SUBJECT: Lead in Private Residential Water Wells in the North-Western Area of Rural Hamilton, former Township of Beverly  PH06025  (Wards 11, 12, 14 & 15)

RECOMMENDATION:

(a) That Public Health Services be authorized and directed to issue a Public Health Advisory, attached as Appendix I to Report PH06025, to inform the owners and users of drilled water wells above the Niagara Escarpment that there is potential for some water wells drilled into the bedrock above the Niagara Escarpment in the City of Hamilton to have excessive lead concentrations in the well water, and that they should consider testing their well water for lead levels;

(b) That the Advisory be mailed to municipal addresses in the affected area;

(c) That Public Health Services provide consultation to water well owners/users for information relating to health concerns where elevated levels of lead in drinking water are found.

(d) That Public Health Services continue to investigate the presence of lead in water wells in cooperation with pertinent Ministries and Agencies.

(e) That the relevant item be removed from the Planning and Economic Development Committee Outstanding Business list.

Elizabeth Richardson, MD, MHSc, FRCPC
Medical Officer of Health
Public Health Services
EXECUTIVE SUMMARY:

At the request of the City of Hamilton Public Health Services and Ted McMeekin, MPP for Flamborough Ancaster Dundas Aldershot, a well water quality survey was done in 2005 by the Ministry of the Environment (MOE) to assess the groundwater quality on several properties near 1759 Safari Road in Flamborough. This was in response to concerns of possible groundwater contamination related to automotive salvaging/wrecking activities on this property. The MOE groundwater quality study reported that lead concentrations above the Ontario Drinking Water Standard (ODWS) were detected in several water wells. Further analysis by the MOE, indicated that the presence of lead was likely not due to a point source of contamination (i.e. the automotive salvage/wrecking activities), but was consistent with a large natural source area, likely within the area’s dolostone bedrock.

In November 2005, the Ministry of the Environment (MOE) provided Public Health Services with their analysis (soil and water). Public Health Services agreed with the MOE opinion that the elevated lead concentrations are likely naturally occurring and are not related to the nearby former automotive salvage operation.

In March and April 2006, the City of Hamilton Public Health Services initiated an investigation of groundwater quality within a two kilometre radius around the initial site of concern and collected water samples from properties within this area. This work was done to determine if excessive lead concentrations were present in a wider area. Well owners were offered lead testing and microbiological testing free of charge. Appendix A shows the general location of the MOE and Public Health Services study area.

Thirty eight actively used residential water wells were sampled in this expanded investigation. Among the 38 wells, 8 wells had lead levels in excess of the Ontario Drinking Water Standard (ODWS). These results provide additional evidence that lead is likely occurring due to natural deposits of lead in the local geology.

Further consultation with the Ministry of Northern Development and Mines (Sedimentary Geoscience Section – Groundwater Program), and the Ministry of the Environment gave better understanding of the potential extent of this naturally occurring phenomenon. It was noted that the presence of lead within the bedrock is due to ancient geologic processes (i.e. features, formations, and chemical processes) that occurred hundreds of millions of years ago. Within the rural areas of the City of Hamilton, there are a significant number of water wells that are drilled into this bedrock, and there is potential for some of the wells to be affected.

The existence of lead in the bedrock occurs in a sporadic or spotty nature and its presence and/or concentrations in well water is influenced by seasonal factors. It can be found that lead concentrations will be higher in late Fall and late Winter/early Spring, and lower in the summer.
Any further investigation of the existence of lead in the groundwater would require detailed planning, coordination, expertise, and resources that do not exist within Public Health Services. This type of investigation may be best organized and implemented in the future through the Hamilton/Halton Source Water Protection Team, in consultation with the relevant Ministries and Agencies.

Given that
- increased lead intake can adversely affect human health,
- naturally, sporadically, and seasonally occurring lead concentrations exceeding the ODWS may exist in some drilled water wells in the rural area of Hamilton above the Niagara Escarpment,
- further investigation would take time to organize and implement, and
- Public Health Services has an obligation to prevent, eliminate, and decrease the effects of health hazards,

it is recommended that Public Health Services inform, as soon as reasonably possible, the owners and users of drilled water wells above the Niagara Escarpment that the potential exists for their well water to have naturally occurring lead present at concentrations above acceptable levels, and that they should test their well water for both total and dissolved lead. Affected well owners could then take relevant steps to limit lead intake where naturally-occurring lead, in excess of the ODWS, is present in their drinking water.

Public Health Services recommends the following communication strategy;

- Issuing a Public Health Advisory via the media
- Mailing the Public Health Advisory to municipal addresses in the affected area.

**BACKGROUND:**

Lead can affect almost every system in the body. The ODWS is set to include a margin of safety beyond the no observable adverse effect limit (NOAEL). Total exposure to lead from all sources in an individual's environment includes air, water, food, and dust/soil. The Acceptable Daily Intake (ADI) for lead from all sources is 0.0035 mg/kg body weight per day (milligrams of lead per kilogram of body weight per day). This level (or lower) of lead intake per day is considered to be a No Observable Adverse Effect Limit (NOAEL) and is not associated with increased lead levels in the blood or lead retention in two year old children. Long-term exposure to high lead levels can cause learning disabilities and behavioural problems in children and anemia (low iron in the blood) at all ages.

On October 7, 2005 the Ministry of Environment sampled seven wells within approximately one kilometre of the site of concern at 1759 Safari Road. These samples were analyzed for metals, petroleum hydrocarbons, volatiles, polycyclic aromatic hydrocarbons and general chemistry (pH, alkalinity and conductivity). None of the samples contained detectable petroleum hydrocarbons, volatile organic compounds or...
polycyclic aromatic hydrocarbons. Zinc, iron, copper, manganese, barium and strontium were detected, but at acceptable levels, below the Ontario Drinking Water Standard (ODWS). There is no discernable trend or health concern at these levels.

Lead was detected from all 7 wells sampled. Samples from 4 of the wells had lead concentrations in excess of the ODWS, which is 0.01 milligrams per litre (mg/L), and one was at the ODWS level.

Comparing unfiltered and filtered samples provides additional information about the likely source of lead, because the unfiltered samples indicate the total amount of lead in the well water, while the filtered samples indicate the amount that is dissolved in the water. Overall, concentrations of lead in unfiltered samples range from 0.002 to 0.068 mg/L. Lead levels in filtered samples were significantly decreased, between 46.7% to 99.9%, with an average decrease of 84.6%, compared to unfiltered samples. The dramatically lower level for the filtered samples indicates that most of the lead in these samples is present on suspended solids in the well water.

Soil was also sampled from eight locations on the adjacent property by the MOE Phytotoxicology Investigations Unit (PIU). The MOE results show no evidence to suggest lead contamination from 1759 Safari Road had occurred or measurably impacted the soil on the adjacent property. Furthermore, since the soil on the adjacent property (around the well specifically) had normal lead levels, elevated lead in drinking water could not be related to surface soil lead levels.

On November 30 2005, MOE and Public Health Services staff met to discuss these soil and water testing results. On December 2 2005, well water testing results, instructions, advice, and information were mailed to all 7 well owners. Appendix B includes the letter mailed to well owners detailing the findings of the study. Appendix C includes the Lead in Well Water fact sheet also mailed to participants.

Following consultation with the MOE, Public Health Services undertook to further investigate lead concentrations in well water supplies in the area to determine what, if any, further action may be required.

On February 27, 2006 a letter (Appendix D) was sent to 57 property owners within a two kilometre radius of 1759 Safari Road informing them about elevated concentrations of lead in wells and requesting their participation in the sampling program. Of these 57 properties, 11 had no physical address or were vacant properties, three did not have a well present on their property, and one was outside the 2 kilometre area. Of the remaining 42 properties, five declined participation and five did not respond to the letter or follow-up telephone calls, leaving 32 property owners who agreed to participate. Six property owners outside the two kilometre radius heard of the study taking place and contacted Public Health Services requesting participation, yielding a total of 38 samples. Overall participation was approximately 75% of all well owners.

A sample from each of these 38 actively used residential water wells was collected by Public Health Inspectors and submitted to the City of Hamilton Environmental
Laboratory for analysis of lead and microbiological parameters including E. coli and Total Coliforms. Lead was found to be less than the method detection limit (i.e. undetectable) for 15 samples (<0.001 mg/L). Fifteen samples had measurable lead levels below the ODWS. The remaining 8 wells had lead concentrations above the ODWS of 0.01 mg/L in the unfiltered samples. Overall, concentrations of lead in unfiltered samples ranged from 0.001 to 0.052 mg/L. Lead concentrations decreased between 0 to 88.9% in matching filtered samples, with an average decrease of 43.3% for the 8 samples above the ODWS level.

As results were received, instructions, advice, and information were mailed to participants with lead concentrations above the ODWS, together with the lab analysis of their well water. Appendix E includes the letter mailed to property owners detailing the results from their well. The Lead in Well Water fact sheet was also mailed to participants with elevated concentrations of lead.

At the time of sampling a questionnaire was completed by the property owners to gather information on daily water consumption, well maintenance practices, well characteristics including age, well type, depth of well, and any presence of lead pipes or lead-soldered pipe joints. Type of treatment system and date of well reconstruction, if any, was also recorded. The questionnaire is attached in Appendix F.

On May 4 2006, a final letter was hand delivered to property owners detailing these study findings. This letter is included as Appendix G.

A map indicating the results from both the MOE and Public Health Services water quality surveys is included as Appendix H.

Analysis of the data from the questionnaires did not identify any consistent association of well location, age, depth, groundwater elevation, or bedrock elevation with high lead levels. Efforts to link the 38 sampled wells with MOE Water Well Records in the MOE Water Well Records database were limited by difficulties matching the MOE Well Record with its respective well. The results from these 38 wells provide additional evidence that lead is likely naturally occurring in the groundwater.

The Provincial Groundwater Monitoring Network (PGMN) operated by the MOE has fourteen groundwater monitoring wells in the rural area of Hamilton. Dissolved lead has been found at acceptable levels in most of these wells. The presence of low levels of dissolved lead in these monitoring wells further indicates that lead is likely naturally present in the groundwater in a larger area in wells that are drilled into bedrock. Total lead concentrations have not been measured in the PGMN wells as these wells are not actively used wells and are only used for ground water monitoring purposes.

Further consultation with the Ministry of Northern Development and Mines (Sedimentary Geoscience Section – Groundwater Program), and the Ministry of the Environment gave better understanding of the potential extent of this naturally occurring phenomenon. It was noted that the presence of lead within the bedrock is due to ancient geologic
processes (i.e. features, formations, and chemical processes) that occurred hundreds of millions of years ago. Within the rural areas of the City of Hamilton, there are a significant number of water wells that are drilled into this bedrock and may be affected.

The existence of lead in the bedrock occurs in a sporadic or spotty nature and is influenced by seasonal fluctuations. It can be found that lead concentrations will be higher in late Fall and late Winter/early Spring, and lower in the summer.

Any further investigation of the existence of lead in the groundwater would require detailed planning, coordination, expertise, and resources that do not exist within Public Health Services. This type of investigation may be best organized and implemented in the future through the Hamilton/Halton Conservation Authority Source Protection Team, in consultation with pertinent Ministries and Agencies.

With assistance from the MOE and NDM, Public Health Services is of the opinion that all possibilities for the presence of elevated lead levels in drilled wells have been considered. No evidence supporting a source other than natural deposits of lead in the local bedrock have been found or indicated.

**ANALYSIS/RATIONALE:**

Consultation with the Ministry of Northern Development and Mines (NDM), and the Ministry of Environment suggest elevated lead concentrations in water wells are likely a natural phenomenon that has the potential to affect wells that are drilled into and drawing water from the dolostone bedrock aquifer. This local bedrock aquifer formation is quite large and is used as a groundwater supply from the Guelph area into Niagara Region, including portions of Halton Region, Kitchener-Waterloo, and Brant County. Portions of this bedrock aquifer formation are also found in the Grey Bruce Region throughout the Bruce Peninsula.

Completion of a scientifically based study of the presence of lead in the groundwater would require expertise, information, insight and resources from Ministries and Agencies other than the City of Hamilton Public Health Services. As previously mentioned, the Hamilton/Halton Conservation Authority Source Protection Team may be the most suitable agency to co-ordinate a Steering Committee, with the relevant stakeholders, to further investigate the issue of lead in groundwater.

A literature review identified very little local research on lead concentrations in private water wells. Studies completed by NDM have identified naturally occurring minerals, including lead, within the local geological formations, but their presence is not homogeneous or consistent with regard to location. This adds to the geologic variability in groundwater sources across the rural areas of Hamilton.

The amount of water consumed per day is generally considered to be 1.5 litres (6 cups) per day for adults and 0.6 litres (2 cups) per day for a two year old child. During the Public Health Services water survey, it was found that some individuals were consuming more than 1.5L of water per day; which means there could be situations
where residents could be at a greater risk of lead exposure via their drinking water supply.

In light of these results, that approximately one in three wells within the area of 12.5 square kilometres (km²) had levels of lead above the ODSW, Public Health Services advises well owners to test their wells for lead. Testing would provide well owners with adequate information to take measures to reduce exposure to naturally-occurring lead that may be present in their drinking water.

The water well user/owner is advised to collect and submit a water sample to an accredited laboratory for both total and dissolved lead analysis. Public Health Services staff have contacted approximately 30 local and nearby laboratories and water testing businesses. Reported cost for lead analysis ranges between $30 and $75 per sample, with an average price of approximately $60 per sample. This would include analysis of both total and dissolved lead.

As lead concentrations are influenced by seasonal fluctuations, it would be most efficient for well owners and/or users to collect their water samples during the late fall and in late winter/early spring. A list of accredited laboratories will be made available by Public Health Services.

If approved by the Board of Health, the Public Health Advisory would be released to the media present at the Board of Health meeting. As this method of communication may not reach all well owners/users that may be affected, Public Health Services recommends that the Public Health Advisory be mailed to all property owners within the affected area - Hamilton above the Niagara Escarpment where municipal water services are NOT available.

The Public Health Advisory would explain;

- why this is a public health concern
- where
  - naturally-occurring elevated lead concentrations have been found,
  - the potential exists for lead to be present in other wells
- what type of well has the potential to be affected
- how, when, and where to collect a well water sample and get it tested for lead
- what to do if lead levels above the ODWS are detected in a water sample

Additionally, Public Health Services would be available for consultation to water well owners/users for health related information, where levels of lead above the ODWS are confirmed.

Public Health Services will continue to collaborate with relevant Ministries and Agencies investigating the presence of lead in the bedrock aquifer that exists throughout the City of Hamilton.
ALTERNATIVES FOR CONSIDERATION:

1. Do Nothing.

Lead levels above the ODWS, coupled with reported above average water consumption may expose people to levels of lead with potential adverse health effects. Since these effects can be prevented and the measures to reduce water in lead (i.e. filtering) are relatively inexpensive, this option is not recommended because it would appear prudent to act to reduce potential health risks from naturally occurring lead.

2. Wait for the organization, implementation, and analysis of a scientific study for the presence of lead in the bedrock aquifer.

Public Health Services has consulted with geologists and hydrogeologists and is aware of the potential for elevated concentrations of lead to exist in some water wells throughout rural Hamilton. Waiting for a study of this magnitude is not recommended as Public Health Services has an obligation to inform and advise well owners, within a reasonable time, that a condition may exist that may adversely affect their health.

3. Offer free lead analysis to owners/users of water wells. Samples would be collected and submitted by the well owner to a laboratory. Analysis costs would be covered by the City in some manner.

The owner of a water supply is responsible for the quality and analysis of the water supply. Providing free lead analysis would be an extraordinary service offering.

Within the City of Hamilton, there are an estimated 8,000 rural residences that could be using a well drilled into bedrock for a water supply. As noted previously, the participation rate of the Public Health Services well water survey was approximately 75%. This participation rate, if applied across the City, would result in an estimated 6,000 requests for water wells to be sampled.

Consultation with pertinent Ministries and Agencies indicated that at least one, but up to three samples be collected at the various times over a year, in order to accurately assess the presence and concentrations of lead in a well. This may increase the estimated number of water samples submitted for lead analysis to 18,000 samples. This number is indicative of the upper range, as it is difficult to predict the actual number of samples that may be submitted. Based on the prices for lead analysis previously noted, 6,000 to 18,000 lead analyses would cost between $360,000 and $1,080,000.

4. Public Health Services organize and conduct a well water sampling survey throughout the rural areas of Hamilton, in order to determine where and when naturally occurring lead may be present or excessive in water wells.
Such an endeavour would not likely produce information that would change the opinion of Public Health Services. Public Health Services has investigated this situation with the pertinent Ministries and Agencies and is of the opinion that a health hazard has the potential to exist in the form of there being a real potential for some water well owners/users unknowingly and regularly drinking water from a well that could have high lead concentrations. Informing all potential well owners/users that could be affected would prevent or decrease the effect of this health hazard.

Public Health Services would need to obtain additional human and financial resources to launch such an endeavour in a timely manner, versus informing and advising well owners that a condition may exist that may adversely affect their health.

If the financial and human resources were made available, it is loosely estimated that at least two to six full-time additional staff would be needed. The wages, benefits, mileage, and lab analysis costs would be between $600,000 and $1.8 million dollars, or more. The logistics of collecting such a high number of samples would be further complicated by the need to collect the samples during certain times of the year.

FINANCIAL/STAFFING/LEGAL IMPLICATIONS:

Financial Implications: None. The necessary resources will come from within existing budgets.

Staffing Implications: A significant demand for public health consultation from water wells owners/users might require the short-term assignment of public health staff from other public health programs.

Legal Implications: Section 10 of The Health Protection and Promotion Act indicates the Medical Officer of Health has a duty to prevent, eliminate, and decrease the effects of health hazards.

Section 11 of The Health Protection and Promotion Act requires the Medical Officer of Health to investigate complaints regarding health hazards related to environmental health, in consultation the Ministry of the Government of Ontario that has primary responsibility, to determine whether a health hazard exists.

POLICIES AFFECTING PROPOSAL:

None

RELEVANT CONSULTATION:
Ministry of Environment
Ministry of Northern Development and Mines
Ministry of Health and Long Term Care
City of Hamilton GIS Services
City of Hamilton Communications staff
City of Hamilton Public Works Department
Hamilton/Halton Source Water Protection Team

CITY STRATEGIC COMMITMENT:

Community Well-Being is enhanced. ☑ Yes ☐ No
Public services and programs are delivered in an equitable manner, coordinated, efficient, effective and easily accessible to all citizens.

Environmental Well-Being is enhanced. ☑ Yes ☐ No
Human health and safety are protected.

Economic Well-Being is enhanced. ☑ Yes ☐ No

Does the option you are recommending create value across all three bottom lines? ☑ Yes ☐ No

Do the options you are recommending make Hamilton a City of choice for high performance public servants? ☑ Yes ☐ No
Dear Sir or Madam:

At the request of the City of Hamilton Public Health Services and Ted McMeekin, MPP for Flamborough Ancaster, Dundas, Aldershot, the Ministry of the Environment undertook a well survey to assess well water quality on several properties on Safari Road in Flamborough. Your property was one of those sampled on October 7, 2005. This letter explains the survey methods, the results of the lab analysis, and provides advice about action you should take.

**Significant Results and Public Health Advice**

The lead concentrations in your well are outlined in the attached table. Your drinking water has lead concentrations above the Ontario Drinking Water Standard of 10 micrograms per litre (ug/L). As a precaution it is recommended by the City of Hamilton Public Health Services that you;

1. Stop using your well water to;
   a. Drink
   b. Make ice
   c. Brush teeth, gargle, or rinse your mouth,
   d. Make meals or use as an ingredient in juices, coffee, tea, puddings, other mixes such as baby food and formula.

2. Review the attached information regarding the health effects of excessive lead in-take and how you can reduce the amount of lead in your drinking water so it can be used safely.

Exposure to lead can come from water, food, air, and soil. Maximum acceptable levels of lead in drinking water are set by considering these other sources, and they are set with a safety factor. As small children are the most susceptible segment of the population to the effects of excessive lead exposure, the limits of lead in drinking water are set with consideration to protect small children (two years of age). Your drinking water has lead concentrations above or near the Ontario Drinking Water Standard, but that does not necessarily represent a health risk to you. The amount of water consumed per day affects your exposure to lead. Your body weight affects the total acceptable daily intake of lead from all sources, including water. The acceptable daily intake for lead from all sources of exposure is 3.5 micrograms per kg of body weight. The maximum acceptable concentration of lead in drinking water has remained constant over the years, whereas other exposures to lead have decreased, such as phase out of lead-soldered food cans, lead additives in gasoline, and lead in paints.

The above paragraph is intended to provide an explanation of how lead levels in drinking water are set and the risk to your health from drinking your well water. You may wish to consult with your Doctor regarding the significance of drinking water that has lead concentrations as reported in the attached table.

If you have questions related to health impacts of lead in drinking water and well water treatment options, please feel free to call Public Health Inspector Matthew Wilson with the City of Hamilton Health Services at (905)546-2424 xt 3579.

**Survey Methods**
The sampling survey consisted of collecting samples from seven wells in the area of Lots 20, 22, and 23 on the north and south sides of Safari Road. These samples were submitted to the Ministry of the Environment laboratory for analysis of metals, petroleum hydrocarbons, volatiles, polycyclic aromatic hydrocarbons and general chemistry (pH, alkalinity and conductivity).

The samples were collected in a way to represent the quality of the groundwater as much as possible. All samples were collected prior to any filtration or treatment system in place. At each sampling location, any storage or pressure tank between the well and the tap was drained and the well flushed for an estimated three well water volumes.

**Results**

The complete lab analysis for your well water is attached.

Lead was detected in each of the seven wells sampled. Four of these wells had lead concentrations above of the Ontario Drinking Water Standard of 10 micrograms per litre (ug/L) and one was only slightly below the Ontario Drinking Water Standard in the unfiltered samples. Overall, concentrations of lead in unfiltered samples range from 2.36 to 67.8 ug/L.

No petroleum hydrocarbons, volatile organic compounds or polycyclic aromatic hydrocarbons were detected. A number of metals were detected, but at concentrations below the Ontario Drinking Water Standard. These metals were zinc, iron, copper, manganese, barium and strontium. There is no discernable trend or health concern with these metal concentrations.

For this study, both unfiltered and filtered (0.45 micron filter) samples were submitted to the laboratory for metals analysis. This was done to determine the total amount of metals in the groundwater of these private wells (unfiltered) and their dissolved concentrations (filtered). Overall, the metals concentrations of the samples decreased significantly when filtered. Of particular note are the lead concentrations, which decreased between 46.7% to 99.9%, with an overall average decrease of 84.6%. This indicates that the majority of lead in these samples is present on suspended solids in the groundwater. Further evidence of this is the sampling completed for one of the surveyed wells where one sample was collected prior to the house’s filtration system and another was collected after this system. This in-line filtration system consists of a cartridge filter unit which is coarser in nature than that used by MOE to filter samples yet still decreased concentrations by almost 55%.

**Findings/Conclusions**

This study indicates that detectable lead concentrations in well water are not uncommon in the area sampled along Safari Road. Lead was also detected at low concentrations in Provincial Groundwater Monitoring Network (PGMN) wells a distance of 3855 m away from the Safari Road sampling area. It is important to note that the metals samples collected from the PGMN are filtered samples. At this point in time there is no discernable trend with respect to the distribution of the lead or other metals in the Safari Road sampling area. The difference in concentrations between filtered and unfiltered samples indicates the majority of the lead encountered in the groundwater of this area is associated with suspended solids and further suggests that mobility of this contaminant is unlikely.

Based on this investigation, it does not appear that the elevated lead encountered in the private wells along Safari Road are an isolated issue but may occur over a much wider area. In the survey
area, there is a lack of a relationship between the presence of lead and the presence of other metals. The lead appears to be associated with particulate matter in the groundwater. The results do not necessarily reflect the “out of the tap for consumption” concentrations as treatment and/or filtration systems were present in most homes.

At this point in time, it is the opinion of the Ministry of Environment that the presence of lead in this area is not due to a point source of contamination but is consistent with a large source area which is quite possibly within the natural dolostone bedrock in the area. At the request of the City of Hamilton Public Health Services, the Ministry of Environment and the City of Hamilton will continue to collaborate with respect to the issue of lead in groundwater and determine what, if any, further action may be required. Should you have additional questions with regard to the sampling that has been done please feel free to contact Brad Farnand of the Ministry of the Environment at 905-521-7765.

Yours truly

Mark Dunn  Eric Mathews
District Manager (A)  Manager Health Protection Branch
Hamilton District Office  Public Health and Community
West-Central Region  Services

C Brad Farnand, Ministry of the Environment, Hamilton District Office
    Matthew Wilson, Public Health Services, City of Hamilton
Lead in Well Water

Issue
Lead is a naturally occurring bluish-grey metal found in small amounts on the earth’s outer layer. Lead also comes from industrial activities including burning fossil fuels, mining and manufacturing. Lead can be hazardous to human health.

Exposure Limits in Drinking Water
The Ontario Drinking Water Standards states that the Maximum Allowable Concentration (MAC) for lead in drinking water is 10 micrograms per litre (ug/L). This level is based on long-term effects and is therefore applied for average concentrations of water consumed over long periods of time. Short-term consumption of concentrations above the MAC does not necessarily pose risk to human health.

Health Effects
Lead that is inhaled or ingested enters the blood stream, where it is sent to all tissues of the body including the liver, lungs, spleen, kidney, bone marrow and skeleton. Lead can affect almost every organ and system in the body. People who are particularly at risk of lead poisoning include young children, infants and unborn children.

Exposure to lead is most serious for young children because they absorb lead more easily than adults. Children’s brains and nervous system are more sensitive to the harmful effects of lead. If not detected early, children with high levels of lead in their bodies can suffer from:
- Damage to the brain and nervous system
- Behaviour and learning problems (such as hyperactivity)
- Slowed growth
- Hearing problems

Lead is also harmful to adults. They may experience:
- Difficulties during pregnancy
- Other reproductive problems (in both men and women)
- High blood pressure
- Digestive problems (appetite loss, abdominal pain, constipation)
- Nerve disorders
- Memory and concentration problems
- Muscle and joint pain
- Fatigue, sleeplessness
- Irritability
- Headache

In Canada, short-term exposure to high levels of lead are rare and can cause vomiting, diarrhoea, convulsions, coma or even death. Long-term exposure to lower lead levels may cause anaemia and damage to the nervous system. Other symptoms are: appetite loss, abdominal pain, constipation, fatigue, dizziness, sleeplessness, irritability and headache.

Diagnosis and Treatment
A blood test is available to measure the amount of lead in your blood.

To treat lead poisoning, stopping the exposure is critical. When the lead is removed from a person’s environment, it helps in decreasing the blood-lead levels.

Reducing Lead in Drinking Water
DO NOT heat or boil your water to remove lead. Lead concentration in the water can increase as the water is boiled, as some of the water evaporates during the boiling process.
DO NOT cook with or drink water from the hot water tap. Hot water dissolves lead more quickly than cold water.
DO NOT use hot water for making baby formula.

If the source of lead is found in the groundwater, flushing the faucet will NOT be effective. Treatment systems can be used to remove lead. These include:
- Reverse Osmosis
- Distillation Units
- Water filters with this certification on their label: ANSI/NSF Standard No. 53 for reduction of lead
- Bringing in water from a known safe supplier

Resources and Additional Information
U.S. Environmental Protection Agency. Lead in Paint, Dust & Soil. www.epa.gov/lead/
February 27, 2006

RE: Well Water Study

Dear Occupant/Owner,

In the Fall of 2005, the Ministry of the Environment (MOE) assessed the water quality of seven wells located on Safari Road in Flamborough. This drinking water quality survey was conducted due to concerns of possible groundwater contamination related to former automotive salvaging/wrecking activities on a specific property. The MOE also conducted additional assessments to examine soil contamination and groundwater movement.

The findings of this work revealed that there was naturally occurring elevated lead concentrations in the water of five of the seven wells assessed. No other health related parameters were found to exceed the acceptable limits. The finding of excessive lead in well water does not immediately represent a health risk to the users. The risk of adverse health effects depends on how much water is drunk and the amount of lead in the water, along with other exposures to lead in a persons environment.

It is the opinion of the MOE that the elevated lead concentrations are due to naturally occurring minerals in the bedrock in which the wells are drilled. Thus, the elevated lead concentrations in the well water are not related to the automotive salvaging/wrecking activities in the area.

The City of Hamilton Public Health Services, Health Protection Branch is widening the area of the well water assessment in order to determine if excessive lead concentrations are present in well water within a 2 kilometer radius of the initial area of concern. The well on your property is likely to be within this area.

Public Health Services is offering the collection and analysis of well water samples for lead and bacteria (Total Coliforms and E. coli) at no cost to you. Should you wish to participate, you will also be asked some questions to collect information regarding well characteristics and daily water usage habits. We will also provide information, guidance, and resampling for lead analysis if lead concentrations above the acceptable limit are found in your well water.

The collection of well water samples is planned to occur during the weeks of March 6, 2006 and March 13, 2006. Please consider if you would like to participate in this assessment. A Public Health Inspector will phone you in the next week to confirm your participation and to answer any questions or concerns regarding the well survey.
The information and lab analysis reports related to your water supply gathered by Public Health Services in the course of this assessment are subject to the *Municipal Freedom of Information and Protection of Privacy Act* (MFIPPA).

If you choose not to participate, Public Health Services strongly urges you to test your well water for lead and bacteria. Bacterial analysis of your well water is available to you at no charge. Pick up and drop off locations within the City of Hamilton and information to collect water samples is included in this package. Analysis for lead and other chemicals can be done through the Ontario Federation of Agriculture. (see attached brochure) for a fee.

If you have any further questions, you may contact Matthew Wilson, Public Health Inspector at (905) 546-2424 Ext. 3579.

Sincerely,

Rob Hall  
Director, Health Protection Branch  
Public Health Services  
City of Hamilton

Attached:  
RH:NM:cb
April 5, 2006

RE: Well Water Study

Dear Owner/Occupant:

The City of Hamilton Public Health Services is conducting a survey to assess well water quality on several properties within a certain area in the Flamborough region. Your property was one of those sampled on March 21, 2006. The lab analysis regarding lead concentrations in your well water was received by Public Health Services on March 27, 2006. This letter explains the results of the lab analysis and provides advice on actions you should take. Another letter will follow with details of the survey methods and study results.

Significant Results and Public Health Advice

The bacteriological results indicate that your well water is safe to drink. The total lead concentration in your well water was 0.025 milligrams per litre (mg/L). The dissolved lead concentration was 0.020 mg/L. This means your drinking water had lead concentrations above the limit of the Ontario Drinking Water Standard of 0.010 mg/L. The difference between the total and dissolved lead concentrations indicates that most of the lead detected is in the particulate matter rather than being dissolved in the water. It is recommended that you consult a reputable water treatment professional (or look into this on your own) to pursue reducing the lead concentrations in your well water. There are devices available that can reduce lead concentrations in drinking water, see the attached fact sheet.

Until you have reduced the lead concentrations in your well water, it is recommended (as a precaution) by the City of Hamilton Public Health Services that you;

1. Stop using your well water to;
   a. Drink
   b. Make ice
   c. Brush teeth, gargle, or rinse your mouth,
   d. Make meals or use as an ingredient in juices, coffee, tea, puddings, other mixes such as baby food and formula.

2. Review the attached information regarding the health effects of excessive lead intake and how you can reduce the amount of lead in your drinking water so it can be used safely.

Exposure to lead can come from water, food, air, and soil. Maximum acceptable levels of lead in drinking water are set by considering these other sources, and they are set with a safety factor. As small children are the most susceptible segment of the population to the effects of excessive lead exposure, the limits of lead in drinking water are set with
consideration to protect small children (two years of age). Your drinking water has lead concentrations above or near the Ontario Drinking Water Standard, but that does not necessarily represent a health risk to you. The amount of water consumed per day affects your exposure to lead. Your body weight affects the total acceptable daily intake of lead from all sources, including water. The acceptable daily intake for lead from all sources of exposure is 3.5 micrograms per kg of body weight. The maximum acceptable concentration of lead in drinking water has remained constant over the years, whereas other exposures to lead have decreased, such as phase out of lead-soldered food cans, lead additives in gasoline, and lead in paints.

The above paragraph is intended to provide an explanation of how lead levels in drinking water are set and the risk to your health from drinking your well water. You may wish to consult with your Doctor regarding the significance of drinking water that has lead concentrations as reported in this letter.

At this point in time, it is in the opinion that the presence of lead in this area is not due to a point source of contamination but is consistent with a large source area which is quite possibly within the natural dolostone bedrock in the area. The City of Hamilton Public Health Services will continue to investigate the issue of lead in groundwater and determine what, if any, further action may be required.

If you have questions related to health impacts of lead in drinking water and well water treatment options, please feel free to call Public Health Inspector Matthew Wilson with the City of Hamilton Public Health Services at (905)546-2424 Ext 3579.

Sincerely,

Eric Mathews
Manager, Health Protection Branch
Public Health Services
City of Hamilton

EM:nm
LEAD IN WELL WATER QUESTIONNAIRE

Name of surveyor: ______________________________________________________________
Name of surveyed: ______________________________________________________________
Address: ______________________________________________________________________
GPS Coordinates: ______________________________________________________________________

1. Since what date have you lived at this address?
   Tenant (mm/yy) _____________
   Owner (mm/yy) _____________

2. How many wells do you know you have?
   ☐ One
   ☐ Two
   ☐ Three
   ☐ More than three

3. How many of these wells are in use for drinking water?
   ☐ One
   ☐ Two
   ☐ Three
   ☐ More than three

4. Where is your well located? *Note: Please show the location to the Public Health Inspector.

   ______________________________________________________________________________
   ______________________________________________________________________________
   ______________________________________________________________________________
   ☐ Don’t Know

5. What date was your well originally constructed?
   Well #1 – (mm/yy) ________________
   Well #2 – (mm/yy) ________________
   ☐ Don’t Know

6. Do you know of any well reconstruction?
   ☐ Yes
   ☐ No
   ☐ Don’t Know

If yes, what was the date of the reconstruction?
   Well #1 – (mm/yy) ________________
   Well #2 – (mm/yy) ________________
What was completed during this reconstruction?
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

7. What type of well do you have?
☐ Drilled
☐ Bored
☐ Dug
☐ Driven
☐ Jetted
☐ Other *Please specify ______________________________________________

8. What is the depth of your well?
☐ 0 - 40 feet
☐ 41 - 80 feet
☐ 81 – 120 feet
☐ Greater than 120 feet
☐ Don’t Know

9. Do you have lead water pipes or lead-soldered pipe joints?
☐ Yes
☐ No
☐ Don’t know

10. Is your well water treated?
☐ Yes
☐ No
☐ Don’t know

If yes, what type of treatment do you have? * Note: Please specify type.
☐ Disinfection ______________________________________________________
☐ Filtration _______________________________________________________
☐ Carbon Filter _________________________________________________
☐ Softener _______________________________________________________
☐ Other __________________________________________________________

11. Have you ever had your well water tested before?
☐ Yes
☐ No

If yes, what parameters did you have analysed?
☐ E. Coli
☐ Metals
☐ Nitrates
☐ Petroleum products
☐ Total Coliforms
☐ Other * Please specify ____________________________________________
12. On average, how often do you have your drinking water tested?

☐ Once per year
☐ Twice per year
☐ Three or more times per year
☐ Rarely or never

If more than once, was this to check a result that showed higher than recommended levels of any of the parameters listed above?

☐ Yes
☐ No

13. On average, how much well water does each person drink per day?

☐ No consumption of well water
☐ Less than 1 Litre
☐ 1-2 Litres
☐ 3-5 Litres

Comments:
May 4, 2006

RE: Laboratory Results for Water Samples Recently Collected from Your Water Supply

Dear property owner:

Thank you very much for your cooperation and participation with our private water well sampling survey. Attached are the laboratory results for the water samples that were recently collected from your drinking water supply, and a general interpretation of our findings.

Our sampling survey involved 38 actively used residential water wells. The results of our survey provide additional evidence that lead is likely naturally occurring at elevated levels in approximately one out of four drinking water wells in the area. This phenomenon is not a common occurrence, but to date another source for the lead has not become apparent. We have considered all possibilities for the presence of elevated lead levels in private wells, but no evidence has become apparent to support a source other than natural deposits of lead in the local geology.

There does not appear to be a relationship between where water wells are located and where high levels of lead were found in the survey area. Reviews of well location, age, depth, groundwater elevation, and bedrock elevation did not show an association with high lead levels. We have consulted with the Ministry of Environment and the Ministry of Northern Development and Mines regarding our findings and the hydrogeology (groundwater characteristics) and geology (rock structure) in the area.

We have directly contacted the people where lead and/or bacteria levels were above the recommended limits and provided advice on how to correct the situation. The bacterial analysis also revealed some localized issues with some wells. This was not unexpected and is somewhat consistent with the general microbiological quality of private wells within the rural areas of Hamilton.

The finding of elevated lead levels in the water of several actively used water wells does not immediately represent a general public health concern or a risk to the users. There are several factors that need to be considered in order to put lead exposure from groundwater into perspective;

- The Maximum Acceptable Concentration (MAC) for lead in drinking water is 0.01 mg/L (milligrams per litre). The MAC was established using criteria that are protective for children (2 yrs old).
- The Acceptable Daily Intake (ADI) for lead from all sources is 0.0035 mg/kg bw per day (milligrams of lead per kilogram of body weight per day). This level (or lower) of lead intake per day is considered to be a No Observable Adverse Effect Limit (NOAEL) and is not associated with increased lead levels in the blood or lead retention in two year old children.
- The amount of water consumed per day is generally considered to be 1.5 litres (6 cups) per day for adults and 0.6 litres (2 cups) per day for a two year old child.
- The risk of exposure depends on the amount of water consumed, the amount of lead in the water, plus other exposures to lead in a person’s broader environment (air, food, work).
Examples

Children:

The lead levels that were at or above the MAC (0.01 mg/L) in actively or routinely used residential wells ranged from 0.01 mg/L to 0.052 mg/L. Using the maximum lead levels found in one of the wells (0.052 mg/L); A two year child (weighing an avg of 13.6 kg or 30 lbs) who drank an avg of 0.6 litres of water per day would consume 0.0312 mg of lead per day from the water. This is well below the ADI of 0.0476 mg of lead (from all sources) for a two year old child weighing 13.6 kgs.

Adults:

Using the same lead concentration of 0.052 mg/L (as above); an adult weighing 72 kgs (160 lbs) who drank an avg of 1.5 litres of water per day would consume 0.078 mg of lead per day from the water. This is below the ADI of 0.252 mg of lead (from all sources) for an adult weighing 72 kgs.

We are continuing to look into this phenomenon and are consulting with other agencies regarding our next steps. At this point in time the information provided above can only be interpreted to apply to the survey area. We felt it was prudent that we provide some answers and interpretation back to all survey participants who took the time and effort to assist us with this project.

We will continue to offer assistance and/or advice to all owners of private wells. If you have questions about your results please call Public Health Inspector Matthew Wilson at 905-546-2424 Ext 3579.

Sincerely,

Eric Mathews
Manager, City of Hamilton
Public Health Services
905-546-2424 xt 2186
<table>
<thead>
<tr>
<th>Your Lab Results</th>
<th>Maximum Acceptable Levels</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E.coli Bacteria</strong></td>
<td>0</td>
<td>The presence of <strong>E.coli</strong> indicates the presence of faecal/sewage contamination. It is important that you use an alternate safe supply of water OR boil your water at a rolling boil for at least one-minute before using it to: Drink; gargle, brush teeth, or rinse your mouth; Make baby food or formula; Wash fruits, vegetable and other food; Wash dishes; Make meals, ice, juices, coffee, tea, puddings, etc. BATHING and WASHING: Do not swallow any unboiled water used for showers and baths. Adults, teens and older children (who will follow instructions) can use unboiled water for baths and showers. Small children can be given sponge-baths instead of tub baths or showers. Washing hands: use an alternate supply of water, or boiled (and cooled) tap water to wash hands, <strong>OR</strong> disinfect hands with an alcohol-based hand disinfectant (containing at least 60% alcohol) after washing with tap water and soap. Flushing toilets and doing laundry is not considered a risk. Consult the Best Management Practices – Water Wells literature or Call our Safe Water Hotline at 905-546-2189.</td>
</tr>
<tr>
<td><strong>Total Coliform Bacteria</strong></td>
<td>Less than or equal to 5 Total Coliforms</td>
<td>0 <strong>Total Coliforms</strong> indicates no Total Coliform bacteria were detected in your water sample. You should sample your water supply at least three times a year to monitor bacteria levels. <strong>1 to 5 Total Coliforms</strong> indicates some minor presence of bacteria in your private water supply. You should resample your water supply to confirm the Total Coliform levels. Three samples collected at least a week apart with Total Coliform levels in this range is not a cause to take further action at this time. You should sample your water supply at least three times a year to monitor bacteria levels. <strong>Greater than 5 Total Coliforms</strong> indicates there is some bacterial contamination in your water supply. You should repeat the sampling and analysis to confirm the results. Make sure you follow the sample collection procedures. Until you have resampled to confirm results that indicate more than 5 Total Coliforms were present; you should follow the precautions above for E. coli. <strong>Note:</strong> Hand washing is not a risk and hand washing precautions are not necessary for the presence of Total Coliforms above 5. Consult the Best Management Practices – Water Wells literature or Call our Safe Water Hotline at 905-546-2189.</td>
</tr>
<tr>
<td><strong>Total Lead</strong></td>
<td>0.01 mg/L</td>
<td>As a precaution; total lead levels above 0.01 mg/L indicate you should use a safe alternate water supply to: Drink, gargle, brush teeth, or rinse mouth; Make meals, wash fruits, vegetables and other food; Make ice, juices, coffee, tea, puddings or other mixes; Make baby food or formula. <strong>DO NOT</strong> heat or boil your water to remove lead. Lead concentration in the water can increase as the water is boiled, as some of the water evaporates during the boiling process. <strong>DO NOT</strong> cook with or drink water from the hot water tap. Hot water dissolves lead more quickly than cold water. As the source of lead is likely from the groundwater, flushing the faucet will NOT be effective. Treatment systems can be used to remove lead. These include: • Reverse Osmosis • Distillation Units • Water filters with this certification on their label: ANSI/NSF Standard No. 53 for the reduction of lead • Bringing in water from a known safe supplier BATHING and WASHING: Do not swallow any water used for showers and baths. Adults, teens and older children (who will follow instructions) may use water for baths and showers. Small children may be given sponge-baths instead of tub baths or showers. Washing hands and dishes; flushing toilets; and doing laundry are not considered a risk. Total lead represents all the lead detected and includes lead suspended in small particles (bits of rock, sand, etc.) and the lead that is dissolved in the water. Dissolved lead levels indicate the amount of lead that is actually dissolved in your water. The difference between these numbers will indicate how much lead was suspended on small particles and how much lead is dissolved in your water. This information may be helpful if you need to install a treatment device to reduce lead levels in your water supply.</td>
</tr>
<tr>
<td><strong>Dissolved Lead</strong></td>
<td>0.01 mg/L</td>
<td>As a precaution; total lead levels above 0.01 mg/L indicate you should use a safe alternate water supply to: Drink, gargle, brush teeth, or rinse mouth; Make meals, wash fruits, vegetables and other food; Make ice, juices, coffee, tea, puddings or other mixes; Make baby food or formula. <strong>DO NOT</strong> heat or boil your water to remove lead. Lead concentration in the water can increase as the water is boiled, as some of the water evaporates during the boiling process. <strong>DO NOT</strong> cook with or drink water from the hot water tap. Hot water dissolves lead more quickly than cold water. As the source of lead is likely from the groundwater, flushing the faucet will NOT be effective. Treatment systems can be used to remove lead. These include: • Reverse Osmosis • Distillation Units • Water filters with this certification on their label: ANSI/NSF Standard No. 53 for the reduction of lead • Bringing in water from a known safe supplier BATHING and WASHING: Do not swallow any water used for showers and baths. Adults, teens and older children (who will follow instructions) may use water for baths and showers. Small children may be given sponge-baths instead of tub baths or showers. Washing hands and dishes; flushing toilets; and doing laundry are not considered a risk. Total lead represents all the lead detected and includes lead suspended in small particles (bits of rock, sand, etc.) and the lead that is dissolved in the water. Dissolved lead levels indicate the amount of lead that is actually dissolved in your water. The difference between these numbers will indicate how much lead was suspended on small particles and how much lead is dissolved in your water. This information may be helpful if you need to install a treatment device to reduce lead levels in your water supply.</td>
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</table>
Total Lead Concentrations in Well Water

Legend
- Total Lead Concentration (mg/L)
  - 0.0 to 0.009
  - 0.01 & Higher
- Property of Concern
- Public Health Services Well Water Survey Area - 2km around Property of Concern
- Ministry of Environment Well Water Survey Area - 1km around Property of Concern
- Groundwater Flow

Total Lead Concentration (mg/L)

0.0 to 0.009
0.01 & Higher

Property of Concern
Public Health Services Well Water Survey Area - 2km around Property of Concern
Ministry of Environment Well Water Survey Area - 1km around Property of Concern
Groundwater Flow
PUBLIC HEALTH ADVISORY

POTENTIAL FOR HIGH LEAD LEVELS IN SOME DRILLED WATER WELLS LOCATED ABOVE THE NIAGARA ESCARPMENT IN RURAL HAMILTON

To: All Rural City of Hamilton Residents who use a drilled water well located above the Niagara Escarpment as their main source of drinking water.

From: Medical Officer of Health for the City of Hamilton

All users and owners of drilled water wells above the Niagara Escarpment in the city of Hamilton are advised;

1. Some drilled water wells may have lead levels above the Ontario Drinking Water Standards (ODWS) due to naturally occurring lead in the bedrock.
2. To test their well water for total and dissolved lead.

The City of Hamilton’s Public Health Services has recently investigated the presence of lead levels in some drilled water wells in the north western rural area of Hamilton.

The Ministry of Environment and Public Health Services tested the water from 45 wells within an approximate 12.5 square kilometer area, and found 13 wells had lead levels above the ODWS for lead. The pattern of lead levels is most likely due to naturally occurring lead.

Lead in the bedrock is present in varying amounts in a sporadic or spotty nature, due to ancient geologic processes that occurred when the bedrock was formed.

Not all water wells are affected. The presence of lead in the bedrock is not everywhere. However, it cannot be said with certainty at this time which areas of rural Hamilton are more likely to be affected than other areas.

As a precaution, it is recommended that people who regularly drink water from a drilled water well located above the Niagara Escarpment test their well water for total lead and dissolved lead.

This Advisory does not apply to:
- The Municipal drinking water system that provides water to the urban area and population of the City of Hamilton.
- The Municipal drinking water systems in Carlisle, Freelton, Greensville, and Lynden. Lead is tested at each of these water systems at least four times per year, and lead has not been found to be a public health concern.
Well water should be tested before taking action to remove/reduce lead levels.

There is no need to see your doctor at this time, unless you have signs or symptoms of prolonged, unexplained, or chronic illness that may be lead-related. Read the attached fact sheet for lead-related conditions.

Lead Facts - Read the attached Fact Sheet on Lead for more information.

Testing Water for Total and Dissolved Lead

- **When:** It is recommended that drilled well water be tested for lead during;
  - Late Fall after the leaves have dropped from the trees.
  - Late Winter or Early Spring during big weather events.
  - Do not test your water for lead in the Summer. The presence and/or levels of lead varies throughout the year, with summer being when lead levels are likely to be lowest or not detectable. It is best to test the water when the lead is most likely to be present.

- **Where:** Attached is a list of laboratories that test water for lead. None of these labs is recommended over another. There may be other laboratories or water testing businesses that provide this service that are not included on this list. The Yellow Pages or the Internet may list additional labs or water testing businesses. There is a cost associated with this analysis that varies amongst labs, and depends on how many different tests are done. Usually, a complete analysis for metals and minerals can be performed for slightly more than the cost for lead analysis alone.

- **How:** Follow the instructions provided by the lab or water testing business. This will usually include;
  - Run the cold water tap for at least 10 (ten) minutes. Use a tap closest to the pressure tank that is not treated (softened, chlorinated, filtered, etc).
  - Wash your hands before collecting the sample.
  - Collect the sample in a bottle obtained from the laboratory or water testing business. Keep the bottle clean and closed before and after collecting the sample, to ensure as much as possible that it does not get contaminated.
  - Return the sample to the laboratory or water testing business the same day as it was collected.

If Lead Levels are High in Your Water

- Stop drinking your water and using it for making coffee/tea, baby food/formula, juices, or as an ingredient in food or meals.
- Contact a water treatment company or research what equipment can be installed to reduce the lead levels. High levels of dissolved lead may be more difficult to reduce.
- Test your water again after you have installed lead removal equipment to determine if lead levels are acceptable.
- Call Public Health Services Safe Water Hotline at 905-546-2189 if you have any questions.
Lead in Well Water

Issue
Lead is a naturally occurring bluish-grey metal found in small amounts on the earth’s outer layer. Lead also comes from industrial activities including burning fossil fuels, mining and manufacturing. Lead can be hazardous to human health.

Exposure Limits in Drinking Water
The Ontario Drinking Water Standards states that the Maximum Allowable Concentration (MAC) for lead in drinking water is 10 micrograms per litre (ug/L). This level is based on long-term effects and is therefore applied for average concentrations of water consumed over long periods of time. Short-term consumption of concentrations above the MAC does not necessarily pose risk to human health.

Health Effects
Lead that is inhaled or ingested enters the blood stream, where it is sent to all tissues of the body including the liver, lungs, spleen, kidney, bone marrow and skeleton. Lead can affect almost every organ and system in the body. People who are particularly at risk of lead poisoning include young children, infants and unborn children.

Exposure to lead is most serious for young children because they absorb lead more easily than adults. Children’s brains and nervous system are more sensitive to the harmful effects of lead. If not detected early, children with high levels of lead in their bodies can suffer from:
- Damage to the brain and nervous system
- Behaviour and learning problems (such as hyperactivity)
- Slowed growth
- Hearing problems

Lead is also harmful to adults. They may experience:
- Difficulties during pregnancy
- Other reproductive problems (in both men and women)
- High blood pressure
- Digestive problems (appetite loss, abdominal pain, constipation)
- Nerve disorders
- Memory and concentration problems
- Muscle and joint pain
- Fatigue, sleeplessness
- Irritability
- Headache

In Canada, short-term exposure to high levels of lead are rare and can cause vomiting, diarrhea, convulsions, coma or even death. Long-term exposure to lower lead levels may cause anemia and damage to the nervous system. Other symptoms are: appetite loss, abdominal pain, constipation, fatigue, dullness, sleeplessness, irritability and headache.

Diagnosis and Treatment
A blood test is available to measure the amount of lead in your blood.

To treat lead poisoning, stopping the exposure is critical. When the lead is removed from a person’s environment, it helps in decreasing the blood-lead levels.

Reducing Lead in Drinking Water
DO NOT heat or boil your water to remove lead. Lead concentration in the water can increase as the water is boiled, as some of the water evaporates during the boiling process.
DO NOT cook with or drink water from the hot water tap. Hot water dissolves lead more quickly than cold water.
DO NOT use hot water for making baby formula.

If the source of lead is found in the groundwater, flushing the faucet will NOT be effective. Treatment systems can be used to remove lead. These include:
- Reverse Osmosis
- Distillation Units
- Water filters with this certification on their label: ANSI/NSF Standard No. 53 for reduction of lead
- Bringing in water from a known safe supplier

Resources and Additional Information
Center for Disease Control and Prevention, 2003. Lead and Drinking Water from Private Wells.
http://www.cdc.gov/ncidod/dpd/healthywater/factsheets/lead.htm

www.hc-sc.gc.ca/iyh-vsv/environ/lead-plomb_e.html


Wisconsin Department of Natural Resources Bureau of Drinking Water & Groundwater. Lead in Drinking Water, 2003.
www.uwsp.edu/cnr/gndwater/privatwells/Lead%20in%20DrinkingWater.pdf

U.S. Environmental Protection Agency. Lead in Paint, Dust & Soil. www.epa.gov/lead

Laboratories
Below is a list of laboratories that test water for lead. None of these labs are recommended over each other. There may be other laboratories or water testing businesses that provide this service that are not included on this list. The Yellow Pages or the Internet may list additional labs or water testing businesses. There is a cost associated with this analysis that varies amongst labs, and depends on how many different tests are done. Usually, a complete analysis for metals and minerals can be performed for slightly more than the cost for lead analysis alone.

- City of Hamilton Environmental Lab
  (905) 546-2424 xt 5834
  700 Woodward Avenue
  Hamilton, Ontario
  L8H 6P4

- Gelda Scientific (905) 673-9320
  6320 Northwest Dr.
  Mississauga, Ontario
  L4V 1J7

- AGAT Laboratories (905) 643-8163
  903 Barton St. East, Unit #19
  Stoney Creek, Ontario
  L8E 5P5

- ALS Laboratories (519) 886-6910
  50 Bathurst Dr
  Waterloo, Ontario
  N2V2C5

- Niagara Analytic Environmental Laboratories (905) 374-5227
  5805 Progress St
  Niagara Falls, Ontario
  L2E6X8

- SGS Laboratories
  1 -877-747-7658
  185 Concession Street
  Lakefield, Ontario
  K0L 2H0

- Activation Laboratories Ltd. (905) 648-9611
  1336 Sandhill Dr
  Jerseyville, Ontario
  L0R1R0

- Caduceon Environmental Laboratories (705) 748-1506
  160 Charlotte St, Suite 206
  Peterborough, Ontario
  K9J2T8

- Testmark Laboratories Ltd. (705) 693-1121
  7 Margaret St. North
  Garson, Ontario
  P3L 1T5

- Integrated Explorations Inc. (519) 822-2608
  67 Watson Road South
  Guelph, Ontario
  N1L 1E3

- Maxxam Analytics Inc. (905) 817-5700
  6740 Campobello
  Mississauga, Ontario
  L5N 2L8