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1 HEARING OFFICER ANTONIOLLI: Good afternoon. Welcome to
2 the Illinois Pollution Control Board. My name is Amy Antoniolli
3 and I've been assigned as the hearing office in this rulemaking.
4 The Board has captioned this proceeding: In the Matter of
5 Revisions to Radium Water Quality Standards: Proposed New
6 Illinois Administrative Code 302.307 and Amendments to 35
7 Illinois Administrative Code 302.207 and 302.525, which the Board
8 has docketed R04-21. In this proceeding the Agency is seeking
9 amendment the Board's Radium Water Quality Standards.

10 This Rulemaking was filed on January 13th, 2004, by the
11 Illinois Environmental Protection Agency. The Board accepted the
12 proposal for hearing on January 22nd, 2004. Today is the third
13 hearing. The first hearing took place on April 1st at the James
14 R. Thompson Center in Chicago, and the second hearing took place
15 on May 6th, 2004, in the Board's offices in Springfield.

16 My far left is Member Nicholas Melas, the board member
17 assigned to this Rulemaking. Seated to my right are Board
18 Members Tanner Girard and Tom Johnson. And also present today
19 from the Board's Technical Unit is Anand Rao.

20 If you'd like to testify today and you haven't already told
21 me, please let me know. There should -- I will put a sign-in
22 sheet for testifying up here somewhere at the front of the room.
23 And today's hearing is governed by the Board's procedural rules.
24 All information that is relevant and not repetitious, will be

1 admitted into the record.

2 At the first two hearings we began a summary by the Agency.
3 However, this hearing was scheduled by reason of a motion by
4 Water Remediation Technology Environmental, therefore, we will
5 begin with the testimony of WRT Environmental. They're two
6 witnesses, Mr. Adams and Mr. Williams, followed by any questions
7 for those witnesses by the public, by the Agency and also by the
8 Board. Please note that any questions posed by board members and
9 staff are designed to help develop the record for the Board's
10 decision and not to reflect any bias. After the questioning
11 period, we anticipate addressing several specific questions that
12 were pre-filed by the Sierra Club and the Environmental Law &
13 Policy Center, jointly, to which the Environmental Protection
14 Agency will have an opportunity to respond. And we can open it
15 up at that point for an additional questioning period.

16 After that time, time permitting, anyone else can testify
17 regarding the proposal. And like all witnesses, those who wish
18 to testify, will be sworn in and may ask questions about -- may
19 be asked questions about their testimony. We will conclude
20 today's hearing with a few procedural items. Member Melas,
21 before we begin, do you have anything to add?

22 BOARD MEMBER MELAS: I'd just like to welcome every one for
23 coming out here in this unwelcoming weather but hopefully the
24 welcome will be more warm here. Thank you.

1 HEARING OFFICER ANTONIOLLI: Thank you. And for the court
2 reporter today, who is transcribing today's proceedings, please
3 speak up and don't talk over one another so that we can produce a
4 clear transcript. And with that, are there any questions about
5 the procedures that we will follow today? Seeing none, I ask the
6 court reporter to swear in WRT's witnesses collectively both.
7 And as you testify please, introduce yourself. Let us know your
8 position and title and then you can go ahead with a summary of
9 the testimony.

10 (The witnesses were sworn.)

11 MR. FORT: Madam Hearing Officer, Jeffery Fort,
12 Sonnenschein, Nath & Rosenthal on behalf of WRT Environmental.
13 Mr. Ted Adams is going to testify first, followed by Mr. Charles
14 Williams. We -- Our testimony is going to address the
15 availability of technology to meet the drinking water standard,
16 which was the occasion for the Agency asking for the revisions to
17 the Water Quality Standards. We're also intending to provide
18 evidence on the impacts to POTWs of the method of disposal that
19 is encouraged by the Agency's proposal, also, the adverse
20 environmental effects of that situation, which is to flush the
21 filtrate that's been collected, the radium that's been removed by
22 the ground water to meet the drinking water standards. We have a
23 material leftover that elevated in radium and the Agency's
24 proposal to allow the material to be flushed down the sewer.

1 If there were no other technology than that, we wouldn't be
2 here today, but there is technology. It is reasonable
3 technology. It is implementable technology, and that is going to
4 be part of our focus today. And, in addition, we will get to the
5 adverse environmental effects of flushing that contaminated
6 filtrate back into the POTWs, back into the sludge that is then
7 used for cropland, or whatever application, and also the aquatic
8 environment.

9 So with that, I'd like Mr. Adams to go first. He's going
10 to summarize his pre-filed testimony. And I would like to -- I
11 think we've marked his testimony as Exhibit 4, and I would like
12 to have that so recorded and admitted as an exhibit in this
13 matter.

14 HEARING OFFICER ANTONIOLLI: Okay. I have a copy of that
15 pre-filed testimony here in front of me. And if there are no
16 objections, I'll go ahead and enter that as Exhibit No. 4. We've
17 already had three exhibits.

18 MS. WILLIAMS: Just for the record, I would like to make an
19 objection for the record. I realize the Board's coveted standard
20 meets the -- I realize the Board's admission standards are
21 enormously broad. I've never seen a Rulemaking where testimony
22 has been stepped out, and I don't expect that to be the case
23 today by any means.

24 But I do, for the record, want to make clear for the Board

1 that I -- WRT has submitted probably 200 or more pages of
2 testimony. I reviewed that testimony very carefully and about
3 one page of that testimony, I believe page 21 of Mr. Adams'
4 testimony, is relevant to the questions that we're here to
5 consider today.

6 You know, we -- it is not the Board's job today to
7 determine what the best treatment technology is for drinking
8 water. That has been established by USEPA'S best available
9 treatment standards and by this Board when we adopted the MCL for
10 radium in 2000. I don't believe it's possible through this
11 Rulemaking to be, you know, place new requirements on drinking
12 water facilities about what type of technology we have to us.

13 Second of all, the large percentage of the testimony,
14 probably the most substantial portion, relates to the issue of
15 radium and sludge which is an important issue for the
16 environment, for the citizens of Illinois, but again, that issue
17 is not what is addressed by this proposal. It's really not
18 within the scope of this proposal. The Agency has made it clear
19 on its regulatory amendment that it is working on long,
20 anticipated provisions to our sludge rule, which we expect to
21 file within the next six months or so. And some of the
22 information that the Board should probably take a look at and
23 consider, once they've been able to be cross-examine -- once the
24 witnesses have been cross-examined about the relevance for that

1 Rulemaking.

2 But, again today, we're setting a standard about what will
3 protect aquatic life use in Illinois waterways. The results of
4 sludge and POTW is not bearing on that case.

5 And finally, the third issue that is addressed by the
6 majority of testimony is safety of workers in plants dealing with
7 these treatments of high radium groundwater. I am sure the Board
8 is very concerned about the safety of workers in these plants, as
9 I am, as is the Agency. But that issue, in particular, is well
10 beyond our expertise as the Agency, the Board's expertise and our
11 jurisdiction. Those are issues that are addressed by OSHA,
12 Department of Labor.

13 So I, in summary, there is one case, I believe, of all the
14 testimony where there is some discussion of aquatic life impact
15 and I hope we can develop that more fully today.

16 I realize the Board is likely to allow the testimony in,
17 and over this objection, but I did, for the record, want to make
18 it clear that we think the Board's time is being, you know, the
19 Board is very busy. And in order to review all of this
20 testimony, very little is going to be helpful for them in making
21 the proposal on the Agency's position. Thank you.

22 HEARING OFFICER ANTONIOLLI: Ms. Williams, I note your
23 objection on the grounds of relevancy, but I will overturn your
24 objection and admit this testimony into the record. And I do

1 have it in front of me. I'll admit it as Exhibit 4. And we'll
2 go ahead and hear a summary of Mr. Adams' pre-filed testimony.

3 MR. FORT: Okay. Will you state your name for the record,
4 please?

5 MR. ADAMS: Theodore G. Adams.

6 MR. FORT: Okay. And, Mr. Adams, you prepared the
7 testimony we marked as Exhibit 4?

8 MR. ADAMS: That's correct.

9 MR. FORT: And are you prepared to give a summary of your
10 testimony now?

11 MR. ADAMS: I am.

12 MR. FORT: Okay. Would you go ahead?

13 MR. ADAMS: I want to thank you for providing the
14 opportunity to present my testimony on behalf of Water
15 Remediation Technology to the Pollution Control Board.

16 My name is Theodore G. Adams. I am president of T. G.
17 Adams & Associates, which is an environmental and radiological
18 consulting firm located in Springville, New York.

19 My educational background consists of a Bachelor of Science
20 Degree in Environmental Biology from the University of Pittsburgh
21 and a Master's Degree in Health Physics from Purdue University in
22 West Lafayette, Indiana.

23 I have over 25 years experience in the areas of Radiation
24 Safety Environmental Protection, Radioactive Waste Management and

1 Decommissioning/Remediation for both commercial and government
2 clients.

3 I have experience in providing radiological consulting
4 expertise to POTWs and currently serve as the Radiological Safety
5 Officer for the Northeast Ohio Regional Sewer District which is
6 located in Cleveland, Ohio, and certified Radiation Expert in the
7 state of Ohio, a certified Project Management Professional and I
8 also possess a license for remediation surface provider in the
9 State of Ohio. My resume is attached as Exhibit A to my
10 testimony.

11 I have reviewed the transcripts and other information
12 submitted to the Pollution Control Board in this matter, and it
13 is my testimony that the proposed rule change and the prior
14 testimony in this matter does not take into account the safety
15 and liability issues relating to the treatment of raw water
16 supplying containing elevated levels of Radium-226 and -228.

17 In the transcript of the April 1st, 2004, hearing, the
18 hearing officer, Ms. Antonioli, asked a very, what I think is
19 the most important critical question, of Mr. Kinsley. She asked,
20 "Are the radium levels high enough in the sludge to require
21 special disposal and special handling?" That question, in my
22 opinion, was not squarely answered and, in my experience, the
23 answer is a resounding yes. The sludge not only requires special
24 handling but also special disposal.

1 Treatment of raw water with elevated radium levels does
2 create safety and liability issues at both the water treatment
3 plant works and the POTW. The handling and disposal of
4 contaminated sludge poses a significant concern and a major
5 impact, both economic and regulatory, to the POTWs. Of equal
6 concern is the potential radiological exposures to the POTW
7 worker, the family who resides on the property that contaminated
8 sludge has been applied and the biota and terrestrial and aquatic
9 plants exposed to the contaminated effluent and sludge released
10 from the POTW.

11 My testimony will address each of these areas to show that
12 allowing disposal of wastewater treatment residuals into the
13 public sewer, and subsequent treatment and disposal by POTWs
14 could result in operational, economic, regulatory and workers'
15 safety issues and impacts for the POTWs as well as environmental
16 impacts to the biota, and health impacts to residents on the
17 sludge-applied land.

18 With respect to POTW responsibilities, there have been many
19 situations where radiological contamination has been discharged
20 to the POTW without the knowledge of the POTW or the ability to
21 take precautionary measures. Now these discharges, even small
22 amounts of radiological materials over time and at then-accepted
23 levels, have caused these POTWs to take extensive clean-up
24 measure and, for some, to come under the jurisdiction of the

1 Nuclear Regulatory Commission.

2 The USEPA adoption of the drinking water standard for
3 radium should cause all of us concern to carefully review that
4 prior record and take precautions to avoid repeating those
5 historical situations.

6 The economic and operational impacts of radiologically
7 contaminated influent/sludge on POTWs are well documented. Table
8 1, which I have located over on the easel, summarized that the
9 POTWs across the United States where the acceptance, processing
10 or handling of radiological contaminate influent and resulting
11 sludge have caused a major impact. While some impacts require
12 minor corrective action response, others such as Cleveland, Ohio,
13 and Tonawanda, New York, required significant expenditures of
14 resources, both dollars and man power, to satisfactory address
15 the problem with dealing with contaminated hardware, facilities
16 and products such as sludge, ash and grit.

17 The two cases that I'm personally are familiar with are the
18 contaminated POTWs in the northeast Ohio Regional Sewer District
19 located in Cleveland, Ohio, and the Kiski Valley Water Pollution
20 Control Authority located in Kiski, Pennsylvania. In each of the
21 cases the POTWs have been saddled with extraordinary costs and
22 required to undertake significant monitoring activities. Costs
23 associated with drilling of contaminated piping hardware,
24 facilities, sludge and ash which are to show to be substantial,

1 some as much as two million in the case of the Northeast Ohio
2 Regional Sewer District, others yet to be determined between one
3 and six million in the case of Kiski Valle POTW. These costs
4 have been the responsibility to the POTW.

5 The NRC, and/or agreement states have not required any
6 discharger, such as the licensee, to pay for the remediation
7 clean up of the contamination of POTW due to a license discharge.
8 As in the case with a Northeast Ohio Regional Sewer District,
9 economic restitution normally is sought in public court, and in
10 short, the POTW is left holding the bag.

11 It is clear to me that POTWs bear the brunt of discharges
12 to the sewers of radiological materials including Radium-226 and
13 Radium-228. It is also clear that numerous regulatory agencies
14 are looking into these issues. And over the last decade, the NRC
15 has tightened its restrictions on allowable discharges to POTWs
16 so that now only materials that are soluble are allowed. Refer
17 you to Exhibit B, overview of federal efforts, to protect the
18 POTWs from impact from receiving radioactive materials from NRC
19 licensed facilities.

20 EPA also convened a working group and published two recent
21 guidances in 2000 and 2004 on this issue. And in the EPA
22 guidance documents recommend against any release to sanitary
23 sewers of filtrate collected from treatment of raw water to meet
24 the Maximum Contaminant Level of Radium-226 and -228.

1 One comment I would have on Table 1, as we look at
2 particularly all these cases, and in nearly all these cases, the
3 release of the radioactive materials to the sewer was either
4 halted or modified to correct the contamination problem.

5 Concerning the adverse impact in POTW workers from exposure
6 to radium-bearing sludge, as presented in the earlier section of
7 my testimony, there have been a number of cases in radionuclides
8 discovered in sewage sludge and ash. And these incidents made
9 clear the need for a comprehensive determination of the
10 prevalence of radionuclides in POTW sewage sludge and ash around
11 the country and the level of potential threats to human health
12 and the environment by various levels of such materials.

13 To provide a reasonable bound on the amounts of
14 radionuclides that actually occur in the sewage sludge and ash,
15 the EPA and NRC in conjunction with ISCORS conducted a limited
16 survey on radioactivity in POTW sludge and ash across the United
17 States and, as a subsequent effort, undertook a dose assessment
18 to help asses the potential threat that these materials may pose
19 to human health.

20 The dose modeling was performed by ISCORS using the sewage
21 sludge, and 95 percent found results which were 13 PCi/g
22 Radium-226 and 5.1 pCi/g per Radium-228 under various exposure
23 scenarios to estimate potential doses to workers and to the
24 public. Based on the ISCORS modeling results, the largest

1 potential dose, 420 milligram per year, is to the POTW Biosolids
2 Loading Worker for exposure to Radium-226 or Th-228 and indoor
3 radon. This relatively high dose estimate is consistent with
4 estimates developed in previous cases.

5 The dose significantly exceeds the annual exposure rate
6 which is 100 milligram per year except for members of the general
7 public, and although a relatively significant potential dose to a
8 POTW Biosolids Loading Worker, which is a specific case, was
9 determined, ISCORS did conclude that there were no widespread or
10 nationwide public health concerns identified by the sewer
11 assessment survey.

12 However, ISCORS did clearly state that their survey was not
13 designed to identify unique or isolated instances in which high
14 levels of radionuclides may be present in sewage sludge or ash
15 and inferences to high levels of radionuclides cannot be made
16 from the survey results alone. It would appear that the
17 treatment of groundwater in northeastern Illinois, to meet the
18 federal drinking water standards for radium, presents such a
19 local or unique situation. A discharge of concentrated radium
20 sludge from a water treatment plant is clearly a unique, high
21 level of concentrated radioactivity.

22 To evaluate this situation, I assessed the potential doses
23 to POTW workers and the public from water treatment facility
24 effluent containing radium at various concentrations in raw waste

1 between 5 and 25 pCi/L, various dilution volumes, zero percent,
2 50 percent; and various radium removal efficiencies of 20
3 percent, 80 percent and 90 percent. Then using a typical radium
4 concentration of raw waste of 15 pCi/L for the six POTWs and
5 using ISCORS methodology, a correlation to a potential dose to a
6 POTW Biosolids Loading Worker was made, and I would refer to
7 Table 3. This table differentiates the effect of radium going to
8 the POTW sludge or the water discharge. I compared the exposure
9 to a POTW worker in a wastewater treatment plant with these
10 amounts of radium in sludge. Table 3 demonstrates the impact of
11 those workers, and in every case involving substantial radium
12 removal from the sanitary waste, in other words, high solids
13 removal, the workers were exposed to excess of 100 milligram per
14 year allowable exposure.

15 Results in Table 3 indicate that substantial issues by
16 Radium-226 and Radium-228 into a sanitary sewer. Only two of the
17 plants, plant E and F, without radon, have potential dose
18 estimates below the 100 milligram per year limit established by
19 the NRC for exposure to ionizing radiation to the public. One
20 scenario, plant B, was run using concentration of raw water of 25
21 picocuries per liter, which was found in Illinois groundwater
22 with 250 picocuries per gram in the sludge which is associated
23 with high solids removal. The results of the dose indicated
24 exposures to the biosolids, sludge load of 9,100 milligram per

1 year. And by comparison, occupational radiation workers, like
2 myself, are allowed only 5,000 milligram per year. Thus it is
3 foreseeable in Illinois that flushing filtrate from a large
4 treatment plant down a sanitary sewer result exposure to twice
5 those levels, and most importantly, without any of the personal
6 protections and monitoring that are required by the NCR for
7 individuals with exposures exceeding 100 milligram per year. The
8 contributions to indoor radon is included, all plants and POTW
9 Biosolids Workers exhibit potential doses exceeding the 100
10 milligram per year limit. And, in fact, many approach the limit
11 established by the federal government, as I mentioned, the NCR,
12 Department of Energy, for occupational exposure of 5,000
13 milligram per year. To be able to place these potential doses to
14 the POTWs Biosolids Loaded Worker, I provided a summary of the
15 southern and federal dose limits for exposure times in radiation
16 in Table 4, Exhibit H.

17 With respect to the recommendation of protection of
18 personnel exposed to radium from treatment of drinking water
19 supplies, I looked at EPA's recommendation in its 2000 and 2004
20 guidance. Most of the substantial recommendations of 2000
21 guidance are also included in the revised 2004 guidance, and with
22 respect to the disposals of solids, the 2000 report says the EPA
23 does not encourage the land spreading or soil mixing of such
24 TNORM unless there is a demonstrated benefit to the public from

1 the material that is TNORM involved.

2 The benefits of land application are construed to exist.
3 EPA believes that such benefits should be laid against the
4 potential hazards and risks of the practice. The main concern is
5 the potential for buildup or movement of radionuclides to create
6 environmental contaminated sites that would require remediation
7 or use of institutional controls or engineering controls.

8 To me, clearly the EPA has some of the same concerns of
9 documents in my testimony. The EPA also expressed concern with
10 release of liquid residual into sanitary sewers. The EPA
11 recommended that in all disposal options, the water treatment
12 facility contact the state and the POTW to ensure the release of
13 the water residuals into the sanitary sewer would not interfere
14 with POTW operations or cause a violation of the POTW's NPDS
15 permit and also would be accepted by the POTW. Again, EPA
16 recognized, as has ISCORS, potential for elevated radium levels
17 in unique circumstances to adversely affect the operations of the
18 POTWs.

19 Lots of sanitary sewers are used for the disposal of radium
20 contaminated filtrate, it is clear to me that the POTW should
21 take at least numerous additional precautions to protect their
22 workers. Indeed, the measures to be taken by the POTW may be
23 expensive as required by the workers of a nuclear power plant.
24 Undertaking those measures requires increased financial and human

1 resources. With respect to land application, those modeling
2 performed by the American Radiation Surfaces, Inc., estimated
3 that a POTW Biosolids Loading Worker could receive a dose of
4 5,200 milligrams per year from sludge containing radium at an
5 activity of 148 pCi/g and a dose of 1,520 milligrams per year
6 from sludge containing radium and activities of 43 pCi/g. The
7 5,210 milligram per year and 1,520 milligram per year, total
8 effective dose be equivalent includes doses from indoor radon.
9 But without the indoor radon, those components, a Biosolids
10 Loading Worker could receive a dose of 170 milligrams per year
11 and 60 milligrams per year form sludge containing radium at an
12 activity level of 148 picocuries per gram and 43 picocuries per
13 gram respectively.

14 These potential doses are significant to both the POTW
15 worker and members of the public as they exceed the regulatory
16 limits and guidelines that were designed to protect the
17 individuals. Additional observations were made with respect to
18 these doses: One potential dose could cause a liability issue to
19 municipalities and to POTWs. Two, typically POTWs are not
20 considered or trained as occupational radiation workers. They
21 are simply members of the public. The above exposures to the
22 Biosolids Loading Worker with the radon component exceeds those
23 of a typical power plant worker. Even without the radon
24 component the exposure to a Biosolids Worker could be twice the

1 limit allowed to the general public (170 milligram per year
2 versus 100 milligram per year). And last, the average annual
3 dose to a nuclear power worker, which is occupational radiation
4 workers and workers in the medical industry who received measured
5 none-zero doses, are 700 and 240 milligram per year respectively.
6 The average to all radiation workers in the United States was
7 evaluated in 1980 was 210 milligrams per year, far less than what
8 we were proposing in the dose assessment for the POTW Biosolids
9 Worker.

10 Lastly, ARS estimated the TEDE to a member of a family farm
11 where radium-bearing sludge had been applied as fertilizer. It
12 was estimated that an on-site resident living in that house
13 located on land and where five annual applications of 148
14 picocuries per gram radium-bearing sludge had been applied would
15 receive a TEDE of 116 milligrams per year, and this clearly
16 exceeds the 100 milligram per year limit allowed to the general
17 public.

18 Disposal of the sanitary sewer, or via land application, is
19 inappropriate due to the potential unnecessary risks and
20 exposures to POTW workers, the public and the environment. These
21 exposures and risks can be eliminated by disallowing disposal of
22 water treatment sludge into the sanitary sewer or land
23 application and instead requiring disposal of the material
24 directly into a permitted solid waste, RCRA, NORM or licensed

1 LLRW disposal facility, commensurate with the radium
2 concentration in the sludge, where it will be isolated from the
3 public and maintained in a controlled manner.

4 Turning to the adverse effects of biota associated with
5 exposure radionuclides, I would offer that no one distributes --
6 or disputes that radium is a human carcinogen. It is common
7 knowledge in the environmental community that human carcinogens
8 are carcinogens or create harmful effects on other living
9 organisms. Of course, often biota and animals are used to screen
10 chemicals to determine if those chemicals also cause adverse
11 health effects, such as cancers, in humans.

12 In reviewing the transcripts of the hearing, I was struck
13 and surprised by the testimony to the effect that the IEPA had
14 done a literature search and found no literature indicating that
15 radium is harmful to aquatic and terrestrial biota.

16 And just one example is the National Council of Radiation
17 Protection Measurement, Report No. 109, entitled "Effects of
18 Ionizing Radiation on Aquatic Organisms," which reference in
19 excess of 50 publications on this topic. And the second example
20 is the Biota Dose Assessment Committee which was established by
21 DOE that has broad representation from DOE offices, national
22 laboratories like Argon National Laboratories, and universities
23 and the private sector.

24 A description of the Biota Dose Assessment Committee can be

1 obtained from their website,
2 <http://homer.ornl.gov/oepa/public/bdac>. Since the information
3 contained is too voluminous for this testimony, it is best that
4 individuals who are interested go to the BDAC website and see the
5 information presented.

6 I would chair that BDAC has reviewed and commented on
7 numerous studies related to the adverse effects of radioactivity
8 on biota and also references in excess of 50 sources.

9 Clearly there are reports and studies that are available
10 that could be used by IEPA to conduct studies to assess the
11 impact on radium and biota. I do not believe that it was
12 accurate to claim either (a) that there is no literature on the
13 subject or (b) that there is no evidence that radionuclides in a
14 particular radium cause harm to aquatic and biota.

15 In concluding, radium and its byproducts are known
16 carcinogens to animals and humans. There is scientific
17 literature available with respect to adverse impacts on radium on
18 aquatic and terrestrial biota. Radionuclides, including radium,
19 disposed of in the sanitary sewer, have created significant
20 economic and operations impacts to the POTWs. The removal of
21 radium by HMO and certain other processes from the groundwater
22 creates an "insoluble waste", for example, particulates. And
23 both the NRC and Illinois Department of Nuclear Safety
24 regulations prohibit the disposal of "insoluble waste" into the

1 sanitary sewers. The Illinois Environmental Protection Agency is
2 allowing disposal of insoluble radium waste to be disposed of in
3 the sanitary sewers. This appears to be inconsistent with their
4 sister agency's prohibition on insoluble waste being released in
5 the sanitary sewers. Radium concentration, such as ISCORS data,
6 and POTW influent and concentrated sludge has been shown to
7 result in elevated potential POTW worker and public exposures.
8 As I testified before, a POTW sludge loader is estimated to
9 receive 420 milligram per year dose from radium and sludge
10 concentration of Radium-226 and -228 of 13 and 5.1 picocuries per
11 gram. This is greater than four times the allowable limit to the
12 general population of 100 milligram per year.

13 ISCORS did not model unique isolated instances in which
14 higher levels are released into the sanitary sewers. WRT/ARS
15 demonstrated, via their POTW operations data and dose modeling
16 approach similar to ISCORS, that POTW operators' exposure could
17 be greater than the 100 milligram per year limit without the
18 radon contribution. With the radon contribution included, the
19 POTW worker dose would approach and could exceed that of a
20 nuclear power plant worker of 5,000 milligram per year. As Low
21 As Reasonably Achievable (or ALARA) principle fundamental
22 objective of all DOE, NRC, NRC and State radiation projects.

23 Public program procedures and engineering controls are used
24 to maintain the exposures to workers and the public As Low As

1 Reasonably Achievable. Allowing the disposal of radium residue
2 into sanitary sewer resulting in unnecessary exposures to POTW
3 workers, the public and biota, rather than requiring treatment,
4 which is engineering control and disposal (via permitted RCRA or
5 licensed NORM or LLRW disposal facility procedure) is
6 inconsistent with the ALARA philosophy.

7 The USEPA recommends against application of any sludge
8 containing elevated radium levels. The EPA is investigating the
9 issues associated with elevated levels of radium and filtrate
10 from treatment of groundwater from drinking water consumption.
11 However, the guidance from EPA supports a prohibition of the
12 discharge of radium from the drinking water treatment plant.

13 Based on the above, it is my opinion that
14 radium-contaminated water treatment sludge or residuals should
15 not be allowed to be disposed of in the sanitary sewer via
16 dispersion, but should instead be disposed of in an
17 environmentally safe, secure and isolated permitted landfill or
18 licensed disposal facility. And I would recommend to the
19 Pollution Control Board that it retain a radium general water
20 quality standard and adopt a specific prohibition on disposal of
21 water treatment sludge and residuals in the sanitary sewers.

22 HEARING OFFICER ANTONIOLLI: Thank you. And before we
23 continue, I would like to note for the record that you did refer
24 to in your testimony, Mr. Adams, Table 1, and I'd like to note

1 that Table 1 is found on page 7 of the pre-filed testimony, which
2 is Exhibit 4.

3 MR. ADAMS: Correct.

4 HEARING OFFICER ANTONIOLLI: And it's also been enlarged
5 and it was here in the hearing room to my right and to your left.
6 You also referred to Table 3, which is found on page 10 of
7 Exhibit 4, and has also been enlarged to my far right. You also
8 noted Exhibit B and Exhibit H, Table 4, which are also attached
9 to Exhibit 4.

10 MR. ADAMS: Yes.

11 MR. FORT: Madam Hearing Officer, would you like to mark
12 these other markings here as exhibits or leave them as
13 demonstrative aids to this testimony?

14 HEARING OFFICER ANTONIOLLI: They are found in -- As I've
15 noted, they are found in the pre-filed testimony so go ahead and
16 just -- as long as I've said that for the record, they've already
17 been admitted.

18 MR. FORT: Okay. You would like to hold questions to Mr.
19 Adams until Mr. Williams has testified?

20 HEARING OFFICER ANTONIOLLI: Yes. Let's continue with Mr.
21 Williams.

22 MR. FORT: Would you state your name for record, please?

23 MR. WILLIAMS: Charles S. Williams.

24 MR. FORT: I believe you submitted pre-filed testimony in

1 this matter?

2 MR. WILLIAMS: I have.

3 MR. FORT: And, Madam Hearing Officer, I believe that's
4 what we marked as Exhibit 5?

5 HEARING OFFICER ANTONIOLLI: Yes.

6 MR. FORT: I would ask the admission to that testimony
7 here.

8 HEARING OFFICER ANTONIOLLI: Do we have any objections to
9 entering the pre-filed testimony of Mr. Williams for the record?

10 MS. WILLIAMS: Same -- I'll reiterate -- I won't reiterate
11 but I will refer back to my prior objection.

12 HEARING OFFICER ANTONIOLLI: I will note your objection on
13 the grounds of relevancy as well to Exhibit 5. And I would have
14 to say that -- to form a more complete record and to enter --
15 enter in more evidence on the issues of environmental impact and
16 economic reasonableness, we'll go ahead and enter Mr. Williams'
17 testimony as Exhibit 5.

18 MR. FORT: Thank you. Mr. Williams, are you prepared to
19 give a synopsis of your pre-filed testimony?

20 MR. WILLIAMS: I am.

21 MR. FORT: Please proceed.

22 MR. WILLIAMS: My name is Charles Williams. I am the
23 founder and President of Water Remediation Technology for the
24 environmental of Illinois. Under my direction WRT has developed

1 proprietary technology for removing contaminants from water and
2 wastewater and is specifically concentrating on helping
3 municipalities comply with the radionuclide rule in a safe and
4 non-polluting manner. I have worked with extractive
5 metallurgical processes for over 30 years and have installed
6 removal technologies for the removal of ammonia, gold, lead,
7 zinc, and silver. For the past four years, I have directed
8 research and development on the removal of contaminants from
9 drinking water, including such contaminants as radium, uranium,
10 arsenic, cadmium, lead, chromium and selenium.

11 The WRT, under my direction, has conducted radium removal
12 pilot plant studies at over 20 sites in six states, 12 of which
13 of these sites are in Illinois. I am a co-inventor on five
14 patent applications related to contaminate removal from water.
15 And WRT is currently constructing five radium removal plants in
16 Illinois; engineering is underway on an additional 20 sites. The
17 WRT process removes radium from drinking water and disposes of
18 the radium-loaded residuals into a low-level radioactive waste
19 facility. My education consists of a Bachelor of Science in
20 Geology from North Carolina State University.

21 The impact of changing the 30-year-old water quality
22 standards for radium, as proposed, is to allow a known carcinogen
23 to be discharged into the waterways of Illinois. The proposed
24 rulemaking effectively eliminates the general use water quality

1 standard for radium. No monitoring of the discharge from a
2 Publicly Owned Treatment Works or directly from a treatment
3 facility would even be required. In effect, the discharge limit
4 would be changed from the current limit of one picocurie per
5 liter of Radium-226 to an unlimited discharge.

6 It should be remembered that the Maximum Contaminant Level
7 goal, the MCLG, for radium established by the USEPA is not five,
8 it's zero. In other words, any radium in drinking water is
9 undesirable and any level above zero carries a health risk. The
10 removal of radium discharge standard from the general water
11 quality standard, as proposed, is not necessary or advisable for
12 the following reasons:

13 (1) Treatment technologies are available that remove
14 radium from the drinking water without generating a radium-laden
15 discharge to the sanitary sewer or to a receiving stream. All
16 radium removal technologies can be designed to avoid the radium
17 release to the sewer or receiving stream.

18 (2) Treatment technologies that do not discharge
19 radioactive residuals to the sewer are economically competitive
20 with those technologies that do discharge to the sewer or
21 receiving stream.

22 (3) Radioactive residuals that are not discharged into the
23 sewer are disposed of in a Low Level Radioactive Waste Disposal
24 Site with long-term maintenance plans and long-term funding.

1 (4) When radium residuals are discharged into the sewer,
2 sewer workers and other public employees are exposed to higher
3 levels of radiation. Not allowing radium residual discharge to
4 the sewer decreases the exposure of sewer workers to radiation
5 and is consistent with As Low As Reasonably Achievable (ALARA)
6 radiation control principles.

7 (5) Removing the radium discharge standards, as proposed,
8 will allow low-flow streams where the discharge from the POTW is
9 the principal flow to be many times the drinking water standard.
10 This implies that the life in the stream that is not used for
11 drinking water has no value. Testimony from the IEPA is the
12 majority of the affected treatment plants discharged to low-flow
13 or zero-flow streams.

14 (6) There is series liability issues regarding potential
15 harm to people and the environment that water treatment plant may
16 be passing to POTWs.

17 (7) The discharge of radium treatment plant residuals into
18 the POTW, which will be allowed by this proposed rule change,
19 will require significant time and resources of government
20 agencies to ensure the health and safety of Illinois citizens.
21 Indeed, a significant new workload will be placed on the
22 governmental agencies to control and monitor sewer worker safety
23 and land-spreading of residuals.

24 (8) The discharge of radium treatment plant residuals into

1 the POTW will create significant increase in workload for the
2 site and worker monitoring and worker training as well as
3 increased liability for the POTW.

4 (9) Under the proposed rule change, the irony is that
5 sludge that is too radioactive for landfills in Illinois is being
6 permitted for spreading on Illinois farm fields and open land.

7 (10) Based on the Memorandum of Agreement between the
8 Illinois Department of Nuclear Safety and IEPA, which is attached
9 hereto as Exhibit 1, significantly more land than currently
10 utilized -- will need to be utilized in land application.

11 Indeed, the limit of 0.1 pCi/g increase in the soil may require a
12 three- to 10-fold increase in land needed for land application.

13 (11) Lastly, common sense says that once you take a
14 carcinogen out of the environment, don't put it back.

15 As indicated by the IEPA, the source of the radium to the
16 natural -- is natural radium dissolved in the raw water pumped
17 back from deep aquifers. Nobody created this problem; it was
18 just there. Since radium is a known carcinogen and the maximum
19 contamination level is zero, any discharge into the Illinois
20 environment, streams or land, should be allowed only after
21 comprehensive studies have been conducted and then only if no
22 other options exist.

23 Communities that draw water from radium-contaminated
24 aquifers need to understand the requirements, the impacts, the

1 unattended consequences of radium disposal. They can then make
2 an informed decision on which treatment process to use and be
3 confident that more restrictive discharge limits in the future
4 will not cause a multi-million dollar treatment facility to
5 become obsolete.

6 Many of the communities with a radium problem are
7 experiencing population growth that requires increase pumping and
8 greater dependence on radium-contaminated aquifers. Oswego,
9 Illinois, for example, is adding two new 1,000 gallon per minute
10 wells during the next year, a 40 percent increase in capacity.
11 Elburn, Illinois, is adding one well next year, a 50 percent
12 increase in capacity. Not only must Illinois contend with the
13 current production of radium, they must deal with more and more
14 radium being added to the surface of the environment each and
15 every year in perpetuity.

16 Radium in drinking water is a serious and complex issue.
17 To understand all the ramifications of the proposed rule change,
18 one needs to know where the radium is being generated, the
19 potential disposal options available to the water producer, and
20 the site of radium removed from drinking water and, ultimately,
21 how the impact of the radium on the environment can be minimized.

22 This chart indicates the places where we have conducted
23 pilot plant tests, or are conducting pilot plant tests, and the
24 amount of Radium-226 and -228 that's present in these sites.

1 Illinois is not alone. As you can see Texas has over 30 -- 33
2 picocuries per liter radium. The highest found in Illinois,
3 where we've done testing, is 22.6 in Woodsmoke Ranch. So
4 significantly high levels of radium. The average for Illinois
5 was 7.8 of Radium-226 and 4.9 of Radium-228 for a combined total
6 of 12.8, which compares to the testing that we've done across the
7 nation at 13.9.

8 HEARING OFFICER ANTONIOLLI: Mr. Williams, I would like to
9 say that the table you're referring to is Table 1 on page 4?

10 MR. WILLIAMS: Table 1, Figure 1, yes.

11 HEARING OFFICER ANTONIOLLI: Go ahead.

12 MR. WILLIAMS: Available to a water treatment facility are
13 truly only three options. They can treat the radium coming out
14 and dispose of that in one of three sites. They can put it into
15 the -- directly into the waterway. They can put the residual, if
16 it is a solid, into a landfill; or they can put the residuals
17 into the sewer which in turn distributes those residuals either
18 to a landfill or to the stream.

19 HEARING OFFICER ANTONIOLLI: I'd like to note, before you
20 change that, you enlarged a Figure 2 on page 6 of the Exhibit 5
21 which describes the Radium Disposal Options For Water Treatment
22 Plants?

23 MR. WILLIAMS: Yes. The current water quality standard of
24 one picocurie per liter effectively protects the citizens of

1 Illinois by not only putting the discharge into a stream but also
2 preventing the discharge into the sewer. The problem you run
3 into, is if you discharge into the sewer a significant amount of
4 radium, that's also reflected into the sewer discharge into the
5 stream. And the one picocurie per liter effectively prohibits
6 that discharge.

7 Of the three options that were available, only the
8 transport to a low-level radioactive disposal site keeps the
9 radium out of the Illinois environment, and to my understanding,
10 is permissible under current Illinois rules.

11 HEARING OFFICER ANTONIOLLI: I'd also note that what we
12 have in front of us now is an enlarged version of Figure 3 on
13 page 7 of Exhibit 5, and it is a version of Radium Disposal
14 Options in Illinois, the exact table on page 7 -- figure on page
15 7.

16 MR. WILLIAMS: Discharge of radium directly from the water
17 treatment plant to a receiving stream will mean that the
18 discharge of radium into a receiving stream is many times the
19 current limit of one picocurie per liter. And indeed, many times
20 the drinking water standard of five picocurie per liter. For
21 example, a municipality that produces water with a radium content
22 of 15 picocurie per liter and installs a reverse osmosis system,
23 as is currently being permitted within Illinois, it will
24 concentrate the radium into a small percentage of the raw water

1 and then discharge that high radium concentrate in a receiving
2 stream. The receiving stream could be receiving levels of
3 approximately 100 picocuries per liter. This level is 20 times
4 the drinking water standard, and if one half the radium is
5 Radium-226, could be as much as 50 times higher than the current
6 standard. The proposed rule change, in my understanding, would
7 permit just such a discharge.

8 Discharge to the sewer creates not only a discharge to the
9 stream but also elevated radium into the sewer sludge which is
10 usually land applied to farms. It exposes sewer workers to
11 unnecessary radiation exposure and it exposes future residents of
12 the land to increase radiation -- or radon exposure (radon being
13 a byproduct of the radium decay). Indeed, it is my understanding
14 that the level of radium in the sewage sludge will be high enough
15 that the sludge will not be disposed of in currently permitted
16 Illinois landfills. Now what this chart shows is the potential
17 sites for disposal after it's treated. May I approach the chart?

18 HEARING OFFICER ANTONIOLLI: (Nods head.)

19 MR. WILLIAM: Okay. If you go to the treatment process,
20 you discharge the treatment residual. That treatment residual is
21 either a solid or a liquid. If it's a liquid, it can't go to any
22 landfill. It has to be a solid to go to a landfill. Therefore,
23 it only has two options. It can go to the waterways directly or
24 it can go into the sewer. If it goes into the sewer, then it is

1 broken into two components, sludge and wastewater. The
2 wastewater then goes into the waterways and the sludge which --
3 both of which will contain radium. The sludge then will go --
4 become a solid and there are a number of disposal options
5 available to a sewage treatment facility. One, if the radium
6 content is less than 226 or 228, it is my understanding that this
7 is acceptable at your local landfill.

8 MR. FORT: I'm sorry. Less than five?

9 MR. WILLIAMS: I'm sorry. Less than five of 226 and 228
10 can go to the local landfill. If it is greater than 50
11 picocuries per gram, it is my understanding that it can go into a
12 permitted landfill in Illinois but that there are no currently
13 permitted facilities to accept those. Or if it is less than 50,
14 it can be land applied but that land applied cannot increase the
15 radium concentration of the soil on which it is applied by more
16 than 0.1 picocuries per gram. Or if it is over 50, then it can
17 go into a low-level radioactive waste site out of the state of
18 Illinois. There are currently two or three, and maybe be one
19 more coming, one is in Idaho, for relatively low level less than
20 225 picocurie of 226. Hanford, Washington, can take up to 10,000
21 picocuries of 226.

22 The impact of these rules are as follows: Disposal radium
23 contaminated sludge should only be done under strict supervision
24 with upper limits of what can be disposed of. In order to

1 minimize impacts to future land users, only a very, very small
2 increase of radium is allowed if applied to the land. The impact
3 of this last rule is very significant. Typically non-radium
4 bearing sewer sludge rates are approximately three ton per acre.

5 Table 2 --

6 HEARING OFFICER ANTONIOLLI: Table 2 is on page 8 of
7 Exhibit 5?

8 MR. WILLIAMS: Table 2 indicates application rates that
9 could be predicted for radium-bearing sludges at the average
10 Illinois content, and the Illinois high radium content. I did it
11 under three cases. In the prior testimony that was indicated
12 that in some cases up to 80 to 90 percent of the radium could be
13 in the sludge and 20 -- 80 to 20 percent could be into the water.
14 So there is quite a variability of what could be in the sludge
15 and what could be in the water. So I ran three cases. The Case
16 1 was 90 percent recovery in sludge. Case 2 is 50 percent
17 recovery in the sludge, and Case 3 was a low recovery in the
18 sludge of 20 percent. Note, the radium has to go somewhere. It
19 either goes to the sludge or it goes to the river. Radium can't
20 be created or destroyed. It's there. It's got to go somewhere.

21 So if you were to look at the 0.1 application rate, an
22 average Illinois case with 90 percent reporting to the sludge
23 would predict an application rate of only .49 tons per acre or a
24 high Illinois case only .27 per tons per acre. All of a sudden

1 you need a large amount of land to land apply this sludge.
2 Notice you're polluting or spreading radium thinly on a large
3 piece of land. In Case 3, which is 20 percent recovery in the
4 sludge, and frankly, I don't believe that's a norm. You're still
5 looking at 1.23 tons per acre in the high case.

6 In short, if you're going to put radium on the ground and
7 if you're going to adhere to the memorandum of agreement, your
8 application rates are far less than what they are today.

9 The question then is, do we need to put it down the sewer?
10 And I contend that all systems can be modified to significantly
11 reduce or eliminate the disposal of radium from drinking water
12 onto the land and into the streams.

13 We missed a page, I think. Let's -- There are really one,
14 two, three, four, five technologies for removing radium. There's
15 reverse osmosis, which basically concentrates the radium into a
16 small amount of the input water; ion exchange, there's hydrous
17 manganese oxide, there's lime softening and there's absorptive
18 medias.

19 HEARING OFFICER ANTONIOLLI: And what you're referring to
20 now are the two figures, Figure 4 and Figure 5, on page 13?

21 MR. WILLIAMS: No, Table 3 on page 9. We're not there.

22 HEARING OFFICER ANTONIOLLI: Table 3 on page 9, okay.

23 MR. WILLIAMS: Many of these methods contemplate disposal
24 of the radium-bearing residuals down the sewer, assuming that the

1 disposal down the sewer will dilute the radium sufficiently so
2 there is no longer a health hazard.

3 Let's go back to this one. We did a calculation based on
4 various assumptions to try and determine what the sludge values
5 would be and what the sewer liquid effluent going into the
6 streams would be under various cases of a feed concentration into
7 the average in Illinois or the high Illinois case. If you look
8 at this chart, what you will see in Case 1, where 90 percent of
9 the radium is in the sludge and 10 percent of the radium in
10 effluent was no dilution. In other words, the water that is
11 shipped out from the water treatment facility reports to the
12 water treatment plant or the wastewater treatment plant with no
13 dilution. In other words, no storm drains in there. It's just
14 the water that has been produced that is going there.

15 HEARING OFFICER ANTONIOLLI: And you're now referring to
16 Table 5 on page 11?

17 MR. WILLIAMS: That's correct. On 12.8 picocurie per liter
18 into raw water, you could expect that 90 percent of recovery, 133
19 picocuries per gram in the sludge, and 1.3 picocuries of total
20 radium in the effluent. Under the high Illinois case, at 22.6
21 you could have as much as 234 picocuries per gram in the sludge
22 and 2.2 in the sewer liquid effluent into the streams.

23 If you go down to the middle case, you're still looking at
24 sludge concentrations of 73 and 130 and 6.4 and 11 into the

1 streams. If you look at the lowest case, remember it either goes
2 into sludge or it goes into the river, in Case 6, even with 50
3 percent dilution, you have have a concentration of sludge of 20
4 and 34 and a sewer liquid effluent picocuries per liter at 6.8
5 and 12. The conclusion for these calculations is that if water
6 treatment residual are discharged to the POTW, then significant
7 levels of radium can be expected to be found in both the sewage
8 treatment liquified effluent and the sewage sludge. Most notably
9 is Case 3, 4, 5, and 6 will exceed the one picocurie limit for
10 Radium-226, and in most cases the five picocurie limit for
11 combined.

12 In the case of low-flow or no-flow streams, then these
13 concentrations would be reflective of what would be found in the
14 streams. These levels of radium are high enough to cause
15 significant concern for both the safety of POTW workers and for
16 the safety of the biota.

17 Let's change to the other one. As mentioned before, I
18 believe that the suppliers of the radium removal equipment can
19 modify their systems to avoid the disposal down the sewer. As
20 long as the disposal down the sewer is allowed and even
21 encouraged, the suppliers have no incentive to develop radium
22 removal that do not pollute Illinois waterways and land. The
23 technology exists to modify the systems and the will can be
24 provided by maintaining the current quality water standard or by

1 banning disposal down the sewer. In the reverse osmosis process
2 the -- I'm going to go back to the board now.

3 HEARING OFFICER ANTONIOLLI: What you're referring to is
4 Figure 4 first?

5 MR. WILLIAMS: Figure 4 and Figure 5.

6 HEARING OFFICER ANTONIOLLI: On page 13 and Figure 5 on
7 page 13.

8 MR. WILLIAMS: In the reverse osmosis system the water is
9 pumped under pressure across a membrane. The treated water that
10 passes through the membrane then becomes the radiant complied
11 water with low levels of radium in it. The rejection water, or
12 the consonant threat, then is available for two choices: One,
13 disposal directly into the waterways. It would be expected to
14 have concentration of radium between 30 and 150 picocuries per
15 liter, or into a sewer pipe. If it's deposited to a sewer pipe
16 and it makes -- and it is now high in total dissolved solids and
17 it mixes with carbon dioxide and other chemicals that's in normal
18 water, then you can expect to see a deposition of radium
19 carbonates and sulfates in the sewer pipe and in the wastewater
20 treatment plants. When the radium and water reaches the
21 wastewater treatment plant, again it will be divided into
22 section. A liquid effluent that is discharged into the waterways
23 that will contain part of the radium and a sludge component that
24 can either be land applied or go to an appropriate landfill, also

1 containing radium, perhaps levels that endanger health. To
2 modify that, to avoid the contamination of the and, the sewage
3 treatment plant, the sewer pipes, at the water treatment
4 facility, and remember it's the water treatment plant's problem.
5 It's not the POTW's problem. They can either precipitate the
6 radium using a barium sulfate process that's well known and well
7 documented. They could absorb it on a media that's provided by
8 Layne Christianson, a competitor of ours, or they can use a
9 source of media like ours. That would eliminate the
10 contamination from that point on and the solid residual could
11 then be taken to a low level disposal site.

12 MR. FORT: Madam Hearing Officer, he's noted the picocurie,
13 you know, concentration calculated on this document. It's really
14 not in the pre-filed testimony as such. Should we mark this as a
15 separate exhibit number just so we got a record of it?

16 HEARING OFFICER ANTONIOLLI: Let's mark it as Exhibit 6.
17 Barring -- Let me have any objections first.

18 MS. WILLIAMS: I just would like him to identify what's on
19 there, what's not.

20 MR. FORT: The table, the earlier, it's 30 to 150
21 picocuries per liter.

22 MS. WILLIAMS: That's what you've added?

23 MR. ADAMS: Right.

24 HEARING OFFICER ANTONIOLLI: And that's added in two places

1 on Figure 4, which is also found on page 13 and what -- what
2 we're entering as Exhibit 6 has those additions?

3 MR. FORT: Correct.

4 HEARING OFFICER ANTONIOLLI: Okay. Are there any
5 objections?

6 MR. HARSCH: Why don't we just correct the one that was
7 originally filed.

8 HEARING OFFICER ANTONIOLLI: I'll go ahead and accept it as
9 Exhibit 6, that way we have both, the clean copy on record as
10 well as the marked up exhibit.

11 MR. FORT: Thank you.

12 MR. WILLIAMS: A second, excuse me, a second common method
13 for radium removal is ion exchange where the radium is collected
14 on a loaded resin and then the resin is regenerated using a salt
15 brine. The salt brine is then discharged down the sewer. You
16 create really several stream waste products here. One, the
17 exhausted resin, when the resin has to be exchanged, it has to go
18 to an appropriate landfill and you have to determine at the point
19 at the time of disposal what that level might be. In many cases
20 a dozen end up going into Hanford or to Idaho.

21 The salt brine then is precipitated is then discharged into
22 the sewer pipe that goes to the sewer for the same problems that
23 I mentioned for reverse osmosis. Here, however, you can be
24 looking at, in my experience, levels of radium in the eluate,

1 that's the brine that is used to remove the radium from the
2 resin, of three to 6,000 picocuries per liter and 100 to 300
3 picocuries per liter into the water used to rinse that resin.
4 Again, it goes into the sludge. Part of it goes into the
5 wastewater. Hence, the potential problem for the one picocurie
6 rule. Part of it goes to land application, and part of it goes
7 to the appropriate landfill. To change that process, so that you
8 don't have to put it down the sewers, so you don't have to put it
9 into the streams, then you have to add another step. You have to
10 add either a precipitation or absorption step very similar to
11 what I described for reverse osmosis. But -- but if you do that,
12 then you eliminate the problem of contamination of the wastewater
13 treatment plant and the radium discharges or at least the vast
14 variety of the radium discharge to the waterways and to the land.

15 MR. FORT: Again, we got the blow up of Figure 6 with the
16 data marked on it that we marked as Exhibit 7 then?

17 HEARING OFFICER ANTONIOLLI: Yes. Are there any objections
18 to entering this Figure 6 and Figure 7 as Exhibit 7? Seeing no
19 objections, I'll go ahead and enter it as Exhibit 7.

20 MR. WILLIAMS: Next process that's in common use these days
21 is a hydrous manganese oxide process where chemicals are added to
22 the drinking water that then form a precipitant with the radium.
23 It is a solid precipitant. The radium is then filtered out in
24 conventional filtration. The radium compliant water is sent to

1 the consumer. Some of that water is then used to backwash the
2 radium loaded filter. The radium loaded filter, backwash is then
3 discharged into a sewer pipe. The concentration, remember this
4 is a solid because you just filtered it out, the concentration in
5 that solid could be up to 10,000 picocuries per gram. If this is
6 a licensed facility under the Department of Nuclear Safety or if
7 it is a licensed facility in our NRC, the discharge of those
8 solids is prohibited to the sewer. Again, you're going to do the
9 same thing. You end up with part of it in the waterways either
10 going to land application or to an appropriate landfill.

11 To modify that system, basically all you need to do is
12 filter the backwash water again and make a solid that can then be
13 transported to a low-level radioactive waste disposal site and
14 avoid the potential contamination that Ted talked about of the
15 sewer and the sewer pipe and showing up on land.

16 MR. FORT: Again, Madam Hearing Officer, can we mark this
17 and admit it as Exhibit 8, it's Figure 8 with the picocuries of
18 up to 10,000 noted on it?

19 HEARING OFFICER ANTONIOLLI: Are there any objections to
20 entering this Exhibit 8. What I have before me is Figure 8
21 Hydrous Manganese Oxide Radium Removal Process? Any objection?
22 Seeing none, I'll enter this as Exhibit 8.

23 MR. WILLIAMS: In the absorbant media process of which
24 water mediation technology manufacturer for the media Layne

1 Christianson utilizes a dowel media. We do a similar thing. We
2 put the media in the tank. The water passes through the tank.
3 It absorbs the radium from the water. We have radium compliant
4 water that comes out the other end and the media, when loaded,
5 somewhere between 400 and 3,000 picocuries per gram is then
6 transported to a licensed and permitted disposal center. There's
7 no modifications that are required.

8 MR. FORT: Again, could they then do this as Exhibit 9
9 which is Figure 11 blown up with the additional notations of the
10 radium contamination in the removed material?

11 MS. WILLIAMS: Can you repeat what that is?

12 HEARING OFFICER ANTONIOLLI: This is the table on page 17
13 it's Absorbent Media Radium Removal Process with additions to 400
14 to 3,000 picocuries per gram. Seeing no objections, I will enter
15 this into the record as Exhibit 9.

16 MR. FORT: Thank you.

17 MR. WILLIAMS: As I indicated, two companies Layne
18 Christianson and WRT, have developed process to remove radium
19 from the drinking water without creating a residual to be
20 disposed of down the sewer. Both of these systems use an
21 absorptive media to remove the radium from the drinking water and
22 the loaded media is disposed of in a Low Level Radioactive Waste
23 Disposal Site. In the case of WRT, WRT provides a complete
24 system consisting of the equipment, the media service and

1 disposal to the Low Level Radioactive Disposal Site. Generally
2 water treatment plant operators have no experience in training or
3 handling radioactive materials. WRT provides radiation training
4 to our personnel and to the water treatment plant personnel to
5 ensure worker awareness of proper procedures. WRT personnel
6 conduct all maintenance and handle all fresh and loaded media.
7 This enables the water treatment plant workers to do their normal
8 jobs without fear of radiation exposure.

9 Regarding costs, the costs of radium removal systems that
10 do not dispose of radium to the sewer or streams is competitive
11 or lower than many of the systems that do. The mayor of Oswego,
12 which has signed a contract with us, has stated that in selecting
13 WRT he has saved over 2 million dollars over the life of the
14 contract. The mayor of Elburn, who has also signed a contract
15 with us, has stated that by selecting the WRT system, they have
16 saved over 2.6 million over the life of their contract.

17 In addition, if the uncontrolled discharge of radium is
18 allowed when the radioactive contamination is recognized and or
19 new regulations are enacted or legal suits brought to stop the
20 discharge of radium, the POTWs will have to change their disposal
21 practices. Since it is very difficult, if not impossible, to
22 remove the radium once it is in the POTW system, the POTW would
23 have to: One, find an alternative disposal method for its sludge
24 and if it has to go to landfills, it could be very expensive;

1 two, imposes a pre-treatment standard on the water treatment
2 plants that require retrofitting of the treatment plants. And
3 all parties will have to deal with deciding who is responsible
4 for the changes, as is indicated in the Ohio case.

5 In conclusion, the suggested rule change by the IEPA is ill
6 advised and could create many more problems than it solves. Most
7 significantly, the existing general water quality standard is the
8 one codified rule that effectively prohibits the reintroduction
9 of radium from drinking water to the land and the waterways of
10 Illinois. Under the existing rule, Illinois is among the
11 national leaders in protecting its streams, rivers and lakes by
12 preventing radioactive carcinogens from being discharged into the
13 waterways. This proposed rule change would turn that upside
14 down. The process that discharges radium into the sewer that is
15 currently allowed are not environmentally sound best practice.
16 After going through the sanitary treatment process, the resulting
17 sludge contains concentrated amounts of radium that is then
18 spread on Illinois farmland. An unintended consequence of sewer
19 disposals is that in the absence of testing, monitoring and
20 notice, sewer workers are not made aware of their exposure to
21 radiation or trained or equipped to handle it. Not only are the
22 absorptive media technologies, such as that of WRT, approved by
23 the Agency to provide a total removal in a cost-effective manner,
24 but all the competing technologies can be re-engineered to

1 provide a similar total solution. This total removal approach
2 does not require new bureaucracy to enforce the regulations
3 governing the discharge of radium particulates into the sewer,
4 the spreading of radioactive sludge into farmland or the
5 discharge of radioactive carcinogens into the streams and
6 waterways. It does not require the discarding of long-standing
7 state and federal environmental regulations.

8 With all do respect to this Board, the proposed rule change
9 will be to allow the unmonitored and unrestricted discharge of
10 large quantities of carcinogenic radioactive materials into
11 Illinois streams and the environment. We urge the Board to act
12 in the interest of human health and the environment to protect
13 the long-term interest of the people of the State of Illinois and
14 to reject the Agency's proposals.

15 HEARING OFFICER ANTONIOLLI: Thank you, Mr. Williams, Mr.
16 Adams, for your testimony. Are there any questions now that we
17 have for the witnesses? The Agency is to begin. Ms. Williams?

18 MS. WILLIAMS: I have quite a few. I don't know if there's
19 a point where you want to break.

20 HEARING OFFICER ANTONIOLLI: We can take it as it goes. We
21 can take a break in a little bit.

22 MS. WILLIAMS: Why don't we start. I pretty much have
23 separated the questions that I have between the two of you, and
24 I'll start with Mr. Williams but if -- Mr. Adams, if you want to

1 pipe in and help answer the questions, that would be great. And
2 I've tried to order my questions based on the presentation of
3 testimony so we can kind of flip through the testimony as we go.

4 EXAMINATION OF CHARLES WILLIAMS

5 Q. (By Ms. Williams) Mr. Williams, on the first page of
6 your testimony you state that that there are 20 pilot plant
7 studies being conducted, over half of them in Illinois. Could
8 you tell us if you have any full scale -- is there any plant in
9 operation on a full scale with using your patented technology at
10 this time?

11 A. We are currently installing five plants in Oswego. We
12 are in final design on -- well, and Oswego is doing two more, so
13 ultimately seven in Oswego. We've contracted with Elburn for
14 two, and one more is in contract negotiations.

15 Q. But none are up and running to date?

16 A. None are up and running.

17 Q. For the, I guess nine that you just described, seven in
18 Oswego and two in Elburn, has WRT estimated the volume of spent
19 media that will be generated at those facilities?

20 A. We have a calculation for each of those sites and each
21 -- and the life of the media at each site. Typically, you're
22 looking at generating in Oswego, the media will last anywhere
23 from one to seven years, depending on their usage and their
24 radium content. Typically, a plant will have 15 tons of media in

1 -- in tank one, and additional 15 tons in tank two.

2 Q. And can you estimate for the Board what size these
3 plants are? About how many homes they service?

4 A. Well, Oswego is up to about almost 20,000 people now.

5 Q. Uh-huh.

6 A. And they -- they have -- well have currently under
7 contract five sites and two more, so seven sites serving 20,000
8 people.

9 Q. So a few thousand at each site. In Elburn?

10 A. I don't really know how big Elburn is.

11 Q. Is WRT licensed to handle and transport low-level
12 radioactive waste in Illinois?

13 A. We've been working with IDNS for, oh, I'd say the last
14 two years, trying to define what kind of licensing is going to be
15 required for us.

16 Q. Okay.

17 A. Those -- those efforts are still under way. We will be
18 making our submittal to IDNS in the next few weeks.

19 Q. On page 6, I believe it is, of your testimony there is a
20 statement -- let me find it. Well, maybe it isn't on page 6. I
21 believe there's -- oh, no, you're right. It's on page 1. There
22 is a statement about change to the standard being basically to
23 the detriment of Illinois rivers, streams and lakes. That's just
24 a general statement of your testimony. I believe there is

1 something similar to the change would threaten Illinois streams,
2 rivers and lakes.

3 A. Yes.

4 Q. Can you explain to us what you mean by that and what
5 evidence there is to support that statement?

6 A. I'll let Ted answer the impact on biota. We believe the
7 elimination of the one picocurie limit of 226 and the -- to -- in
8 my opinion, effectively no standards, would allow the discharge
9 of levels that, I believe, are currently well shown to have
10 impact on biota.

11 MS. WILLIAMS: Can you give us some examples of where we
12 can look to demonstrate that they're well shown to have an
13 impact?

14 MR. ADAMS: Where I would go, and where I would have, and I
15 guess where I have the difficulty with the EPA and the statement
16 in the previous testimony, was that there were no literatures or
17 literature couldn't be found that states that there were no
18 impacts --

19 MS. WILLIAMS: Sure.

20 MR. ADAMS: -- of radiological material. I think one which
21 I -- which I want to reference, which I included in my testimony,
22 was the NCRP 109. And that is, in my testimony, that would be
23 just the book, okay. And in there, what you will see, is their
24 objectives in this report. This is the NCR-2 which was tasked by

1 the Department of Energy to look at the impacts of radiation or
2 radiological materials on biota, aquatic biota. Their objectives
3 were to review the available literature on the Effects of
4 Ionizing Radiation on Aquatic Organisms, to provide guidance for
5 the establishment of a dose rate below which deleterious affects
6 the aquatic populations are acceptably low, to provide a series
7 of simple though symmetric models which will be employed to
8 demonstrate compliance with such guidance, to evaluate the
9 validity of the statement that if man is avidly protected, then
10 other things, other living things, are also likely to be
11 sufficiently protected. And last, to make a recommendation --
12 recommendations for pertinent future resource and research.

13 HEARING OFFICER ANTONIOLLI: And what you just read was a
14 section out of this document that you refer to on page 21 of your
15 pre-filed testimony, Effects of Ionizing Radiation on Aquatic
16 Organisms?

17 MR. ADAMS: Yes, page 1.

18 MS. WILLIAMS: Madam Hearing Officer, would you like me to
19 start with one or would you like me to mark the exhibit as --

20 HEARING OFFICER ANTONIOLLI: Let's continue with 10.

21 MS. WILLIAMS: I'm going to show you what I will have
22 marked Exhibit 10, Mr. Adams, for identification is this the
23 document you're referring to?

24 MR. ADAMS: Yes, it is.

1 MS. WILLIAMS: Do you have an objection if we have it
2 entered as an exhibit for the Board?

3 MR. ADAMS: No.

4 MR. HARSCH: You will provide me a copy?

5 MS. WILLIAMS: Yes.

6 MR. FORT: This is -- this is -- Counsel, this is bound
7 together with a tab. Do you have a more secure copy than just
8 fastening it together that way? It could -- Anybody could easily
9 and inadvertently lose a page out of that.

10 MS. WILLIAMS: There are a 115 pages. They're all
11 numbered. I mean, I would be happy, if you want, to give them
12 your book.

13 MR. FORT: It's your document so you can introduce it how
14 you like.

15 HEARING OFFICER ANTONIOLLI: Are there any objections to
16 entering what I have before me, which is a copy provided by the
17 Agency, of Effects of Ionizing Radiation on Aquatic Organisms and
18 NCRP Report 109 as Exhibit 10? Seeing no objections, I will
19 enter this as an exhibit.

20 MS. WILLIAMS: Okay. Thank you. Mr. Adams, can you tell
21 us what that publication has to say about radium?

22 MR. ADAMS: What the publication has to say is general in
23 nature and that it looks at the -- both the acute and chronic
24 exposure of radioactive materials or radiation to organisms,

1 aquatic organisms, and is defined as absorbants and has a list of
2 -- a list of or examples of various types of radionuclides that
3 are included as part of those which exhibit exposed dose to the
4 aquatic organisms. It is not specific to radium.

5 MS. WILLIAMS: Does it have something specific to say about
6 radium?

7 MR. ADAMS: I've not looked at all the cases and all the
8 research examples so I couldn't answer to say that it excludes
9 radium or not.

10 MS. WILLIAMS: Are you aware if it's based on real word
11 experience or theoretical models?

12 MR. ADAMS: It is based on both. It is based on laboratory
13 analysis for acute. It is also based on models throughout the
14 world.

15 MS. WILLIAMS: On page 55 --

16 MR. ADAMS: I'm sorry?

17 MS. WILLIAMS: Table 7, page 55. Did you see what I'm
18 referring to, Table 7.5?

19 MR. ADAMS: Yes.

20 MS. WILLIAMS: 7.5 at the bottom of page 55, are you able
21 to explain for the Board what that table is describing and
22 interpret that for the Board?

23 MR. ADAMS: Okay. The table is titled External and
24 Internal Absorbed Dose to Fish from Water at a Concentration that

1 Produce a dose equivalent of --

2 HEARING OFFICER ANTONIOLLI: Can I interrupt for a minute?

3 Do you have an extra copy?

4 MS. WILLIAMS: I do have an extra copy. Okay. I think,

5 Mr. Adams, that you just read the title of the table?

6 MR. ADAMS: Right.

7 MS. WILLIAMS: Which I appreciate, but could you tell us

8 what it says? Can you tell us what it mean?

9 MR. ADAMS: Yes. The titled or the table has a list of

10 radionuclides that has their equivalent or a representative

11 nuclide concentration in water that would deliver a total dose to

12 the human and also has external dose which is an extra type of

13 external outside dose.

14 MS. WILLIAMS: Uh-huh.

15 MR. ADAMS: An internal dose would be that which we would

16 be exposed to from ingestion such as eating or drinking

17 contaminated foods.

18 MS. WILLIAMS: Have you attempted to translate that dose

19 into a concentration in picocuries?

20 MR. ADAMS: I have not. But there are others such as the

21 second example that I used which was --

22 MS. WILLIAMS: If I was --

23 MR. FORT: Can he finish his answer?

24 MS. WILLIAMS: Sure. I'm sorry. Go ahead.

1 MR. ADAMS: There are other examples that I had chaired,
2 other examples approximately in my testimony with biota doses
3 that the DOE --

4 MS. WILLIAMS: You mean the other sites that you had in
5 your testimony?

6 MR. ADAMS: That's correct, yes.

7 MS. WILLIAMS: Well, we can talk about that.

8 MR. ADAMS: Okay.

9 MS. WILLIAMS: To -- I mean, that's fine when we're done.
10 What would your response be if I was to tell you that the Agency
11 interpreted that table to a level of 22,000 picocuries per liter
12 as being the concentration? Does that seem high or low to you?
13 Do you have any opinion on a figure like that?

14 MR. ADAMS: Well, I think, the answer to that question
15 depends on the condition of the, assuming the stream or the
16 concentration of the water that individual is exposed to or the
17 organism is exposed to.

18 MS. WILLIAMS: Say that again.

19 MR. ADAMS: For me to answer that question, high or low is
20 relevant only to the condition of which the individual organism
21 is exposed to that concentration of water. In other words,
22 particularly aquatic organisms are very susceptible to water
23 chemistry, temperature, the type of stress they're under, so to
24 say simply a number out of the clear blue sky, I would be

1 hesitant to make a response.

2 MS. WILLIAMS: So -- so is what you're saying basically
3 that you don't have a recommendation for the Board about what a
4 safe concentration would be for aquatic life?

5 MR. ADAMS: I would say that I think the Board needs to
6 take time to look at what they said about the impacts or no
7 impacts on the aquatic --

8 MS. WILLIAMS: Sure.

9 MR. ADAMS: -- biota. Stop, go back into the literature,
10 take a look at what's there, whether it be this information or
11 the biota dose committee's user friendly methodology and look at
12 site specific situations to determine what the appropriate
13 standard is. You have situations that are low, no flow, that is
14 going to be different in situations where you have a receiving
15 stream that is moving, cleaning itself, etc. The other part of
16 it is in the aquatic area, you're dealing with both sediments and
17 the water.

18 MS. WILLIAMS: Uh-huh.

19 MR. ADAMS: Which is what we're looking at in the Biota
20 Dose Assessment Committee. They look at both.

21 MS. WILLIAMS: Now have you submitted the work of the Biota
22 Dose Assessment Committee to the Board for their review?

23 MR. ADAMS: What I have in my testimony is their website.

24 HEARING OFFICER ANTONIOLLI: The website and the document

1 itself has not been made part of the record.

2 MR. ADAMS: The actual document has not?

3 HEARING OFFICER ANTONIOLLI: Correct.

4 MR. ADAMS: Correct.

5 MS. WILLIAMS: Would you be willing to do that?

6 MR. FORT: I'm not sure that an entire site is amenable to

7 being transported into a record in this electronic age.

8 HEARING OFFICER ANTONIOLLI: No, it would be --

9 MS. WILLIAMS: What if you just cite it to the radium

10 recommendation versus whatever is referred to radium in there.

11 BOARD MEMBER MELAS: In this document?

12 MS. WILLIAMS: No, the second document.

13 HEARING OFFICER ANTONIOLLI: Which document are you

14 referring to?

15 MS. WILLIAMS: The one with the website.

16 HEARING OFFICER ANTONIOLLI: The website on page, let's

17 see --

18 MS. WILLIAMS: 21.

19 MR. FORT: You're asking if he has information on what

20 would be a safe or a non-safe level of radium in waters?

21 MS. WILLIAMS: I think so. I think that's what the Board

22 is asking here. I think that's the purpose -- purpose of this

23 proceeding.

24 MR. FORT: Do you want to take a swing at that one and

1 answer that question?

2 HEARING OFFICER ANTONIOLLI: Well, we haven't entered
3 anything into the record yet. I would say that without having
4 the information in front of the Board now, we won't enter it as
5 an exhibit but it can be submitted in post-hearing comments if we
6 want to address any questions to that at that point.

7 MS. WILLIAMS: Right. That was my question. That
8 basically that they submit, at least, the relevant portions of
9 that document for the Board's review and post-hearing.

10 HEARING OFFICER ANTONIOLLI: Just wanted to clarify.

11 MS. WILLIAMS: Sure.

12 BOARD MEMBER JOHNSON: You're the proponent here. It seems
13 to me that the notice is on the proponent on these Rulemakings to
14 provide the Board with information documenting the change you're
15 proposing to be protective of the Illinois environment.

16 MS. WILLIAMS: Absolutely. And that's why we made sure to
17 get a copy of this study that has been provided to the Board
18 today. We have not been able yet to acquire the study so I felt
19 that if these folks had reviewed it, it would help the Board. I
20 mean, if the Board isn't concerned about receiving it, then
21 that's fine.

22 BOARD MEMBER JOHNSON: No, no, that's fine. I'm just --

23 MR. ETTINGER: I'm Albert Ettinger. I just want to say the
24 Sierra Club, that we're definitely interested in seeing data that

1 would establish what this level is. And our principal purpose,
2 in fact, here is to find out precisely that information. And we
3 hope that somebody will submit it in a timely fashion, in fact,
4 so we can see it and have some crack and the public seeing this
5 in time, perhaps to comment, so I hope someone will get it to us
6 fairly quickly so we will get to look at in the comment period.

7 BOARD MEMBER RAO: Just a follow-up. This other document
8 are methodology that you refer to available on a website, does it
9 give a magic bullet number or is that some kind of evaluation
10 that needs to be done on a site specific basis?

11 MR. ADAMS: There's a series of steps that the individual
12 needs to go through. It is what's called a graded approach. The
13 first step is a screening level step in which there are
14 conservative values given for Radium-226, 228 and both the water
15 and sediment for a terrestrial environment and aquatic
16 environment. And I have -- I mean, I can share those numbers if
17 that's what you want.

18 HEARING OFFICER ANTONIOLLI: I'm going to stop you at a
19 summary there just because we don't have the document in front of
20 us. And if you'd like to go into further detail in your
21 post-hearing comments, you can.

22 BOARD MEMBER RAO: No, I was just asking what the document
23 is about.

24 HEARING OFFICER ANTONIOLLI: And he did give a brief --

1 MR. ADAMS: I gave you numbers.

2 BOARD MEMBER RAO: No need for numbers.

3 HEARING OFFICER ANTONIOLLI: Can you go ahead and give a
4 summary of it?

5 MR. WILLIAMS: Yes, yes.

6 MR. ETTINGER: Excuse me, sorry. To the extent the witness
7 does have numbers, I think it would be useful for us to hear them
8 as soon as possible so that we, you know, we can hear them and
9 use them in reflecting our future comments of the public.

10 HEARING OFFICER ANTONIOLLI: Okay. Go ahead. Let -- let's
11 go off the record for a minute.

12 (A discussion was held off the record.)

13 (A short break was taken from 3:11
14 until 3:21.)

15 HEARING OFFICER ANTONIOLLI: Okay. We're back on the
16 record and it is right now 3:21. We just took a 10-minute break.
17 And having discussed a document referred to Mr. Williams'
18 testimony, on page 21, and seeing as the -- what's contained in
19 the document is relevant and we're all here and can ask questions
20 about it, we will go ahead with a discussion of that. If you
21 would like to continue, Mr. Williams.

22 MR. ADAMS: I would be happy to provide a summary statement
23 with detail.

24 HEARING OFFICER ANTONIOLLI: Okay. Go ahead.

1 MR. FORT: We have a suggestion here to maybe move this
2 along and some of the questions that have been asked here. And
3 this witness has looked at, you know, not only the document that
4 the Agency offered but also this other website with various
5 information that we will -- we will bring forth that relevant
6 information. It's certainly part of our public comment
7 post-hearing, but we thought in the interest of moving this
8 along, we would ask Mr. Adams to sort of tell us what he thinks,
9 given his understanding of that database, and how it relates to
10 that proceeding.

11 MR. ADAMS: As I mentioned earlier, the Biota Dose
12 Assessment approach is a multi-step approach. First step is a
13 screening level. At the screening level, according to the Biota
14 Dose Assessment, the water levels that are shown in Mr. Williams'
15 testimony on Table 3, 5 and 6, According to the BDAC, the Biota
16 Dose Assessment level and the screening level, one must evaluate
17 site specific factors in order to justify that those levels do
18 not cause the dilatory effect. This would be the aquatic and
19 terrestrial animals.

20 BOARD MEMBER JOHNSON: Okay.

21 BOARD MEMBER RAO: No, that's what I want to know whether
22 there was a number that's provided in the document or is it based
23 on the types of that? That was my question and I guess you
24 answered it.

1 MR. ADAMS: At the screening level there are numbers.

2 BOARD MEMBER RAO: And those numbers you're going to
3 provide them in your comment?

4 HEARING OFFICER ANTONIOLLI: If you -- if you do know it,
5 go ahead.

6 MS. WILLIAMS: Can you explain what you mean screening
7 level? I mean, can I ask that?

8 BOARD MEMBER MELAS: Sure.

9 MR. FORT: I don't know how far you want to go into
10 explaining the methodology that's used. My understanding is of
11 what he said, his testimony here is that you have water
12 concentrations in the range of Case 3, 5 or 6, that this body of
13 data in the Biota Dose Approach would require site specific
14 analysis in order to determine that those levels were safe to
15 biota or terrestrial animals at least; is that correct?

16 MR. ADAMS: That's correct. I would only point that is
17 only water. And the methodology for the biota also includes
18 sediment which of course those tables do not include. So you got
19 to look at both, the water concentration and the sediment
20 concentration.

21 BOARD MEMBER RAO: Okay.

22 MR. FORT: Okay.

23 MS. WILLIAMS: So can I ask a follow-up?

24 BOARD MEMBER MELAS: Yes.

1 MS. WILLIAMS: So you're saying that the far right hand of
2 the table, that if you -- with that document that you have 10
3 picocuries per liter in the receiving stream?

4 MR. ADAMS: Yes.

5 MS. WILLIAMS: Then you have to do what?

6 MR. ADAMS: Site specific analysis, characterization
7 sampling.

8 MS. WILLIAMS: Okay. Are you aware of any study that has
9 done that, had a site specific analysis with radium in
10 particular?

11 MR. ADAMS: I am not.

12 MS. WILLIAMS: You want me to continue then?

13 BOARD MEMBER MELAS: Yeah, go ahead.

14 HEARING OFFICER ANTONIOLLI: Please do?

15 CONTINUED EXAMINATION OF CHARLES WILLIAMS

16 Q. (By Ms. Williams) I would like to go back to where I
17 left off with Mr. Williams. In your testimony you state that the
18 MCLG for radium is zero. And of course radium is natural --
19 naturally occurring, correct? You probably need to not nod for
20 the court reporter. You nodded your head.

21 A. You haven't asked a question yet.

22 Q. Oh, well, I thought I did. It's a naturally occurring
23 element, correct?

24 A. Radium is a naturally occurring element.

1 Q. But when you refer to the MCLG, that is a goal for
2 drinking water, correct?

3 A. That's correct.

4 Q. Are you aware of any USEPA criteria developed for
5 surface water with regards to radium?

6 A. I'm not aware of any EPA guides for surface water but I
7 will give you my logic. If you put water radium into a stream
8 and down stream that water is removed for drinking water, there
9 is more radium in that water than if you had not put it in there.
10 Therefore, you are over the zero goal.

11 Q. Over the zero goal for the drinking the water? Later,
12 you mean downstream you're saying?

13 A. Downstream.

14 Q. Okay. Do any of the facilities that are currently under
15 construction, or in the design phase using your technology in
16 Illinois, are any of them going to have blending capabilities?

17 A. There have been no considerations for blending in the
18 facilities we have been working on.

19 Q. So they will all have zero level of radium?

20 A. No, they will all have certainly sub five in their
21 discharge to the consumer. There are some communities that have
22 asked us to look at providing cost estimates for half of the MCL
23 or two and-a-half.

24 Q. And how -- could you explain how that would work at the

1 plant?

2 A. At the water treatment plant, depending on the frequency
3 of exchange of media, we can obtain a lower than five level sent
4 to the consumer. In fact, the vast -- every plan we have done
5 has had no trouble achieving the five. Most of the plants, for
6 the vast majority of the time, were sub one and two picocuries
7 combined to the facilities.

8 Q. And you're not aware of anyone purchasing your
9 technology that in sense used blending?

10 A. Not my knowledge, no.

11 Q. On, I think it's page 2 of your testimony, you state
12 that sending radium residuals to the publicly owned treatment
13 works or receiving stream is not a sound environmental practice.
14 Can you explain to us what this statement is based on, what
15 authorities you can point to for that claim?

16 A. I think the entire testimony of Mr. Adams pointed to the
17 fact that there are risks associated that are not needed to be
18 taken by sending it to a POTW.

19 MR. ADAMS: May I add something?

20 MS. WILLIAMS: Sure.

21 MR. ADAMS: I think what we have here is a situation where
22 we either prohibit radium particulates, particularly putting
23 radium going down the sewer, which then eliminates the need for
24 concern of the POTW risk, for the workers to the treatment

1 facility, to the sludge. If you don't do that, then the flip
2 side is that the POTW, if it even knows it's receiving the
3 radiological material, radium, then we saw it in ISCORS numbers,
4 even at low numbers like 13 picocuries and five picocuries, have
5 the potential to expose individuals that are not radiation
6 workers. And I guess my question is why would we want to do
7 that. It's not consistent with the law that is reasonably
8 achievable philosophy which is the basic philosophy of any use of
9 radioactive material, in fact, the radiographic material has to
10 -- has to be beneficial to even use it.

11 MS. WILLIAMS: Can I just --

12 MR. ADAMS: Sure.

13 MS. WILLIAMS: Out of curiosity, can you tell me if there
14 is any consideration of economics in this ALARA, am I saying
15 that, right?

16 MR. ADAMS: Yes, ALARA. There can be. In other words, one
17 does -- one might look at what is a cost to reduce a level of
18 exposure to an individual. NRC uses -- NRC uses a guideline of
19 1,000 or \$2,000 per milligram, that's one example.

20 MS. WILLIAMS: You raise a really good question that I had
21 -- a really good point that I had a question for you on that
22 later, so I will skip ahead to that. On your testimony on page
23 23, I believe it is, if it's not too inconvenient for the Board
24 to follow.

1 BOARD MEMBER MELAS: What page?

2 MS. WILLIAMS: 23. I'm going to read the last sentence,
3 the recommendation area, you say, "I would recommend to the
4 Pollution Control Board that it retain a radium general water
5 quality standard and adopt a specific prohibition on the disposal
6 of water treatment sludge/residuals in sanitary sewers". It
7 appears to me from this statement, and I think a similar
8 statement in Mr. Williams' testimony, that you are asking the
9 Board to adopt, not just -- not to change the existing canter but
10 to adopt some new prohibition that would prohibit any --
11 basically prohibit backwash from a community drinking water
12 supply that is treating for radium using this type of technology.
13 Is that -- is that the recommendation that you have to the Board?

14 MR. ADAMS: That's mine?

15 MS. WILLIAMS: That's yours. Do you have any
16 recommendation as far as where in the rule that you go or how it
17 should be worded or -- because that is not something similar to
18 anything we have right now, so I think it would be helpful to
19 know how you would expect a prohibition like that would be
20 worded, and what authority it would be based on?

21 MR. FORT: You're asking him as to how to write that reg,
22 is that the question? I think that if you're serious about that
23 kind of prohibition, you're looking at pre-treatment standard
24 requirement. We already have the requirement of not damaging the

1 POTW. You could add some more specific there. I mean, I think
2 you would have to work on what the issues are and a variety of
3 things, but I think there are places to do that and there are
4 specific programs to be adopted to put in a POTW.

5 MS. WILLIAMS: And so that's my question. Somewhere maybe
6 in the pre-treatment you think we should change that to have a
7 prohibition? I'm just trying to understand what exactly is being
8 recommended to the Board.

9 MR. FORT: Personal basis as a lawyer, not a witness, I
10 would think that would be the kind of place you would put this
11 kind of prohibition. Mr. Williams and Mr. Adams have supported
12 the wisdom of that in their testimony, but the actual words I
13 don't think -- we didn't come here with a slip of paper to say,
14 you know, adopt this.

15 MS. WILLIAMS: And I just, you know, I wanted to clarify
16 because it's sort of stuck in there. It's not very clearly laid,
17 fleshed out so I just wanted to understand that is definitely
18 what you are recommending. Okay. Are you aware of any other
19 states that have, or countries even, that have such a
20 prohibition?

21 MR. ADAMS: In the NRC or agreement states?

22 MS. WILLIAMS: Uh-huh.

23 MR. ADAMS: Agreement states, excuse me, the prohibition of
24 insoluble material in particular, in certain agreement states,

1 NRC agreement states and NRC licensee, there is an existing
2 prohibition for the disposal of insoluble, in other words,
3 particulates into the sewers.

4 CONTINUED EXAMINATION OF CHARLES WILLIAMS

5 Q. (By Ms. Williams) Are you aware whether WRT has
6 inquired about of the Illinois Emergency Management Agency,
7 Division of Nuclear Safety, has WRT consulted with them about
8 this?

9 A. We have.

10 Q. And what is their interpretation?

11 A. Of what?

12 Q. Of whether it is prohibited to dispose of insoluble
13 radiation materials in the sewer?

14 A. If -- There is in my understanding, and if you want to
15 know IEMA's opinion, I would suggest you ask them.

16 Q. Uh-huh.

17 A. But my understanding is if it is a licensed facility,
18 you may not discharge radioactive solids, such as that are used
19 by HMO, into the sewer. If it is not a licensed facility, then
20 I'm not sure that they have an opinion.

21 Q. And did they -- Okay. You're not sure if they have an
22 opinion?

23 MR. ADAMS: Well, let me add --

24 Q. (By Ms. Williams) Can I show you this exhibit that I

1 marked. This is Exhibit 11. Have you seen this document before
2 Mr. -- Mr. Williams?

3 A. Yes.

4 Q. And I don't -- Like you said, if we want to know their
5 opinion, I think that's who we should ask. I just -- Does it
6 represent an accurate portray of a letter that you received from
7 the Illinois Emergency Management Agency --

8 A. Yes.

9 Q. -- regarding these issues? And I guess I don't really
10 have a comment on it. I would just like to have it entered as an
11 exhibit so the Board can read what IEMA has on this position.

12 HEARING OFFICER ANTONIOLLI: Does anyone have an objection
13 to entering what I have before me, which is letter from IEMA,
14 Illinois Emergency Management Agency, Mr. Steve Collins, from the
15 Division of Nuclear Safety to Charles Williams from WRT
16 Environmental?

17 MR. HARSCH: Ms. Williams, can you provide me a copy after
18 this hearing?

19 MS. WILLIAMS: Okay. I might have an extra one.

20 MR. HARSCH: Since you're going to provide other copies at
21 the hearing, that's fine.

22 MR. FORT: Can I ask the -- I don't have an objection to
23 this document. But my understanding was that the Agency was part
24 of this. Does the Agency not have a witness on this or knowledge

1 of this?

2 MS. WILLIAMS: Of the letter? I didn't participate in this
3 so I can't speak to that but I can -- I can include that in our
4 comments if you like me to.

5 HEARING OFFICER ANTONIOLLI: And seeing no objection, I
6 also -- yes, I also note on the front it has a note marked
7 received by the Environmental Protection Agency on December 18th,
8 2003. I'd like to enter this letter I have before me now as
9 Exhibit 11.

10 MR. ADAMS: May I add one more --

11 HEARING OFFICER ANTONIOLLI: Comment?

12 MR. ADAMS: -- comment?

13 HEARING OFFICER ANTONIOLLI: Go ahead.

14 MR. ADAMS: Exhibit B of my testimony I provided an
15 overview, and the fourth paragraph down says that, Illinois, an
16 NRC Agreement State, followed in parallel with the NRC's change
17 in the provision. The provision being prohibiting insoluble
18 materials to be disposed in the sanitary sewers. Thus Illinois
19 Regulation 32, Illinois Administrative Code 340.1030(a)1,
20 contains the same regulatory language and prohibits the disposal
21 by a licensee of non-soluble radioactive materials into a sewer.

22 MS. WILLIAMS: You pinpointed another of my questions which
23 was the -- explain Exhibit B. So what you're saying you
24 prepared Exhibit B?

1 MR. ADAMS: Yes.

2 MS. WILLIAMS: It was offered by you as a summary?

3 MR. ADAMS: Yes.

4 CONTINUED EXAMINATION OF CHARLES WILLIAMS

5 Q. (By Ms. Williams) Okay. Back to Mr. Williams. Your
6 testimony goes into quite -- quite a bit of discussion of removal
7 technology, such as yours, that would not discharge radium into
8 the sewer. Can you tell us where the radium goes?

9 A. If it is not discharged to the sewer?

10 Q. Uh-huh.

11 A. Then it would have to go as a solid to a low-level
12 radioactive disposal site.

13 Q. And how many of those are there in the country right
14 now?

15 A. At varying levels?

16 Q. Uh-huh.

17 A. Hanford, Washington; Envirocare of Utah, U.S. Ecology
18 site in Idaho, and there's, I believe, three more currently in
19 the permitting process.

20 Q. And do you have contracts with some of these?

21 A. We have established a 40-year contract with Hanford and
22 with Grandview and Idaho.

23 Q. And at the end of 40 years, that would be presumably
24 renegotiated or something?

1 A. (Nods head.)

2 Q. Do you know what the expectancy of those facilities
3 until they are full?

4 A. Neither are in any danger of filling up.

5 Q. You talk about how your technology is economically
6 competitive with others, would you say that would still be true
7 for a community that had already installed a different
8 technology?

9 A. I would have to look at the specifics of that community.
10 I know that in New Jersey, for example, we are actually replacing
11 a ion exchange system because of the cost of regular ion exchange
12 systems.

13 Q. There's some places in the testimony where you state
14 that the Agency's proposal would lead to exposures to higher
15 levels of radiation. Can you explain how you think the levels
16 would be higher than they are currently prior to installation of
17 treatments at all facilities for high level radium groundwater?

18 MR. FORT: Object. I don't think that's his testimony. Do
19 you want to be specific --

20 MS. WILLIAMS: I just want to clarify his testimony.

21 Q. (By Ms. Williams) You're not saying the levels of the
22 environment is supposedly stopped -- or adopted would suddenly
23 increase over where we're at today, were you?

24 A. What do you mean in the environment?

1 Q. The receiving streams of Illinois, the waters in the
2 state of Illinois?

3 A. Well, let me give you an example. Ottawa, Illinois, has
4 just installed a reverse osmosis system.

5 Q. Uh-huh.

6 A. That reverse osmosis system, in my understanding, is
7 discharging directly into a storm water drain. It doesn't go to
8 a POTW. Under the current rule, I don't understand how they
9 would be allowed to do that.

10 Q. Do you know about what the flow of the receiving stream
11 that receives their discharge?

12 A. No, I think it's the river.

13 Q. So you're not aware that there's a mixing zone that
14 would allow -- Do you know if they have a mixing zone?

15 A. I would assume they have a mixing zone.

16 Q. And that might be how that would be allowed?

17 MR. FORT: Object on the speculation. If the Agency has
18 some testimony on what -- how the permitting exists in sources,
19 that would be useful.

20 MS. WILLIAMS: I will withdraw the question.

21 Q. (By Ms. Williams) Are you aware of any direct
22 discharges like that in the state of Illinois?

23 A. No, but I've never checked your discharge.

24 Q. On page 2, you state, your testimony too, that are

1 proposal, that this implies that the life in the stream that is
2 not used for drinking water has no value, fish, birds and plant
3 life. Would you say that's true of the fact that you don't
4 regulate conformance, for example, is that -- is that indicative
5 of no value -- of placing no value on aquatic life in Illinois
6 simply because there is no standard for that?

7 A. If the rule is changed, as I understand it, the change
8 that the IEPA has requested and you have a no-flow zero flow
9 stream that does not have a water intake on it, then there is no
10 discharge limit for that stream.

11 Q. Can you explain what it means to have a zero flow, how
12 that's defined?

13 A. I'm sure there's somebody here that can. I understand
14 that there's very low flow other than the flow that comes out of
15 the POTW.

16 Q. Your testimony also states that our proposal would
17 require increased efforts and expense to ensure workers' safety
18 in POTW. Can you explain to us how levels of radium in POTWs are
19 going to change from how they are today to if the proposal is
20 adopted by the Board?

21 A. Under the current one picocurie rule discharge to
22 stream, I don't believe that a water treatment radium treatment
23 facility can discharge into the POTW without violating that rule.

24 Q. How -- I don't understand that.

1 A. You don't understand that?

2 Q. Correct.

3 A. Well, let me --

4 Q. The rule applies to the stream, correct? The rule
5 applies to the stream?

6 MR. FORT: Are you going to let him answer the question or
7 are you going to argue with him? Which one do you want?

8 A. If you are discharged, there is no question at all that
9 that one limit is very low. I will agree with you. I will say
10 it is very low. Is it unrealistically low? Maybe. That's for
11 you guys to decide. But I will also tell you that an unlimited
12 discharge is definitely unrealistically high. Now you asked me
13 -- May I have that? I'll point it out.

14 HEARING OFFICER ANTONIOLLI: Can you identify what you're
15 --

16 MR. FORT: This is Table 5 from his testimony.

17 A. And I do not have measurement data. Unfortunately to my
18 knowledge IEPA has just now tried to collect the data. But, for
19 example, in probably the best case scenario, the Case 1, over 90
20 percent of the radium is in the sludge and 10 percent of the
21 radium is in effluent with dilution, then your liquid effluent
22 from that POTW would probably, based on the assumption, be around
23 0.4 picocuries liter combined.

24 Q. (By Ms. Williams) From effluent of the pipe?

1 A. Out the pipe. If half of that is Radium-226, then it
2 would be 0.2 picocuries outside the pipe at the pipe discharge
3 prior to mixing zone, all right? Now --

4 Q. And this is Table 5 from your testimony, right?

5 HEARING OFFICER ANTONIOLLI: It's on page 11 of --

6 Q. (By Ms. Williams) Can you explain --

7 A. Let me finish the answer.

8 Q. Sure.

9 A. Now it is quite probable as a percent of the radium in
10 the sludge goes down and the percent of radium that reports to
11 the water stream from the POTW goes up because; remember if it's
12 not in the sludge, it's got to be in the water; if it's not in
13 the water, it's got to be in the sludge; that you will exceed, in
14 fact, you exceed the one picocurie in probably most of these
15 cases. And you would exceed the five picocuries in Case 3, 4,
16 high Illinois case; and Case 5, both cases; Case 6, both cases.
17 And in even in the 90 percent going into the sludge, you're --
18 you should be right at the one picocurie 226 limit if they're
19 both in there. So I am not here to say that one picocurie is --
20 is achievable if you discharge into the sewer. I doubt that it
21 is in most cases.

22 Although I will tell you if you get 50 dilution or 60
23 percent dilution, there will be times when you will achieve it.
24 Nor will I tell you that taking five -- leaving five picocuries

1 in the sludge, or I'm sorry, leaving five picocuries in the
2 compliant water, guarantees that you will be under one. I think
3 there is a good case to be made that you will be under one, but
4 there will be no guarantee of it.

5 Q. Can I ask you a little bit about this table?

6 A. Which table?

7 Q. Five. At the bottom in the little -- with the asterisks
8 it says, "Assume 0.33 grams of sludge per gallon of influent to
9 the POTW". Can you tell me if that figure is consistent with the
10 Illinois design standards for POTWs?

11 A. I can tell you that it is consistent with what is being
12 produced by Illinois facilities. I will tell you where the
13 number comes.

14 Q. You mean by being produced by Illinois drinking water
15 plants?

16 A. No, wastewater treatment plants.

17 Q. But this is an influent?

18 A. Influent to --

19 Q. I understand what you're saying.

20 A. Right.

21 Q. Why does Mr. Adams use different figures in his
22 testimony?

23 A. Other than .33?

24 Q. Yes.

1 A. He can probably tell you.

2 MR. ADAMS: I suggested a range of 0.23 grams per gallon of
3 influent up to as high as 0.8, depending on the type of treatment
4 facility that is out there. The 0.33 that is here, actually came
5 out of the IEMA/IPA response letter that you entered into
6 evidence a few minutes ago.

7 MS. WILLIAMS: Okay.

8 MR. ADAMS: And that --

9 MS. WILLIAMS: They use that?

10 MR. ADAMS: -- is to the best of my knowledge, the grams of
11 dry sludge per gallon of influent at Joliet.

12 MS. WILLIAMS: If you had used a number more like 0.8 in
13 developing this table, can you explain for us how these figures
14 would have been different?

15 MR. ADAMS: The -- the -- the sewer liquid effluent would
16 not have changed I don't believe. The --

17 MS. WILLIAMS: Why not? Oh, it was --

18 MR. ADAMS: Because you look at percentage.

19 MS. WILLIAMS: The sludge number would change?

20 MR. ADAMS: The sludge numbers would change.

21 MS. WILLIAMS: By what -- by what order?

22 MR. ADAMS: Well, if you use .8, it would be .23 into .8 so
23 you would -- not quite a reduction of --

24 MS. WILLIAMS: They'd go down by that?

1 MR. ADAMS: Yes. On the other hand, some of the facilities
2 in Illinois are as low as .21.

3 MS. WILLIAMS: Okay.

4 MR. ADAMS: And they would, of course, have gone up.

5 MS. WILLIAMS: But you're not aware what the Illinois
6 design standards say for that?

7 MR. ADAMS: No, I look at what you guys provided me for
8 this is what this plant is doing.

9 BOARD MEMBER GIRARD: Before we get away from -- are you
10 moving a way from table five?

11 MS. WILLIAMS: I was thinking of it, but if you have some
12 questions on that --

13 BOARD MEMBER GIRARD: I was trying to understand this. I
14 was going go back to Table 1 and I wonder if I could ask Mr.
15 Williams questions on Table 1 and then go back to Table 5. Now
16 on Table 1, these 12 Illinois sites that you listed these are
17 community drinking water supplies?

18 MR. WILLIAMS: That's correct, sir.

19 BOARD MEMBER GIRARD: And so in terms of the feed, you're
20 talking about -- are you talking about all the water that enters
21 these drinking water plants and that's the level of radium in the
22 water that goes there?

23 MR. WILLIAMS: Yeah, let me explain where these numbers
24 exactly come from. In each of these sites, the community has

1 asked us to come and conduct a pilot plant study. We would
2 conduct -- connect with one double a well. They may have
3 multiple wells but we only test one at a time. And during that
4 pilot plant study on a routine basis we sample the water that is
5 entering their distribution system from that well. And these
6 concentrations are the numbers average for those measurements.

7 BOARD MEMBER GIRARD: So that might be a -- just one
8 particular well in that community drinking water system?

9 MR. WILLIAMS: That's correct.

10 BOARD MEMBER GIRARD: Okay. So --

11 MR. WILLIAMS: Typically they will give us their highest
12 well and try to make it as hard as we can.

13 BOARD MEMBER GIRARD: I was wondering if you -- do you have
14 any data from the POTWs that are associated with those water
15 treatment plants on the levels of radium in the sludge?

16 MR. WILLIAMS: Unfortunately we don't.

17 BOARD MEMBER GIRARD: So that -- and you don't know if
18 that's available? I mean, is that available at the POTWs?

19 MR. WILLIAMS: Historically the POTWs in Illinois have not
20 been required to sample their sludge. It's my understanding with
21 the new radionuclide rule, a sampling program is being initiated.

22 BOARD MEMBER GIRARD: Do you know if any of these community
23 drinking water supplies, if they have any radium removal now or
24 does any of it come out in any other incidental clarification

1 processes?

2 MR. WILLIAMS: Typically radium is only in the groundwater.
3 It's not in surface water. So in the water treatment plant
4 there's really no mechanism for precipitation at the water
5 treatment plant. There are a number of sites within Illinois.
6 I'm sure that the IEPA can tell you who they are who have
7 instigated a radium removal system. I know that De Kalb has put
8 in an ion exchange. I know Channahon has put in HMO. I know
9 that several others have already started to try and meet the five
10 rules.

11 BOARD MEMBER GIRARD: Okay. So that now that brings me
12 back to Table 5. The reason I was asking about levels of radium
13 in the sludge is that if you know how much radium is going into
14 the water treatment plant, then it goes out to the community,
15 comes back to the POTW, then we can see where the radium is
16 going. Is it going into the sludge? Is it going out in the
17 effluent. Now you're assuming now that most of it, you know, if
18 you were doing a model that, you know, would have over 90 percent
19 going out in the effluent or --

20 MR. WILLIAMS: Well, in this testimony before this
21 committee there was testimony that said basically that it's very
22 site dependent on what goes to the water and goes to the sludge.
23 I think measurements in New Jersey and Wisconsin show it's a high
24 percentage ends up in the sludge. But in the testimony it

1 showed, I think, in Joliet's case, and they're here so they can
2 tell you, that about 20 percent in one sample and they had only
3 two samples, was in the sludge and 80 percent of the water and
4 another sample roughly 80 percent was in the sludge and 20
5 percent was in the water. So when I did my cases here, that's
6 what I kind of assumed. A high recovery into the sludge and 90
7 percent of the sludge and low recovery into the sludge and a 20
8 percent of the radium in the sludge. That's why I handed you so
9 many cases because it seems to be quite variable of what goes in
10 the sludge and what goes in the water.

11 BOARD MEMBER GIRARD: Now in terms of Joliet, are those
12 actual radium numbers for their whole system or this just a test
13 on a particular removal process for one well?

14 MR. WILLIAMS: You need to chat with Joliet. My testimony
15 from their testimony is it was a grab sample from a discharge
16 from one of their two treatment plants.

17 BOARD MEMBER GIRARD: So well then my question is, if we
18 have some real data out there, I mean, is there any way to sort
19 of look at the assumptions in your model here that went into
20 Table 5 to see how that plays out in the real environment?

21 MR. WILLIAMS: I wish I had that data. I think we have to
22 recognize for IEPA, and all of us, this is a brand new problem.
23 And I wish there was data out there that we collected over the
24 last five years that we've known this was coming to say this is

1 what goes here and this is what goes there. But I don't believe,
2 and I would ask IEPA if they know of that data, to provide it so
3 that we could look at it.

4 BOARD MEMBER GIRARD: Thank you. That's all my questions.

5 CONTINUED EXAMINATION OF CHARLES WILLIAMS

6 Q. (By Ms. Williams) Okay. With regard to that Table 1
7 the -- well, I just wanted to clarify. Woodsmoke Ranch, I'm not
8 familiar with Woodsmoke Ranch, Illinois. Can you just tell
9 us where that is or how many it services?

10 A. It's small a community --

11 Q. How many homes there? How many people it services?

12 A. -- west of Chicago. Frankly, I personally don't know a
13 whole lot about it other than pilot plant results. Now in each
14 of these cases the new permit for the pilot plant was through the
15 IEPA, so the IEPA is fully aware of what we're doing.

16 Q. Did the averages that you provided here, average for the
17 Illinois of 12.8 picocuries per liter combined, do you know if
18 that's typical for the radium bells or --

19 A. I believe it would be relatively representative. It's
20 certainly representative of what we sampled.

21 Q. Right.

22 A. Now there's 100 sites in Illinois, and I suspect some
23 may be higher and some may be lower, but this is what we have
24 sampled. I mean, since IEPA, you guys are working with these

1 guys every day, I would expect you to have the data.

2 Q. I'm just trying to clarify. On page 6 of your testimony
3 you give an example of an assumed or a sample source water with a
4 15 picocurie per liter concentration, and you state that using
5 reverse osmosis the concentration of the backwash, and tell me if
6 I'm using the wrong term --

7 A. Yeah, and reverse osmosis, no backwash.

8 Q. Okay. The concentration of the concentrate water --

9 A. Concentrate.

10 Q. Okay. Would be 100 picocuries per liter. Can you
11 explain how you got that conversion?

12 A. Sure. In reverse osmosis you pump 100 percent of the
13 water into a membrane separation and under high pressure part of
14 the water goes through, part of the water doesn't go through.
15 The amount of the water that goes through is variable depending
16 on the pressure that they use for the system. It can be anywhere
17 from 75 percent of the water goes through to 95 percent of the
18 water goes there. If you assume a 10 to 1 concentration ratio at
19 15, you would be at 150 in the one remaining 10 percent, roughly.
20 If you assume 95 percent recovery, that cuts that somewhat.

21 Q. So you assumed what in this?

22 A. I said approximately. It would be anywhere from 80 to
23 120 --

24 Q. Okay.

1 A. -- in the concentrate. If half of that is 226, then,
2 you know, you're substantially over your one or your five.

3 Q. For drinking water?

4 A. For drinking water. Interesting enough, I mean --

5 BOARD MEMBER JOHNSON: Substantially over what?

6 BOARD MEMBER MELAS: Substantially over five.

7 A. I use your 80 to 120 then -- and I mean your limits --
8 and that's -- your discharge that is going somewhere, either to
9 the sewage treatment plant or to the stream. If it's going to
10 the stream, now you're talking about that 17 times the drinking
11 water standard going into the stream or roughly 50 times the one
12 picocurie 226 if half of it is 226.

13 Q. (By Ms. Williams) Do you have an opinion as on whether
14 that level, 80 to 120 picocurie liters, would be harmful to
15 aquatic life?

16 A. I think we covered this ground. I am not a biologist.

17 Q. Okay.

18 A. And so --

19 Q. That's fine. You're right.

20 A. It is my belief that it is not good for aquatic life.
21 Interesting -- I mean, this is the interesting thing, because if
22 you change -- if you were to put in a radium removal system on
23 the concentrate, the size of that radium removal system would be
24 reduced by the same concentration ratio. So you would only have

1 to put in a tenth of the size of the radium removal system. In
2 addition, if you took the radium out, you could reintroduce that
3 water back into the stream and not be throwing away 20 percent of
4 the water or 10 percent of the water, whatever your number is, of
5 what you're pumping out of ground, which seems to me to be a good
6 -- just as a side, a good water conservation issue.

7 BOARD MEMBER JOHNSON: Just to try and get the broad
8 picture here. And I think what brings me to your comment earlier
9 that you weren't going to argue that this one picocurie per liter
10 is a low number. It seems to me like you could build an aqua
11 duct and could designate an Illinois river, you could pump
12 drinking water into it directly from a community drinking water
13 treatment plant and it would violate the current water quality
14 standards, am I looking at this wrong? Is that right?

15 A. No, that's correct.

16 BOARD MEMBER JOHNSON: So doesn't it strike you unusual
17 that our water quality standards for our rivers allow for only 20
18 percent of the amount of radium we're allowed to drink in
19 Illinois?

20 A. I don't know how the one picocurie limit was set. I do
21 find that it is one of -- it is the lowest that we have
22 encountered. On the other hand, I think no limit, which is what
23 the rule proposes, is not a viable change.

24 BOARD MEMBER JOHNSON: You know, you might have answered

1 this, I think. I'm not sure whether Ms. Williams asked you this
2 or not, but in your testimony, pre-filed testimony, alluded to,
3 you got five, currently five radium removal facilities going in
4 the state of Illinois?

5 MS. WILLIAMS: Pilots.

6 BOARD MEMBER JOHNSON: Pilots.

7 A. We have piloted, let's say, 18. I can't remember in the
8 other states. All of them are working. We have yet to go to
9 pilot anywhere, and it's going to happen. We haven't gotten to
10 it yet. We have not chosen that proposal.

11 Now -- or where they have chosen another system because
12 some of them have to come back to see what they're going to do.
13 The 23 today that we're currently in negotiations with, of the 12
14 we have seven sites that are under contract, five in Oswego, two
15 in Elburn. Oswego has received the construction permit and will
16 be coming on in about a month and-a-half, I guess.

17 BOARD MEMBER JOHNSON: The question I wasn't sure whether
18 it had been asked and answered already, and I apologize if it
19 has, at what level do you take your -- you're obviously going
20 into a place that has a radium content level of higher than five?

21 A. Sure.

22 BOARD MEMBER JOHNSON: Do you take it down to five? Do you
23 take it lower than that?

24 A. It's up to the community. You can't get it to zero. I

1 wish you could, but you can't get it all out. You've got to
2 remember we're dealing with parts per trillion. These are little
3 teeny tiny amounts. We've been very successful in getting it
4 lower too. And like I said earlier, some communities are
5 requesting that we evaluate can we do two on the same basis.
6 Typically what a contract would say would be stay below 4.8, in
7 other words, a little bit below the five; but that's a community
8 decision where they want to end up.

9 BOARD MEMBER JOHNSON: Thanks.

10 HEARING OFFICER ANTONIOLLI: Ms. Williams, would you like
11 to continue?

12 Q. (By Ms. Williams) There's a statement on page 7 that I
13 want to ask you about and I think there might be similar in Mr.
14 Adams' testimony too but maybe not quite so clear. You say,
15 "Indeed it is my understanding that the level of radium in the
16 sewage sludge will be high enough that the sludge could not be
17 disposed of in any currently permitted Illinois landfill". Can
18 you explain to me what you base that understanding on?

19 A. I had a meeting with Steve Collins of the IDNS, do you
20 have any facilities in Illinois, highly disposal site, permitted
21 to accept radium over five. And his response is no one has
22 permit for it.

23 Q. Of land you're saying? Steve is of the Department of
24 Nuclear Safety and you said they have not permitted anyone or

1 they're saying that the EPA has not permitted anyone?

2 A. It is my understanding that there is no landfill in
3 Illinois permitted about whatever state agencies need to be to
4 permit it to accept radioactive waste that is greater than five
5 picocuries; is that correct? I mean, you're the IEPA.

6 Q. Boy, I wish I knew everything that we do here. You
7 haven't talked to the Bureau of Land? You're going based on what
8 he said to them, right?

9 A. Well, these are low level nuclear wastes and he's
10 nuclear safety but I think I went to the right place. I don't
11 know.

12 Q. You did provide a copy of the MOU between EPA --

13 HEARING OFFICER ANTONIOLLI: Can you tell us where you're
14 looking?

15 MS. WILLIAMS: Sure. Exhibit 1 to his testimony.

16 Q. (By Ms. Williams) It is identified as a memorandum of
17 an agreement. There's like an introductory report and then a
18 memorandum of agreement that's signed between the Illinois EPA
19 and the Department of Nuclear Safety from 1984, correct? Do you
20 understand what that agreement provides for with regard to sludge
21 that falls between five picocuries per liter and 50 picocuries
22 per liter?

23 A. It's per gram.

24 Q. Thank you. Per gram.

1 A. It is my understanding that I think we put that back up.
2 It's number -- Figure 3. That radium sludge between five and
3 less than 50 picocuries per gram, which is right by your finger
4 right there, no, down some, is available either for disposal in a
5 landfill. If one is available, they can take that, or for land
6 application, as long as the application does not increase the
7 radium background on that piece of ground by more than 0.1
8 picocurie per gram.

9 HEARING OFFICER ANTONIOLLI: Can I note for the record that
10 you are right now referring to Figure 3 for your testimony and I
11 think Ms. Williams is asking you about Exhibit 1 and the numbers
12 --

13 A. This is -- this my interpretation of Exhibit 1.

14 MS. WILLIAMS: And I was asking him actually about part of
15 Figure 3 basically where he said there were no permitted
16 facilities in Illinois underneath landfill.

17 HEARING OFFICER ANTONIOLLI: At that level. Okay. Go
18 ahead.

19 Q. (By Ms. Williams) Okay.

20 A. And I will tell you why I ask the question. There's a
21 city here in Illinois called Wynstone that has both a barium and
22 a radium out of the compliance issue. And we were trying to
23 figure out the most cost-effective way for them to treat both the
24 radium and the barium. And it may be that the most

1 cost-effective way is to use an absorbant media to remove both of
2 those but would end with a very low radium content, let's say, 40
3 picocuries per gram. So I was searching for a place to put one
4 -- to put that and could not put that in Illinois.

5 Q. Are you aware of this document, Exhibit 1 to your
6 testimony, outlining some practice that need to be used by
7 landfills if they're going to accept greater than five picocuries
8 per gram sludge?

9 A. There are restrictions on what kind of landfill they can
10 be put in and the amount of cover to minimize the potential for
11 future reopening of where that sludge is put and --

12 Q. What do you mean kind of landfill? Can you explain what
13 you mean by landfill?

14 A. I'm not a landfill guy.

15 Q. Me either. That's why I asked.

16 A. I mean, I guess I would prefer that you, you know, it's
17 between you guys and the IEPA.

18 Q. Sure.

19 A. And the IDS, what you ment in that memo. What I can
20 tell you is you got to have 10 foot of cover and you got to have
21 enough care so that you know that in the future someone doesn't
22 dig into it. I forgot the word that they used. You got it in
23 front of you. That would allow basically they want to protect
24 against the radium emissions from that radium sludge as is the

1 case.

2 Q. Now if we were able to find such a landfill in Illinois,
3 could your media be disposed of there?

4 A. I would do an economic evaluation to do so. I told
5 Wynstone I would love to put there. Wynstone, loading will only
6 go to, I think we're using 40 or 50, and the stuff the -- and
7 frankly because it all depends on cost.

8 Q. Can you explain to me for Table 2 where you talk about
9 that anticipated application rate? Can you just briefly explain
10 to me what calculations were used to get that into that?

11 A. Sure. In Table 2 we looked at percent recovery in the
12 sludge again and said, okay, 90, 50 and 20. And if the effluent
13 or the raw water radium is at these levels and 50 ends up in the
14 sludge and if the sludge is .33 grams per gallon, then, you know,
15 fairly simple math teach you to use application rates.

16 BOARD MEMBER RAO: May I follow-up on that?

17 MS. WILLIAMS: Please.

18 BOARD MEMBER RAO: Mr. Williams, now in the table you have
19 listed the dry ton per acre predicted application rate. And I'm
20 assuming that is based on the combined Radium-226 and -228?

21 A. That's correct.

22 BOARD MEMBER RAO: Are you aware of any other limitations
23 that may be applicable for sludge application on land like
24 nitrogen or phosphorus which may control --

1 A. Arsenic or lead?

2 BOARD MEMBER RAO: Yeah. That would -- that would be more
3 concentration than the radium concentration.

4 A. No, actually to the contrary.

5 BOARD MEMBER RAO: Okay.

6 A. Again, I am not a sewer expert. When I look at, again
7 the letter that she introduced into testimony, Joliet at the
8 sewage plant, west plant, their approved application rate was 2.4
9 to 2.6 dry ton per acre and at the east plant was 3.3 and 3.5 dry
10 tons per acre. These numbers, again using Joliet's .33 grams of
11 dry sludge per gallon of influent, would indicate, you know, that
12 they would have to reduce their application rates substantially
13 and would have to have a multiple factor of more land to apply
14 the sludge on to stay within the 0.1.

15 BOARD MEMBER RAO: Okay. Thank you.

16 Q. (By Ms. Williams) And is that the annual increase that
17 was used to generate these -- the 0.1 that is used?

18 A. The 0.1 is in the memorandum agreement.

19 Q. And that's what's used in your table?

20 A. Yes.

21 Q. That's applicable now, right? I mean, has that really
22 changed for -- for example, if you take a facility that's not
23 currently up and running with their treatment of their radium
24 groundwater, those levels of sludge are going to be there now,

1 correct, and that problem is going to be there now in terms of
2 complying with the new or what?

3 A. I don't know. Let's -- let's be blunt. There's --
4 Since we haven't been sampling and analyzing the sludge, we
5 really don't know what's there. Now there's a lot of variables
6 that come into play here. Currently the radium is coming into
7 the water treatment system uniformly. In other words, it's being
8 shipped out to the consumer. What's not removed in the piping or
9 through irrigation or whatever, ends up in the sewage treatment
10 plant. Now after you put in a radium removal system that -- that
11 generates a radium residual, liquid solid, whatever, that is
12 shipped to the sewage treatment plant, it's no longer shipped
13 there consistently. It may be shipped there once a week. It may
14 be shipped there every few days. It may be shipped there every
15 two weeks. So is that radium sludge going to be unified through
16 the POTW? I don't think we have any data to tell us that. But
17 it will be different, I'll tell you that. One --

18 Q. Do you think it will be different?

19 A. If you're using HMO, you will have solids going into the
20 sewage treatment plant. You will have a higher probability of
21 radium reporting to your sludge as opposed to your -- into your
22 liquid discharge. The sole purpose, or one of the purposes, of a
23 sewage treatment plant is to remove solids. So if you're
24 shipping solids, you would expect more of it to show up in the

1 solids. If you're shipping an ion exchange brine, you're
2 shipping more chlorides, which make things more soluble, so you
3 may see an increase in the chlorides and in -- an increase of
4 what's soluble, what's going into the river.

5 Q. I guess both testimony, certainly on page 11, in bold
6 you talk about the levels of radium are high enough to cause
7 significant concern for the safety of POTW workers. And of
8 course in Mr. Adams' there's quite a bit about that. Can you --
9 can you tell us about -- are you aware of what levels of
10 radiation have been found in POTWs up until now?

11 A. No. Are we talking about --

12 MR. ADAMS: The two major efforts were, as I provided in my
13 testimony, the ISCORS and actually before that was the study that
14 was conducted by AMSA, which was a preliminary study before the
15 ISCORS.

16 MS. WILLIAMS: Do you know did they assume a certain number
17 of hours spent by the workers?

18 MR. ADAMS: Yes, yes.

19 MS. WILLIAMS: What number of hours did they assume?

20 MR. ADAMS: You have to be a little more specific? To what
21 particular worker?

22 MS. WILLIAMS: To the POTW worker actually is what I'd like
23 to talk about rather --

24 MR. ADAMS: Particular to POTW worker there were handlers

1 and sludge.

2 MS. WILLIAMS: Can you tell -- so they assume different --
3 that would be my first question?

4 MR. ADAMS: Yes.

5 MS. WILLIAMS: They assume different length of exposure --

6 MR. ADAMS: Yes. ISCORS looked at different jobs within
7 the POTW, some were handling, some were dealing directly with the
8 sludge, more contact such as the belt or the filler keg belt,
9 looked at dealing with the less concentrated activities and the
10 time that it took or time that was spent --

11 MS. WILLIAMS: Okay.

12 MR. ADAMS: -- in conducting those activities. So in a
13 case of a POTW worker who was a biosolids sludge, that was
14 basically eight hours a day as opposed to that sludge.

15 MS. WILLIAMS: And for the others, it was less than that
16 depending on the high?

17 MR. ADAMS: Right, depending on -- the sampler he may be
18 doing a five-minute sample, get in, get out.

19 MS. WILLIAMS: Now when you say ISCORS, did that -- is the
20 implication that other group did not look at the -- did not
21 differentiate between the amount of time?

22 MR. ADAMS: The other group's purpose was to not look at a
23 dose -- correlate sludge concentration to a dose worker. The
24 AMSA study was just to gather information on the -- at that time,

1 I know, radiological concentrations of POTW sludge.

2 MS. WILLIAMS: The sludge itself you're talking about then?

3 MR. ADAMS: Or ash.

4 MS. WILLIAMS: If you look at ash values, those are going
5 to vary from sludge, correct?

6 MS. ADAMS: Yes, yes.

7 MS. WILLIAMS: They would be higher, right?

8 MR. ADAMS: Yes.

9 MS. WILLIAMS: Do you know if they assume that the sludge
10 drying beds were indoor or if they were open air?

11 MR. ADAMS: In the ISCORS it was indoor.

12 MS. WILLIAMS: Okay. Do you know if that's typical?

13 MR. ADAMS: I don't know the percentage of indoor versus
14 outdoor.

15 MS. WILLIAMS: But presumably if there was an outdoor, the
16 risk would go down, right?

17 MR. ADAMS: The risk is directly correlated to radium. If
18 you have --

19 MS. WILLIAMS: Which then is affected by the level of
20 ventilation, correct?

21 MR. ADAMS: It can be affected by the level of ventilation
22 in the room change, yes.

23 MS. WILLIAMS: So they looked at radon specifically rather
24 than radium per se?

1 MR. ADAMS: They looked at both.

2 MS. WILLIAMS: At both?

3 MR. ADAMS: Both.

4 MS. WILLIAMS: Okay.

5 MR. ADAMS: Because you're getting exposure with or without
6 radon. My testimony is using their methodology even without
7 radon, you're getting 117 per year to a dose of a public
8 individual, not a rad worker. And if you look at 170 versus the
9 100, which is the NRC and EPA public exposure limit, that's been
10 exceeded.

11 MS. WILLIAMS: Can you explain to me what types of
12 radiation are emitted by the different particles we're talking
13 about to Radium-226 to 228 radon?

14 MR. ADAMS: Radium-226, that is an Alpha emitter -- alpha
15 emitter is like helium but it's a particle. It's very high
16 energetic particle in the case of Radium-226.

17 MS. WILLIAMS: It doesn't pierce the skin though, right?

18 MR. ADAMS: Alpha particles do not. The energy is almost 5
19 MEV, which is fairly energetic particles but it does not
20 penetrate the skin. It is more -- we're more concerned about it
21 being in the skin. In other words, getting into the mouth
22 through the nose, inhalation, ingestion, injection, through a
23 cut. Radium-226 -- actually Radium-226 is both Alpha and a gamma
24 remitter because of its decay into various dotters.

1 MS. WILLIAMS: After it decays into gamma remittor --
2 MR. ADAMS: Right.
3 MS. WILLIAMS: -- or Radium -- 226?
4 MR. ADAMS: The valley can take -- exposed to radium 238.
5 It goes through a series of decay. And when it gets to the
6 Radium-226, then the Alpha emitter to Radium-222. So if you just
7 look at the long decay series, you have a number of --
8 MR. WILLIAMS: But when, correct me if I'm wrong, when 226
9 decay, it gives off both Alpha and gamma rays?
10 BOARD MEMBER MELAS: Yeah.
11 MR. ADAMS: No.
12 MR. WILLIAMS: 226.
13 MR. ADAMS: 226 is an Alpha emitter specifically to 226 is
14 an Alpha emitter. Radium 228 is a beta emitter. A beta emitter
15 is slightly more energetic. It's into the greater than five MEV.
16 It can be stopped, beta particles, it's particle, can be stopped
17 by some clothing or some shoeing. There is some high energetic
18 betas that can penetrate skin. There's a few of those. It too
19 is a more or less an internal, through the mouth, through the
20 nose, skin injections and those I say have about a five
21 and-a-half to 5.6 MEV.
22 HEARING OFFICER ANTONIOLLI: Okay. I'm going to interrupt
23 here and go off the record for a minute.
24 (A short break was taken from 4:31

1 until 4:40.)

2 HEARING OFFICER ANTONIOLLI: Okay. Back on the record now
3 at 4:40. And I believe I have a motion by Mr. Harsch.

4 MR. HARSCH: Roy Harsch on behalf the City of Joliet.
5 Today is the third hearing that was scheduled at the request of
6 WRT and Albert Ettinger has responses to his questions. Given
7 the time that it is today, the fact that the Agency has yet to
8 complete their questions, we have yet to have any opportunity to
9 hear the Agency's response to Mr. Ettinger's pre-filed questions
10 and I have not had the opportunity to ask a number of questions
11 that we have for these two witnesses that have been taken up all
12 of the afternoon, I would request that we stop this hearing at a
13 normal time this evening and schedule an additional hearing,
14 hopefully in Chicago or the Chicago land area, to allow my client
15 the opportunity to ask questions of these two witnesses, plus
16 hear the response of the Agency to the pre-filed questions and
17 possibly follow-up questions on those responses.

18 HEARING OFFICER ANTONIOLLI: Okay. I note your request
19 and, as I understand, we -- there are no limitations as far as
20 the facilities are concerned. We can stay here for a little
21 while tonight and we will try to finish at a reasonable time if
22 we can. But we'll stay past five and try to get as much
23 information as we can today. In the interest of administrative
24 economy, it looks like we can try to stay here a little bit

1 longer to get -- to have the witnesses the opportunity to answer
2 the questions that we have today. We won't -- we can stay until
3 seven o'clock, and at that point we can reevaluate and, if
4 necessary, set another day.

5 MR. HARSCH: And that will include the Agency's response to
6 the questions?

7 HEARING OFFICER ANTONIOLLI: We'll see what we get through.

8 MS. WILLIAMS: I have to be somewhere at 5:30. Can we take
9 another break?

10 HEARING OFFICER ANTONIOLLI: Sure. We'll take another
11 break. We don't have to go from here on out. Why don't we
12 continue where we left off before. If other people have
13 questions that are relevant to what we're discussing, please add
14 your questions and let's continue from Ms. Williams.

15 CONTINUED EXAMINATION OF CHARLES WILLIAMS

16 Q. (By Ms. Williams) Mr. Williams, one of the figures that
17 you provided, I think it was up there, was a Figure 4 and 5
18 looked at the reverse osmosis radium removal process and it laid
19 out different steps in the treatment process and different
20 options and the flow chart format. One item I noticed was not
21 there, aren't there available methods to -- such as holding tanks
22 to prevent sending all of the radium concentrate to the treatment
23 plant at one time? Do you understand what I'm asking?

24 A. I think in every case, not just the RO case --

1 Q. Right.

2 A. -- there are mediation steps that could be taken to,
3 what's the word, allow a more prolonged discharge.

4 Q. Uh-huh. And then there are facilities that do that,
5 correct?

6 A. Not any RO facilities, but certainly there's no reason
7 that you can't.

8 Q. Can't. On page 18, I believe, you talk about cost
9 savings. Can you explain to us a little bit what those cost
10 savings are based on?

11 A. I can -- I've attached as exhibits, you know, what the
12 mayor said it's --

13 Q. So you're basing those on their statements that they've
14 determined those will be cost savings?

15 A. That's correct. I mean, they did select us so
16 presumably.

17 Q. So you obviously recommended to them that they could
18 have a cost savings with your system, right?

19 A. No.

20 MR. FORT: No, I'm going to object because all they can do
21 in contract is make a bid. They don't know necessarily what
22 others are bidding.

23 MS. WILLIAMS: Really?

24 MR. FORT: No, I don't think so.

1 Q. (By Ms. Williams) So you didn't tell them?

2 A. No.

3 Q. Well then that's fine.

4 BOARD MEMBER RAO: Just a follow-up to cost of radium
5 removal on page 80. Do you have any rough estimates as to what
6 the treatment cost would be for your treatment technology in
7 terms of a per gallon basis or to remove radium?

8 A. It's variable, depending on the concentration of radium
9 in the water, the amount of utilization of the system and the
10 size of -- how many gallons to treat per year. Typically the
11 more they treat, the cheaper it gets. We've been bidding, I
12 think, the lowest number we have given out is 28 cents per
13 thousand gallon and that included equipment, media, media
14 exchange and foul disposal of media. So it was an all
15 inconclusive price up to a high of perhaps as \$1.50 of 1,000.
16 And in the case of Wynstone where they were looking to removing
17 barium and radium, so it's quite variable on the specific site.

18 BOARD MEMBER RAO: And you've not made any comparison of
19 this cost to other particular technologies, have you?

20 A. It's a bid situation, so each company bids usually what
21 they think they can do it for.

22 BOARD MEMBER RAO: Yeah.

23 A. We, to my knowledge, at least at present, you know,
24 we've not given out a final number after a pilot plant that has

1 been rejected, so we believe that we are certainly competitive,
2 and in many cases, we believe that we're the least expensive
3 method of removing radium.

4 BOARD MEMBER RAO: Thank you.

5 Q. (By Ms. Williams) I just have a couple questions on
6 page 19 and I think I'm done with your testimony. When you say,
7 I think the third bullet point from the bottom, you say something
8 about this total removal approach does not require a new
9 bureaucracy, can you explain what you mean by new bureaucracies?

10 A. If you put radium down the sewer, then there are, in my
11 belief, a lot of things have to happen. If you put it down the
12 sewer, you got to monitor what the radium coming out and going
13 into the streams is. You got to monitor the workers' safety.
14 You got to monitor where the radium is applied, if it's land
15 applied. And recognizing that Radium-226 has a 1,600 year path
16 life, you've not just got to monitor it, you've got to monitor it
17 forever.

18 Q. So but all those are existing problems in communities
19 where they have been not treating for radium, correct?

20 A. Well, you know, I don't believe any of the monitorings
21 is going on. It may be starting as this goes forward --

22 Q. Uh-huh.

23 A. -- but I don't think it's existed.

24 Q. Does the bullet point right above that, I just want to

1 clarify, you say absorptive media technology such as that of WRT
2 approved by the Agency, can you just give me IEPA by Agency or do
3 you know by what agency you mean in that?

4 A. I'm sorry. I haven't found that yet. Here it is.
5 Yeah, the IEPA has given us an instruction.

6 Q. So that's what you mean by that statement?

7 A. Yeah.

8 Q. Okay. And that is for which facility?

9 A. Oswego.

10 Q. That's the one permit you have so far?

11 A. That is, yeah, that's the five system.

12 MS. WILLIAMS: Okay. I think I've covered a lot of what I
13 had for Mr. Adams too but not quite everything.

14 EXAMINATION OF THEODORE ADAMS

15 Q. (By Ms. Williams) I just want to clarify -- I don't
16 believe we've clarified yet, the facility that you talk about
17 with the personal experience in Ohio and Kiski Pennsylvania, can
18 you explain to us what was the source of contamination was at
19 that those facilities?

20 A. In the case of the one East Ohio Regional Sewer District
21 located in Cleveland, Ohio, the source was a Cobalt-60
22 teletherapy unit factory manufacturing and repair firm. In the
23 instance of the Kiski Valley Wastewater Treatment Plant, it was a
24 fuel -- a nuclear fuel fabrication facility that discharged its

1 effluent into the sanitary sewers.

2 Q. And do you feel that the concentration of radioactive
3 contaminants found at those facilities would be likely to be
4 found at most wastewater treatment plants in Illinois?

5 A. Those two instances were very specific.

6 Q. Okay.

7 A. With respect to what ISCORS found, which is related to
8 those two, those two incidents, and any others that I presented
9 in Table 1, were really the precursors for ISCORS and the sample.
10 They're very -- it's very dependent. And one of the surprises
11 was that per the ISCORS study, radium was a key component in the
12 POTW sludge or ash. I don't know whether --

13 Q. Generally, you mean across the country if someone
14 said --

15 A. These studies were done across the country both at AMSA,
16 both at ISCORS. They were volunteer POTWs. There was 55 in the
17 AMSA, 315 plus in the ISCORS. That was all confidential. My
18 guess would be that at least one or two were from the Illinois
19 area.

20 Q. The ones in the ISCORS study are probably similar to
21 things you might find in Illinois, correct?

22 A. I would think so. In those NORM areas, if you don't
23 have the Cobalt-60, that won't be the case.

24 Q. But if you have radium in your groundwater?

1 A. Yes.

2 Q. Thank you. I want to look at Exhibit C with you to your
3 report. And I just want to -- I just want to clarify it a little
4 bit. This isn't the entire report that you've provided, correct?

5 A. Correct. It's just an excerpt.

6 Q. Have you made any modifications to this report?

7 A. No.

8 Q. So when we go through, you know, after the table of
9 contents, I notice -- and then there's an overview on page 1,
10 after that there are several pages with just bullet points?

11 A. Yes.

12 Q. This is part of the original study?

13 A. Yes, it is. The AMSA study.

14 Q. Even though -- so the page numbers stop on page 1?

15 A. That's a part of an appendix to that study.

16 Q. Do you know which one? Can you tell us through the
17 table of contents which appendix?

18 A. Appendix C.

19 Q. Radionuclide Survey?

20 A. Uh-huh.

21 Q. Which has a page number on it of XIII. I'm just trying
22 to figure out, it just seems like very different format than the
23 rest of the study. I wanted to clarify this is an accurate
24 representation of the study itself. Do you know if the study is

1 available on USEPA's website if we wanted to take a look at it?

2 A. I believe it is. It's certainly on the Biosolids AMSA
3 website.

4 Q. Okay. Take a look at page 6 of your testimony. On the
5 last sentence it says the, "EPA guidance documents recommend
6 against any release to sanitary sewers of filtrate collected to
7 meet the MCL". Is there a citation to where that recommendation
8 is found in that document?

9 A. I would have to look in the 2000 or 2004. That's where
10 it is cited.

11 Q. In both of them or one or the other or --

12 A. They both comment on it. I would have to look to see
13 specifically which one of those contains that exact cite.

14 Q. Because, I mean, if this was true, it would really
15 prohibit the use of a technology that utilizes backwash, right?

16 MR. WILLIAMS: I didn't hear the question. What was your
17 question?

18 Q. (By Ms. Williams) That is USEPA guidance documents
19 recommend against retaining to the consumers filtrate, that would
20 prohibit technologies that use backwash, correct?

21 A. I think the answer is both are guidance documents. They
22 don't prohibit anything.

23 Q. Okay.

24 MR. FORT: Excuse me. If you're looking for a reference,

1 if you look at page 12, it has a specific page reference to the
2 2004 guidance.

3 MS. WILLIAMS: Page 12 of?

4 MR. FORT: Mr. Adams' testimony.

5 MS. WILLIAMS: The testimony.

6 MR. FORT: Yeah, if you look at the Exhibit A, the relevant
7 pages are excerpted there for both use -- both use guidance.

8 Q. (By Ms. Williams) This is about land application, isn't
9 it? I mean, we can take a look at it further but I think that's
10 about land application. It's true, isn't it, that USEPA does not
11 have a level for radium in sludge in their sludge rules, do they?
12 I believe they're Part 503 of the Code of Regulations in sludge
13 requirements?

14 A. I believe that's correct.

15 Q. And the ISCORS study did determine that generally
16 there's not a problem nationally with radiation exposure to POTW
17 workers, correct?

18 A. POTWs in general, that's correct.

19 Q. In table -- I believe when you were looking in
20 developing your assumptions, you had to make an assumption about
21 the dilution rate, right?

22 A. Yes.

23 Q. And you looked at dilution rates of zero and 50 percent,
24 I believe?

1 A. That's correct.

2 Q. Can you tell me how you picked -- was there any -- Was
3 that just a number that you picked to be examples or was there
4 something that you base those numbers on?

5 A. That information was provided by WRT. And I can
6 reference to let Mr. Williams talk in specifics.

7 Q. Sure.

8 MR. WILLIAMS: The zero was chosen because it's your worst
9 case scenario.

10 MS. WILLIAMS: Right.

11 MR. WILLIAMS: It's also representative of times when there
12 is no rainfall so it would be a dry period episode. The 50 was
13 chosen just to say, hey, be aware there is dilution that can
14 occur in these things and that may be a big number or a little
15 number, so it's a site specific analysis that needs to be made.

16 MS. WILLIAMS: And if that number was higher, the
17 concentrations would go down?

18 MR. WILLIAMS: If there is more dilution of non-radium
19 water, then the concentrations in both the effluent to the
20 stream, and assuming that that water comes with the same amount
21 of sludge, would also go down in the sludge.

22 Q. (By Ms. Williams) On page 9 you say a typical -- this
23 is Mr. Adams now, a typical radium concentration is 15 picocurie
24 per liter. I mean, I know we had some testimony that it can

1 definitely get that high, but did you choose that for a
2 particular reason?

3 A. I think it was in the range and I wanted to show --

4 Q. But it is higher what WRT provided an average for
5 Illinois, is that right, for their -- the ones that they've done?

6 MR. WILLIAMS: I think we're 12.8.

7 Q. (By Ms. Williams) And in your Table 3, as a worst case
8 scenario, you use a concentration of 25 picocuries per liter.
9 Are you aware of anywhere that in Illinois that a level that high
10 has been found?

11 A. WRT gave me an example of 25 picocuries per liter in
12 Illinois.

13 Q. Was that a maximum value or an average value?

14 MR. WILLIAMS: The highest average number we have
15 encountered is 22 something. Look it up.

16 Q. (By Ms. Williams) Thank you. On that table you had
17 22 --

18 A. The highest value that we have encountered in Illinois
19 is 22.6 as an average value. Now were there samples that were in
20 that that were over 25, I'd be glad to go look at the pilot plant
21 study and look at that for you.

22 Q. Do you have a figure on the exposure rate on WRT
23 employees that would be handling the absorbed media?

24 MR. WILLIAMS: The answer is yes. We've looked at -- we

1 monitor all of our pilot plants to look at the radium exposures
2 during the pilot plants. We have then gone out and looked at
3 typical exposure values to municipal workers and are still in the
4 process of still figuring out what it is going to be to our
5 workers because it is dependent on how many plants they're
6 servicing in a year. We institute within WRT radiation training
7 monitoring of workers and every day will fall within the
8 guideline.

9 MS. WILLIAMS: You talk about the 2000 and the 2004
10 guidance documents were USEPA, are you aware if either of those
11 are final documents or if they're drafts or --

12 MR. WILLIAMS: Yeah, they're both drafts.

13 MS. WILLIAMS: Both drafts?

14 MR. WILLIAMS: Actually there was even a predecessor. I
15 think there was a '94 and '96 predecessor leading to those.

16 Q. (By Ms. Williams) On page 12 of -- Mr. Adams' states
17 under the 2004 guidance, most of the substantive recommendations
18 of the 2000 guidance are also in the revised guidance, can you
19 identify for us what changes were made? What ones were not? I
20 mean, obviously most means some were, some were not. I don't
21 mean everything. Just what they threw out?

22 MR. FORT: I'm going to object to the question because
23 these documents are each a couple 100 pages. And we tried to --
24 I think Mr. Adams tried to summarize sort of the highlights of

1 what was said there. Those are publicly available documents if
2 you want to compare them.

3 MS. WILLIAMS: I'm just not sure where we would need to
4 look at the 2000 guidance and if there's a 2004 guidance that's
5 out there that pretty much says the same. If they were the same,
6 I wouldn't have to look.

7 HEARING OFFICER ANTONIOLLI: I'll let Mr. Adams respond so
8 that he can clarify what he meant on page 12 of his testimony.

9 A. The substantive comment or recommendations in both
10 guidances dealt with disposal of the sludge, protection of the
11 workers, the different types of treatment systems. The emphasis
12 on the 2000 was more on the disposal options, less on the worker
13 protection. In the case of 2004 there were more description,
14 discussion about the types of radiation and more discussion on
15 the protection of the worker. My opinion, the combination of
16 both of those guides would make a much better document.

17 Q. Okay. Thank you. That helps a lot. So on page 15, I
18 think it is, yes, the bottom of page 15 you mention the figures
19 of 0.8 and 0.23 grams of sludge per gallon and we did talk about
20 this already. I just want to understand in that sentence when
21 you say a standard treatment system would have 0.8 while an
22 active elevated sludge system would have 0.23, what do you mean
23 by standard treatments in those sentence?

24 MR. WILLIAMS: Those are my words, not his, and maybe

1 they're not the right words. In sewage treatment systems, is my
2 understanding, is you're going to have fairly high variability
3 from the amount of sludge produced from it depending on the
4 sophistication of the system. The more sophisticated the system,
5 the less sludge you produce, and that's what I was trying to
6 indicate.

7 MS. WILLIAMS: Okay. Less sophisticated is --

8 MR. WILLIAMS: Yeah.

9 Q. (By Ms. Williams) Bear with me for a second. I might
10 be almost done. Mr. Adams, do you see any disadvantages from
11 WRT's system from the perspective of the environment or the POTW
12 worker, the drinking water, plant worker, folks that live near
13 the low level radioactive waste sites?

14 A. I think my concern here, my interest and my concern, is
15 really for the POTW.

16 Q. The worker. Oh, okay. The sanitary district you mean,
17 for example?

18 A. The sanitary worker. My experience, real life
19 experience, has been involved with the POTW situations, like I
20 explained, which were shown on Table 1. And as long as the
21 Agency is contemplating and allowing any type of particulate,
22 whether it's WRT or the other firms' treatment systems, the
23 insoluble material going into a POTW or into a sanitary sewer
24 leading to a POTW, both the real evidence and the dose modeling

1 of the ISCORS, shows that there is going to be certainly a high
2 indication, high probability of exposure to the individual
3 worker, especially with radium, especially with radium, because
4 radium is unique in that it has a radon component so as long as
5 we're --

6 Q. I guess the answer is no then probably. That's okay.

7 A. Done.

8 Q. That's okay. Do you know what the impact of WRT's
9 system would be on indoor radon levels at a drinking water plant?

10 A. Not a drinking water plant.

11 MR. WILLIAMS: I can answer that. Since we're not exposing
12 either the media or the water to the air, there is no radon
13 component coming out of air. Now as we collect radium, then that
14 radium decays on the media to radon. Now we have been monitoring
15 the radon discharges into the water because there is also due to
16 chemical a radon in the drinking water. And we have shown no
17 increase in radon in the drinking water over what comes into our
18 system, meaning, that not only is the media capturing the radium
19 but it is also containing the radon that's generated by that
20 radon.

21 MS. WILLIAMS: Based on Exhibit H, Mr. Adams provides a
22 summary of a variety of radiation, legal requirements, standard
23 rules guidances, stuff like that, right. It's correct that there
24 is no USEPA criteria for radon in surface water radium -- sorry,

1 radium, I mean, that's not listed here. There's no USEPA
2 criteria listed for radium in surface water, correct?

3 MR. WILLIAMS: No.

4 MS. WILLIAMS: Nor a listing of any sludge limitations?

5 MR. WILLIAMS: That's correct.

6 MS. WILLIAMS: Is there -- are there any requirements that
7 apply to sludge from drinking water plants? Maybe Mr. Williams
8 can -- either of you, if you know.

9 MR. WILLIAMS: It's just exposure. It doesn't say where
10 exposures are coming from.

11 MR. FORT: Go ahead.

12 MR. ADAMS: I believe the answer to your question is not
13 really specific but there are dose rates or dose limits provided
14 by the EPA or the NRC.

15 Q. (By Ms. Williams) They're reflected in here?

16 A. I have the NRC's listed that is 100 milligrams out of
17 20.1301. I do not have, and I could have included the EPA, which
18 is also 100 milligrams, 15 milligram to a single source.

19 Q. Per exposure -- for exposure then you're saying, that's
20 an exposure?

21 A. As a dose limit.

22 Q. But not a limit on what the sludge itself can be entered
23 into the concentration?

24 A. (Nods head.)

1 Q. Is there -- I mean, going back a little bit to the
2 question of environmental impacts, have you looked at the
3 environmental impacts of emissions for transporting waste across
4 the country or anything like that?

5 MR. WILLIAMS: What kind of emissions are you talking?

6 MR. FORT: Are you talking about the truck?

7 MS. WILLIAMS: Is that something that should be taken into
8 account as being a plus or a minus?

9 MR. WILLIAMS: The Department of Transportation has
10 established rules for transportation of low-level radioactive
11 waste, and we have looked at --

12 MS. WILLIAMS: Safety rules you mean?

13 MR. WILLIAMS: Those rules. And we follow them.

14 MS. WILLIAMS: I think that's all I have for now. I would
15 like to consult with my folks for a minute and we can move on.

16 HEARING OFFICER ANTONIOLLI: I think we should proceed with
17 more questions for these witnesses. Let's take a five minute
18 break.

19 (A short break was taken.)

20 (Board Member Johnson exits hearing.)

21 HEARING OFFICER ANTONIOLLI: Back on the record. It is now
22 5:30 and we will start with a quick question or two with Member
23 Melas and --

24 BOARD MEMBER MELAS: And I will turn it over to you. Mr.

1 Adams, we've been debating within ourselves now since January on
2 this new rule, the water standard, the overall thing. And you've
3 given us a great deal of information from primarily directing our
4 attention to the problems in the POTWs, the health questions and
5 all this. Now the only thing that we have on the record that we
6 have heard from POTWs is metro Chicago in favor of the proposal
7 as made by the USEPA and the City of Joliet -- IEPA I promoted --
8 or demoted them. They really are today. And the City of Joliet.
9 What the Illinois association position is we don't -- there's
10 nothing in the record that speaks to it. Now that poses kind of
11 a quandary in my mind to the people that you're mostly concerned
12 with here are saying they're in favor of this rule. I don't
13 know, are you referring to the study that AMSA made, I guess is
14 national, I guess 80 samples across the country? Not too many of
15 the those POTWs had the problem of radium in this other
16 pollutant.

17 MR. ADAMS: Correct.

18 BOARD MEMBER MELAS: So I -- the economy gets me. It would
19 seem to me if what you're saying has real validity, the POTWs
20 don't approve this and it's just the opposite?

21 MR. ADAMS: I would agree. I don't know why not. I would
22 expect this whole room to be filled with POTW operators. I mean,
23 you go back and look at AMSA and go back and look at ISCORS.
24 It's very clear the dose methodology is used is laid out. I

1 don't know why they're not knocking on the doors.

2 BOARD MEMBER MELAS: Okay. That's fair. I'll just turn it
3 over to Mr. Harsch and maybe he can go on with his questions.

4 HEARING OFFICER ANTONIOLLI: Go ahead.

5 CROSS-EXAMINATION OF CHARLES WILLIAMS

6 Q. (By Mr. Harsch) Roy Harsch with the law firm of
7 Gardner, Carton & Douglas today here on behalf of the City of
8 Joliet. Mr. Williams, I think a question was asked by the Agency
9 and I'm not sure it was answered. What is the change in the
10 impact of either sludge handling or wastewater discharges to
11 receiving stream from a municipality that currently does not
12 treat per radium versus when it has to install technology and
13 meet the five picocurie limitations and were to discharge its
14 water treatment plant residual to the sewer?

15 A. I think you're basically asking me is there any change
16 between the amount of radium that is showing up in a wastewater
17 treatment plant today versus post treatment?

18 Q. Correct.

19 A. And I'm going to answer that in two ways. I think for
20 the most part the total amount of radium reporting to a sewage
21 treatment plant will not be significantly changed. The form of
22 that radium, whether it's solid, whether it's a liquid, whether
23 it's in a chloride solution or not, will change. The percent
24 that goes to solids and percent that goes to liquids may change.

1 I think the real question here, and based on Ted's testimony, is
2 just because we're doing it now and have been doing it doesn't
3 mean we should continue to do so. And under that analogy, we
4 would still be throwing trash out the windows.

5 Q. I understand that point. I don't mean to interrupt you.
6 I think you've made that point very well today. In terms of the
7 actual difference between now and post treatment, it would be
8 substantially the same amount of radium going to the POTW?

9 A. I mean, I can give you things that would be different.
10 Sump diffuses for example, if you have irrigation in your system
11 and let's say during the summer months you're irrigating
12 substantially, that radium doesn't show up in the POTW now but it
13 would after you put in a treatment system.

14 Q. I'll grant you that.

15 A. But I think the fundamental question is -- is still is
16 the radium in the sewer now or later.

17 Q. That radium that's laid in water that's currently being
18 used for irrigation is going to end up happening, ground water
19 and flow into the streams in all probability?

20 A. Well, I think it's -- theoretically you're doing your
21 irrigation to not have run off.

22 Q. Do you have any data that would show the impact of the
23 change in the chemical form of the radium would be going to the
24 POTW post installation of treatment?

1 A. Well, you have to look at each individual system. The
2 HMO process would create a radium precipitant on manganese
3 particle that's dramatically different from radium dissolved in
4 the surface water. There's a different form, different shape.

5 Q. You haven't measured or sampled?

6 A. We have not. I understand that Joliet is doing pilot
7 planning on HMOs and will do so.

8 Q. You mentioned that you had 12 pilot facilities in
9 Illinois, that's -- you're under contract in two municipalities;
10 is that correct?

11 A. That's correct.

12 Q. In response to a question, I think you said you quoted a
13 range of 20 cents per thousand gallons or treated some number as
14 a cost of your system?

15 A. Yeah, in response to a question of how much does your
16 system cost, I gave a range it varies depending on each
17 individual site and what the site specifics are. But I think we
18 quoted a low of 28 cents and a high of somewhere around \$1.50.

19 Q. Do you know what form or manner the vendors of reverse
20 osmosis or lime softening or other competing technologies would
21 present their proposal to a municipality?

22 A. I think it would depend on what the municipality asks
23 for.

24 Q. Is it common for equipment vendors to quote costs on

1 dollars per gallon treated or is it normally a capitol cost?

2 A. It can be done both ways.

3 Q. On the first page of your testimony you're citing the
4 MCL and MCLG for radium if it's a carcinogen of zero and have
5 made that point. What cancers do you believe are caused by
6 Radium-226 and 228?

7 A. Well, I'm not a doctor or health physicist, but I
8 understand especially bone cancer that radium is what they call a
9 bone seeker and replaces calcium to the bone and in the decay of
10 the radium at a point given off the particles creates health
11 effects.

12 Q. Is the result of -- is that a phenomenon that's caused
13 by the ingestion of the material as opposed to exposure of the
14 body?

15 A. Yeah, the principal form is ingestion. Now radon is
16 another source as a byproduct but that's another issue.

17 Q. That's for Radium-226 and -228 if ingested?

18 A. Ingestion.

19 MR. HARSCH: Mr. Adams, would you agree with that?

20 MR. ADAMS: I would agree with that.

21 Q. (By Mr. Harsch) I think in clarification to questions
22 you indicated that your treatment system, WRT's process was
23 designed always to meet the five -- produce a water that would
24 comply with the current standards of five picocuries; is that

1 correct?

2 A. I think what I said was we strive to meet the client's
3 desires. If it's five, we strive to meet five. If it's less, we
4 strive to meet less.

5 Q. In your 12 pilot plants that you have, what current
6 levels are you producing?

7 A. Well, it is dependent frankly. Many of the pilot plants
8 are so short that they don't even get to more than two, two
9 and-a-half. Oswego we ran for quite a long time. Over a year,
10 year and-a-half. And in the configuration of the pilot plant,
11 which is by no means the final configuration plant, I think, we
12 were following up in the four to -- four to five range.

13 Q. So two and-a-half to four a few times?

14 A. In a pilot plant situation, sure.

15 Q. And the longer you operate -- If I understand your
16 system, is the longer you operate the system with the media in
17 place, the higher the level treated water?

18 A. Yeah, what -- what we do to achieve compliance is if
19 they tell us we want to exchange the media at this point in time
20 when the discharge hits this point, that's when we exchange the
21 media, so basically we are able to tailor the discharge to
22 whatever the client requires.

23 Q. And the costs, of course, go up every time you change
24 the media?

1 A. If you reduce the time that the media is in a system,
2 then the costs go up.

3 Q. So if the municipality were to operate their system in a
4 cost-effective mode, they would perhaps schedule a change out at
5 four and-a-half which would be amply below five, would that be --

6 A. Yeah, it's their call. They look at the costs, and if
7 they want us to evaluate cost of other numbers, we will certainly
8 do so.

9 Q. Well, you're going through the process and so that's the
10 common number that you use?

11 A. That's a common number that we use.

12 Q. So that system would be producing and delivering to the
13 system a finished water between two and-a-half -- or two and four
14 and-a-half you said, if I do my math correctly, and a treatment
15 -- the POTW removes between 20 to 50 percent of the radium that's
16 present in the water that is discharged to it, those treatment
17 system's effluent would not currently be in compliant with the
18 one picocurie existing standard, would it?

19 A. Well, it depends. Depends on the breakdown of 226 and
20 228 within the system. But there is a possibility that even
21 leading the discharge standard of five that a sewage treatment
22 discharge to a river could be in the plus one picocurie of 226.

23 Q. Well, if I used the 20 percent figure in your -- that
24 you've used in your analysis, that would mean that 80 percent of

1 the radium would remain in the water, 20 percent going to the
2 sludge, so the math quickly gives you a number of about one. In
3 fact, if you go up to 50 percent at two and-a-half, you're one in
4 and a quarter, and if you go up to 75 percent at four and-a-half,
5 you're over, aren't you?

6 MR. FORT: I object to this question which has so many
7 compound elements to it, but if you can answer.

8 A. Well, I mean the first thing, you're not taking into
9 account the division of 226 and 228. So if you're assuming the
10 100 percent of the radium was 226, I think, yes. If you have a
11 five going to the sewage treatment facility with no dilution and
12 the minimum amount of removal, you could be above one.

13 Q. (By Mr. Harsch) None of the systems that you're
14 operating in Illinois are full scale systems, are they?

15 A. No.

16 Q. They're all pilot?

17 A. That's correct.

18 Q. Are the pilot systems operated of the septic same as
19 system full scale?

20 A. Well no pilot plant is the same as scale. Principally,
21 yes, they're very similar.

22 Q. And your full scale you're going to have 15 tons of
23 material in tank one and 15 tons of the media in tank two, if I
24 understand that correctly?

1 A. It varies. Each system is designed for the well and the
2 radium content of that well.

3 Q. So that was an example --

4 A. That was an example.

5 Q. That's a common example?

6 A. Yeah. Most of the Oswego ones are in that ballpark.
7 Basically we try to design it so that a tank will hold basically
8 a truck load, and so that if you take a truck load out, you
9 minimize your cost and you -- you have a long time between
10 trucks, maybe one, three, four years.

11 Q. So the material then would remain in the tank for one,
12 two, three -- three years?

13 A. (Nods head.)

14 Q. So the concentrate radium held if -- hold it in the
15 media for that length of time?

16 A. That's correct.

17 Q. In your -- Are your pilot plants operated in a manner
18 that the water that's treated is released to atmosphere pressure
19 or are they operated in a manner where the -- the finished water
20 is delivered at system pressure?

21 A. Ultimately they're released to the atmosphere.

22 Q. Your full scale facilities will be built so that they
23 are connected directly to the system, am I understanding?

24 A. If that's what they request.

1 Q. That's the standard design?

2 A. We have at least one that we're talking about going into
3 a holding tank, but we have the storage tank right afterwards.

4 Q. In Table 4, you're giving concentrations of 5,000 to
5 15,000 picograms for the HMO backwash water, are you aware of any
6 location in a municipal water treatment process the holding tanks
7 at a water treatment plant or sanitary sewer or wastewater
8 treatment plant where the solids component of the backwash water
9 is, in fact, separated from the liquid fraction?

10 A. Say that again.

11 Q. Anywhere POTW -- Anywhere in the municipal public water
12 supply treatment plant or in a POTW that would accept the
13 backwash from an HMO system, is there anywhere in that system
14 where these solids at that concentration are, in fact, segregated
15 from the liquid fraction?

16 A. I'm thinking I'm trying to divide that in two areas, I
17 guess. What you asked me was, if I understood you correctly, was
18 is there anywhere in the water treatment plant currently that
19 separates solids from liquids?

20 Q. Correct.

21 A. Is that correct?

22 Q. Correct.

23 A. Certainly in -- in some water treatment plants
24 specifically water -- service water plants, they do a tremendous

1 amount of separation of solids and liquids. Typically in a
2 ground water plant you would not do that unless for some reason
3 you turbidity was high.

4 Q. So if I got an HMO system installed, as one of the
5 alternatives that you have testified at length to today for
6 radium treatment for groundwater, are those systems going to --
7 any of them separate that solid component --

8 A. Yes.

9 Q. -- from the backwash water?

10 A. They all separate it from the drinking water. The very
11 first step after you make it is you separate the solid component
12 from the drinking water.

13 Q. And then how is it removed?

14 A. And so you concentrate that into a tank -- let me -- I'm
15 getting where you want me to go and the next step is to
16 reintroduce water, perhaps three to five percent of the water
17 that you use to backwash that and put it back into closed
18 suspension for disposal down a sewer line. I think that is the
19 correct process.

20 Q. So these concentrations are not the concentrations in
21 the -- in the water and solids after it's been backwashed?

22 A. The concentrations that I see here are the solids
23 concentration, not the solid plus liquid concentration.

24 Q. Okay. And that would be a lower concentration?

1 A. The composite would be much lower.

2 Q. In the -- I think in response again to a question about
3 the impacts from your system, and maybe Mr. Adams would weigh in
4 here too, if I've got 30 tons of media that's collecting radium
5 and I'm holding it for one to three years, isn't the radon --
6 isn't the radium going to decay and produce radium?

7 A. Yes.

8 Q. What happens to that radon?

9 A. In our test work so far, all of the radon, or the vast
10 majority of the radon, remains within the media.

11 Q. Have you tested the finished water for radon?

12 A. Yes.

13 Q. And you've not shown any increase?

14 A. Within the range of, you know, analytical skills, no.
15 Some were slightly up. Some were slightly down. But we have
16 shown no increase.

17 Q. Is the fact that those pilot systems operate vented to
18 the atmosphere provide the -- another potential escape route for
19 the radon? In other words, if they're open to the atmosphere,
20 can't the radon leave as a gas?

21 A. Yeah, but we're measuring the radon coming off in the
22 water. There is no vent into the system before you measure it.

23 Q. If you measure -- You try to measure radon, I guess, in
24 your system, right?

1 A. There is no system.

2 Q. I mean, in the atmosphere surrounding your system?

3 A. In the air?

4 Q. Uh-huh.

5 A. There's no opening -- there's no opening of our system
6 until you're outside. We measure the radon in the liquid before
7 it leaves our facility, and there is no increase. Could there be
8 some radon released from the water? There is radon in the water.
9 However, at least in every sample we've taken, far below the 300,
10 I think it's picocurie per liter level, we have seen no
11 indication in any of our pilot plant testing of any radon
12 problem.

13 MR. HARSCH: Mr. Adams, would you concur that the operation
14 of a pilot system for less than 30 days gives you a comparable to
15 compare to a system where you're going to retain the media for
16 one to three years?

17 MR. ADAMS: I'm not familiar with a pilot system so I can't
18 give you any.

19 MR. HARSCH: That would be more radon produced in -- as
20 time proceeds?

21 MR. ADAMS: (Nods head no.)

22 MR. FORT: Object. I think we've been through that part.
23 And if Mr. Adams has familiarity with the technology and
24 mechanism scale-up factors, then that's fine. But, I mean, we

1 talked already about the data at the particular equipment here as
2 opposed to theoretical situations.

3 HEARING OFFICER ANTONIOLLI: You can all -- He can give you
4 is his opinion, and then go ahead.

5 MR. HARSCH: I think he shook his head no.

6 HEARING OFFICER ANTONIOLLI: As it is approaching six
7 o'clock, if you want to finish up, if that's your answer, he can
8 go ahead and indicate for the record your answer and then we'll
9 finish up with the last question and go off the record.

10 MR. ADAMS: (Nods head no.)

11 HEARING OFFICER ANTONIOLLI: Then we'll go off the record
12 at this point.

13 (A discussion was held off the record.)

14 HEARING OFFICER ANTONIOLLI: I think we have another
15 exhibit to be filed by the Agency.

16 MS. WILLIAMS: Yes, the Agency has prepared responses to
17 the written questions that were submitted by the Sierra Club. Do
18 you want me to number them as an exhibit?

19 HEARING OFFICER ANTONIOLLI: Exhibit 12.

20 MS. WILLIAMS: I guess I'd like to just briefly explain, I
21 have one original Exhibit 12 and it refers to Attachment A.
22 Attachment A is the same as Exhibit 10. I've already provided
23 copies so I'm not going to provide an additional -- I mean, I'll
24 give the one originals and the others will be copies of it.

1 HEARING OFFICER ANTONIOLLI: Yeah, that will be attached to
2 your exhibit.

3 MS. WILLIAMS: Attachment A is the same as Exhibit 10?

4 HEARING OFFICER ANTONIOLLI: Yes. Do we have any
5 objections to the Agency answering their responses to questions
6 pre-filed by the Environmental Law & Policy Center jointly?

7 MR. FORT: My only objection goes to the extent the Agency
8 is expecting that they will not be subject to any further
9 questions or follow-up on what they put on paper here?

10 HEARING OFFICER ANTONIOLLI: Follow-up can be addressed at
11 the next hearing. This goes for these answers into the record
12 for consideration between now and then. There's no further -- if
13 there's no further objections, I'll go ahead and admit this as
14 Exhibit 12. And what we'll do for the record, I would just like
15 to say that this closed first notice public comment period for
16 now, when this began, when this appeared in the Illinois Register
17 on August 6th, 2004, and lasts 45 days. The Board is accepting
18 public comment to be included in this second notice, opinion and
19 order until September 20th, 2004, but we will schedule a fourth
20 hearing in this matter and that will be scheduled at a later date
21 by hearing officer order.

22 We expect a transcript of today's hearing to be ready
23 within eight business days. And after we receive, it the Board
24 will post our transcript on our website at www.ipcb.state.ill.us.

1 There the transcript, as well as the Agency's proposal and all of
2 the Board's orders throughout these proceedings are viewable and
3 downloadable at no charge. Alternatively you can order a copy of
4 the transcript from the clerk of the Board, and that concludes
5 today's hearing. Does anyone have questions before I adjourn?

6 BOARD MEMBER MELAS: Can we talk about the possible dates?

7 HEARING OFFICER ANTONIOLLI: Not right now. We'll go ahead
8 and adjourn.

9 (The hearing was adjourned at 6:04 p.m.)

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STATE OF ILLINOIS

COUNTY OF FAYETTE

C E R T I F I C A T E

I, BEVERLY S. HOPKINS, a Notary Public in and for the County of Fayette, State of Illinois, DO HEREBY CERTIFY that the foregoing 135 pages comprise a true, complete and correct transcript of the proceedings held on the August 25th, 2004, at the offices of the Illinois Pollution Control Board, 1021 North Grand Avenue West, North Entrance, Springfield, Illinois, in the case of Revisions to Radium Water Quality Standards: Proposed New Ill. Adm. Code 302.307 and Amendments to 35 Ill. Adm. Code 302.207 and 302.525, in proceedings held before Hearing Officer Amy C. Antonioli, and recorded in machine shorthand by me.

IN WITNESS WHEREOF I have hereunto set my hand and affixed by Notarial Seal this 2nd day of August A.D., 2004.

Beverly S. Hopkins
Notary Public and
Certified Shorthand Reporter and
Registered Professional Reporter

CSR License No. 084-004316