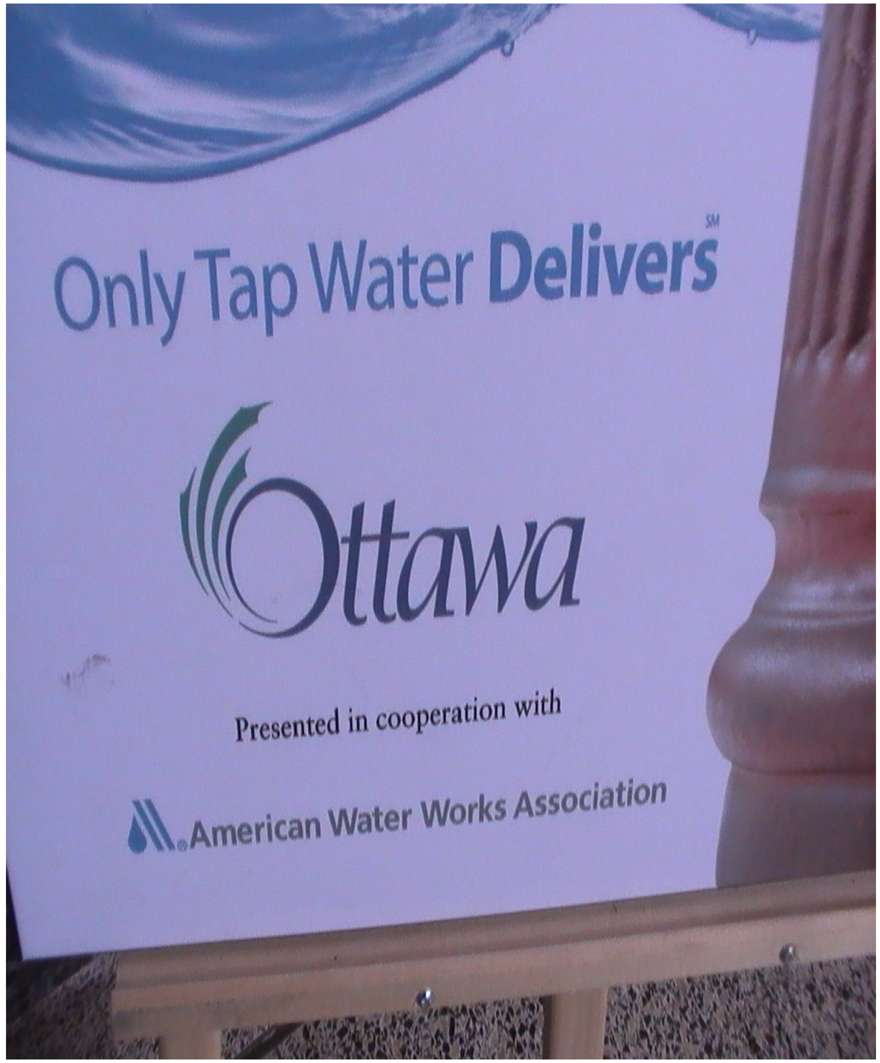
DON'T BLAME THE CITY FOR ALL THE "TOXIC" CHEMICALS IN YOUR TAP WATER!

In Canada we have the Safe Water Act which directs municipalities to disinfect their drinking water in order to prevent outbreaks of waterborne diseases such as cholera, e-coli, dysentery, legionnaires disease, typhoid fever, gastroenteritis, poliomyelitis, and many more known viral, bacterial, parasitic and protozoal infections present in raw water.

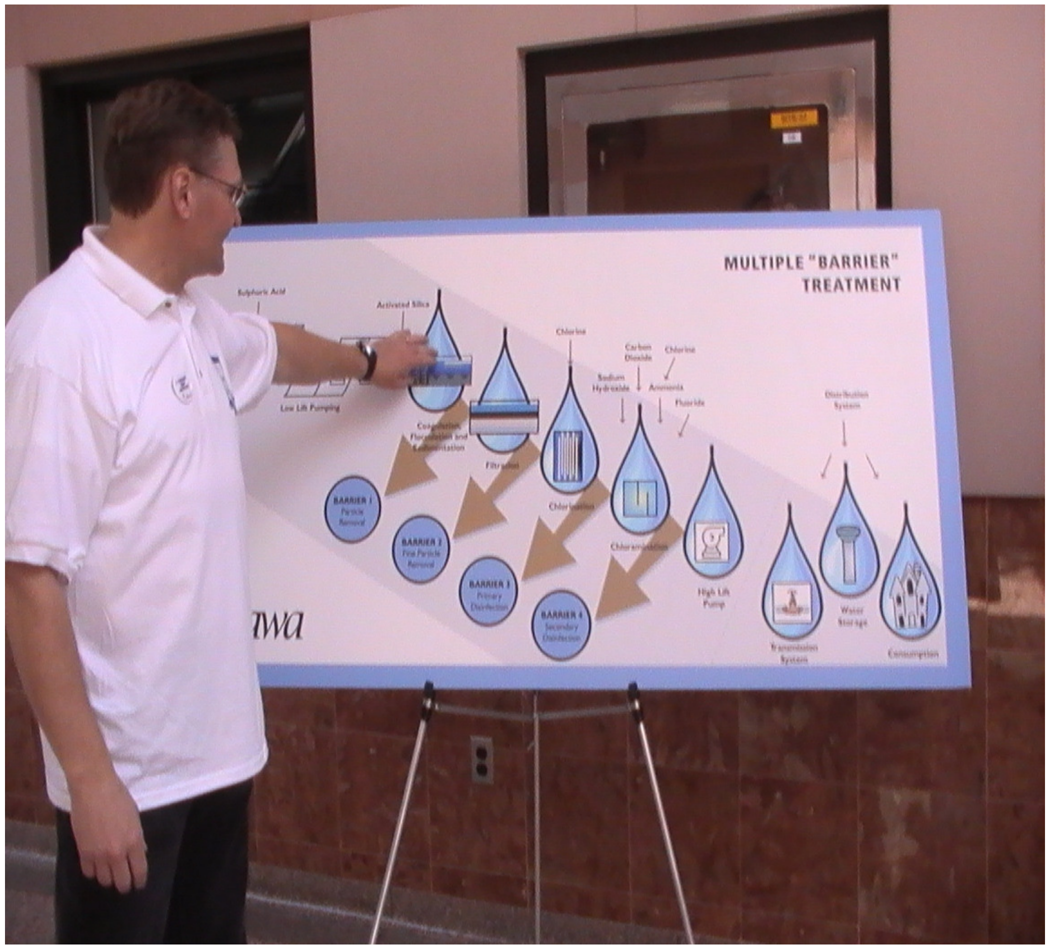
In order to prevent such diseases in Ottawa, the city adds large quantities of Sulphuric acid, Aluminum Sulphate, Sodium Silicate, Sodium Hydroxide (better known as Caustic soda), Chlorine, Ammonia and Chloramines (a mixture of Chlorine and Ammonia) all toxic but necessary in order to prevent the spread of these often deadly diseases.

My tour of the Ottawa water filtration plant 2009

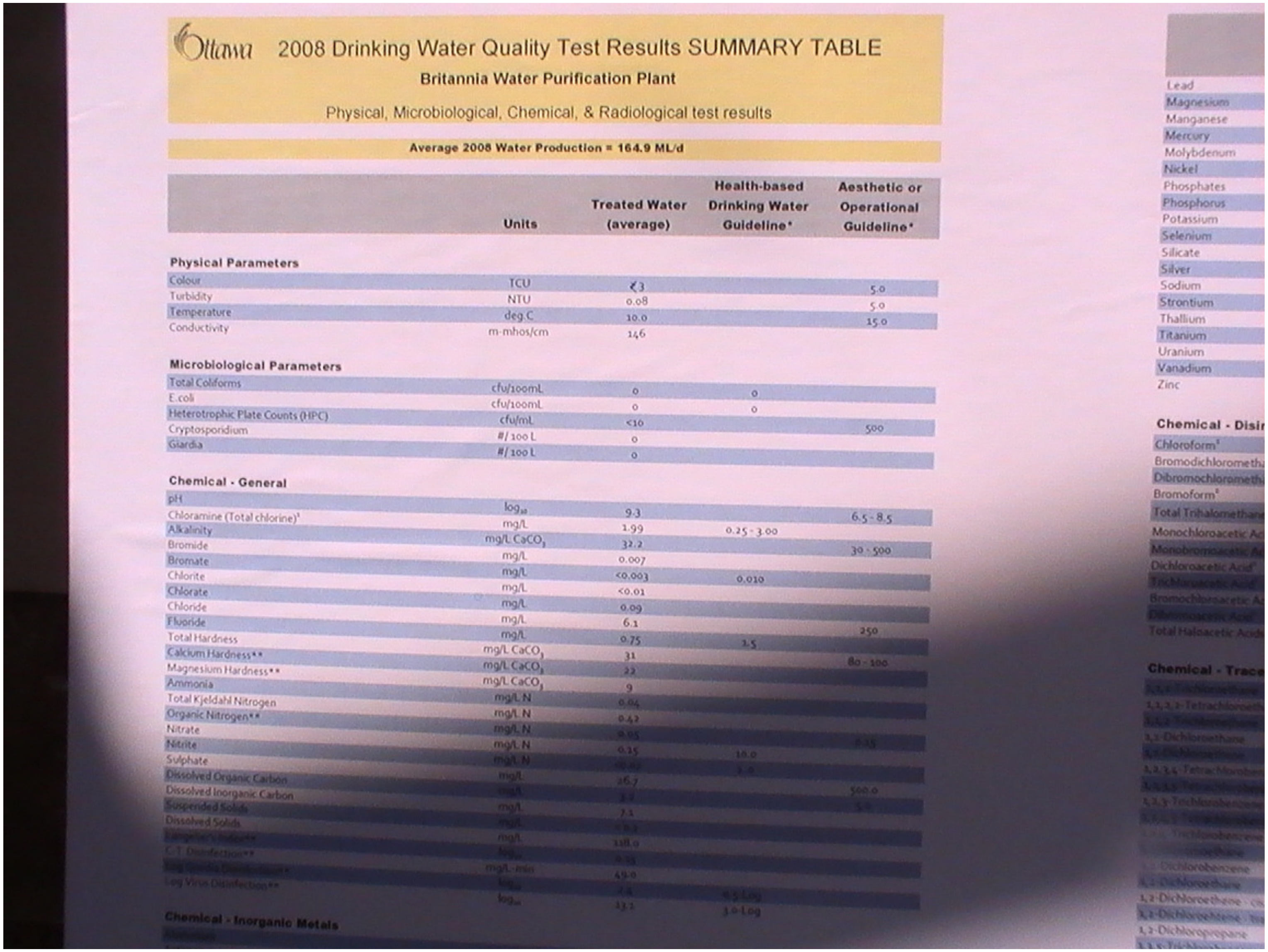


My first question was what Ottawa
had to do with the American Water Works

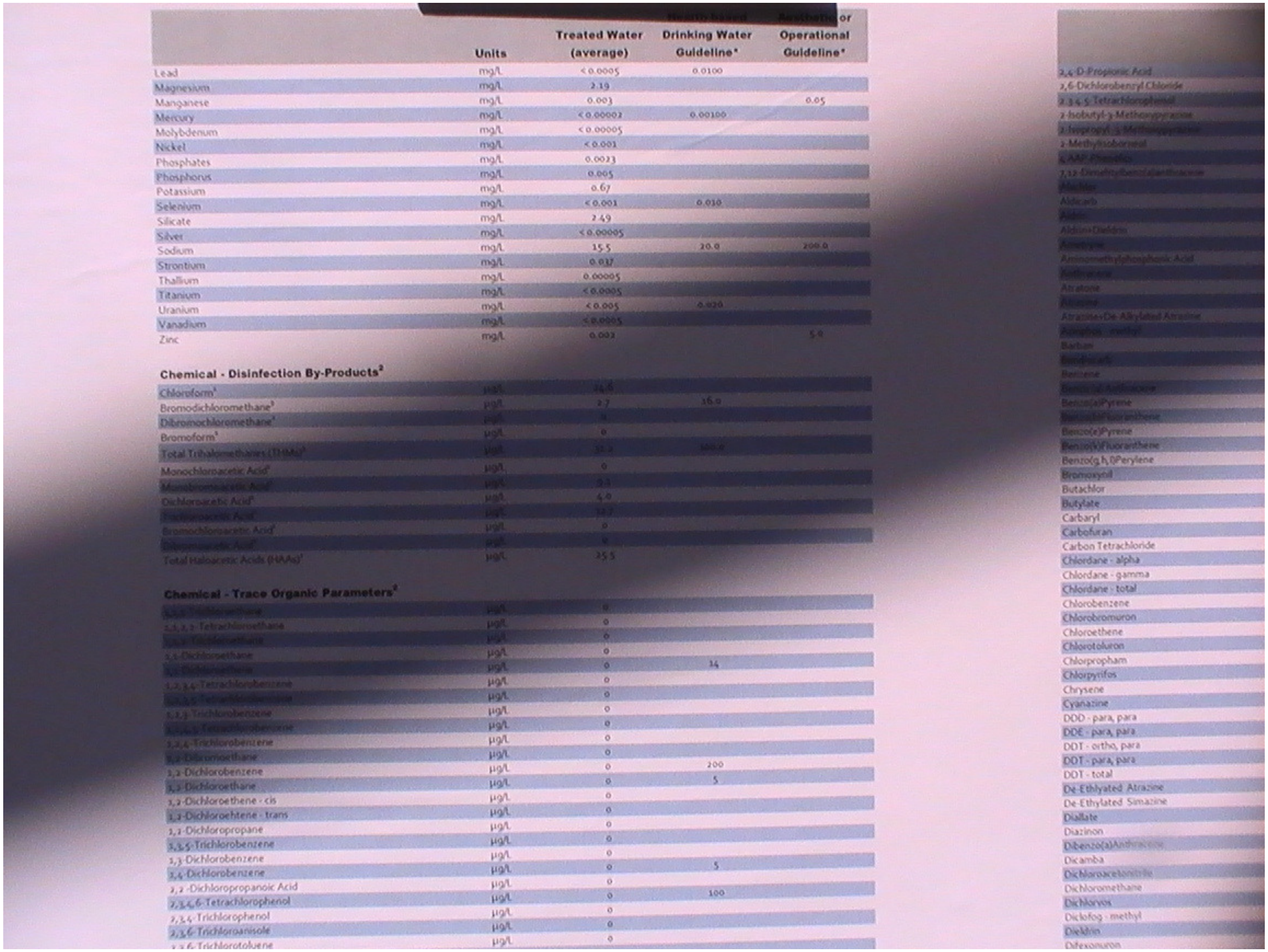
HERE WE ARE TOLD WHAT POISINS ARE USED
TO DISINFECT THE WATER



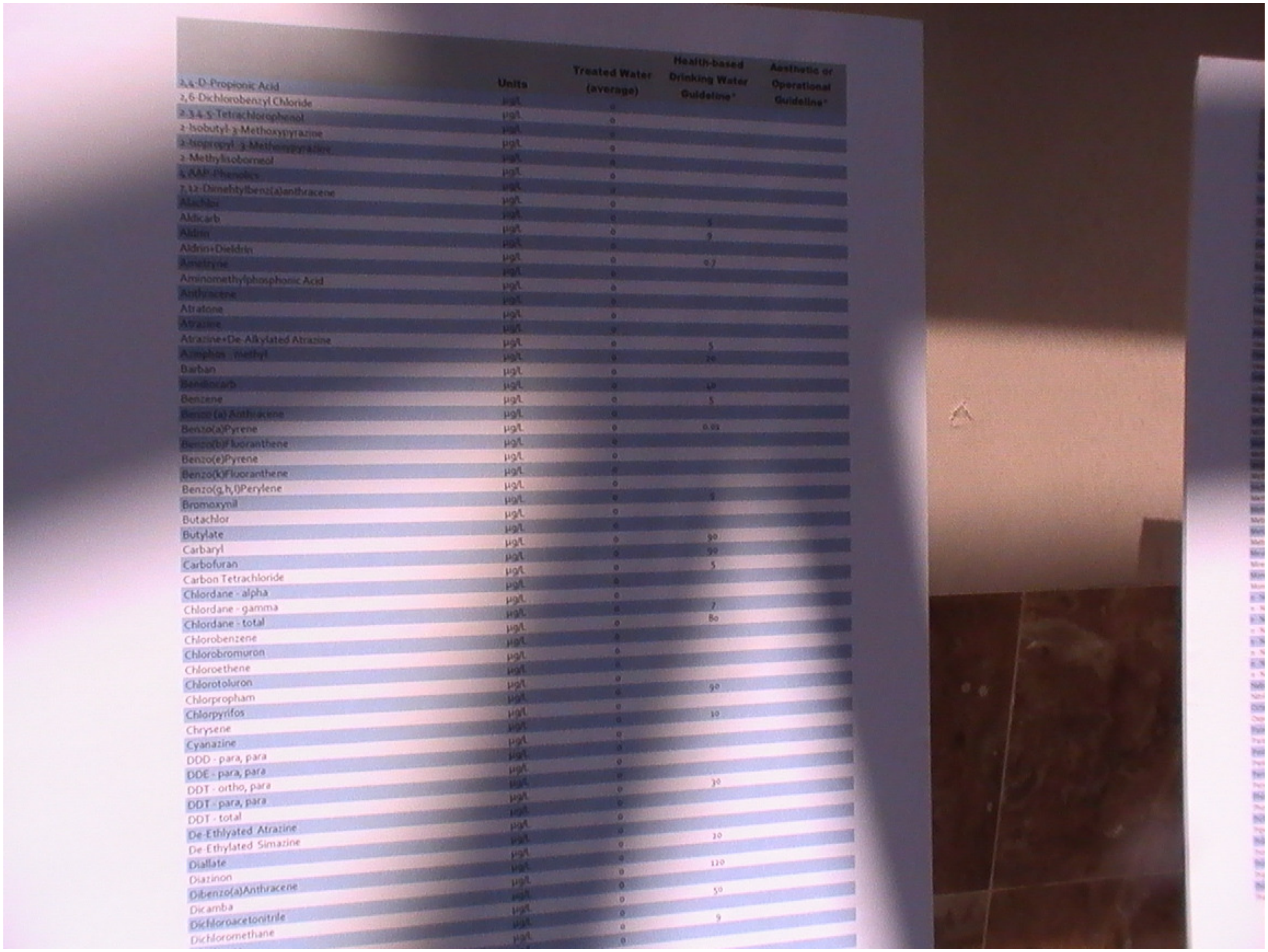
They do not hide what is in the treated water



The lists of containments on the wall just kept coming.



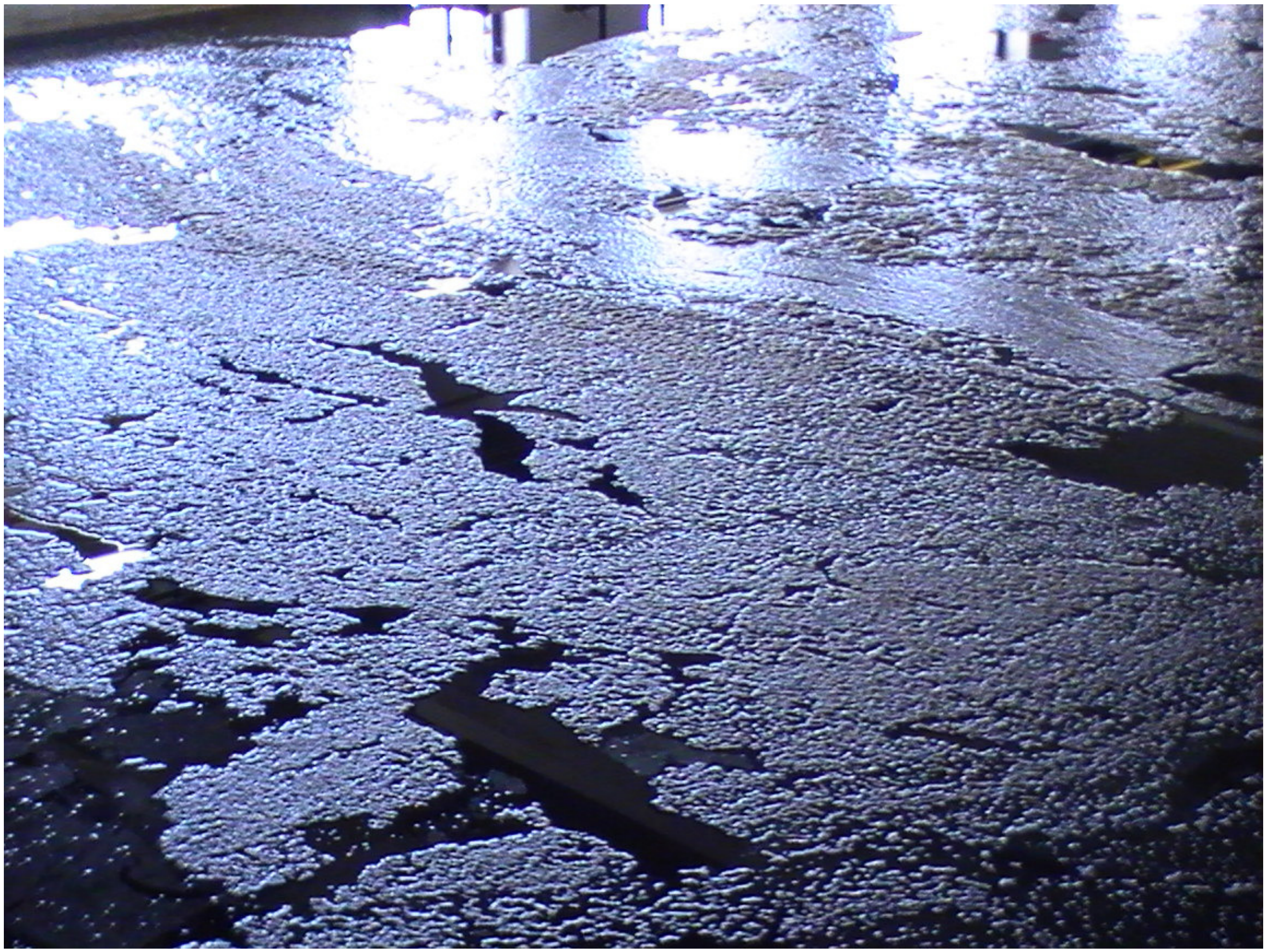
The general public would not have a clue what any of these contaminants could do to us.



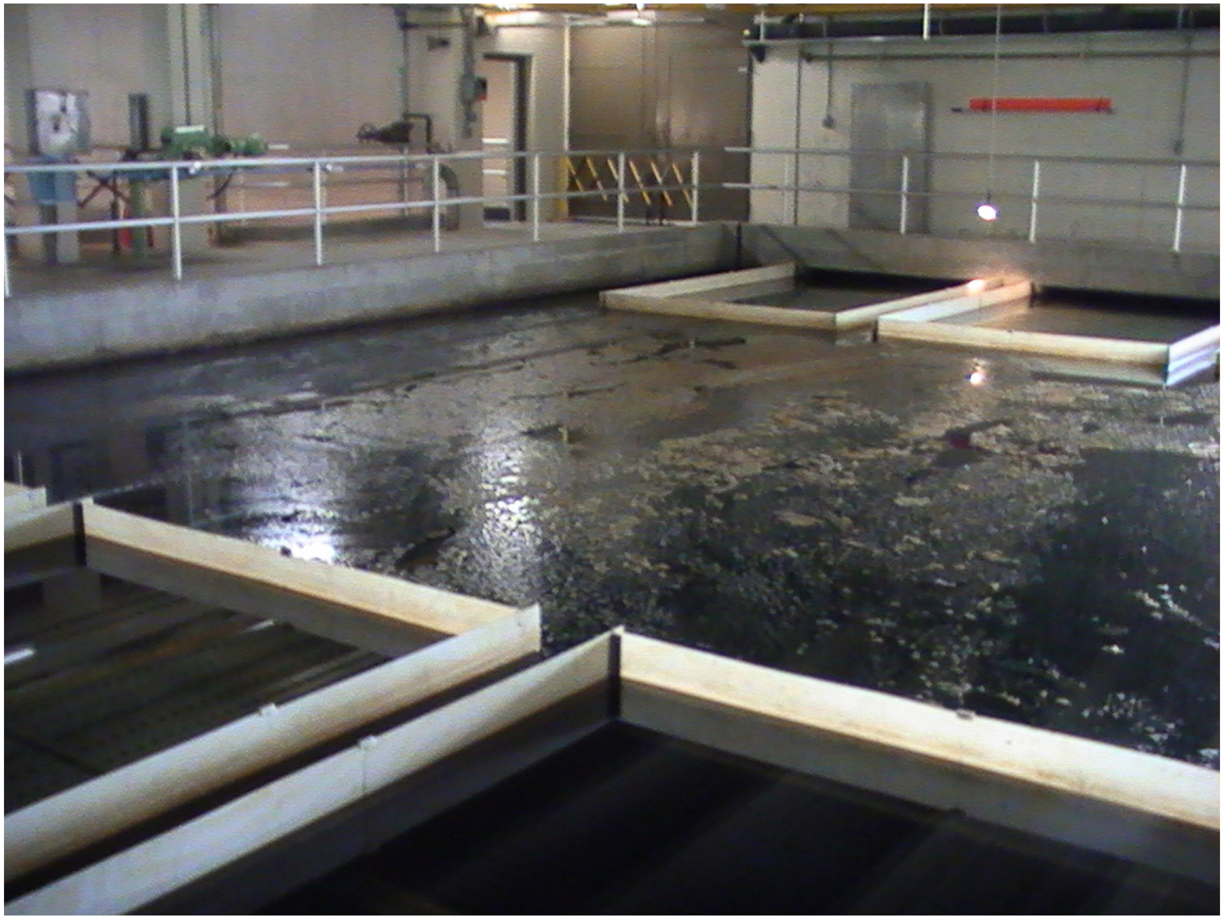
	Units	Treated Water (average)	Health-based Drinking Water Guideline*	Aesthetic or Operational Guideline*
2,4-D-Propionic Acid	μg/L	0		
2,6-Dichlorobenzyl Chloride	μg/L	0		
2,3,4,5-Tetrachlorophenol	μg/L	0		
2-Isobutyl-3-Methoxypyrazine	μg/L	0		
2-Isopropyl-3-Methoxypyrazine	μg/L	0		
2-Methylisoborneol	μg/L	0		
4-AAP-Phenolics	μg/L	0		
7,12-Dimehtylbenz(a)anthracene	μg/L	0		
Alachlor	μg/L	0	5	
Aldicarb	μg/L	0	9	
Aldrin	μg/L	0		
Aldrin+Dieldrin	μg/L	0	0.7	
Ametryne	μg/L	0		
Aminomethylphosphonic Acid	μg/L	0		
Anthracene	μg/L	0		
Atratone	μg/L	0		
Atrazine	μg/L	0		
Atrazine+De-Alkylated Atrazine	μg/L	0	5	
Azinphos - methyl	μg/L	0	20	
Barban	μg/L	0		
Bendiocarb	μg/L	0	40	
Benzene	μg/L	0	5	
Benzo (a) Anthracene	μg/L	0		
Benzo(a)Pyrene	μg/L	0	0.01	
Benzo(b)Fluoranthene	μg/L	0		
Benzo(e)Pyrene	μg/L	0		
Benzo(k)Fluoranthene	μg/L	0		
Benzo(g,h,i)Perylene	μg/L	0		
Bromoxynil	μg/L	0	5	
Butachlor	μg/L	0		
Butylate	μg/L	0		
Carbaryl	μg/L	0	90	
Carbofuran	μg/L	0	90	
Carbon Tetrachloride	μg/L	0	5	
Chlordane - alpha	μg/L	0		
Chlordane - gamma	μg/L	0		
Chlordane - total	μg/L	0	7	
Chlorobenzene	μg/L	0	80	
Chlorobromuron	μg/L	0		
Chloroethene	μg/L	0		
Chlorotoluron	μg/L	0		
Chlorpropham	μg/L	0		
Chlorpyrifos	μg/L	0	90	
Chrysene	μg/L	0		
Cyanazine	μg/L	0	10	
DDD - para, para	μg/L	0		
DDE - para, para	μg/L	0		
DDT - ortho, para	μg/L	0		
DDT - para, para	μg/L	0		
DDT - total	μg/L	0	30	
De-Ethlyated Atrazine	μg/L	0		
De-Ethylated Simazine	μg/L	0		
Diallate	μg/L	0		
Diazinon	μg/L	0	20	
Dibenzo(a)Anthracene	μg/L	0		
Dicamba	μg/L	0	120	
Dichloroacetonitrile	μg/L	0		
Dichloromethane	μg/L	0	50	

First they bring in the water from the Ottawa river

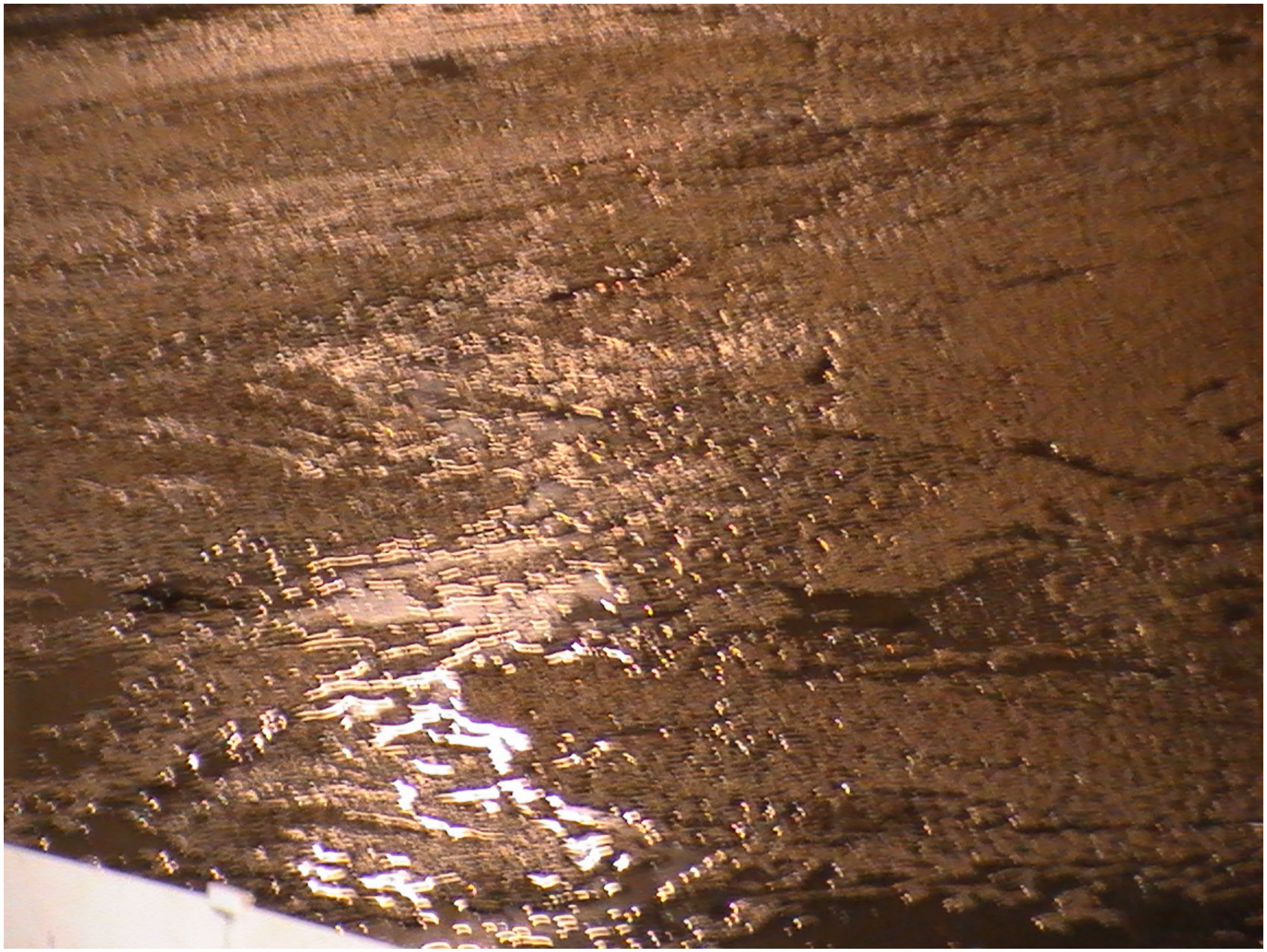
Then they dump in Alum (Aluminum Sulphate) to coagulate the algae.



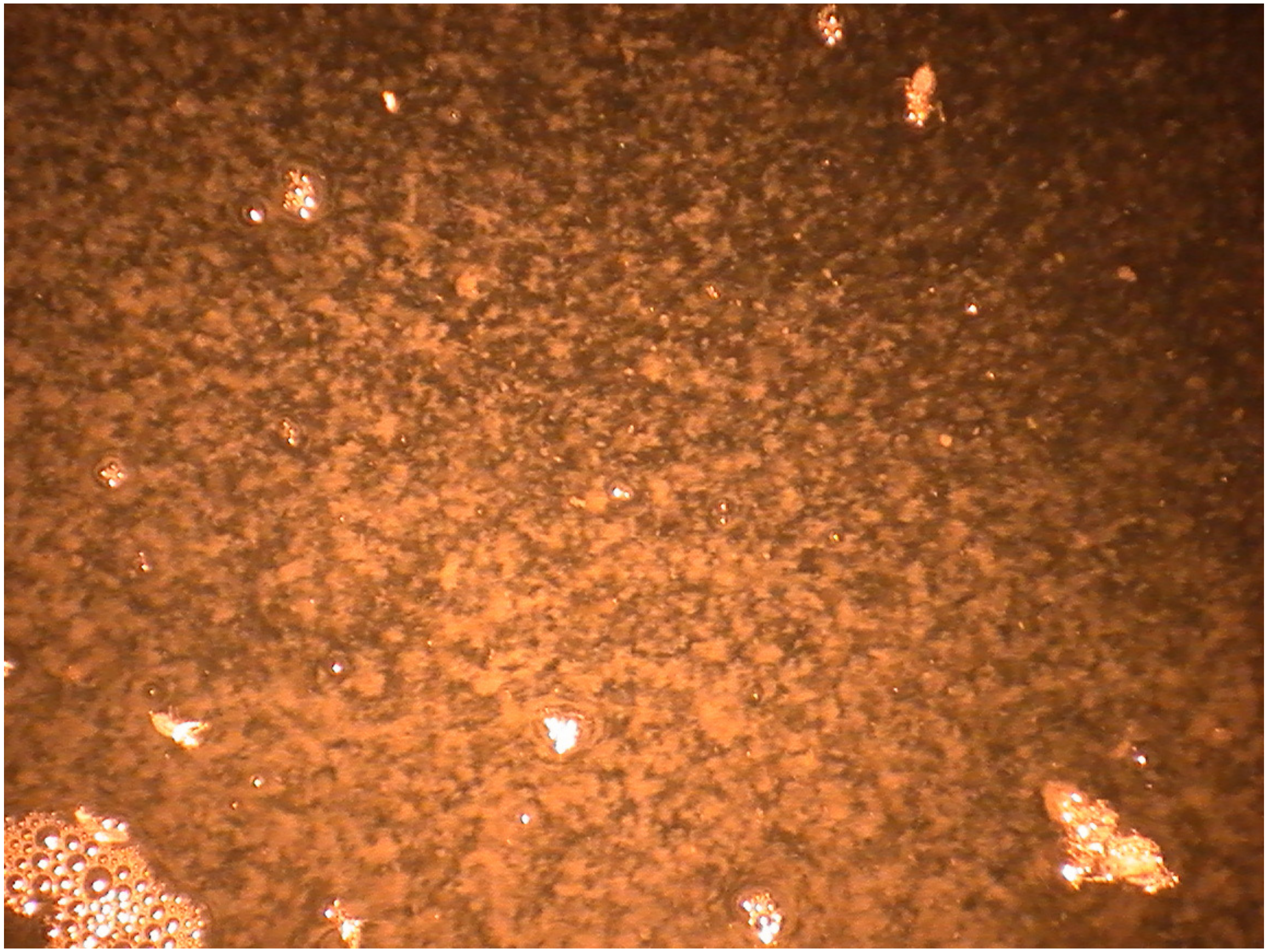
They sift out the chunks and Algae



If the public only could see what the water looked like before they treat it.



The real nasty stuff they flush out back into the river with the Alum.
That's another story.

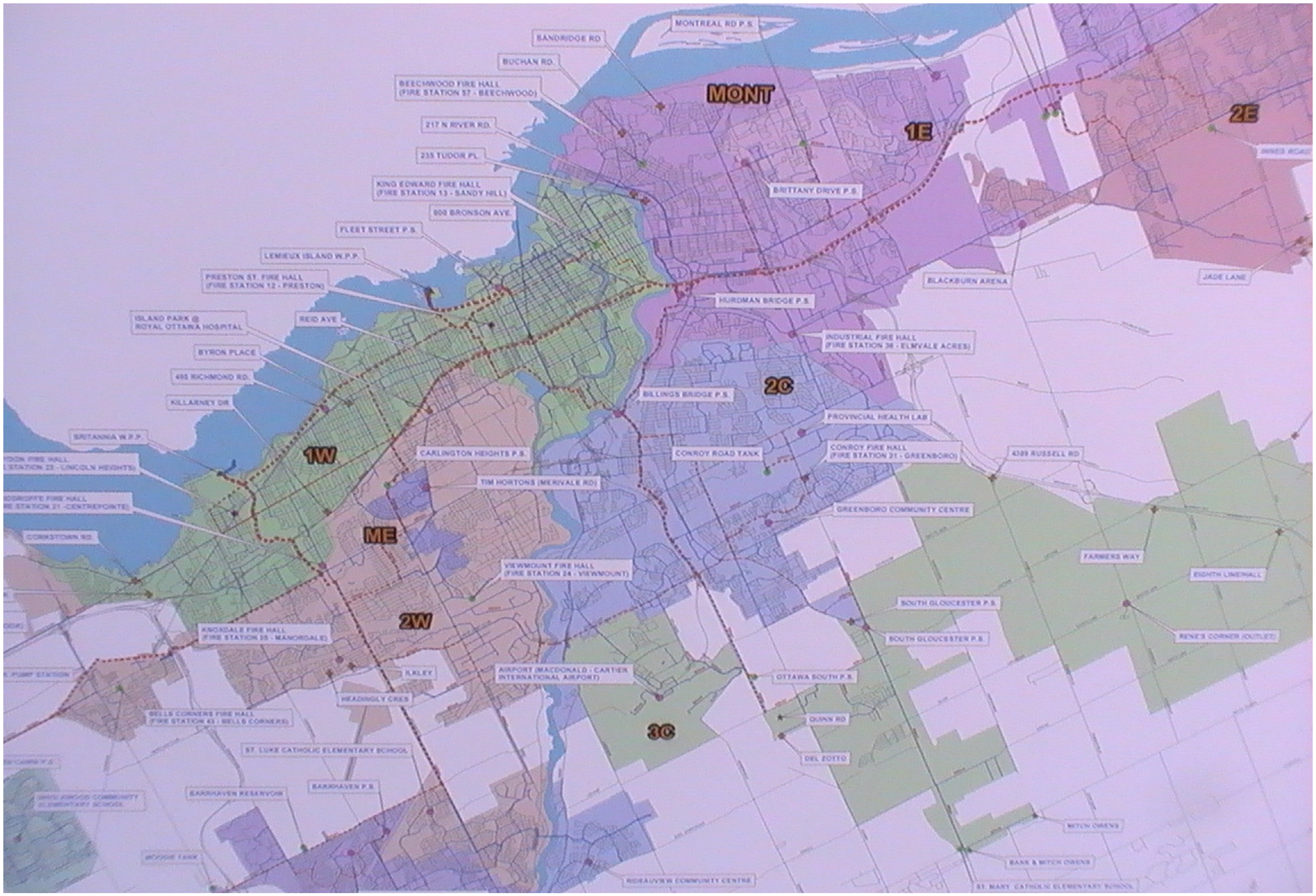


Maybe this is one of the reasons we are not allowed to swim in the river?

E.coli seeps into the river from sewage overflows, animal droppings and fertilizer runoff from farmer's crops. At high enough levels, E.coli can cause skin rashes, eye, ear or nose infections, and can be very dangerous for someone with an open wound.

Here the water is getting a shot of Sulfuric Acid before of travels to the pipes to get injected with Chlorine

Before the water is sent down hundreds of kilometers of networks of pipes it is given a serious shot of Chloramine (a mixture of Chlorine and Ammonia) so as not to build up bacteria along the way. Some of these pipes are hundreds of years old.



Millions of litres of raw sewage gets dumped into the Ottawa river every year. Most of the time we are not allowed to swim in it, so it is amazing that they can make the water clear enough to give people the impression that it's safe to drink.

Ottawa had 384 overflow incidents that added up to 851 million litres of raw sewage seeping into the river from combined sewers.

This is an admirable effort for which the city should be congratulated. However, all of those toxic chemicals remain in the drinking water right up to your tap, along with the 40 chemicals that the city monitors and assures us are at supposedly "acceptable" levels, and with the 2000+ other chemicals that have been found in drinking water that they do not have the resources to identify or remove. The City's claims of producing safe water (according to federal and provincial guidelines) are true, provided your definition of safe applies only to the risk of waterborne disease.

However, the research community, including Health Canada, The Public Health Agency of Canada, The Food and Drug Administration (FDA), the Centre for Disease Control (CDC) and the Environmental Protection agency (EPA) in the US, The World Health Organization, Universities of Calgary, Minnesota, Alberta and Memorial University in Newfoundland, Journal of the National Cancer Institute, Medical College of Wisconsin, American Journal of Public Health, Water Quality Association, New Scientist and Science News magazines, National Academy of Sciences, US Council of Environmental Quality and hundreds of other national and international organizations have for decades, clearly identified that drinking chlorinated water over an extended period leads to cancer, heart disease and a long list of other life threatening diseases.

The greatest danger we all face is this cocktail of chemicals that go on to form further toxic chemical compounds. One obvious example is the known carcinogenic Trihalomethanes that are created when chlorine is added to the water and then reacts with the organic material in the water.

SO WHY DOESN'T THE CITY DO SOMETHING ABOUT IT?

Because they can't. Unfortunately the city has a dilemma that is virtually impossible to resolve. The city has to produce 281 million litres of water every day so that we can turn on our taps and wash dishes, do laundry, flush toilets, water our lawns and even drink some of it. The water we actually consume is far less than five percent of the water that is disinfected. To actually "purify" that much water every day would send our property taxes through the roof and even if they could remove all the chemicals at the plant it would become re-contaminated as it passes through the 2800 kilometers of crud laden water pipe to get to our taps. I was told at the Ottawa filtration plant that it takes three weeks for the water to reach my home. The city is having difficulty building an infrastructure to separate rainwater from raw sewage. Just think what a system to separate drinking water would cost.

<<<< These are new water pipes on the left that are being used to gradually replace the older crud laden water pipes on the lower right.

The dilemma the city faces is virtually impossible to resolve and even if it were possible it would more than double our property taxes. However, there is a simple and relatively inexpensive solution to this major problem. I personally praise the city for all of the work they do to keep us safe from deadly diseases and I want that chlorine in the water right up to my taps.

At that point I can decide whether I install a good water purification system to protect my family's health or just sit back and let them become the filter. If you decide your family should become the filter then remember replacing the clogged human organs can be a long, painful and sometimes fatal process and you always get a used one. As for me I would rather be able to discard the filter cartridge with all the bacteria, toxic chemicals, heavy metals and other toxic contaminants and start fresh with a new cartridge each year or two.

I say a "good" water purification system simply because there are so many water purifiers that imply that they purify the water, but don't. At least the Brita Company is honest enough to state in the small print, hidden on the inside of the refill packaging that "The Brita Pitcher Filter is not intended to purify water". There are so many carbon filters that are cheap but only do half the job. There are sophisticated reverse osmosis systems that remove everything including the essential minerals and cause the water to be acidic. Fortunately after a lot of research I found that there are some really good water purifiers on the market that really do remove 99.99% of the contaminants and still retain the essential minerals and natural PH balance.

I personally prefer the four stage ‘Full Spectrum’ purifier with a washable ceramic cartridge that filters down to 0.3 of a micron and you get to see all the crud in the water that is trapped on the outside of the ceramic cartridge as shown in the picture on the next page.

A good purifier is not that expensive when considering the long term health of you and your family.

If you draw your drinking water from a well, you should remember that many of the chemicals mentioned above have infiltrated the ground water aquifers and of course are not identified when you have your water tested, as the lab is only testing for e.coli and total coliform, but do not look for any toxic chemical contaminants in the water. Even people on a well should seriously consider a good filtration system. If you have a salt softener and therefore need to buy a reverse osmosis system, to remove the excessive sodium, then watch for two important features. Number one is that it has a remineralizing cartridge to put the natural minerals back into the water. Number two is to watch for price. A local company recently featured on the CBC’s Marketplace, for bad marketing practices, sells their reverse osmosis system for $4300.00 when another local water filter company sells an identical, Canadian made, “remineralizing” reverse osmosis system for $995.00

This is a picture of my washable ceramic cartridge with the brown residue from the city water that it has removed before my family drinks it. A new cartridge is white. It's nice to see what you don't have to drink and that your purifier is really working for you.

You thought taking a shower was safe. Doctors are now saying that taking a nice hot 10 minute shower exposes the body, through inhalation and skin absorption, to as much chemical contamination as drinking four litres of city water. Some doctors have suggested that people without shower filters should seriously consider having very short showers with water as cool as they possibly can as the heat creates more contaminated vapour mist to inhale. There are even filters that just hang on the spout while you fill the bath, for people that like to have a long soak in the bathtub or for bathing little children.

Some interesting facts:

- Most people who don't drink city water, say it is because of the taste of chlorine and drink other flavoured drinks instead.
- Many youth, once given purified water switch away from sugar laden drinks and are quite happy to drink purified water.
- Many citizens who drink chlorinated water do not taste the chlorine because their taste buds, like smokers, have become insensitive to the taste and it often takes several months of drinking purified water before it returns.
- People who drink eight glasses of purified water a day decrease the risk of colon cancer by 45%, breast cancer by 79%, bladder cancer by 50%, rectal cancer by 38% as well as preventing or reducing incidence of back and joint pain, kidney stones, urinary tract infections, constipation and migraine headaches. Water is certainly not the only cause of cancer but it is a major contributor.
- The body can survive a week without food but cannot survive a day without water.

Research and evidence to support the content of this article are provided by Health Canada, The Public Health Agency of Canada, The Food and Drug Administration (FDA), the Centre for Disease Control (CDC) and the Environmental Protection agency (EPA) in the US, The World Health Organization, Universities of Calgary, Minnesota, Alberta and Memorial University in Newfoundland, Journal of the National Cancer Institute, Medical College of Wisconsin, American Journal of Public Health, Water Quality Association, New Scientist and Science News magazines, National Academy of Sciences, US Council of Environmental Quality and hundreds of other national and international organizations concerned about the effect of drinking water on the health of individuals.

Water Treatment Chemicals

For the chemical treatment of water a great variety of chemicals can be applied. Below, the different types of water treatment chemicals are summed up.

- **Algaecides**
- **Antifoams**
- **Biocides**
- **Boiler water chemicals**
- **Coagulants**
- **Corrosion inhibitors**
- **Disinfectants**
- **Flocculants**
- **Neutralizing agents**
- **Oxidants**
- **Oxygen scavengers**
- **pH conditioners**
- **Resin cleaners**
- **Scale inhibitors**

Algaecides
Algaecides are chemicals that kill algae and blue or green algae, when they are added to water. Examples are copper sulphate, iron salts, rosin amine salts and benzalkonium chloride. Algaecides are effective against algae, but are not very usable for algal blooms for environmental reasons.
The problem with most algaecides is that they kill all present algae, but they do not remove the toxins that are released by the algae prior to death.

Antifoams
Foam is a mass of bubbles created when certain types of gas are dispersed into a liquid. Strong films of liquid than surround the bubbles, forming large volumes of non-productive foam.
The cause of foam is a complicated study in physical chemistry, but we already know that its existence presents serious problems in both the operation of industrial processes and the quality of finished products. When it is not held under control, foam can reduce the capacity of equipment and increase the duration and costs of processes.
Antifoam blends contain oils combined with small amounts of silica. They break down foam thanks to two of silicone's properties: incompatibility with aqueous systems and ease of spreading. Antifoam compounds are available either as powder or as an emulsion of the pure product.

Powder
Antifoam powder covers a group of products based on modified polydimethylsiloxane. The products vary in their basic properties, but as a group they introduce excellent antifoaming in a wide range of applications and conditions.
The antifoams are chemically inert and do not react with the medium that is defoamed. They are odourless, tasteless, non-volatile, non-toxic and they do not corrode materials. The only disadvantage of the powdery product is that it cannot be used in watery solutions.

Emulsions
Antifoam Emulsions are aqueous emulsions of polydimethylsiloxane fluids. They have the same properties as the powder form, the only difference is that they can also be applied in watery solutions.

Biocides
See disinfectants
Detailed information on biocides is also available here

Boiler water chemicals
Boiler water chemicals include all chemicals that are used for the following applications:
· Oxygen scavenging;
· Scale inhibition;
· Corrosion inhibition;
· Antifoaming;
· Alkalinity control.

Coagulants
When referring to coagulants, positive ions with high valence are preferred. Generally aluminium and iron are applied, aluminium as $Al2(SO4)3-$ (aluin) and iron as either $FeCl3$ or $Fe2(SO4)3-$. One can also apply the relatively cheap form $FeSO4$, on condition that it will be oxidised to $Fe3+$ during aeration.
Coagulation is very dependent on the doses of coagulants, the pH and colloid concentrations. To adjust pH levels $Ca(OH)2$ is applied as co-flocculent. Doses usually vary between 10 and 90 mg $Fe3+$/ L, but when salts are present a higher dose needs to be applied.

Corrosion inhibitors
Corrosion is a general term that indicates the conversion of a metal into a soluble compound.
Corrosion can lead to failure of critical parts of boiler systems, deposition of corrosion products in critical heat exchange areas, and overall efficiency loss.
That is why corrosion inhibitors are often applied. Inhibitors are chemicals that react with a metallic surface, giving the surface a certain level of protection. Inhibitors often work by adsorbing themselves on the metallic surface, protecting the metallic surface by forming a film.

There are five different kinds of corrosion inhibitors. These are:
1) Passivity inhibitors (passivators). These cause a shift of the corrosion potential, forcing the metallic surface into the passive range. Examples of passivity inhibitors are oxidizing anions, such as chromate, nitrite and nitrate and non-oxidizing ions such as phosphate and molybdate. These inhibitors are the most effective and consequently the most widely used.
2) Cathodic inhibitors. Some cathodic inhibitors, such as compounds of arsenic and antimony, work by making the recombination and discharge of hydrogen more difficult. Other cathodic inhibitors, ions such as calcium, zinc or magnesium, may be precipitated as oxides to form a protective layer on the metal.
3) Organic inhibitors. These affect the entire surface of a corroding metal when present in certain concentration. Organic inhibitors protect the metal by forming a hydrophobic film on the metal surface. Organic inhibitors will be adsorbed according to the ionic charge of the inhibitor and the charge on the surface.
4) Precipitation inducing inhibitors. These are compounds that cause the formation of precipitates on the surface of the metal, thereby providing a protective film.
The most common inhibitors of this category are silicates and phosphates.
5) Volatile Corrosion Inhibitors (VCI). These are compounds transported in a closed environment to the site of corrosion by volatilisation from a source. Examples are morpholine and hydrazine and volatile solids such as salts of dicyclohexylamine, cyclohexylamine and hexamethylene-amine. On contact with the metal surface, the vapour of these salts condenses and is hydrolysed by moist, to liberate protective ions.

Disinfectants

Disinfectants kill present unwanted microrganisms in water. There are various different types of disinfectants:
· Chlorine (dose 2-10 mg/L)
· Chlorine dioxide
· Ozone
· Hypochlorite

Chlorine dioxide disinfection
ClO2 is used principally as a primary disinfectant for surface waters with odor and taste problems. It is an effective biocide at concentrations as low as 0.1 ppm and over a wide pH range. ClO2 penetrates the bacterial cell wall and reacts with vital amino acids in the cytoplasm of the cell to kill the organisms. The by-product of this reaction is chlorite. Chlorine dioxide disinfects according to the same principle as chlorine, however, as opposed to chlorine, chlorine dioxide has no harmful effects on human health.

Hypochlorite disinfection
Hypochlorite is aplied in the same way as chlorine dioxide and chlorine. Hypo chlorination is a disinfection method that is not used widely anymore, since an environmental agency proved that the Hypochlorite for disinfection in water was the cause of bromate consistence in water.

Ozone disinfection
Ozone is a very strong oxidation medium, with a remarkably short life span. It consists of oxygen molecules with an extra O-atom, to form O3. When ozone comes in contact with odour, bacteria or viruses the extra O-atom breaks them down directly, by means of oxidation. The third O-atom of the ozone molecules is than lost and only oxygen will remain.

Disinfectants can be used in various industries. Ozone is used in the pharmaceutical industry, for drinking water preparation, for treatment of process water, for preparation of ultra-pure water and for surface disinfection. Chlorine dioxide is used primarily for drinking water preparation and disinfection of piping.

Every disinfection technique has its specific advantages and its own application area. In the table below some of the advantages and disadvantages are shown:
*TechnologyEnvironmentally friendlyByproductsEffectivityInvestmentOperational costsFluidsSurfaces*Ozone+

Flocculants
To promote the formation of flocs in water that contains suspended solids polymer flocculants (polyelectrolytes) are applied to promote bonds formation between particles. These polymers have a very specific effect, dependent upon their charges, their molar weight and their molecular degree of ramification. The polymers are water-soluble and their molar weight varies between 105 and 106 g/mol.
There can be several charges on one flocculent. There are cationic polymers, based on nitrogen, anionic polymers, based on carboxylate ions and polyampholytes, which carry both positive and negative charges.

Neutralizing agents (alkalinity control)
In order to neutralize acids and basics we use either sodium hydroxide solution (NaOH), calcium carbonate, or lime suspension (Ca(OH)2) to increase pH levels. We use diluted sulphuric acid (H2SO4) or diluted hydrochloric acid (HCl) to decline pH levels. The dose of neutralizing agents depends upon the pH of the water in a reaction basin. Neutralization reactions cause a rise in temperature.

Oxidants
Chemical oxidation processes use (chemical) oxidants to reduce COD/BOD levels, and to remove both organic and oxidisable inorganic components. The processes can completely oxidise organic materials to carbon dioxide and water, although it is often not necessary to operate the processes to this level of treatment
A wide variety of oxidation chemicals are available. Examples are:
· Hydrogen peroxide;
· Ozone;
· Combined ozone & peroxide;
· Oxygen.

Hydrogen peroxide

Hydrogen peroxide is widely used thanks to its properties; it is a safe, effective, powerful and versatile oxidant. The main applications of H_2O_2 are oxidation to aid odour control and corrosion control, organic oxidation, metal oxidation and toxicity oxidation. The most difficult pollutants to oxidize may require H_2O_2 to be activated with catalysts such as iron, copper, manganese or other transition metal compounds.

Ozone

Ozone cannot only be applied as a disinfectant; it can also aid the removal of contaminants from water by means of oxidation. Ozone then purifies water by breaking up organic contaminants and converting inorganic contaminants to an insoluble form that can then be filtered out. The Ozone system can remove up to twenty-five contaminants.
Chemicals that can be oxidized with ozone are:

· Absorbable organic halogens;
· Nitrite;
· Iron;
· Manganese;
· Cyanide;
· Pesticides;
· Nitrogen oxides;
· Odorous substances;
· Chlorinated hydrocarbons;
· PCB's.

Oxygen

Oxygen can also be applied as an oxidant, for instance to realize the oxidation of iron and manganese. The reactions that occur during oxidation by oxygen are usually quite similar.
These are the reactions of the oxidation of iron and manganese with oxygen:

$2\ Fe^{2+} + O_2 + 2\ OH^- \rightarrow Fe_2O_3 + H_2O$

$2\ Mn^{2+} + O_2 + 4\ OH^- \rightarrow 2\ MnO_2 + 2\ H_2O$

Oxygen scavengers

Oxygen scavenging means preventing oxygen from introducing oxidation reactions. Most of the naturally occurring organics have a slightly negative charge. Due to that they can absorb oxygen molecules, because these carry a slightly positive charge, to prevent oxidation reactions from taking place in water and other liquids. Oxygen scavengers include both volatile products, such as hydrazine (N_2H_4) or other organic products like carbohydrazine, hydroquinone, diethylhydroxyethanol, methylethylketoxime, but also non-volatile salts, such as sodium sulphite (Na_2SO_3) and other inorganic compounds, or derivatives thereof. The salts often contain catalysing compounds to increase the rate of reaction with dissolved oxygen, for instance cobalt chloride.

pH conditioners

Municipal water is often pH-adjusted, in order to prevent corrosion from pipes and to prevent dissolution of lead into water supplies. During water treatment pH adjustments may also be required. The pH is brought up or down through addition of basics or acids. An example of lowering the pH is the addition of hydrogen chloride, in case of a basic liquid. An example of bringing up the pH is the addition of natrium hydroxide, in case of an acidic liquid. The pH will be converted to approximately seven to seven and a half, after addition of certain concentrations of acids or basics. The concentration of the substance and the kind of substance that is added, depend upon the necessary decrease or increase of the pH.

Resin cleaners

Ion exchange resins need to be regenerated after application, after that, they can be reused. But every time the ion exchangers are used serious fouling takes place. The contaminants that enter the resins will not be removed through regeneration; therefore resins need cleaning with certain chemicals.
Chemicals that are used are for instance sodium chloride, potassium chloride, citric acid and chlorine dioxide. Chlorine dioxide cleansing serves the removal of organic contaminants on ion exchange resins. Prior to every cleaning treatment resins should be regenerated. After that, in case chlorine dioxide is used, 500 ppm of chlorine dioxide in solution is passed through the resin bed and oxidises the contaminants.

Scale inhibitors

Scale is the precipitate that forms on surfaces in contact with water as a result of the precipitation of normally soluble solids that become insoluble as temperature increases. Some examples of scale are calcium carbonate, calcium sulphate, and calcium silicate.
Scale inhibitors are surface-active negatively charged polymers. As minerals exceed their solubility's and begin to merge, the polymers become attached. The structure for crystallisation is disrupted and the formation of scale is prevented. The particles of scale combined with the inhibitor will than be dispersed and remain in suspension.
Examples of scale inhibitors are phosphate esters, phosphoric acid and solutions of low molecular weight polyacrylic acid.

On this website you can also find information on pooltesters and poolcheck
For terminology on water please check our Water Glossary

Read more: http://www.lenntech.com/products/chemicals/water-treatment-chemicals.htm#ixzz0dDQoGhD5