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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

PUBLIC MEETING

TUTU WELLFIELD SUPERFUND SITE

CURRICULUM CENTER
386 ANNA'S RETREAT
ST. THOMAS, U.S. VIRGIN ISLANDS

DATED:
March 5, 1996

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The following is a transcript of the United States Environmental Protection Agency, Region II, Public Meeting on the Tutu Wellfield Superfund Site, before JULEE NORMAN, C.S.R, held on the 5th day of March 1996, at the Curriculum Center, 386 Anna's Retreat, St. Thomas, United States Virgin Islands.

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P R O C E E D I N G S

MS. JOHNSON: Okay. Good evening. Do you hear me? Okay, fine. Good evening. I'm Lillian Johnson, and I'm in charge of the community relations program at EPA. Now many of you have seen me so I don't have to tell you any more than that. Tonight we're certainly very, very happy to welcome you here, and we're especially happy to be here because when some of us left New York yesterday morning, the temperature was about 14 degrees and we still had snow on the ground from the weekend storm. So it was such a pleasure to fly into this beautiful weather here in St. Thomas.

Also, many of you know that when we were here last April, we said to you at that time that we were going to return -- well, we wanted to return last summer, but that didn't materialize. So we scheduled meetings to come back to visit with you in September. And, of course, due to the hurricanes, we were not able to make the meetings. In addition, we've had some budget situations, which I'm sure many of you are aware of, but before that occurs again, we decided we better try to get this meeting in. So we're especially glad that we were able to be here at this time.

Now about this meeting, when we were

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here the last time, it was more of a very, very informal meeting. Caroline just wanted to really give you an update on where we were with our site activities. This time we're here really to present information to you concerning the result of the remedial investigation and feasibility study that we've conducted and also to present to you the proposed plan where we are certainly asking for your comments.

As part of the community relations process, we hold meetings such as this so that we can get your input. In addition to the public meeting, however, you can always write in your comments.

Now there -- we really had a couple of public comment periods on this site. Due to the fact that we had originally planned to come down last September, we had scheduled a public comment period that started around August 23rd, and it was scheduled to end September 22nd. Since we were not able to do the meeting at that time, we have since rescheduled the public comment period. And the present comment period started February 12th, and it's scheduled to end on March 13th. So you have time to get any written comments in that you need to in addition to giving us your comments here tonight.

For those of you who would like to

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review some of the documents that have been produced on this site, there are two repositories in place. One is right here in this building and the other is at DPNR's building at the Wheatley Shopping Center. So if for some reason you would like to look at some of the documents in these two locations, that beautiful orange form --

MS. HARSCH: Can you speak up, please? I can't hear you over the air-conditioning.

MS. JOHNSON: Sure. That beautiful orange form that you have will give you the listing of the times that the repositories are open.

Normally at these public meetings we try to make very, very short presentations, but tonight we do have a lot of information we need to share with you, so it's going to be a little bit longer than we would normally have because it's so important that we give you all the necessary information that's going to help you understand the process that is the Superfund process as well as to help you understand what it is we're doing to clean up this site.

Okay. Now let me tell you who's with us here tonight. First of all, we have Caroline Kwan, who is the project officer on this site, and Caroline has been with this site now for, what, ten years or so?

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MS. KWAN: No.

MS. JOHNSON: Caroline has been the only EPA project manager on this site.

In addition to Caroline, many of you know Melvin Hauptman. Mel is chief of the Caribbean and the New York Superfund Section.

We have two risk assessors. We have Mark Maddaloni, who's really with the environment and protection agency, and Mark is going to be talking about the human health risk assessments. And then we have Sally Odland, who is with Camp, Dresser and McKee. She's the contractor to EPA who -- Sally has been with the project for a long time and she has been working very closely with us. In addition, we have a young man over here, Lee Dioso. Lee is also with Camp, Dresser and McKee, and he is working as our community relations support person.

There are some other people in the audience tonight, and we may have to hear from them before the evening is over. We have representatives from DPNR and we also have representatives from ATSGR.

Now before we get started, I just want you to know that we are recording this meeting. As part of the public participation process, we are really required by law to have a transcript of this public

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meeting. So we do have a transcriber here. So when we get to the question and answer period, we're going to ask you to please stand up and give her your name and speak I guess louder than I am, so that she can hear what you're saying. And I'm sorry, I have an oversight here. Our attorney, my friend, Andy. We have Andrew Praschak here. Andy is the attorney, EPA's attorney on this site, and Andy's located in our Caribbean field office.

Okay. Now we'll get started now with Caroline. And what we're going to -- all right. Fine. We've made a little change here on our agenda. So what we have is a ten-minute videotape and the tape will kind of run you through the Superfund process.

[VIDEOTAPE WAS PLAYED.]

MS. JOHNSON: Okay. We just wanted to show you the videotape to give you a little background on what Superfund is all about and that's really intended for you who not familiar with the process.

Now I really want to introduce you to the star of our show, and it's Caroline. And St. Thomas should be very proud of Caroline. Caroline knows all the really good restaurants. Caroline knows where to get all the really good bargains, and Caroline stays at the best places on St. Thomas. So I give you

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our star, Caroline.

MS. KWAN: Thank you.

Hi, I'm Caroline Kwan from the U.S. EPA, the project manager for the Tutu well site. As you heard from Elliot Laws, our administrator of EPA in Washington, how a Superfund applies to a particular site. And I want to just at this point tell you how we applied the Superfund at the Tutu well site. I want to give you the location and the background and what we did during the remedial investigations and feasibility studies. At the end I would like to present the various remedial cleanup alternatives for this project for the Tutu well site, how we clean up the groundwater, how we propose to clean up the groundwater and the soil at the Tutu well site.

First, the historical perspective. The Tutu well site is located at Anna's Retreat at the eastern end of St. Thomas along Highway 38. There are various commercial establishments along the highway such as gasoline stations, car repair shops, shopping centers, dry cleaners, fast food restaurants along this route.

Some of the site background for the Tutu well site is back in July 1987, Mr. Eric Tillett noticed an odor emanating from his well. He contacted

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the Department of Natural Resources, and DPNR in turn contacted EPA for assistance. EPA tested wells and detected various chemicals in these wells. The various chemicals detected in these wells are 1, 2 dichlorolethylene, abbreviated DCE; trichloroethylene, abbreviated TCE; tetrachloroethylene or perchloroethylene, abbreviated PCE. We also found benzene, toluene, ethylbenzene and xylene, abbreviated BTEX.

Shortly after, the Department of Planning and Natural Resource closed these wells, closed some of these wells to protect human health.

In January 1988, EPA initiated a Superfund removal action. This consists of cleaning and disinfecting the contaminated cisterns. We redid the plumbing of the housing where the well was closed down and provided trucked water to the affected residents in the Tutu area, and we also initiated a groundwater monitoring program.

In March of 1990, EPA issued an administrative order to Texaco, Esso and O'Henry Dry Cleaners to take over EPA removal actions as I described above. To this date, Esso, Texaco and O'Henry has been providing trucked water to the affected residents to the Tutu wellfield.

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In February 1992, EPA proposed the Tutu well site on the National Priorities List, and it became finalized September 29th, 1995, this past September.

On February 19th, '92, Esso and Texaco signed an administrative consent order to conduct the remedial investigations and feasibility studies, the RI/FS abbreviated, for the Tutu well site.

All of the Superfund sites usually undergo remedial investigations. The purpose of the remedial investigation is to identify and characterize the potential source, the horizontal and vertical extent, the rate, direction of transport, potential migration pathways for contaminants such as petroleum hydrocarbons, volatile organic compounds, VOCs abbreviated, in groundwater and in soils.

In the conclusion, some of the conclusions of the studies are the hydrogeology. The aquifer underlying the Tutu well site is a makeup of fractured volcanic bedrock and the groundwater flow is toward the lower Turpentine Run. This is the groundwater flow which I'm going to draw.

During Phase I of the remedial investigation, which we conducted from April of 1992 to December 1992, we installed 19 groundwater monitoring

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wells, 8 surficial soil samples, 17 soil borings. All of these samples were analyzed for volatile organic compounds and metal compounds.

During Phase II of the remedial investigation, which we conducted from April 1994 to July 1994, we sampled a total of 51 monitoring wells and 15 supply wells.

Some of the results of this work -- in addition to the remedial investigation, EPA also conducted a vadose zone modeling, which Sally Odland will describe in a little detail later on in her presentation. The result of this modeling, which we call the soil screening levels, were used as a guidance value to identify soil areas that may require remediation cleanup based on the potential for leaching of contaminants into the groundwater. Some of the soil impact properties that exceeded this soil screen level are Ramsay Motor, Texaco Tutu Service Station, Esso Tutu Service Station, Western Auto/Four Winds Plaza, O'Henry Dry Cleaners and the Curriculum Center.

The groundwater study we have conducted identified northern and southern groundwater plumes. At the northern groundwater plume, at the northern groundwater plume, we have about 78 parts per billion, ppbs, to 2100 parts per billion of volatile organic

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compounds. Also within the northern plume, we detected benzene, toluene, ethylbenzene at the Texaco station 3,700 ppbs to 21,000 ppbs; and at the Esso Service Station, we detected 4,000 ppbs to 22,000 ppbs of benzene, toluene and ethylbenezene.

At two locations, at two locations, we suspect that there's a dense non-aqueous phase liquid. We call it DNAPLs abbreviated. DNAPLs is a nonsoluble liquid such as hydrocarbons or/and solvents. They are denser than water. This could act as a continuous releasing source of contaminants into the groundwater, into the aquifer. The two suspected places are O'Henry Dry Cleaners and the Curriculum Center.

Now I turn over our next presentor of Mark Maddaloni, our risk assessment person in the EPA.

MR. MADDALONI: Thank you, Caroline.

As Caroline mentioned, I'm here to discuss the results of the risk assessment for the site. And rather than just rattle off some numbers which might be difficult to interpret, allow me to walk you through the EPA risk assessment process.

Let me just begin by saying that there's no mystery to risk assessment. We do it all the time. When you decide to cross a street, there's a certain risk associated with that activity, namely being hit by

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a car. So if you are down in town and dash across during heavy traffic, you increase the risk of that likelihood, whereas if you wait for a green light, you reduce the risk.

The point I'm trying to make is that risk assessment is a process that regularly plays itself out in our everyday lives. We just tend to do it intuitively. Now, admittedly, assessing risk at a Superfund site is considerably more complex, and EPA has just formalized the process in response to that, and let me walk you through it.

It's a four-part affair consisting of hazard identification, exposure assessment, dose response or toxicity assessment, and finally, we wrap those three, those three components into what we call a risk characterization where we're then able to make numerical determinations about the amount of risk at a site.

So let me begin with the first part, the hazard identification. The first thing we need to know about when we approach a hazardous waste site -- I guess that means you can't hear me back there. All right. I'll try to talk louder.

The first thing we need to know about when we approach a hazardous waste site are what are

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the chemicals of concern. And EPA has developed what's called a target compound list, which is an extensive assembly of contaminants that are known to be assiociated with hazardous waste sites.

And as Caroline was detailing, we also do a very thorough site history. So in the event that there's some sort of unusual chemical that we wouldn't typically analyze, we have that capacity. So we take all this analytical data that we collect, and then we do things like look at its concentration, we look at the frequency of detection, we make comparisons with background concentrations for naturally occurring elements, and we are finally able to boil this, believe me, rather lengthy list of chemicals down to what we call our contaminants of concern. And these are the main chemicals that are potentially driving risks at the site. And at Tutu, I think Caroline referred to most of them. A lot of chlorinated hydrocarbons, perchloroethylene, vinyl chloride, benzene, and some inorganics, arsenic most notably.

So now we take this information from the hazard identification, and we move into the next step which we refer to as the exposure assessment. And there we're looking at the affected populations, whether they be residents or various types of workers,

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trespassers, whatever is appropriate for that site situation. And we look at these what we call receptors -- I know it's a cold sounding term, but we'd look at these people that are potentially impacted, and we are essentially asking ourselves two questions: Where are these contaminants and how do they get into my body?

Well, where are they? They could be in any of the environmental media. And, again, we look at soils, and we look at soils that have sediments, and in addition, water, groundwater, which is a very big issue at this site. If there were surface waters, reservoirs, rivers, streams, we'd look at that. If there's contaminants in the air, we'll look in the air.

How do they -- how do contaminants get into the body? There are what we call three main portals of entry into the body. Your most prominent is ingestion of contaminants. You could also be exposed through your skin by getting contaminants on the skin; and finally, by inhaling them.

And then it pretty becomes a matter of mixing and matching. You're looking at the impacted media and the different exposure pathways, and you see if you have a completed what we call an exposure pathway. And, well, one of the most prominent here at Tutu is, naturally, we have a lot of residents in the

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area and the groundwater is contaminated. Don't drink the groundwater. That's an exposure pathway.

We know children incidentally ingest soil and even adults to a lesser extent. So if there's contaminated soil, you have again populations impacted. That's another exposure pathway and so on and so forth. We look at a lot of different worker-type activities in addition to the residents.

Now, so we've identified our chemicals that we're concerned with, and now we have, you know, looked at the ways people could get exposed. And what we're trying to grasp here is what kind of dose they may be impacted by. And the next step is what we call the dose response or, of course, toxicity assessment. And EPA divides toxicity assessment up into two main categories: cancer and non-cancer.

So let me talk about the cancer-causing agents first. Current scientific thinking indicates for the most part that carcinogens do not possess a threshold. And what that means is that any exposure to a carcinogen, no matter how small, can at least theoretically cause some infinitesimal yet finite increase in the cancer risk. And as a consequence of that, by convention we always display cancer risk as a probability. It's always one in something. And you've

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probably seen government agencies, perhaps EPA or something like FDA, saying, if you, you know, eat these grapefruits that are sprayed with pesticides, you'll have a one in a thousand or a one in a million excess lifetime cancer risk. Okay. Since there's no threshold, there's always some probability of the event occurring.

And what we then do is generate information on the cancer-causing potential of common contaminants and combine that with information from the exposure assessment, essentially dose, and by combining the dose with the potency of the carcinogen, we can then make a numerical determination of cancer risk as presented as a probability, one in something.

Let me put cancer on the back burner for a few moments, but I'm going to get back to it when we talk about the risk characterization, and let me spend some other time on something that tends to get played down because it's not as sensationalized as cancer, and that's not the non-cancer causing agents. What I mean by that is that just any agent or any effect other than cancer. Mostly, it's to major organs, like liver, kidney, nervous center, respiratory system or some other vital body part.

And the way we assess non-carcinogens is

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with what we calling a reference dose. Now a reference dose is a measure of an agent's threshold because non-carcinogens are believed to possess a threshold. So the reference dose that EPA generates is again a measure of an agent's threshold-causing effect to which many safety factors have been added.

And I just want to spend a few more moments on this concept of threshold because it's very important in the EPA decision-making process. You might reasonably say that if you found contamination, any contamination in whatever, you know, wherever you looked for it, you'd say, you know, just get rid of it. That sounds, that sounds sensible, but in a sense, EPA's a victim of its own successes in that we currently possess the capacity or the analytical technology to measure such extraordinarily small amounts of contaminants in whatever media we're looking at that if we were to say -- take the approach to excavate any soil that you could find the smallest trace of contamination in, we would literally be moving the first few feet off the entire island. And I think you could all appreciate that this would not be a very effective way of administering this program and allocating limited resources.

So EPA uses toxicity thresholds to set

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standards that are first and foremost protective of the public health and yet practical at the same time. And perhaps I could give you an example of a toxicity threshold that you could probably relate to easily, and probably most of you have heard of the gas carbon monoxide. It can be devastatingly poisonous and you probably most have heard of, you know, these horror stories where whole families have got wiped out from a clogged up flue pipe. We, in fact, in our New York office have lost a division director because of that exact situation, a clogged up flue pipe. Just one or two weeks ago one of our colleagues passed away for that. So it's a very real threat.

Anyway, the point I'm making is that in this sort of situation, we have the levels, the concentrations of carbon monoxide in the environment have vastly exceeded this threshold for causing effect and its results could be devastating, but carbon monoxide is a byproduct of the combustion process. So whenever anything burns, some carbon monoxide is given off. And, again, as I was saying, with a sufficiently sophisticated instrument, you could detect carbon monoxide just almost anywhere. You certainly would be able to detect it in this room, but again the point being that it would be in decidingly subthreshold

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concentrations, and we're apparently none the worse for inhaling an occasional molecule of carbon monoxide. So that's how we handle toxicity thresholds.

Now, so we've identified our contaminants at the site. We've made some judgments, conservative judgments about how people might be exposed to them. We've looked at the types of toxicity, cancer and non-cancer causing. And finally, we're able to make some numerical statements about the risk. And again, this is divided up into cancer and non-cancer causing, well, concerns.

Let me deal with cancer again first. EPA has established an acceptable cancer risk range of from one in ten thousand to one in a million. What that means is if, due to a site-related hazard, if your excess lifetime cancer risk is greater than one in ten thousand, that generally obligates EPA to take action.

And I just again would like to take a moment to try to put this one in ten thousand in some sort of perspective. The baseline cancer rate in our society is approximately 25 percent, maybe even a little higher. So one in four people over the course of their lifetime contracts cancer. That shouldn't surprise anyone. I'm sure we all know individuals that have been so afflicted.

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And the scientific evidence, you know, points to lifestyle factors as contributing the lion's share of this baseline rate: smoking, without a question; alcohol consumption; dietary concerns; low fat -- low fiber, high fat diet; exposure to ultraviolet radiation -- in other words, sunbathing, which I know a lot of that is done around here.

Anyway, those are the types of things that cause such a high baseline cancer rate. And I'm not here to try to explain or justify why it's that high, but suffice it to say that if you took a sample population of 10,000 people, and followed them over the course of their lifetime, you would reasonably expect to find 2,500 cancer cases. That's 25 percent.

Now what EPA's saying is if you took this same sample population of ten thousand and exposed them for a long, for a long term -- we usually assume residential exposure of 30 years. So if you were to take that population and expose them chronically to all the site-related contaminants, and if that population's cancer risk was to have increased by one single case, from 2,500 to 2,501, that would be deemed unacceptable by the EPA.

And what we found at this site was that, in fact, residential exposure, residential exposure to

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drinking water did produce a significant cancer risk. And you can see, we looked at children and adults. And there are five in ten thousand for the children, and six in ten thousand for the adults. And even employees, there was over one in ten thousand. For another type of workers, construction workers, it was within our acceptable risk range.

So that's what I have to report. Caroline and Mel will talk about what we intend to do about that.

Now that's just half the picture, and again we have to deal with the non-cancer causing agents. And the way we evaludate those is that we utilize what's called a hazard index. That's designated there by -- well, it's hazard. It should say hazard index there. And that is defined as the chronic daily in-take or the dose of contaminants divided by what I referred to earlier as the reference dose, remembering that the reference dose again is the measure of that contaminant threshold for causing effects with built-in safety factors. So if the chronic daily injection -- again, we get that from the exposure assessment. So if your regular exposure is greater than the reference dose, then there is clearly a potential for hazard there. And so if that fraction --

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again, the dose divided by the the reference dose -- exceeds one, again that pretty much obligates EPA to take action.

And what we saw in the groundwater was that not only was it presenting a cancer risk, but you can see by those numbers, 67, 29, they're all greater than one. So it was also that all the non-cancer causing agents were also in levels of concern.

And what we found -- let me back up for one moment because I talked about the groundwater, and we also looked at the site's soil. And the cancer risk during the remedial investigation was actually in the unacceptable range. We see it there as in one in ten thousand.

Then something monumental occurred in September, namely the hurricane, and literally changed the togography of a lot of the areas. And we went back and did additional sampling, and the main contributor of the cancer risk in the soils at the Tillett's Garden Art Center was just PCBs. The levels of PCBs were significantly diminished. And based on our most recent sampling data, our levels of risk in the soils at the Tillett Gardens Art Center area are in the acceptable range as well as the hazard index.

So, again, that's the result of the

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human health risk assessment, and I'm going to turn it over to Sally Odland of CDM to do the ecological. We look at both human health and the environment or ecological receptors.

MS. ODLAND: Thank you, Mark.

Let me know if you can hear me in the back. Is this loud enough? Okay. I'll speak up a little bit.

Now as Mark mentioned, EPA also looks at ecological risk. Their primarily concern is protecting humans from site contaminants, but they're also responsible for determining whether or not there might be an impact to wildlife. The process is very similar to the same sort of mathematical modeling that goes on for the human health risk assessment.

First of all, you need to decide if there's a problem or a hazard. That would involve identifying a source and identifying receptors and a pathway. Now the Tutu area is not really a pristine wildlife area. It's fairly highly developed. There's shopping centers and a number of residents, et cetera, but there are places where there is contaminated surface soil behind some of the properties that back on to undeveloped areas, and it's not uncommon to have wildlife in the form of lizards or iguanas or birds, et

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cetera, that would come on to the properties and could come into contact with contaminated soils and then carry the contamination up the food chain.

So EPA decided to perform an ecological risk assessment. The only media area that was evaluated was soil because there's really no way for the wildlife to come into contact with the groundwater.

This is called a food web. It's basically a very simplified conceptual diagram of who eats who among the ecological receptors. Now if you start with the surface soils where the contamination is, then those can be ingested by bugs or worms or uptaken by plants or small animals who come into contact with surface soils. And from there, they can work their way up the food chain. We chose some receptor species, two receptor species, one near the bottom of the food chain, a lizard, the animal who might logically consume insects for the most part that have been in contact with contaminated soils, and then a receptor high up the food chain, a bird of prey, the hawk, because sometimes contaminants will biocumulate or concentrate as they work their way up the food chain.

These are the results of the ecological assessment. Similar to the human health assessment,

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there's a threshold value that EPA has determined. You have similar chemicals of concern. In this case, arsenic and PCEs and phenols are the main drivers. And you add there, you look at the cumulative effects of all of these contaminants on a potential receptor over the lifetime of that animal, and you look at their total body dose that they would accumulate and go through some mathematical calculations to come up with an index to compare the values you find to studies in the literature of the concentrations of chemicals that have been noted to have a health impact on similar species or at least a species that's relatively closely related. This doesn't necessarily mean death. This could be limited growth or effect on reproduction, et cetera.

Anyway, what we found was that at the bottom of the food chain there was a moderate potential for impact from the site contaminant levels to the anoles, to the lizards. The hazard index was 138, and that was assuming a worst case scenario, which is not actually realistic. It's very conservative, but it assumes that those lizards would consume almost a hundred percent of their food from the most contaminated part of the site, and they do have a limited range, but obviously this would affect

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individual lizards, not a whole population. They would all have to be basically living within a very small area where soils have been contaminated.

Higher up the food chain, the hawk had a relatively low -- it exceeded the threshold, but it had a relatively low hazard index because it has such a large range and obtained a lot of its food from other areas, other sources that might not be contaminated.

The risk drivers for the anoles were arsenic, PCE and phenols, but these were restricted to very small areas of soil on the Tutu site, principally behind the O'Henry Dry Cleaner, and that was an area that was already slated to be cleaned up because of concerns of groundwater contamination. So, in fact, this last summer those soils were excavated, and that was after the assessment was performed. You would have to say now that there's a minimal chance of exposure to wildlife from site soils at the Tutu site.

So the question becomes, where does that leave EPA with respect to the need to clean up soils? They pose a minimal risk to human health and a minimal risk to wildlife, but there's one other thing that needs to be looked at before you can say, okay, leave them alone, and that's, are those soils -- do they have contaminants at sufficient concentrations that those

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soils can leach their contaminants into groundwater by the rain percolating through the soils?

So what we did was we did some back calculations, some beta soil modelers, to determine what concentrations of chemicals could remain in the soils that would not pose a risk to groundwater. And you have to work backwards to do this. You start with groundwater and you take those chemicals that were identified as risk drivers. Principally, the vinyl chloride and the trichloroethylene, and -- well, the DCE and vinyl chloride is a big risk driver, too, and then there's other chemicals that are present way above the drinking water standards, a lot of gasoline constituents: the BTEX, benzene, toluene, ethylene, xylene compounds are very much higher than the drinking water standards.

So we took these two groups of chemicals because there are two types of plumes at Tutu. There's gasoline plumes and there's chlorinated solvent plumes. And the chemicals in each group behaved similarly. We picked an indicator chemical for each group that would have the strictest cleanup levels because the drinking water standards would be the lowest and it would move the most quickly through the soils, be the most mobile. We chose benzene to represent the gasoline constituents

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and we chose PCE to represent the chlorinated solvents. That way when you calculate a cleanup level for these, you know that it's a conservatiave approach, you know that it will be strict enough that by addressing benzene, by default you will have cleaned up all of these other related constituents because their cleanup levels would be higher.

I should also point out that these were to determine guideline values. There are no regulatory levels for soils. So this was just a way of looking at the individual properties and saying, does this property pose a risk, an indirect risk to human health through the groundwater migration pathway?

This is a schematic that explains a little bit about what our groundwater or our beta soil model does. We used a numerical simulation that was a spreadsheet model that's does mathematical calculations in a series of cells from the ground surface down to the water table. We have two-inch cells. And each time, you start with an initial concentration in groundwater -- I mean, in soils, and you allow rain water to percolate, and in each cell, that contamination achieved equilibrium with soil and with the rain water. Some of it sticks to the soil, absorbs to the soil, some of it goes into the groundwater, and

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at that point it can be attacted by microbes and it can be converted into other compounds, but its concentrations can be reduced, and then it moves on to -- it moves into the next cell at a lower concentration than it was originally. And you repeat this mathematical process from cell to cell to cell until you reach the groundwater. And at that point the concentration of leachate that has reached the groundwater becomes further diluted by the groundwater that was flowing through, but if you're working backwards and saying, my groundwater has to be at five, you can start a trial and error process and feed additional concentrations into your model and you keep plugging and chugging until you make sure that if this concentration was on the site in time and years, you feed in different trial concentrations until your model shows you that the groundwater concentration will be at or below the drinking water standard five. And the end product of that -- this is for an individual property. We did these for the four main properties that are at the heads of the plumes. The end result -- again, this is concentration in soil and depth in feet from the ground surface -- shows that you can have a fairly high initial concentration in soils up here, over 700 parts per billion, but that's because there's organic carbon

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near the surface that will bind the contaminants and keep them from moving into groundwater. As you get deeper -- in this case, when you hit bedrock at about two or three feet -- the concentration that's allowable is much, much lower because there's nothing to retard the movement of contaminants. There's not as much organic carbons. And the contaminant levels that were here in the bedrock can rapidly leach into groundwater. And if they were any higher, they would result in modeled concentrations that were higher than the drinking water standards.

So using that method on a property by property basis, we came up with site specific soil cleanup guidelines for EPA to apply to each of the properties, and then they could take the site concentrations of soils and look at every property and say, does this area need to be remediated as a source, a potential source of chemicals to groundwater.

I'm going to give this back to Caroline now and she'll explain the remedial options that were looked at.

MS. KWAN: That's why it took so long. After we go through all this process, do the whole investigation, the whole risk assessment to find out what's going on, how we apply these data, these

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analytical data, what concentration we put in, we come up with a remedial action goal. We have to clean up the groundwater here and we have to clean up the soils in the Tutu well site. The soil impact and the groundwater impact, we have both impacts at the Tutu well site.

Now at the last part, we came up with some remedial action goals, the cleanup goals. To achieve these goals, how to achieve these goals and what goals we are going to try to achieve.

Our goal is to remove and control the source of groundwater contamination, restore the aquifer for potable use at locations where DNAPLs are not present, control further migrations of contaminated groundwater, and eliminate leaching of contaminated soil into the groundwater.

From these goals, we came up with feasibility objectives. We want to develop potential remedial alternatives to address environmental problems, evaluate these potential remedial cleanup alternatives through the EPA criteria established in the federal regulations.

We have nine criteria that we go through. The two threshold criteria are the overall protection of human health and the environment. We

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want to make sure that the remedial objectives and also the cleanup objectives are in compliance with the relevant and appropriate requirements. We want to make sure the cleanup objectives are long-term effectiveness and permanence. We want the reduction of toxicity, mobility or volume through the treatment. We want to make sure that the short-term effectivenss is short and minimal. We want to make sure it's implementable and the cost is not -- the cost is minimal. We want to make sure DPNR is in concurrence with us. And lastly, the community is in acceptance of this remedial cleanup.

We have developed five soil remedial alternative cleanup options for the Tutu well site. The first one, we call it SRA abbreviated, Soil Remedial Alternative 1: No action, institutional pollution controls. These are described in the orange pamphlet that we passed out today. It's described in detail plus additional information is being provided in the repositories and also in the administrative record at the Curriculum Center and also at the DPNR office at Wheatley Shopping Center.

SRA 2: We would want institutional controls and capping in some of the impact areas.

SRA 3: We want to combine institutional

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controls and capping. We want in-situ soil vapor extraction, SVE, excavation and off-site disposal.

In Soil Remedial Action Alternative number 4, we would like to combine institutional controls, capping, ex-situ SVE, excavation and on-site disposal.

Soil Remedial Alternative number 5, we would like to combine institutional controls, in-situ SVE, excavation and off-site disposal.

We have four groundwater cleanup options. We named it GRA 1 abbreviated. GRA 1 is no action with institutional controls.

GRA 2: We have institutional controls, source containment, point of entry treatment -- POET, P-O-E-T abbreviated -- systems, treatment and discharge.

GRA 3: Institutional controls, plume containment, treatment and discharge.

GRA 4: We'd like to combine institutional controls, source and plume containment, treatment and discharge.

We also have developed some discharge options. We know that water is a valuable resource in the Virgin Islands. After we treat this water, we would like to either connect it to the existing WAPA

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water main to be provided for the residents and businesses or truck the treated water to the impacted residents or install a water distribution system to the impacted residents. And, lastly, which I did not put down on my slide, which I do not like to do, is go to waste. If all these three options do not work or are not implementable, we might have to dump the treated water to the waste, which is not an option we would like to entertain because the treated water will be drinkable to the federal -- you know, it will be drinkable for everybody, and we just don't like to discharge it to a sewer after we treat it.

Mel Hauptman, my boss, will be describing what EPA and DPNR recommended for a remedy for the Tutu well site. Mel.

MR. HAUPTMAN: Good evening. Now after this long discussion and many years of investigating this site, I'd like to describe to you what our preferred remedy is for both soils and groundwater.

Let me do the easier of the two ones first, which is soils. Now remember again these soils are leaching their chemicals into the groundwater, which makes the groundwater undrinkable at these concentrations.

For our preferred remedy for soils,

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we're recommending what we call institutional controls. Those are controls over use of property and soils that we are going recommend to the local authorities, mainly DPNR, to implement for us, and those are to place limitations on these impacted soils that have these chemicals in them, namely, that we want these properties primarily that are now commercial and industrial to stay that way. We don't want these properties to all of a sudden become residential properties where the exposure situation and the risk assessment that Mark described could be totally different. So the industrial properties we want to remain industrial. The commercial ones we want to remain commercial. And we think that's going to happen anyway.

We are recommending to the local authorities to prohibit excavation and disturbance of these impacted soils without government okay and authority and approval because if we start digging in these soils, you're going to probably make it worse and make the transport to the groundwater worse; or if you take these soils away from these properties and use them somewhere else, they might have some other effect on people than they are currently having. So we are going to recommend that the soils not be disturbed and

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not be excavated and not be removed from the site unless they have local authority and okay and EPA authority and okay.

Now at the two properties that have DNAPLs, we're going one step further. And these two properties are the O'Henry Dry Cleaner and the Curriculum Center. We're saying, don't disturb those buildings and dig into the rock where these DNAPLs high concentrations are and take that rock away and use it somewhere else for the very same reasons.

Now I'm going to go property by property and describe the alternatives that we prefer. For the Esso Tutu gas station, we are recommending in-situ -- in other words, in place -- soil vapor extraction. And that is nothing more than putting a drill rod in the ground, drilling it in -- it has a lot of holes in it -- and applying a vacuum to that perforated pipe in the area above the water table to extract the volatile organic chemicals, the benzene and the xylene and toluene, out of those soils and clean those soils up. We call that SVE. And those off-gases will be treated through thermal oxidation to make sure we can discharge them to the atmosphere safely.

At Four Winds, we are proposing to take away the dirty soils and dispose of them. This is only

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part of the Four Winds Plaza. We're not talking about the entire shopping center.

At O'Henry, and it's very similar to what I'll describe for the Curriculum Center, it's again in-situ soil vapor extraction and/or dig it out, ex-situ, with the same kind of treatment but in a controlled pile. For the bedrock, it will be done in-situ only and again thermal oxidation for the gases.

The Curriculum Center looks very similar to the O'Henry discussion that I just gave you. Again, excavation, disposal, SVE treatment, putting back the treated soils once they're cleaned, and SVE treatment for the bedrock, and again thermal oxidation.

At the Texaco, in-situ soil treatment and again catalytic oxidation for the gas.

Now that's the soil discussion property by property.

For groundwater, again, there are a bunch of institutional controls that we are recommending or are planning to implement, namely, the decommissioning of existing wells, that if we left them running and operating, some of these wells produce a lot of water, our other treatment discussion that I'll give you in about two minutes, it will have a detrimental impact. It will screw it up. So we want

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to control who uses this groundwater in the valley as well as how it's used. So we are recommending decommissioning some existing and domestic and commercial wells within the groundwater plume.

We are also recommending the prohibition or unathorized new use of groundwater. In other words, new wells in the valley without government approval.

Back to the same one, the first one. We are proposing to install some brand new pumping wells within the confines of the plume, and they fall under two categories. Three wells we are recommending to control the dynamics of the plume or the movement. Two of the wells are for better source control. The three wells for plume control, two here, right here. These are called one and two in your handout -- excuse me, two and three. One is up here. Again, it's to control the dynamics of this plume. The other two extraction wells are four and five to control the source at the Curriculum Center and the dry cleaners.

We are proposing to extract a total of a hundred gallons per minute out of all of these wells in total, all five together; construct a central water treatment plant; and restore this aquifer to drinkable concentrations. In all of this process, it will probably take a couple of years. We can only guess the

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number of years right now because of the complexity of this geology. We'll be doing semiannual groundwater monitoring to see how the concentrations hopefully will be declining over time.

Now that was both soil I described as well as groundwater. After we conclude this public process that we're in right now, which will end again March 13th, we will hopefully sign a decision document called a record of decision which will select a remedy for the site. That would contain a soil remedy and a groundwater remedy. We will answer questions that are posed to us. We will respond to questions or comments in a document attached to the record of decision called the responsiveness summary. We are planning on signing this document by the end of April.

Now I'd like to give you back to Lillian Johnson.

MS. JOHNSON: Thank you.

Okay. Thank you so much for being very patient with us. As I said early on, we do have -- we did have a lot of information that we needed to share with you because we want you to really understand what's going on and what we've been doing for the last several years. Also, we hope that the information that we have given you tonight will certainly help you in

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making your decision and in making your -- in better understanding what decisions we have to make, and that you will certainly be more effective in trying to help us make those decisions.

So what I need to do right now before we start with the question and answer session, why don't we just take a five-minute break so we can give our stenographer a little rest here and you can stretch. Don't go anyplace.

Also, a number of people came in and you did not sign in. We do have a sign-in sheet here. We would like for you to sign in because we use this to help us to update our mailing list so that when we have information that we need to send to you, we will have your names here. So just if you didn't sign in, please sign in.

Okay. Caroline just gave me a message saying that the PRP meeting will begin at 8:30 tomorrow at the GERS Building. All right. So why don't we take a five-minute break, but don't leave us.

[A SHORT RECESS WAS TAKEN.]

MS. JOHNSON: Okay. We need to get started again.

Okay. Now this is where we get you involved. This is the session we refer to as questions

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and answers. So what I would like for you to do if you have questions, please stand up and give us your name because, remember, we have our stenographer here, so she needs your name so that it can become part of the record. And these are the experts here, so they will answer your questions hopefully.

Okay. Yes.

DR. SMITH: Good evening. My name is Henry Smith. I'm the Director of Water Resource Research at the university.

First off, you didn't mention comments, but I'd like to start with a comment and continue with a question if that's okay.

I note with interest as one of your criteria the community acceptance criteria, and that actually raises my concern. I read through the document here extensively, and I think I have a sufficient technical background to read this document. However, I'm very concerned that the affected population, and I would suspect the majority of people in this room, do not understand what this document says. I don't mean that as a criticism to the person who wrote it. I just bring it to your attention that in order to have the community acceptance, it's very important that the community understands the language

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that you're speaking. And at this point I would guess, and I think I can safely guess, that this audience does not represent -- is not representative of the community that's affected by the Tutu aquifer.

The video explained that there are several programs in which the community might get assistance in being involved. And my question then is, are there opportunities beyond tonight or beyond the preceding period, which you so graciously extended because of the hurricane, are there opportunities for the community to become involved and opportunities for the EPA to discuss these, let's say, selected alternatives and remediation measures in a language that the community can more effectively participate in?

MS. JOHNSON: Okay. I appreciate your comment there. Just let me say this, that this is not the first time that we've been here for a meeting of this nature. As a matter of fact, we've been coming down now since I think it was '92.

And I must admit that we have tried in terms of the last few meetings to reach out to the more affected people, I guess you would say, and we've done that through a couple mechanisms. One -- and I don't know if the young lady's here. Is she here? At the last meeting we had here in April, there was a young

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lady, Fern Callwood -- is it Callwood?

MR. DIOSO: Callwood, yes.

MS. JOHNSON: She volunteered to pass out information in the community for us. And what we did -- I know I sent her information to do that and so did Lee. And you've had numerous conversations with her; is that correct?

MR. DIOSO: Yes.

MS. JOHNSON: So that was one outreach technique we used.

And one other, if you believe this, I live in New York and I live in a 33-story high-rise building, and one of my neighbors is from St. Thomas. And it just so happens that in September when we were planning this trip, I met his brother, who lives here on the island, and he volunteered also to reach out to the community people. I sent him information which he passed on to the people in the community.

I'm mentioning that to you because those are just a few of the mechanisms that we have used to try to get people in the community to help us in terms of disseminating the information.

Now to address your question about whether this is the only opportunity, the comment period does end on March 13th. I would think that if

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there are some particular questions or concerns you have that you would like to sit down on a one-on-one and talk to the people, we're here after the meeting, and then, of course, they will be here tomorrow. Unfortunately, I can't think of an opportunity for you at this time where we could really do more education, to break it down where you could better understand what we are talking about.

It is true that it's a very, very technical process that one goes through, and you can't do it like overnight nor can you do it over a week. It has to be a process that goes on for a few years where you stay with us, you know. You start in the beginning when we release the work plan, and then you work with us until we get to this point, but my only suggestion at this particular time is that perhaps I could send you some additional information on the Superfund, and for your particular questions or concerns, maybe you could talk with the people here tonight or you could arrange to maybe talk with them tomorrow. They will be here tomorrow. I'll be gone. If that will help, I mean, we would certainly want to do what we could to help you. Will that help?

DR. SMITH: Well, I don't think it's a personal question that I have that you're going to help

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me.

MS. JOHNSON: Well, I'm saying you, but I mean, collectively, would that help?

DR. SMITH: I understand exactly what you're saying. I'm involved in an agency that we have problems with public participation.

MS. JOHNSON: Sure.

DR. SMITH: And like you, we regard it as a commitment. As difficult as it might be, you know, we do seek public participation in what we're doing. I guess one aspect of the question that I asked was, as you move into implementing alternatives that you're going to follow, I think it's very important for the community to understand what's happening.

MS. JOHNSON: Sure. I agree with you.

DR. SMITH: Okay. And I'm wondering if there are ways or -- there were programs that were mentioned on the video. Are there other ways that the community is going to become educated on what is happening beyond selection of the preferred alternative?

MS. JOHNSON: Sure. There are other ways and we can keep you informed on those other ways, and then you can help us because, see, I'm concerned because each time we have a meeting here, it appears

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that we don't always get the people who are most affected. So maybe you then could help us to make sure that we have those people at any future meetings, and any future information that we dissemanate, then you can help us to get that information out to those people.

Now I think in the videotape they talk about technical assistance grants, and that's one of the things I talked about at a couple of meetings prior to this. And what that's all about is if you live around a Superfund site and you have an organized group, then if you would like to apply for this technical assistant grant, which is about $50,000, that the group can apply for it so that you could go out and hire your own technical consultant. That would be one mechanism that you might want to look at. And this technical consultant then would work with you to keep you informed as to the various activities that are going on at the site and, of course, help you to better understand the entire process.

So I don't have any of those booklets here tonight. I can certainly, you know -- you give me your address, and I'll certainly send that to you. We have had them in the past because I know, Leonard, you have them in your office; right?

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MR. REED: Yes.

MS. JOHNSON: All right. Next.

MS. HARRIGAN-FARRELLY: Good evening. Joan Harrigan-Farrelly, and I have a couple of questions -- well, actually four questions, but I'll be brief. One, does EPA or Health and Human Services plan on monitoring a sample population over the long term to determine if indeed anyone was affected by the contamination?

The other question, when will the actual cleanup process begin? I know that in April you make your decision, but when does the actual cleanup process begin, and is that going to be hampered by the budget crisis that we're now facing in terms of the federal government?

How long will wells remain capped and how long will the soil and water be affected by the contaminants?

And also, how will the soils -- you mentioned soil disposal, and I'm just curious as to how the soils will actually be disposed of.

And maybe this is more for DPNR: Are the gas stations and drying cleaning plants currently being monitored to make sure that no further contamination is taking place either in the Tutu area

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or in the rest of the territory?

And, also, since you mentioned that DPNR will be monitoring or must permit any further wells in the area, I'm curious as to on what basis those permits would be given in terms of drilling more wells.

And just maybe one question in terms of Dr. Smith's question, what is thermal oxidation?

Thank you.

MS. JOHNSON: All right. Now you've given us a few things here. So I think the first one I'll refer to one of our representatives from ATSGR.

MR. MADDALONI: Let me make a preliminary statement first. EPA itself does not conduct these types of population or what we call epidemiologic studies to follow a population in time to detect, you know, disease incidences, but our sister agency, the Agency for Toxic Substances and Disease Registry, does have that capacity. And we have two representatives from the ATSDR here and I'll introduce Steve Jones first. He's our regional representative, and he'll, I think, pass it along to his colleague. Okay. So Steve.

MR. JONES: As Mark just said, my name is Steve Jones. I am with the Agency for Toxic Substances and Disease Registry, ATSDR. It's part of

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the Department of Health and Human Services. The next step down is U.S. Public Health Service. We're an environmental health agency. We are strictly tasked with doing the environmental evaluations for Superfund EPA hazardous waste sites. And, in fact, we do have currently a public health assessment out for the Tutu well site.

Our agency is based in Atlanta. I'm a regional representative. I'm in the same office as the EPA folks that are here in New York, but, like I said, most of our people are in Atlanta. That's all I really have to say in general. With me is Sven Rodenbeck. Sven is a health assessor, and he specifically is one of the authors of the health assessment document, and he can answer your question.

MR. RODENBECK: As I understand, the question was, are we, ATSDR or the Department of Health and Human Services, going to monitor people; is that correct?

MS. HARRIGAN-FARRELLY: Yes.

MR. RODENBECK: Okay. Directly, no. We have not recommended that. It is not stated to do that in our health assessment, the main reason being the difficulty of identifying which people were actually exposed beyond the people that live right here in Tutu,

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and those people I'm talking about were where the water was trucked around to fill up different cisterns.

For the people here in Tutu, it's such a small population, there is not a way to be able to tell if we saw anything, whether it was above what was expected. As what was talked about previously in the presentations on the risk assessment, there's certain -- unfortunately, a certain amount of cancers occur. What we're looking for is that above what normally occurs. And to do that, you need an extremely large population in the thousands, but what we are recommending and ATSDR will be doing is education of the physicians here in St. Thomas to educate them on what possible health effects may occur as a result of the exposures that occurred here.

So in that regard, if the local physicians start seeing something that they think warrents further investigation, we will be then back to follow up with them. Okay.

MS. JOHNSON: Thank you.

MR. RODENBECK: Thank you.

MS. JOHNSON: What was your next question?

MS. HARRIGAN-FARRELLY: When will the actual cleanup process begin, and I was asking also if

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it would be hampered by the budget crisis.

MR. HAUPTMAN: After we sign this record of decision hopefully at the end of April, we then are required to ask the potentially responsible parties, the people who caused the pollution, whether they are willing to implement the remedy we selected in the record of decision.

Now the way these remedies are performed is two steps. Let's assume that these people are willing to implement this remedy. That alone at a minimum could be a four month time period for them to agree to sign a legal document with us whereby they promise they will make that remedy with our oversight.

Now the implementation that I was just describing is two parts. Number one is design. You have to design all of these pieces to make sure it works, and it could take about two years to design this remedy. Just like you want to build a house, you don't go out there with a shovel. You make a picture first. So you design this remedy first. It takes two years.

So the earliest we could possibly see actual physical construction cleanup work take place is two and a half, three years from now.

This process, as EPA sees it right now, putting aside the issue over the fact that the

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Superfund law is up for reauthorization and could possibly be changed and we are not able to predict what our Congressmen are going to put together, let's assume it's something like we have now, the current budget crisis that EPA has experienced, we're still here doing our job. So we hope it will not affect this site or any other site.

MS. JOHNSON: Okay. Was that your last --

MS. HARRIGAN-FARRELLY: Well, I had also asked how long the wells would remain capped and what would be done with the soil once the soil was removed.

MS. KWAN: We are recommending that these wells within the plume area that's going to impact our remediation cleanup schematic be capped until the aquifer is restored.

MR. HAUPTMAN: How long will it take, Caroline.

MR. HARRIGAN-FARRELLY: And the soil?

MS. KWAN: And the soil. When I mention disposal, when we mention off-site disposal, if these soils are contaminated, they should go to an off-island disposal landfill -- I mean, a qualified off-island disposal landfill. We don't have one in St. Thomas, in the Virgin Islands. It will be off-island.

MS. HARRIGAN-FARRELLY: It won't be

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Bovoni?

MS. KWAN: The landfill has got to be in compliance with the EPA regulations.

MS. HARRIGAN-FARRELLY: And thermal oxidation?

MS. KWAN: Excuse me?

MS. HARRIGAN-FARRELLY: Thermal oxidation?

MS. KWAN: Thermal oxidation is burning off gas because when you do -- when you draw a pipe into the ground and suck the gas out, we want to make sure this gas is just not released, you know, to the environment. So we'll have thermal oxidation, which is a machine that will control the environment, get the gas out, and emit it into the environment. It's not -- it will be burnt off in a properly controlled manner instead of just emitting it to the environment.

MS. HARRIGAN-FARRELLY: Thank you.

MS. JOHNSON: Next, please.

MS. GOMEZ: Debra Gomez. How long will the aquifer take to restore?

MS. KWAN: We have problems with two properties. Remember what I was saying? DNAPLs, the the dense non-aqueous phase liquids, as I described before, that will act as a continuous releasing source

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to the fractured bedrock in two locations: the Curriculum Center, at this location, and down by the O'Henry property.

As today's technology goes, we don't have the technology that will clean up these two properties as we would like. So we will have to pump and control the movement of this plume, the source, from migrating elsewhere, but we don't have the technology to clean up the problem as we would, you know, like to because it acts as a continuous source. And Sally has something.

MS. ODLAND: Yes, I'd like to add a little bit of clarification. It depends very much where in the contaminant plumes the wells are located when they could be restored. If source control is implemented so that the high concentration portions of the groundwater plume are contained close to the sources, and if there is pure product and that's contained close by, the fringes of the plume can clean up quite quickly, within, what, three to five years in some of the outlying areas. And then with careful monitoring, it's conceivable that those could be restored to use if pumping them wasn't going to affect the rest of the plume again and screw up the remedy.

Near to the source areas, it could take

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considerably longer, tens of years. And if there's actually pure product present in some of these areas, it could take -- it may not be able to be done in those particular areas. You could control it and possibly restore the rest.

MS. JOHNSON: Thank you. Yes.

MS. JENNINGS: Marcella Jennings. I was wondering what type of technology are you going to use to clean up this water, and then are you going to test the water after that? You're talking in the literature about semiannual testing of the groundwater, but are you going to test the water after the technology has been implemented before it's distributed?

MS. KWAN: Of course. We would definitely treat -- I mean, we also, as part of this remediation on the groundwater part, when we do the -- you know, put the wells in to control the plume, to control the source for migrating further down the valley, we will also then install this water treatment. It will probably be an air-stripper. I mean, I presume it will be an air-stripper. That's the most -- how do you call it -- the most known technology, the most proven effective technology for these contaminants, these volatile organic contaminants that you have.

When this water is released -- after

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it's treated, we will definitely test this water down to a federal drinking water standard before it's released out. We would test the influent before it goes to the stripper and out -- and effluent after it comes out of the stripper to make sure it meets the EPA drinking water standard before we distribute it to anywhere.

MS. JENNINGS: Does the Water and Power Authority know of this plan to use the water main?

MS. KWAN: Well, the thing is these are the options. That's why we listed four options. We showed three options on the overhead. The last option was discharge to a sewer, which we don't want to because the water will come out and it will be drinkable water. It will be like down to the federal maximum contaminant level, which is MCL, which is like, you know, the drinkable standards.

We have talked to WAPA about it. We have talked to the Department of Public Works about a year ago. They are thinking about it, but, like I said, the implementation of this plan will not happen until two and a half to three years down the road. So they're saying it's too far along for them to, you know, to foresee the future.

MS. JENNINGS: One more question as far

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as the air-stripper. I've seen -- I've tested an air-stripper, and it did have some contaminants still in there, and it had to go to an R/O. It was after the R/O, the reverse osmosis, that they did not have a problem.

MS. KWAN: Well, that's why we would -- like Mel Hauptman was saying, it goes in two stages. We have design and we have construction. During the design stage, we will sample, you know. We will test it out. We will install it. We will do modeling. We will install a miniature plant somewhere to test the technology before we implement it. I mean, we're not just going to go out there and like say, there's an air-stripper. We're not just going to go out there and do it, you know. That's why it's two-part phases. It's the design and also the construction and implementation part and also the O & M. I didn't explain the operation and maintenance. That's very important down the road also, you know, to maintain the treatment center and maintain the wells and the operation of the wells, you know, the pumping wells.

MS. JOHNSON: Yes.

MS. GJESSING: My name is Helen Gjessing. I'm a member -- I'm here as a member of the League of Women Voters. I have several questions, but

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I'll only ask one at a time.

MS. JOHNSON: You'll have to speak up.

MS. GJESSING: I have several questions, but I'll only ask one at a time and let other people have a chance.

MS. JOHNSON: We appreciate that. Thank you.

MS. GJESSING: So my first question is in regard to the contaminant migration pathway, pathways that are mentioned on page 5. It mentions that transport into the surface water like Turpentine Run, for example, can potentially occur via groundwater discharge. Can it also occur via runoff of contaminated soils?

MS. KWAN: Yes.

MS. GJESSING: Or from contaminated soils?

MS. KWAN: Definitely.

MS. GJESSING: All right. If the answer is yes, then a followup to that would relate to the environmental risks, which are on page 7 and 8, which tells us that two indicator species on-site were chosen, the red-tailed hawk and the anole or the lizard. My question is, if the plume is not stopped, would not all of the Mangrove Lagoon life also be at

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risk?

MS. ODLAND: I will answer that one. Right now the plume is nowhere near the Mangrove Lagoon. As far as we can tell right now, the groundwater has not yet discharged into Turpentine Run. The first place that the groundwater from the site will ultimately discharge to would be around -- is that Route 32? There's a small wetland on Route 32, which would be the first place we would expect to see contaminants. From there, water will go on downstream, but the concentrations at the toe of the plumes are very low compared to in the hotter areas of it, and there's considerable dilution -- we expect considerable dilution as it mixes with the surface water, and there's a much, much larger urban impact that affects Turpentine Run that would completely mask the effect of this site's contaminants, and that's the treated discharge from the sewage plant.

From what I understand, there were water quality degradation problems in Turpentine Run and down into Mangrove Lagoon, but the chemicals that those are attributed to are typical of sewage effluent and they're not the chemicals that we're seeing at the site. And it's such a huge volume of water relative to the amount of plume that would discharge in there that

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I don't think you'd ever see those effects.

And if the remedy is implemented within the next couple of years, there will be wells near the toe of that plume to keep it from even discharging into the wetlands, which is, what, five miles north of the lagoon, something like that. There's a long, long ways this water would have to go, and it would be -- the site contaminants would be diluted along the way by all the incoming other waters. The lagoon is threatened by urbanization, not by the site chemicals in our opinion.

MS. JOHNSON: All right.

MS. ODLAND: Was that the only question or were there two?

MS. JOHNSON: Right now.

Were there other hands in the back or were you just telling her to speak up? Were there hands in the back for questions?

[AUDIENCE CAN'T HEAR]

MS. ODLAND: I apologize.

Okay. The question was whether or not the site chemicals will ultimately impact Mangrove Lagoon. And in our opinion, no, they won't. The contaminant plumes have not -- that are in the groundwater have not yet discharged to surface water as near as we can tell from the current data. When they

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do discharge, the point where that -- where this site groundwater enters Turpentine Run should be along Route 32. After you turn by Fort Mylner and go up over that first hill, it's still I think about four or five miles from Mangrove Lagoon.

The concentrations at the toe of the plume are pretty low. They're about 15, 20 parts per billion. And when that water joins the surface water, it becomes diluted.

There are degradation problems that we're aware of in the water quality in the lower regions of Turpentine Run and in Mangrove Lagoon, but those can be attributed to discharge of treated water from the sewage treatment plants that discharge directly into the run. And the amounts, the volumes of water that those plants are discharging is much, much greater than any amount of water that would discharge from the plume. So I don't think you would -- and the chemicals that they're seeing in the lagoon are the ones that are associated with sewage treatment plants. They're not the chemicals we're seeing in the site plumes. So we don't think that that's a real worry for this site.

And when the containment part of the remedy is enacted when those wells are put -- or a well

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is put at the toe of the plume, then groundwater from the site shouldn't even discharge into the run at all.

I hope that answered it.

MS. JOHNSON: Right. Were you able to hear that? When we use the mike, can you hear better?

Okay, fine. Thank you.

Are there other questions? Yes.

DR. SMITH: Henry Smith. I'm aware that there's technology that can treat sewage to a point where you can actually drink the water and it's purer than any water that you find naturally. I think the psychologic effect has a great effect on whether somebody is going to actually consume that water. Are there any areas where the treatment that you are proposing, after treatment using this method, the water goes to directly to a public distribution system rather than discharge the groundwater or some other intermediate means?

MR. HAUPTMAN: In my experience in other places, and particularly, in Long Island, New York, where water is also a precious commodity, the only water they have is from the ground, and a lot of it has become contaminated primarily from human activity. Many public wells, particularly in Nassau County, the county closer to New York City, over the years have

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become contaminated by volatile organic chemicals the same as these have been. And even without EPA and without Superfund, these water companies designed and built air-strippers and treated the water, which meets the federal standards and the New York state standards, and is being put right into the pipeline just like before the stripper ever existed primarily because these water suppliers have no other place to put wells. So again, it's a precious commodity type of discussion.

If you don't have a lot of water, you can't kiss an aquifer good-bye and put a well someplace else. You can only use what you have. But to answer your question in the simple tense, yes, this water has been used over many years directly for consumption by people.

MS. JOHNSON: Okay. Are there other questions or comments? We want to give everybody an opportunity before I go around again. If not, then we'll go back to you.

MS. GJESSING: Well, maybe I should come up here.

MS. JOHNSON: Why don't you do that.

MS. GJESSING: Okay. I wanted to return just for a second to this off-gas treatment, the catalytic oxidation and the thermal oxidation. My

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question is, what is the result of those treatments? What happens to the gas? Is it converted, it's oxidized; it's changed in form? Is it released into the environment as a harmless, you know, converted gas or what?

MR. HAUPTMAN: This thermal oxidation is nothing more than a glorified torch. It's a flare. Now these off-gases probably don't have enough chemicals in them to burn by themselves. If you put a match to this vapor, it probably will not burn, plus it's wet because it came out of the ground. So we might have to enrich this gas with something like propane to make sure it burns at the right temperature and has the right structure of these chemicals because we want to turn these chemicals into CO-2 and water if it works the right way.

MS. GJESSING: Okay.

MR. HAUPTMAN: This is not brilliant technology either, I must say.

MS. GJESSING: Okay. I understand. All right. The last question I had was on the DNAPLs. It was said that EPA will restore the groundwater to potability except where DNAPLs are present. My question was, do you -- is it quite certain the location of the DNAPLs? Those two areas that you've

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identified where they are present, are those with any certainty the only areas they are present; and, secondly, what can be done to contain them other than to not allow rock removal? I mean, what prevents them from spreading into the, you know, groundwater and other places?

MR. HAUPTMAN: These gray hatched areas are where we have every reason to believe DNAPLs are present under the ground. Now how do we know that? We know we have contaminated groundwater, drinking water. By putting a well in, you pull out a water sample, and you analyze the water, and it's got chemicals in it.

Did we ever put a hole in the ground here and find pure materials? The answer is no. So we have to go on what we call indirect indication of DNAPLs. For example, the concentration of the groundwater at these two locations is significantly higher than what would result if we just took minor concentrations in the subsurface before you got to the water table, which means it looks to us like we have pure material that is leaking into the groundwater that's resulting in very, very high concentrations in the groundwater at those localized places. So we indirectly think we have DNAPLs.

Now how do you fix it? The two

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containment wells will prevent the spread. The soil vapor extraction is going to try to get at this source that's going in to the saturated zone above the water table. If we could, we'd try to put a hole in the ground and try to suck out the pure DNAPL itself. The trouble is you can't find it usually because it doesn't behave under normal conditions, especially in fractured rock. It's going to find the nearest crack and go that way or go that way. It doesn't follow the laws of physics other than the pure law of gravity, and who knows where all these cracks are. So that's the best we can do.

MS. JOHNSON: Thank you, Mel. You were very demonstrative there.

Okay. Are there other comments or questions? Go on, put your hand up there. Yes.

MS. HARRIGAN-FARRELLY: I again wanted to ask the question as to what monitoring procedures are now in place to ensure that there is no further contamination either in this site or in any other site or at any other site.

MS. JOHNSON: Would you repeat the question again please? Just repeat the question again for them.

MS. HARRIGAN-FARRELLY: I wanted to know

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if there are any monitoring procedures put in place to ensure that there is no further contamination either at this site or that other contamination is not going on at other dry cleaning sites or gas stations and so on.

MR. HAUPTMAN: Well, this site we believe we've got pretty well covered. I mean, we've been to those facilities many, many times, and we're going to be doing that in the future even before the remedy is implemented. And, of course, we have our territorial people also doing the same thing, namely, DPNR.

Now is the same thing happening on other sites on the island? The answer is probably yes. Where are they? We're trying to find that out right now. There are two programs, one to go after gasoline stations. It's called the Underground Storage Tank Program to make sure these tanks are intact and not leaking because that's what these things tend to do over time. And the major petroleum companies tend to do a pretty good job of making sure their tanks are not leaking because you see a lot of them being ripped out all of a sudden as soon as this law got passed. The smallest stations, the private guys, I'd be more worried about him because he's probably not doing it as aggressively.

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Other dry cleaners, in fact, all dry cleaners generate this very same kind of material, this waste, perchloroethylene, perk. They're supposed to under current federal law handle and dispose of those chemicals properly. And we have some inspection taking place in the islands, and we've been to every single dry cleaner. I don't know that answer right now because it's covered under a different federal law. And that's a lousy excuse, but that's the one I'm going to give you tonight.

MS. JOHNSON: Thank you, Mel.

Okay. It's been a very, very long day, but we're hanging in here. Yes, let's go to the back. Yes, sir, in the blue.

MR. ALLEN: I can't speak so loud. I may have to use the mike.

MS. JOHNSON: Please come right up. Okay. Just give her your name.

MR. ALLEN: My name is Moses Allen. I represent Aquathin Water Purification. My question is concerning the chart the gentleman had on the board.

[AUDIENCE CAN'T HEAR]

MS. JOHNSON: Do you have a cold?

MR. ALLEN: My question is concerning the chart -- I have a cold; that's why -- the gentleman

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had on board. He was showing there a well that was at this point and there was another well that was at that point. Do you have an idea of how much pollution, which is chemicals, might have seeped into the ground?

MR. HAUPTMAN: This one and this one, you're talking about?

MR. ALLEN: Right.

MS. KWAN: We have installed about -- a few monitoring wells in the LAGA Building, and the highest concentration at the LAGA Building we have is 360 parts per billion of PCE and our drinking water standard is 5 parts per billion. So we have problems in this area.

MR. ALLEN: So how much area would you say that amount covered ground wise? Don't you think that you have a chance of being -- since that is the water level on the water table, the water would be able to be spreading out in a vast amount in a bigger area, don't you think?

MS. KWAN: We have, we have installed them around the downgradient of this area to monitor the width of the plume. And we felt that this -- we have a pretty good idea that -- we mapped out this plume area, and it's probably around the whole area of this property.

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MR. ALLEN: My reason for asking the question is because if I have to shock a well, which is to chlorinate a well, the amount of -- well, maybe it's a gallon of water -- a gallon of Clorox or whatever, the amount of water that would spread out through that well, you know, to shock that well would be surprising. That's what I'm asking because we're dealing with gasolene or benzene or whatever. That's why.

MR. HAUPTMAN: Are you asking how much these operators first spilled into the ground?

MR. ALLEN: If you have an idea of how much gallons might have been.

MR. HAUPTMAN: No.

MS. KWAN: No.

MR. ALLEN: How would you assess that at that point then?

MR. HAUPTMAN: Because we put a lot of monitoring wells around, and for many years you sample all of the wells, and you can draw these outlines by those concentrations.

MS. JENNINGS: How much of the area is indicated?

MR. HAUPTMAN: How much plume?

MS. JENNINGS: At the LAGA Building.

MR. BENNETT: The length of the plume

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that's described on the figure is about three to four thousand feet long and the width of it is probably --

MR. HAUPTMAN: That's the whole thing though.

MR. BENNETT: Right. That's the entire envelope that's encircled right there on the figure there.

MR. HAUPTMAN: She was asking about the LAGA footprint.

MR. BENNETT: The scale here on the bottom of the figure is 200 feet. There's a bar scale on the bottom there. Right there is 200 feet to the LAGA plume. Just a second and we'll give you an answer.

It's about five hundred to a thousand feet, the length of the LAGA plume.

MS. JOHNSON: Caroline, he has one more question for you, but I was telling him that since he's having trouble speaking, when we finish up, you can sit down with him.

MS. KWAN: Okay.

MS. JOHNSON: Okay, fine.

MR. ALLEN: Maybe everyone would like to hear.

MS. JOHNSON: Okay. What is it?

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His question is, what would be the solution used to clean up the water?

MR. HAUPTMAN: We're going to install extraction wells, pump the groundwater out, and put it through a treatment system that involves an air-stripper. For those of you who don't know what that is, it's typically a tower that has packing in it. The water trickles through the top and you blow air through the bottom, and it drives the contaminants out of the water phase into the air phase. You get clean water coming out the bottom and you get dirty air coming out the top and you control both ends of it. That's an air-stripper.

MS. JOHNSON: Okay. Very good. Feel better.

Are there -- just a moment now. Did I see another hand in the back before?

Okay. Fine.

MS. SCOTT-WILLIAMS: Good evening. My name is Stephanie Scott-Willliams. I'm a resident of New Tutu. And I just want to ask a very simple question because I think a lot of people would like to know -- I came in late and I apologize, but I'd like to know, what can the residents do to reduce any risk involved?

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I was trying to skim through this and I saw human risk and it was talking about soil, and the six to a hundred thousand and all that, ten thousand but, you know, in plain, old, simple English, what can the residents do to reduce this risk of cancer because they said what can be expected is that there's a certain amount of cancers that will occur. Are there any specific types that would occur that we might be looking for? I'm not trying to be --

MS. JOHNSON: No, no. You go right ahead.

MS. SCOTT-WILLIAMS: I just want to know, you know, for my grandchildren and my great-grandchildren, what can we expect and what types of situations?

MR. MADDALONI: As far as how to reduce exposure, most -- well, how to reduce your risk, most of the risk is coming from the groundwater, and we're dealing with that now. So you should take it upon yourself to do whatever you need to do to ensure that you're not drinking untreated groundwater out of this aquifer.

MS. SCOTT-WILLIAMS: One problem I have about the reports that we get, we ofter hear two months later that the water we drank was contaminated. Now

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are we stupid? I mean, you're telling me what I drank was contaminated. Can we avoid something like that happening? Can we avoid drinking contaminated water? I mean, these reports come out afterwards, and you say, hey, you all just drank a bunch --

MR. MADDALONI: We're constrained by the technology. And, you know, as we are able to detect problems and disseminate that information, that's how it's attained. And I mean, I grant you that it's water under the bridge in a lot of situations and we can't undo past exposure. We simply can't. My only small amount of comfort to you is that the cancer risk estimates are based on long-term, 30-year exposure, every day drinking over two quarts of water a day. So the levels, you know, you're still going to have some small element of risk, but again, I said that, you know, the air we're breathing has a small amount of carcinogens in it. So we're all at small levels of risk.

And EPA has defined a level of acceptable risk. And I grant you it's a value judgment attached to that. And that's what we operate under, and that was dictated by the law when it was written in 1980, what acceptable risk is. And, you know, you personally, your constitution may not agree with that,

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and that's something that you would probably have to take up with Congress to have that changed, how we define acceptable risk, but, you know, that's what we operate under. And where we have determined there's an unacceptable risk, we are doing everything in our power to remedy it.

MS. SCOTT-WILLIAMS: Thank you.

MS. JOHNSON: Okay. Next? Any more questions?

MR. JOWERS: Jay Jowers. I would like to know if the aquifer can be changed direction through construction, like moving around, dynamiting or moving earth because we have a lot of construction going on now, and when we ask for soil tests, it's put on the back burner, and we never test the soil to make sure there are not contaminants moving around. And there is quite a lot of construction in this area, as you can tell. There is a new sewer treatment plant going up. They're just starting that plant right on the road here. Is that going to be monitored by you or is it going to be monitored by somebody else? Does it not contaminate the aquifer again, and can the aquifer be moved if it's done by dynamiting or by man or whatever?

MR. HAUPTMAN: The biggest effect that people have on groundwater flow is by putting in

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groundwater wells, by pulling the groundwater out, which has already happened in this valley. Can we change the dynamics of this aquifer by changing the rock structure? Probably not. It would be a monumental task to do it.

And the first point that I described about mankind pulling water out of the ground and affecting the dynamics of the aquifer or drinking water that's contaminated, our remedy tries to address that. It tries to tell people if you live inside this plume and you have a residential well and you're not being provided water by truck, which many people are through our early action, the easiest recommendation is don't drink that water because if you're in a plume, you probably have dirty water. Thank you.

MS. JOHNSON: Are there any more comments? Oh, okay.

MS. JENNINGS: Just one more. Marcella Jennings again. I'd like to address Miss Kwan. When they said they cleaned the cisterns, I want to know how and what techniques they used to clean the cisterns that received this contaminated water, and also did they recommend at some point that those units use some kind of charcoal filtration or activated charcoal for any residuals?

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MS. KWAN: Back earlier when our EPA folks did the early removal action, I was not involved, but I read the report back then, how they disinfect the cisterns. I assume they disinfected using an appropriate method, but I don't think they -- how do you call it -- they did anything else after they disinfected and they cleaned it out, and also they did the plumbing of the houses, the residential houses to make sure that these cisterns are not connected for the regular use of the house. But did you ask specifically something else besides cleaning the cisterns?

MS. JENNINGS: Did they recommend some type of filtration for any of the residuals that may have occurred in the water?

MS. KWAN: No, I don't think -- no, we did not, but the thing is the affected residents are being provided with trucked water for their potable use throughout all the years that they were closed down since '88 in the Tutu area.

MS. JOHNSON: Are there any more comments?

Okay. Thank you for coming. If there are no more comments or questions at this time, I want to personally thank you for coming out and -- please sit down though -- and being very patient with us,

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because, as I said early on, there was a lot of information we had to impart tonight, and it was very, very technical. And so I do appreciate your patience for being here, and I do hope that you've gotten something out of this meeting tonight and that you will write us comments, write in your comments. If there are any other questions that you need clarified, we will be here for a little while longer because we have to put the tables back, but in the meantime, Caroline's address and telephone number is on the proposed plan. So you might want to give her a call or write to her. So, again, I do thank you and I really do appreciate your sitting through this rather long meeting tonight. Thank you.

[MEETING WAS ADJOURNED.]

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REPORTER'S CERTIFICATE

I, JULEE NORMAN, a Certified Shorthand Reporter, do hereby certify:

That the foregoing proceedings were taken down in shorthand by me, and thereafter transcribed into typewritten form by me or under my supervision;

That the foregoing is a true and correct transcription of the proceedings had on said date and at said place.

IN WITNESS WHEREOF, I hereby attach my signature and seal this 21st day of March, 1996.

Julee Norman, CSR

JULEE NORMAN, NOTARY PUBLIC
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