37 Pittmann Cres.
Ajax, Ontario
L1S 3G4
October 28, 1993

Gordon Durnil and Claude Lanthier, Co-Chairs
International Joint Commission
Washington, D.C. and Ottawa, Ontario

Re: Six Recommendations to the IJC on Radionuclides

Dear Chairmen Durnil and Lanthier,

As requested by you at the 1993 Biennial IJC meeting on Great Lakes Water Quality, October 24, in Windsor, Ontario, attached are our six recommendations. They centre on the issue of tritium in drinking water, and the standards and studies on this persistent toxic substance.

We hope these recommendations are helpful in the formulation of your report. If further information or dialogue would be useful, we would be happy to meet with you.

We can be reached at the above address, or at (905) 686-0654.

Thank you for your consideration of our concerns.

Yours truly,

R.G. (Bob) Willard

S.B. (Sherrill) Willard

RECOMMENDATIONS TO THE IJC

ISSUE # 1:

GIVEN THAT: CANADIAN STANDARDS FOR TRITIUM IN DRINKING WATER ARE 280 TIMES HIGHER THAN U.S. STANDARDS

. The U.S. standard for tritium concentration in drinking water is 740 Bequerals/Litre (Bq/L).

. There are 3 Canadian tritium concentration "limits" that are variously quoted:

1. Maximum Permissable Concentration (MPC): 210,000 Bq/L
2. Maximum Acceptable Concentration (MAC): 40,000 Bq/L
3. "Target Concentration": 4,000 Bq/L

. Since only the highest, MPC, is used in Ontario Hydro's Health and Safety Division tables and charts of tritium in drinking water in their "Annual Summary and Assessment of Environmental Radiological Data" documents (1), then the de facto Canadian standard is 210,000 Bq/L.

. This Canadian standard of 210,000 Bq/L, when compared to the U.S. standard of 740 Bq/L, is 280 times the U.S. standard. (See attached chart: "U.S vs. Canadian Standards")

... AND GIVEN THAT: THERE IS NO EVIDENCE THAT CANADIANS ARE 280 TIMES MORE RESISTANT TO PERSISTENT TOXIC SUBSTANCES THAN AMERICANS!

... AND GIVEN THAT: THE HUGE 2,400,000,000,000,000 BEQUERAL SPILL OF TRITIUM AT THE PICKERING NUCLEAR GENERATING STATION WOULD HAVE CLOSED THE AJAX WATER PLANT FOR AT LEAST AUG 6-8 IN 1992 IF IT HAD BEEN LOCATED IN THE U.S.

. Hydro's own documents admit that there was an accidental huge release of 2,400 Terabequerals of tritium into lake Ontario on August 2, 1992 from its Pickering Nuclear Generating Station (NGS). That is 2,400 trillion bequerals! That is 2,400,000,000,000,000 Bequerals - more than 5 times the total 1990 tritium release of 440 -trillion bequerals from the same plant! (1) This was a massive spill, in both absolute and relative terms!

. It normally takes only 3-8 hours for effluent from the Pickering NGS to reach the Ajax water supply plant, which is just 2.5 miles downstream. (See attached chart: "Location Map"). It took 6 hours to discover the August 2, 1992, spill had happened, and another 5 hours to close the Ajax water plant. By that time, we normally would have been drinking it! By an incredibly fortunate set of unusual current conditions, it took 4 days before the spill reached the water plant (2), allowing it to be significantly diluted.

. Even so, the tritium in the Ajax water was above the **U.S. 740 Bq/L limit on 3 days** - August 6, 7, and 8 (See attached chart: "Ajax W.S.P. Tritium Concentrations in Raw and Treated Water, August 2 1992 to August 15, 1992") (3). The Ajax water plant stayed open, however, for all but 4 hours on August 2, so **we were drinking water that exceeded American standards.** This unacceptable situation could have easily lasted for at least a week, and in much higher concentrations, and still have been within Canada's much looser standards. We were just lucky that the concentration was diluted by the unusual 4-day delay caused by the lake currents.

... AND GIVEN THAT: CANADIAN NUCLEAR REACTORS ARE PERMITTED TO POLLUTE LAKE ONTARIO DAILY WITH TRILLIONS OF BEQUERALS OF TRITIUM BECAUSE OF LOOSE CANADIAN STANDARDS

. Incredibly, Hydro reports that the August 2, 1992 spill was only 3% of their monthly limit, which means it was **within their daily limit.** That means that the Pickering NGS is **permitted an "August 2, 1992-sized" spill every day.** That is, it could leak 2,900 litres of heavy water containing 2,400 trillion bequerals of tritium into Lake Ontario every day, 365 days a year, and still be within Canadian limits!

. Therefore, Canadian nuclear reactors are permitted to pollute the Great Lakes water supply used by both Canadians and Americans with **trillions of bequerals daily** of radioactive persistently toxic tritium - and this under normal conditions, not spill conditions. This puts the health of both countries' citizens using the water supply in potential jeopardy.

WE URGE THE IJC TO: 1. IMMEDIATELY DECLARE THE US.STANDARD OF 740 BQ/L FOR TRITIUM IN DRINKING WATER AS THE MINIMUM STANDARD FOR BOTH CANADA AND THE U.S.

ISSUE #2:

GIVEN THAT: THE PUBLIC AND REGIONAL GOVERNMENTS HAVE BEEN CONDITIONED TO ASSUME "STANDARDS EQUAL SAFETY"

. The Durham Region, for example, assures us that it is safe to build a new 36 Million Imperial Gallons per Day (MIGD) water supply plant to replace the old 12 MIGD plant on the Ajax waterfront, just 2.5 miles downstream from the Pickering NGS.(4) (See attached chart: "Location Map"). From our experience with the August 1992 spill, we already know this is too close to allow enough react time. That's why the U.S. requires water plants to be at least 5 miles away from nuclear plants. There is no evidence that Canadians can react twice as fast as Americans.

. The Region claims that if the standards were not safe, they would be lowered. The Canadian standard is 280 times higher than the U.S. - is it really safe?

. Tritium cannot be filtered out of water in municipal water purification plants. That is, the concentration of tritium sucked in through the intake pipe in the lake is what comes out of our taps.

. The highest weekly tritium concentrations from the Ajax WSP, which is the closest water plant downstream from the Pickering NGS, are consistently 3-9 times higher than tritium concentartions at upstream locations, or at water plants farther away. (See attached chart: "Tritium in Drinking Water - Lake Ontario / 1989") (9) This protracted exposure to low levels of radiation in water has been shown by scientists to cause significant health dangers, as explained below. There is no evidence that "standards equal safety".

... AND GIVEN THAT: THE "PETKAU EFFECT" SHOWS THAT PROLONGED EXPOSURE TO LOW LEVEL RADIATION IN WATER HAS A DISASTROUS IMPACT ON OUR IMMUNE SYSTEM AND CELLS

. In 1972, scientist Abram Petkau at the Canadian Atomic Energy Commission's Whiteshell Nuclear Research Establishment in Manitoba made an amazing accidental discovery. "He demonstrated in the laboratory that low-level radiation generated highly toxic charged oxygen molecules known as 'free radicals' that can destroy cell membranes much more efficiently at low dose rates than at high ones. To his surprise, cell membranes burst from exposure to just 1 rad (a measure

of the amount of radiation absorbed) over a long period of time. Conversely, Dr. Petkau had previously found that 3,500 rads were required to break the cell membrane when X-rays were applied for only a few minutes." (5)

. The "Petkau Effect" states:
"A protracted exposure to ingested beta emitters may be 1,000 times more harmful to cell membranes than a brief exposure to X-rays." (5) "The longer the exposure, the smaller the dose needed to damage cells."(5) Tritium is a beta emitter, and we are unwillingly ingesting a trickle of it every day in our drinking water. Ontario Hydro's reassurances about how little radiation we are receiving from this tritium in our drinking water, compared to X-rays, seem less comforting in light of these scientific facts.

. Immune system damage from low doses:
"Petkau's discovery could explain surprisingly great levels of immune system damage from protracted exposure to very low levels of radiation."(5) "The correlations of health effects with low-level radiation ... may thus be caused indirectly by chronic low-level exposures to ingested radiation through hormonal and immune system damage from free radicals."(5)

. Premature aging from low doses:
"Free radicals are so dangerous to living systems because they form in water, and water comprises 80% of a cell. Free radicals not only destroy healthy cells, but also affect normal cell function in a way believed to speed the aging process."(5)

... AND GIVEN THAT: <u>OTHER RESPECTED INTERNATIONAL SCIENTISTS HAVE CORROBORATED DR. PETKAU'S FINDINGS</u>

. Dr. Charles Waldren and co-researchers have shown that low doses cause mutations: "If free radicals are formed near the cell nucleus, the damaged cell may survive, but in a mutated form ... very low levels of ionizing radiation produce mutations 200 times more efficiently than the conventional method of using high doses, or brief bursts from X-ray machines ... their findings contradict the conventional scientific dogma that the dose response curve is linear, and that a straight line can be used to estimate low-dose effects from studies of high doses."(5)

. Dr. Alice Stewart's British study, based on the Oxford Survey of Childhood Cancers which covers 22,351 cases, as reported in the BEIR V Report (the National Academy of Science's Committee on the Biological

Effects of Ionizing Radiation, 1990): "Extremely small radiation doses in the environment are capable of affecting the future health of individuals exposed as fetuses ... her group discovered a direct correlation of childhood cancers and leukaemia with background levels of gamma radiation from natural and man-made sources in England, Wales, and Scotland ... the standards set for exposure of adults to low-level radiation may be 1,000's of times too high for the developing fetus."(5)

. Other international research scientists supporting these concerns include: Dr. John Gofman, Dr. Karl Morgan, Dr. Thomas Mancuso, Dr. Ernest Sternglass, Dr. McFarlane Burnette, Dr. Alice Frase, Dr. Robin Whyte. (5)(6)

... AND GIVEN THAT: <u>THERE IS MOUNTING WEIGHT OF SCIENTIFIC EVIDENCE THAT OUR CURRENT STANDARDS ARE 100 TO 1,000 TIMES TOO HIGH</u>

. "Government standards for environmental releases of radioactivity from nuclear facilities may be 100 to 1,000 times too high, especially for infants."(5)

. The reference was to American standards. What does this say about Canadian standards, which are 280 times higher than U.S. standards?!

. Standards for radiation exposure are being continuously tightened up. The limit for human exposure recently dropped by a factor or 5 (from .5 rems to .1 rems). The Atomic Energy Control Board (AECB) of Canada is recommending that the radiation dose limit for the general public be reduced by a factor of 10 (from 10 millisieverts to 1 millisievert) during the nine months of pregnancy.

. The Canadian standard for tritium in water has not been reviewed for 14 years. It is time!

WE URGE THE IJC TO: <u>2. SUPPORT AN IMMEDIATE REVIEW OF BOTH THE U.S. AND CANADIAN STANDARDS FOR TRITIUM IN DRINKING WATER TO ENSURE THAT THEY ACCOUNT FOR THE DANGERS OF LOW DOSES ON HUMANS, ESPECIALLY FETUSES.</u>

ISSUE #3:

GIVEN THAT: THE 1991 AECB REPORT HAS ALREADY SHOWN 86% HIGHER DOWN SYNDROME IN INFANTS NEAR THE PICKERING NGS

. In 1991, the Atomic Energy Control Board (AECB) published "Tritium Releases From The Pickering Nuclear Generating Station and Birth Defects and Infant Mortality in Nearby Communities, 1971-1988".(7) Using hospital records, the report looked at still births, physical birth defects, and deaths in the first year of life from 1971-1988

. It did not include spontaneous abortions, which it admits is the "most common adverse reproductive outcome", since it had no data from the hospitals about them

. It did not include less severe mental retardation that was not accompanied by physical deformity

. It did not include a study of childhood diseases beyond 1 year, so cancers and leukaemia which would usually show up between 1 to 4 years of age were not included

. Even with these exclusions, it concluded that Down Syndrome was 86% greater in newborns in the Pickering area than normal ... that's what made the headlines

. It also showed that Down Syndrome in infants from mothers who were only 20-24 years old was 2.65 times higher than is normal for the rest of Ontario (7)

. Of the 22 defects categorized in the AECB report, there were also 5 other defects in addition to Down Syndrome that were 25-71% higher in the Pickering and Ajax areas than in the rest of Ontario. The 5 defects were limb reduction abnormalities; ear, face, and neck abnormalities; urinary system abnormalities; circulatory system abnormalities; and ventricular system abnormalities.(7)

. Graphs in this report dramatically show that the infant standardized mortality ratios for Ajax were consistently 2-5 times higher than those for Scarborough. (See attached chart: "Infant Birth Defect SMRs For Pickering And Adjacent Areas, 1971-1988") (5) The Ajax Water Supply Plant is 2.5 miles downstream from the Pickering NGS, while the Scarborough WSP is 6 miles upstream. Is there a correlation here?

... AND GIVEN THAT: THERE WERE SIGNIFICANT RELEASES FROM THE PICKERING NGS IN 1991 AND 1992 THAT MAY HAVE IMPACTED THE HEALTH OF FETUSES IN PREGNANT MOTHERS DRINKING THE TRITIATED WATER.

. Hydro's reports show higher tritium in the Ajax/Pickering drinking water in early 1991, late 1991, and, of course, after the August 1992 spill. (1)

. The susceptibility of fetuses to toxic radioactive substances like tritium is undisputed.

... AND GIVEN THAT: THERE ARE NO NEW STUDIES PLANNED TO UPDATE THE 1991 AECB STUDY

. Human beings are not 'fruit flies'. It may take years before the cumulative impact of drinking small doses of tritium in drinking water is evident, especially in our reproductive systems. The AECB report only went to 1988, and the 4 new reactors in the Pickering B NGS only came on-stream in 1986. The full impact has barely started.

. Even so, the assessment of the impact of the 3 higher than normal water-born tritium releases in 1991 and 1992 from the Pickering NGS on children of local mothers who were pregnant when the spills happened would be instructive.

. The AECB report itself acknowledged that "it would seem prudent to do further investigation of Down Syndrome in Pickering and Ajax."(7) To our knowledge, no such investigation has been initiated.

WE URGE THE IJC TO: 3. REQUEST THE AECB UPDATE ITS 1991 REPORT WITH DATA UP TO 1993.

ISSUE # 4:

GIVEN THAT: THERE ARE NO STUDIES OF ADULT BREAST AND PROSTATE CANCERS NEAR CANADIAN NUCLEAR PLANTS

. There are appallingly few studies available on adult cancers near Canadian nuclear plants. We know of none.

. There is ample empirical evidence that there are numerous recent cases of prostate and breast cancer in the Pickering/Ajax area recently.

... AND GIVEN: (ALL THE REST OF THE ABOVE INFORMATION)

WE URGE THE IJC TO: 4. INITIATE STUDIES ON THE CORRELATIONS OF ADULT CANCERS, ESPECIALLY BREAST AND PROSTATE CANCERS, TO TRITIUM RELEASES IN WATER FROM THE PICKERING NUCLEAR PLANT.

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ISSUE #5:

GIVEN THAT: TRITIUM MEETS THE 6 IJC SELECTION CRITERIA FOR "PERSISTENT TOXIC SUBSTANCES" (8)

. Just on the criteria of Persistence, tritium has a 1/2 life of 12.3 years, which certainly qualifies it in the "high" category which includes any substance with a 1/2 life above 56 days!

... AND GIVEN THAT: THE IJC WATER QUALITY BOARD HAS ALREADY IDENTIFIED 11 "CRITICAL POLLUTANTS" IN THE GREAT LAKES (8)

... AND GIVEN THAT: TWELVE WOULD MAKE AN EVEN "DIRTY DOZEN"!

WE URGE THE IJC TO: 5. INCLUDE TRITIUM ON THEIR LIST OF PERSISTENT TOXIC SUBSTANCES, AND CONSIDER ADDING IT THEIR LIST OF CRITICAL POLLUTANTS

ISSUE #6:

GIVEN THAT: THE 1993 BIENNIAL IJC MEETING FOCUSED PRIMARILY ON THE IMPACT OF CHLORINE COMPOUNDS ON THE GREAT LAKES

... AND GIVEN THAT: RADIONUCLIDES, AND ESPECIALLY TRITIUM, PRESENT AN EQUALLY SEVERE DANGER TO THE GREAT LAKES ECOSYSTEM, INCLUDING HUMAN HEALTH

WE URGE THE IJC TO: 6. MAKE RADIONUCLIDES, ESPECIALLY TRITIUM, THE MAIN FOCUS OF THEIR 1995 BIENNIAL MEETING

REFERENCES

1. Ontario Hydro Health and Safety Division. "Annual Summary and Assessment of Environmental Radiological Data" for 1988, 1989, 1990, 1991, 1992.

2. Ontario Hydro Health and Safety Division. October, 1992. "Preliminary Assessment of the Impact of the Tritium Leak at the Pickering Nuclear Generating Station".

3. Ontario Hydro graphs of tritium concentrations at the Harris, Horgan, Ajax and Whitby water plants after the August 2, 1992 spill, as distributed by the Durham Region Works Department at the March 24 meeting of the Pickering/Ajax Water Plant Committee.

4. The 6 volumes of the "ESR for the Water Supply Plant to Serve the Pickering/Ajax Area", July 1991

5. Gould, J.M. and B.A.Goldman. 1990. "Deadly Deceit: Low-Level Radiation - High Level Cover-Up". Four Walls Eight Windows. New York, New York. ISBN: 0-941423-35-2

6. Graeub, R. 1992. "The Petkau Effect: Nuclear Radiation, People and Trees". Four Walls Eight Windows. New York, New York. ISBN: 0-941423-72-7

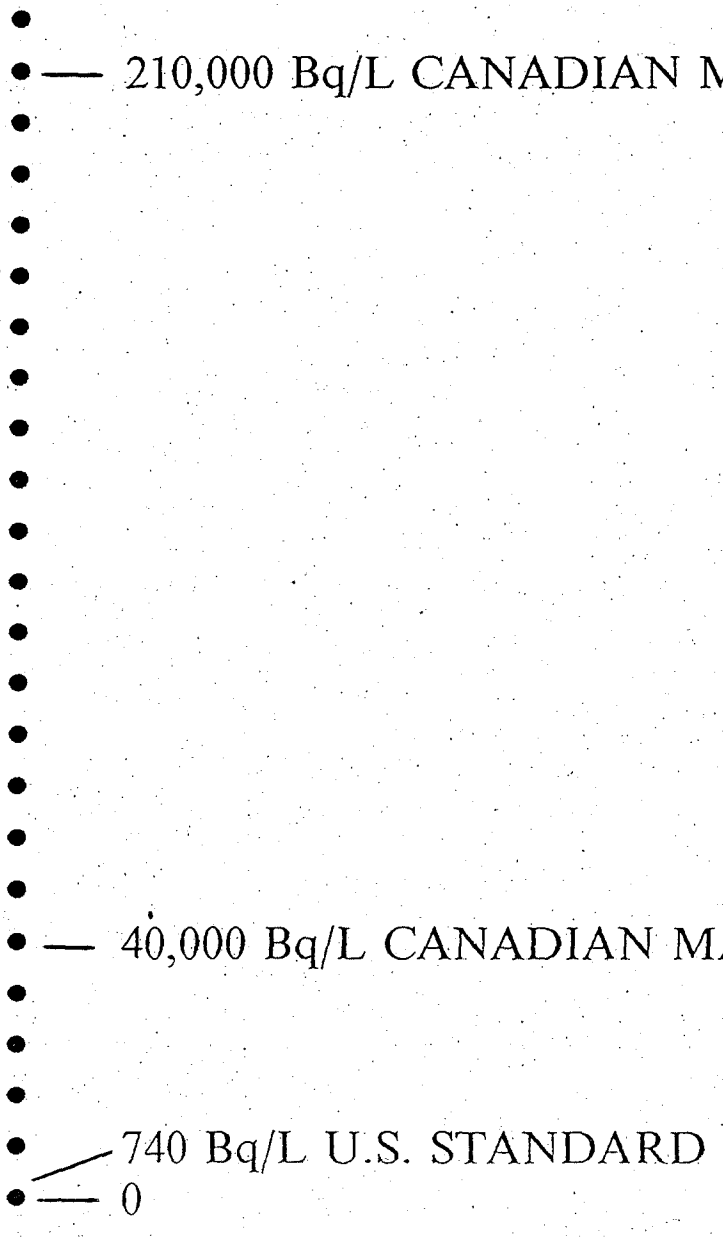
7. AECB Project Report No. 7.156.1. 1991. "Tritium Releases From The Pickering Nuclear Generating Station and Birth Defects and Infant Mortality in Nearby Communities, 1971-1988"

8. IJC Virtual Elimination Task Force, August 1993. "A Strategy For Virtual Elimination Of Persistent Toxic Substances". Volume 1. Windsor, Ontario.

9. Coalition of Environmental Groups. March, 1992. "Nuclear Power Hazard Report, 1989/1990". Oshawa, Ontario.

U.S VS CANADIAN STANDARDS

Tritium in Drinking Water (Bq/L)

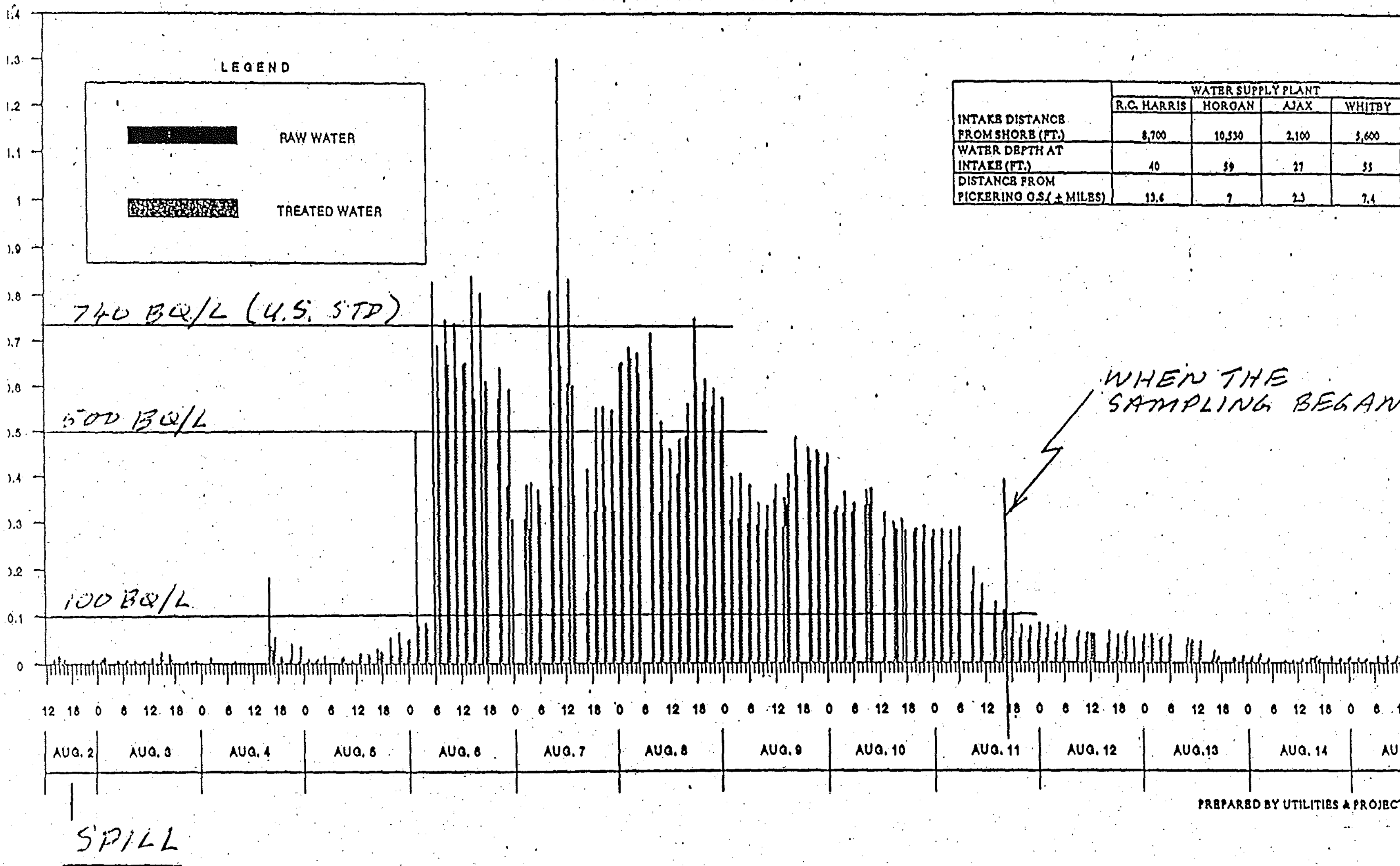


AJAX W.S.P.

TRITIUM CONCENTRATIONS IN RAW AND TREATED WATER

TRAUBAX
10-MAR-93

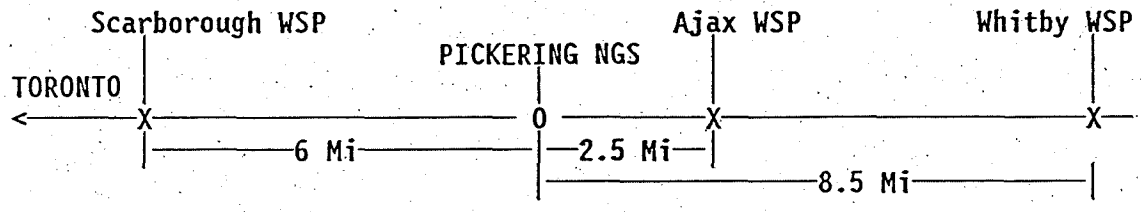
AUGUST 2, 1992 TO AUGUST 15, 1992



	WATER SUPPLY PLANT			
	R.C. HARRIS	HORGAN	AJAX	WHITBY
INTAKE DISTANCE FROM SHORE (FT.)	8,700	10,530	2,100	5,600
WATER DEPTH AT INTAKE (FT.)	40	59	27	55
DISTANCE FROM PICKERING O.S.(± MILES)	13.6	7	2.3	7.4

PREPARED BY UTILITIES & PROJECTS

LOCATION MAP



WEST ----> CURRENTS ----> EAST

LAKE ONTARIO

LEGEND:
WSP: Water Supply Plant
NGS: Nuclear Generating Station

Tritium in Drinking Water -- Lake Ontario / 1989

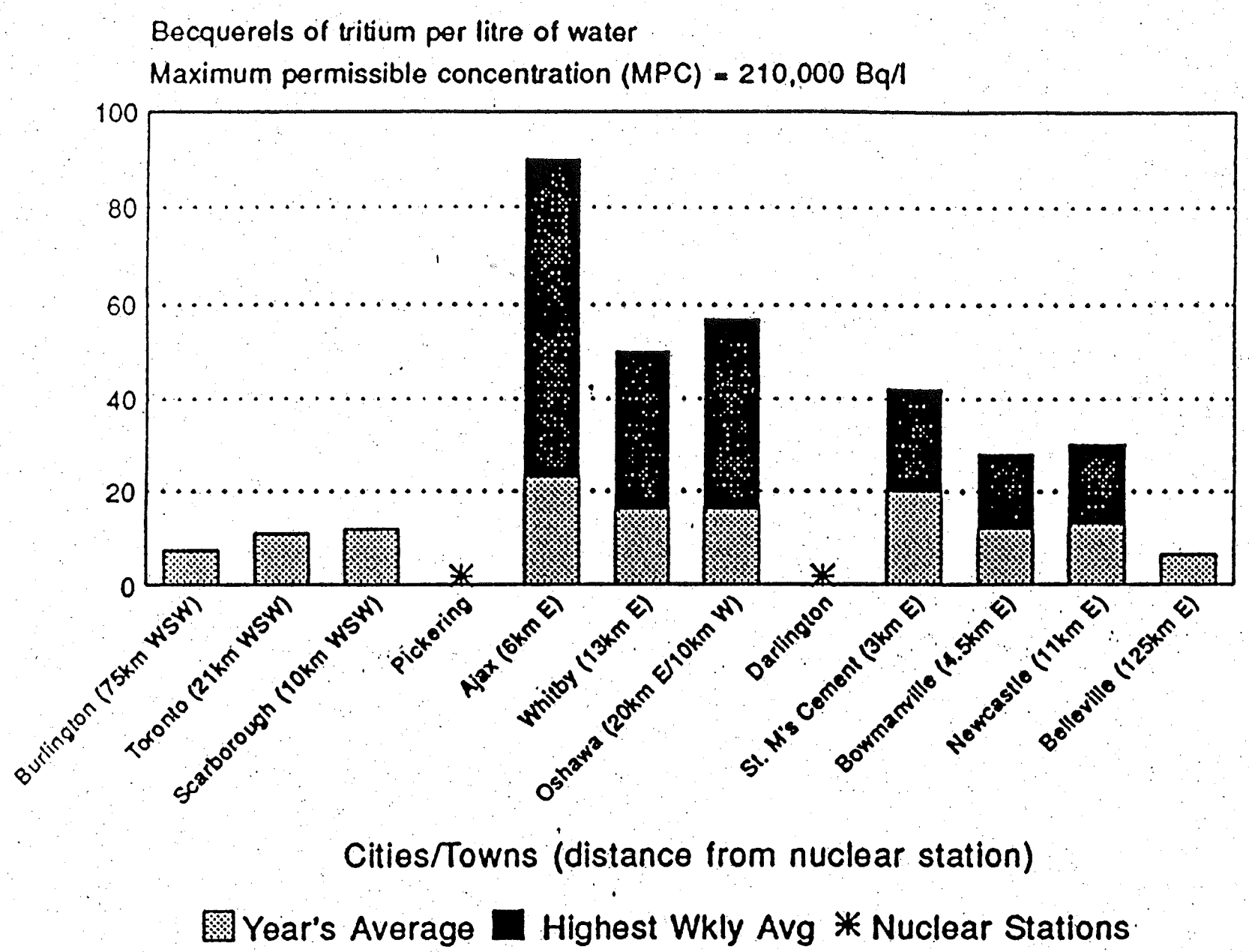
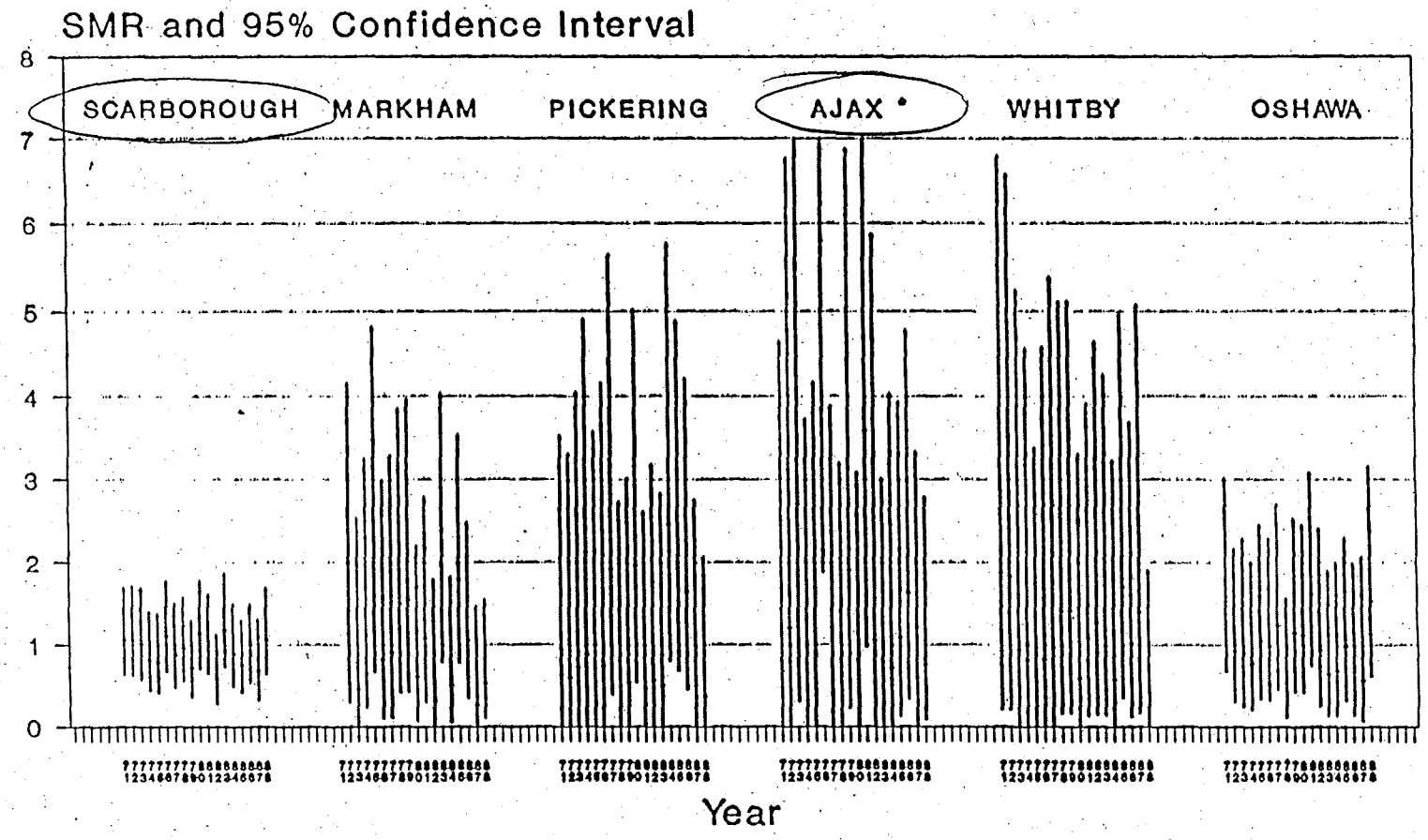


Fig. 1.6 - Infant Birth Defect SMRs for Pickering and Adjacent Areas 1971-1988



Reference Rates : All Ontario
SMR - Standardized Mortality Ratio
* Upper limit truncated to 7