, you're not being exposed, and there (are) no ways the(se) metal(s) can get into

your body if you're simply bathing in that water."

***What levels is USEPA using to identify homes in the Town of Pines that will be offered an interim water supply?***

USEPA has used 1997 Removal Action Levels (RALs) for boron (0.9 mg/L) and molybdenum (0.01 mg/L) as protective levels to identify homes in the Town of Pines to be offered an interim alternate drinking water supply. The RALs are developed by USEPA's Office of Solid Waste and Emergency Response (OSWER).

Regarding boron, another branch of USEPA, the National Center for Environmental Assessment (NCEA), has used more recent research to update its evaluation of the health effects of boron in August 2004. Although the RAL for boron has not

been updated by OSWER since 1997, if the new information from NCEA were to be used to update the RAL, it could be 2.2 times greater or 2 mg/L.

Regarding molybdenum, if current information from the USEPA's Office of Water were used to update the RAL, the RAL could be 5 times greater, or 0.05 mg/L.

USEPA is currently reviewing the RALs, though it is not know when future updates will be released.

***Where can I get more information on boron or molybdenum?***

You can get more information from the ATSDR, which is a US government agency at [www.atsdr.cdc.gov/toxpro2.html](http://www.atsdr.cdc.gov/toxpro2.html).

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**Our Commitment....**

NIPSCO and Brown are committed to keeping you informed on the progress of the municipal water service extension and the investigation of the Pines Area of Investigation. Look for future *Pines Updates* to update you to our progress. We have also created a website to provide continual updates on the project:

**[www.pinesupdate.com](http://www.pinesupdate.com)**

Please contact the Communications Coordinator at the address listed below to be placed on the mailing list.

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