

- Transcript of Proceedings: examination of Whipple, Larson, Darrington
and Hymerling

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1 MR, ENGLISH: General Whipple, is he here
2 today, please?

3 [REDACTED] W H I P P L E, J R., being called as a witness
4 [REDACTED] the Township of Bedminster, is duly sworn and
5 testified as follows:

6 DIRECT EXAMINATION BY MR. ENGLISH:

7 Q General Whipple, what is your present occupa-
8 tion? A I'm the Director of the Water Sources
9 Research Institute of Rutgers University.

10 Q How long have you had that position?
11 A Since 1965.

12 Q Will you tell us, please, what has been your
13 formal academic education and what academic degrees
14 received? A I am a graduate of West Point. I
15 have degrees of B.S. I went to Oxford as a Rhodes Scholar,
16 with a degree of B.A. I am a graduate in engineering from
17 Princeton, with a degree of Doctor C.E.

18 Q Do you have with you a curriculum vitae?
19 A Yes, I do.

20 [REDACTED] And what generally does this contain?
21 [REDACTED] indicates the nature of my experience. I had 30
22 years in the Army Corps of Engineers, working mostly on
23 civil works. I was Chief Engineer of the New York Worlds
24 Fair Corporation for four years. I established my own offices
25 as a consultant in New York City and moved from there to my

1 present position.

2 Q Does this document also set forth a list of
3 [REDACTED] publications? A Yes, it does.

4 MR. ENGLISH: May I offer in evidence the
5 curriculum vitae?

6 MR. BUCHSBAUM: No objection.

7 THE COURT: All right.

8 (Curriculum vitae received and marked D-18
9 in evidence)

10 Q During your period of active duty with the
11 U.S. Army Corps of Engineers, did your work have
12 [REDACTED] lar emphasis or character? A Yes, [REDACTED]
13 planning, administration, the construction of water
14 projects of different kinds; flood control, hydroelectric
15 power, navigation and water supply, combined with other pur-
16 poses. I also took part on the Pollution Control Advisory
17 Board of the then Public Health Service as an adjunct of my
18 other work for about two years.

19 Q Generally, what kind of things have you done
20 [REDACTED] to Rutgers in 1965? A We started
21 [REDACTED] which is supposed to encompass any water
22 [REDACTED] problems of the State and region. These water
23 resources research institutes were established at that time,
24 and there was no particular guidance as to which portions or
25 elements of water resources we would do research in.

1 As it happened, we have concentrated almost
2 entirely on water pollution matters because these are the
3 [REDACTED] have proved to be of major interest. So that
4 [REDACTED] about the second year that I was there, I would
5 say that 90 per cent of the activity of the Institute and a
6 corresponding amount of my activity have been devoted to
7 these problems of water pollution as related to water supply
8 and the environment.

9 Q Have any of your research projects been
10 specifically for or at the request of or on behalf of
11 Township of Bedminster? A No, at not [REDACTED]

12 Q Who funded it, or who funds your
13 projects? A The greater part of our funding has
14 come from the Office of Water Resources Research of the
15 Department of the Interior. For about four years the State
16 of New Jersey gave us matching funds with which to match
17 Federal appropriations. We have had major funding from the
18 Environmental Protection Administration, and some funding
19 from industrial sources, from the Delaware River Basin

20 [REDACTED] Have there been any publications that have
21 [REDACTED] results of your research on water pollution?

22 A Yes, there have been quite a few of them referred to
23 in the publications list of the curriculum vitae which I
24 passed.
25

1 Q I show you a document, General, and ask you
2 if you can tell the Court what it is? A This
report is titled Preliminary Mass Balance BOD on three New
Jersey rivers.

5 Q Who is the author of that report?

6 A I am the principal author of that report.

7 Q Is this one of the publications that has come
8 out of your research at Rutgers? A Yes, it is, it
9 was published by the Institute in 1969, I think, although it
10 is not put on the cover.

11 MR. ENGLISH: May I have the report
12 for identification?

13 (Report referred to above received and marked
14 D-19 for identification)

15 Q First of all, can you tell us what BOD means,
16 that having been part of the title of this paper, D-19 for
17 identification? A It is biochemical oxygen demand.
18 It is a measure, the common measure of organic pollution in
19 water.

20 Can you explain a little bit more for the
21 non-scientific laymen, just what the biochemical
22 oxygen demand is in water and how it works and why it is
23 significant? A It is the demand, the potential
24 demand of oxygen of any body of water. That is measured in
25 milligrams per liter; it is called biochemical oxygen demand.

1 It is significant in that it measures the total amount of
2 biodegradable organic matter which, when degraded by bacteria,
3 and depletes the oxygen of the stream and cause objectionable
4 conditions killing fish, odors and so on.

5 It is one of the most common, if not the
6 most common, index of pollution. Of course there are many
7 other parts of pollution, but this is the most common index
8 of pollution.

9 Q Can you summarize for the Court the conclu-
10 sions which were reached in your research as contained in
11 Exhibit B-19 for identification? A This
12 represents findings that were not originally con-
13 when the research was initiated. We had started
14 research which was designed to show the development of pollu-
15 tion in accordance with increase of population. And what we
16 found to our astonishment was that the pollution in the
17 rivers was much greater than that that could be accounted
18 for as coming from the identified sources of pollution.

19 Q How would you describe identified sources of
20 A The waste treatment plants which were
21 identified and recorded by the States, or other--in the case
22 of New Jersey, there were no effluents that hadn't been
23 treated, were identified. But the State had the duty, the
24 old Department of Conservation had the duty of locating and
25 recording these sources of pollution in the stream, which

1 were the waste treatment plants, either municipal or indus-
2 trial), and sampling them from time to time, and of course
3 making efforts to see that they were reduced to reduce the
4 pollution in the stream. Those were the officially identi-
5 fiable sources of pollution in the stream. They were the
6 ones towards which the efforts of the State were directed,
7 and in fact, have been directed ever since, with only very
8 recent attention to other sources.

9 We had found out, to our astonishment, that
10 in all of these streams that we investigated--which were the
11 New Jersey rivers; the Millstone, the Raritan and
12 Passaic--that there was at least three times as much
13 pollution in each stream; and in the case of one water shed
14 times as much pollution in the stream as could be identified
15 as coming from the recorded sources of pollution.

16 Now, this finding which was a complete
17 surprise to us evidently indicated something of very basic
18 fundamental importance. We took this to the State and got,
19 I may say, a rather unsympathetic hearing and published this
20 to indicate the tremendous significance of these
21 findings which meant that the official efforts at controlling
22 pollution in this State were directed to the solution of only
23 a minor part of the problem, namely about a third in these
24 particular water sheds. The remaining two thirds of the
25 pollution coming from sources which had not been identified

1 or located by the State.

2 In spite of the lack of imagination of the
3 people who initially talked to, we published this and other
4 [redacted] attempt to explain how significant this was and
5 to obtain research funds with which to explore this situation
6 further because it obviously cried out for further develop-
7 ment.

8 Q If you found that a major part of the pollu-
9 tion came from other than recorded sources, I think you said--

10 A Yes.

11 Q What would be the non-recorded sources
12 accounted for your findings of the major part of [redacted]
13 tion of these rivers? A Well, at that [redacted]
14 no way to identify them. Of course, we surmised that this
15 would include such things as runoff from agricultural lands,
16 from minor industries that hadn't been identified and located
17 by the State, from urban runoff and leakage from sewer sys-
18 tems. But we had no particular way to determine at that time
19 exactly what this consisted of.

[redacted] General Whipple, I show you a document which
[redacted] sent to you is a duplication of Chapter Five of
22 your report, D-19 for identification, and ask you if you can
23 verify my representation? A Yes, I can, because I
24 identified it before the hearing, and identified it with my
25 initials. It is Chapter Five of this document.

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Q And Chapter Five contains what part of your

A Discussion and conclusions,

MR. ENGLISH: I will offer Chapter Five, Discussions and Conclusions, which is a part of Exhibit D-19 for identification into evidence.

MR. LANIGAN: No objection.

MISS THOMPSON: No objection.

THE COURT: All right, it will be admitted.

(Chapter Five referred to above received and marked D-20 into evidence)

MR. ENGLISH: I may say if the Court prefer the whole report, I would be happy to offer it. But as a rather non-scientific layman, I found Chapter Five more illuminating than the rest of it.

THE COURT: I think the library of exhibits has grown adequately at this point, and we will be satisfied with Chapter Five.

Q Now, General Whipple, I show you another document and ask you if you can tell the Court what this is?

This is a photocopy of an article that I read in Water Sources Research and BOD Mass Balance and Water Quality Standards, which was published in Water Sources Research. This is the journal of the American Geophysical Union on June, 1970. This article took the findings of this preliminary mass balance report that we referred to and summarized them for

1 the national journal so that it could get wider attention
2 and be subject to discussion.

3 [REDACTED] The main difference is that in this article
4 [REDACTED] further and pointed out that the establishment
5 of water quality standards based solely on recorded sources
6 of pollution was not solving the problem, and that a recon-
7 sideration of water quality standards for the future had to
8 be made on the basis of the complete analysis, including
9 these unrecorded sources of pollution.

10 I chose this journal partly because [REDACTED]
11 of these publications is allowed in the journal, [REDACTED]
12 journal of co-reputation, so that if anybody differed
13 this, they would have an opportunity to put in a [REDACTED]
14 analysis.

15 MR. ENGLISH: May I offer in evidence the
16 published article, BOD Mass Balance and Water Quality
17 Standards?

18 MR. LANIGAN: No objection.

19 MISS THOMPSON: No objection.

20 [REDACTED] THE COURT: All right.

21 [REDACTED] (Article referred to above received and marked
22 [REDACTED] in evidence)

23 Q As a matter of fact, General Whipple, has
24 there been any debate in the Water Resources Research Journal
25 discussing the content of your article, which is D-21 in

1 evidence? A As far as I know, there was not,
2 I never--there was no--I don't think there was, because they
3 [REDACTED] me if there had been.

4 Now, after the first phase or stage of your
5 research, which culminated in Exhibit D-20 in evidence and
6 D-21 in evidence, did you pursue further research?

7 A Yes, we did.

8 Q And what was the purpose of that next stage?

9 A We obtained further funds from the Office of Water
10 Resources Research for a study which had the number [REDACTED]
11 Jersey, which is called Dynamics Biochemical Oxygen [REDACTED]
12 This involved myself, Dr. Joseph V. Hunter, Dr. [REDACTED]
13 and a number of graduate students and other people [REDACTED]
14 became associated with this project as it carried, as it
15 continued. That project was authorized and either started
16 in 1969 or '70, I don't recall which. And it has continued
17 until the preparation of a completion report, which is now in
18 press.

19 We have published one or two other things
20 [REDACTED] of interim findings, but we have continually
21 [REDACTED] this matter. And by effect, we have now received
22 [REDACTED] funds which carry on these studies further, even
23 in more specific terms in carrying out the same investigation
24 of the nature and origins of unrecorded pollution.

25 Q Now, I show you a document and ask you if you

1 can tell the Court what this is? A This is a
2 report based on the original research, which is co-authored
3 [REDACTED] and myself, February of 1970, and it is called
4 Predicting Future Growth of Organic Pollution in Metropolitan
5 Area Rivers. It is a publication of the Water Resources
6 Research Institute.

7 Q Who is M. Marcus? A He was then an
8 associate professor of the Economics Department of Rutgers,
9 who is now the Chairman of Economics for the University.

10 Q And this document, comes out of the [REDACTED]
11 stage? A Yes.

12 Q All right. Let us finish that up [REDACTED]
13 MR. ENGLISH: May I offer it in [REDACTED]
14 report entitled Predicting Future Growth of Organic
15 Pollution in Metropolitan Area Rivers, by M. Marcus
16 and William Whipple, Jr.?

17 MR. LANIGAN: No objection.

18 MISS THOMPSON: No objection.

19 THE COURT: Admitted.

20 [REDACTED] (Article referred to above received and
21 [REDACTED] and D-22 in evidence)

22 Q Can you summarize for the Court, General
23 Whipple, the conclusions you came to in Exhibit D-22?

24 A This was based on the findings of pollution and
25 report that you had previously. It compared the growth of

1 pollution over the years in these three river basins with
2 the growth of population in the same basins. It indicated
3 [REDACTED] this period, as the population had increased, so
4 [REDACTED] pollution. But that in these three basins,
5 over this period, the total pollution had increased at a
6 slower rate than the population had.

7 Q Did you reach any conclusions as to the fact
8 that the increase in the rate of pollution was different from
9 that of the increase in the growth of population?

10 A Yes. We believed that the--since this was
11 a period in which the State was beginning to make
12 vigorous efforts to control pollution, that some
13 industries were changing their processes as to put
14 pollution into the streams. And that therefore, in spite of
15 the growth of population, the gross pollution entering the
16 stream was less proportionate than the population.

17 This was our explanation of these data, which
18 of course was inferential. There is no direct proof one way
19 or another to explain these statistics,

20 [REDACTED] And now, can we get back, please, to your
21 [REDACTED] of the research project? And can you tell us
22 generally what methods you used and what kinds of problems you
23 were seeking to investigate? A We wanted to find
24 the sources of this unrecorded pollution as precisely as we
25 could. The first thing we did was to find a number of water

1 sheds; initially, six, which would be divided into three

2 [REDACTED] We would have two water sheds that would have
3 [REDACTED] lands, totally undeveloped land. We would
4 [REDACTED] that would be primarily agricultural land. And we
5 would have two that would be primarily single family housing.

6 And we had to change one of those latter two
7 because ultimately we found that the housing results were
8 completely blanketed by some industry. This was the Mile
9 Run Project in New Brunswick. Although this was primarily
10 housing, a small amount, relatively small amount [REDACTED]
11 that was minor industry and commercial sites produced
12 more pollution than the effect of the housing was [REDACTED]
13 So we had to find another site. And we then obtained indices
14 of pollution that we could attribute to these three categories
15 of land based on these basis, comparing the pollution from
16 the undeveloped land single family housing and the row crops.

17 We found, in general, that there was some
18 pollution--in the case of pollution, we are measuring BOD in
19 this case only. We found that there was some organic pollu-
20 [REDACTED] from the wholly undeveloped lands and materially
21 [REDACTED] row crops and single family housing, which
22 might be as much as twice as much, but was still relatively
23 low degrees of pollution.

24 On the other hand, we found that the Mile
25 Run area had very heavy pollution, although there were no

1 recorded sources of pollution in it. These results then,
2 [REDACTED] used enough as far as housing urban areas were
3 [REDACTED] and we then changed the research in the last year
4 [REDACTED] housing area which would have very little indus-
5 try.

6 We took the town of Morristown, which is an
7 old town, relatively clean, with little industry in it, and
8 traced the pollution coming from the water shed which includes
9 about half, a little more than half of the town of Morristown.

10 Q May I interrupt you for a minute?
11 your project got into the stage of Morristown, did
12 [REDACTED]ish any preliminary findings? A Yes,

13 Q I show you a document and ask you what that
14 is? A This is a paper which was prepared by Dr.
15 Saul L. Yu in the names of himself, my name and Dr. J. V.
16 Hunter. And it was presented at the fall meeting of the
17 American Geophysical Union in San Francisco in 1971. Its
18 title is Assessing Organic Pollution from Agricultural, Urban
19 and Wooded Land.

20 [REDACTED] And what generally does that paper set forth?
21 [REDACTED] sets forth the relationship between the organic
22 pollution from these lands of row crops, single family housing
23 and undeveloped wooded lands respectively. And just one point
24 showed that the urban runoff is much higher.

25 Primarily it is an evaluation of organic

1 pollution from these less, non-urban types of development.

2 MR. ENGLISH: May I offer in evidence the
3 [REDACTED] entitled Assessing Organic Pollution from
4 Agricultural, Urban and Wooded Lands?

5 MR. LANIGAN: Do you have a copy?

6 MISS THOMPSON: That one we have never been
7 furnished, I don't think there would be any objec-
8 tion.

9 MR. LANIGAN: I have no objection to it.

10 MR. ENGLISH: I don't know if the [REDACTED]

11 MR. LANIGAN: No objection.

12 THE COURT: There being no objection
13 be admitted.

14 (Article referred to above received and
15 marked D-23 in evidence)

16 Q General, will you please tell us more about
17 your research project in Morristown? A In Morris-
18 town we made a special effort to find out not only the organic
19 pollution, but the nutrients as well coming from this area.

20 May I interrupt you and ask you what nutrients
21 [REDACTED] context? A Nutrients are phosphates
22 and nitrates that are important to the pollution picture be-
23 cause they are, in effect, nutrients for plant life and then
24 engender the growth of algae on streams, which cause the effect
25 known as eutrophication. The withholding of nutrients or

1 excessive nutrients from streams is an objective of balance
2 pollution control systems. Because of its effects, small
3 [REDACTED] of nutrients are, of course, essential for
4 [REDACTED] in the stream and are desirable.

5 Q Can you tell us, please, what eutrophication
6 means? A Eutrophication is the process which

7 occurs mainly in lakes, but also in rivers. It is primarily
8 a lake phenomenon, by which a lake is considered to age. A
9 youthful lake has clear water and little vegetable matter in
10 it. But as the lake grows older, organic matter
11 in it, and ultimately the lake will become a swamp
12 bed.

13 Eutrophication process is that the [REDACTED]
14 of organic aging by which nutrients allow vegetable matter
15 to accumulate in the lake.

16 Q Is eutrophication the same thing as pollution?

17 A It is one aspect of pollution, yes. They are really
18 not quite correct. I mean, semantically they are different
19 things. But they are closely related because one aspect of
20 [REDACTED] namely the nutrients, causes the undesirable
21 [REDACTED] condition.

22 Q If a reservoir which formed part of the
23 public water supply had arrived at a stage of eutrophication,
24 would the water be regarded as potable? A It would
25 be potable most of the time. It is an undesirable condition,

1 though, because the blues may cause the water to become
2 anaerobic, So that good reservoir management tries to limit
3 [REDACTED] growth of algae which characterizes an advanced
4 [REDACTED] trophication.

5 Q What is anaerobic? A It is in the
6 absence of oxygen. It characterizes water which has no
7 oxygen, which is not potable water.

8 Q All right.

9 MISS THOMPSON: Could I have the answer read
10 back?

11 (Whereupon the court reporter read
12 last answer)

13 Q Now, let us get back again, please, to your
14 research project in Morristown. What did you do there?

15 A We checked--in the first place, we isolated a proper
16 drainage area to work with, which consisted of the streams--
17 the Whippany River passes through Morristown. It has tribu-
18 taries that come in it from above. We were able to get
19 gauging stations on those streams and a gauging station below
20 [REDACTED] that we could measure the flow of water at these
21 [REDACTED] measuring it accurately. And also take
22 samples at these points.

23 The area above Morristown, although the
24 Whippany River, itself, is quite polluted lower down, this area
25 is quite good water. There are only a few small sources of

1 pollution above Merristown, and the ones that were within
2 ~~our area~~ were only three small ones. And we were able to get
3 ~~samples~~ at these points, so that we could characterize the
4 ~~type~~ of pollution as being three small waste treat-
5 ment plants which we could get samples. And these two major
6 tributaries, we could measure the pollution that came in in
7 these points and compare that with the pollution at a point
8 below.

9 It is not a simple process of addition, but
10 biochemical oxygen demand changes with time in ~~stream~~
11 there have to be computations made as to what amount
12 pollution should remain after such and such travel ~~time~~
13 even though the distance concerned was not very great.

14 By these means we were able to tell how much
15 pollution must be coming in from the relatively small area
16 which drains into this portion of the river, which includes
17 a major portion of the town. This way we were able to get
18 the biochemical oxygen demand and also the nutrients that we
19 were interested in.

20 Do I understand you to say that as water
21 ~~flows~~ stream for a certain distance and over a period
22 of time, it may become less polluted in respect to BOD?

23 A That is correct. There is a rather fairly complex
24 mathematic relationship, depending on temperature, on the
25 depth and the velocity of the stream and other parameters.

1 Q Now, have you not completed this second
2 stage of research that you embarked on four years ago?
[REDACTED] we have.

[REDACTED] Have you published a report of it yet?

5 A We have a complete report in process of publication
6 which has been sent to the printer, actually, last Friday,
7 And it is a final report, although it hasn't come out. Some
8 portions of this have been submitted for publication and
9 accepted for publication in a national journal. However,
10 they will not appear until May.

11 Q I show you a document and ask you
12 tell the Court what this is? A This is [REDACTED]
13 from our 1974 report, the one that is now in publication.
14 The title of the report is Unrecorded Pollution and Dynamics
15 of Biochemical Oxygen Demand. It would be co-authored by
16 myself, Dr. Hunter, Dr. Yu and two graduate students who
17 contributed to it. And this is sections 4 and 5. Section 4
18 pertains to unrecorded wastes from non-industrial urban areas,
19 specifically Morristown. Well, that is all we have. That is
[REDACTED] But it summarizes all the results that we had on
[REDACTED] own experience.

22 MR. ENGLISH: May I offer into evidence the
23 paper just identified by the witness, which is Section
24 4 of the report to be published entitled Unrecorded
25 Pollution and Dynamics of Biochemical Oxygen Demand?

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MR. LANIGAN: I have no objection.

MISS THOMPSON: No objection.

THE COURT: It will be admitted.

(Article referred to above received and marked D-24 in evidence)

Q Can you summarize for the Court, General Whipple, your conclusions with respect to your research on the Whippany River in the vicinity of Morristown?

A We were able to compare the amount of biochemical oxygen demand coming during periods of rainfall and periods of dry summer runoff, and also compare the experiences of other investigators whose work we competent, which in the meantime had been done in Durham, North Carolina and Cincinnati, Ohio.

Based on a comparison between all of the three, which were reasonably similar, we came to the conclusion that for urban areas of concentrated population but non-industrial in character, you should allow between two and three one hundredths of a pound of biochemical oxygen demand per day as the probable unrecorded wastes from

Now, to identify how much this is, this amount approximately corresponds to the effluent from a good secondary waste treatment plant serving the same population.

Now, in addition to that, we also found that

1 there were heavy nutrients loads coming from Morristown even
2 during dry weather; both phosphates and nitrates, though
3 this is insufficient data from other sources to be able to
4 characterize or predict exactly what this should be quantita-
5 tively. We wouldn't hazard a prediction.

6 Q Can you tell us how this pollution from
7 unrecorded sources probably got into the Whippany River?

8 A It is much easier to do this for BOD than it is for
9 the nutrients. The BOD we knew--and other people have found--
10 that normal street runoff, whenever it rains, brings in
11 dous quantities of pollution into streams. At the
12 flash of a thunderstorm, the biochemical oxygen demand
13 runoff may be as high as one half that of untreated sewage,
14 or about 200 BOD. Of course, the averages are very much lower
15 than that.

16 So that during rain periods, a lot of it is
17 runoff directly from the streets. However, the runoff that
18 comes during dry periods has to come from other sources, and
19 this includes unrecorded leakages from minor industries, from
20 wash establishments, all kinds of little busi-
21 ness stuff dribble out somewhere, or illegally
22 connected to the waste treatment plants. It includes leakage,
23 unquestionably, from the sewers, themselves, because sewers
24 are not laid with really tight joints. Water leaks into them
25 when it rains. And in dry weather, the sewerage, itself, leaks

1 out into the surrounding ground.

2 All of these things contribute unquestion-
3 [REDACTED] pollution that comes from centers of population.
4 [REDACTED] do not do detective work to determine just which
5 establishments were producing which proportions of pollution
6 in Morristown.

7 Q Now, as a result of the research projects
8 you have described for the Court, do you have an opinion or
9 judgment as to the relationship between an increase in
10 population in a water shed and the problem of pollution
11 the streams? A Yes, I very definitely [REDACTED]

12 Q What is that? A That [REDACTED]
13 in population that I know of is almost sure to increase
14 pollution that is coming into a stream; that the major
15 increases, the greatest increases, come from two sources;
16 one is concentrations of industry and certain heavy commerci-
17 al activities such as fuel oil distribution; the other is
18 from concentrations of population in urban areas.

19 There is no doubt that when you bring popu-
20 [REDACTED] together than single family housing and you
21 [REDACTED] instead of open grassed area around the build-
22 ings that you get a very much greater amount of pollution
23 coming in.

24 And so that there is a very great distinction
25 that we found between the single family housing which has a

1 relatively small amount of pollution which presumably gets
2 absorbed in the lawns and open areas and the areas that are
3 [REDACTED] population where there is a great deal more
4 [REDACTED] that comes out. This is something that hasn't been
5 fully developed.

6 The Environmental Protection Agency in
7 Washington tried for years to avoid facing this problem
8 because it was embarrassing to them. And it was only less
9 than a year ago that they admitted officially that this was
10 a subject proper for research. And because of this [REDACTED]
11 not only lack of official interest, but active off [REDACTED]
12 disinterest, the subject has not been properly re [REDACTED]
13 and there is a great deal still unknown about it, particularly
14 as regards the heavy metals and the nutrients.

15 But there is no doubt at all that there is a
16 very strong correlation between concentration of population
17 and unrecorded sources of pollution.

18 MR. ENGLISH: You may cross examine.

19 THE COURT: Before you do, we will take a
[REDACTED] minute recess.

(Whereupon a recess was taken)

20 [REDACTED] QUESTION BY MISS THOMPSON:

22 Q General Whipple, let me direct your attention
23 to Chapter 5 of Preliminary Mass Balance of BOD of three
24 New Jersey rivers. Do you have a copy of that?
25

1 A Yes.

2 Q Particularly to page 85. I believe your
3 [REDACTED] earlier this morning was that in making a deter-
4 [REDACTED] the amount of organic loading in the three rivers
5 you studied, you did make some, in a generalized statement,
6 with regard to probable sources of that unreported pollution,
7 is that correct? A Yes.

8 Q Now, among the probable sources of unreport-
9 ed pollution is something called background loading, is it
10 not? A Yes.

11 Q Can you explain to the Court what
12 loading is? A That is the pollution that
13 from undeveloped areas, or other areas. Not from [REDACTED]
14 activity, but from the natural soils, rocks and vegetation.

15 Q And would it be correct to say that in your
16 statement of conclusions you hypothesized that a substantial
17 proportion of the unrecorded organic loading in the water
18 sheds you studied would have been the result of background
19 loading? A That's correct.

20 Q Also, with regard to the unreported sources
21 [REDACTED] loading, you also concluded, did you not, that
22 some proportion of that unreported organic loading would come
23 from leakage from improperly constructed or poorly constructed
24 septic tanks, is that correct? A That is right.

25 Q It has been stipulated by counsel, by the

1 parties in this law suit, that as of 1968 43 per cent of the
2 septic tanks in Pluckemin and Bedminster Village sections of
3 [REDACTED] Township were either malfunctioning or considered
4 [REDACTED] to be malfunctioning, with the existence of
5 43 per cent of the septic tanks being malfunctioning have
6 an affect with regard to unreported sources of pollution?

7 A It certainly would,

8 Q Now, it was also stipulated between the
9 parties in this law suit that a number of the septic tanks
10 in the Pluckemin and Village of Bedminster section
11 Bedminster discharge into French drains and storm
12 Can you first tell us what French drains are?

13 A French drains are buried masses, usually of rock and
14 gravel, in which storm water or waste water can be discharged.

15 Q If septic tanks were to discharge into French
16 drains and storm drains, would that contribute to an
17 unreported organic loading of the stream? A It
18 might or it might not. If they discharged into storm drains,
19 that, of course, would be conducted by pipes down to a water
20 [REDACTED] would, of course, contribute.

21 [REDACTED] But if they discharge into French drains, it
22 would depend entirely on the character of the soil whether
23 the material would be absorbed or whether it would ever reach
24 the stream.

25 Q Have you at any time made any determination

1 of the character of the soil in Bedminster? A No,

2 [REDACTED] Now, it is also true, is it not, that in your

3 [REDACTED] Chapter 5, you stated that another presumable
4 [REDACTED] source of unreported organic loading would be agricultural
5 uses? A That's correct,

6
7 Q Now, there is a document which has been
8 admitted into evidence in this law suit which indicates that
9 approximately 2,000 acres of the Village of Bedminster are
10 presently used for crops. Would that have an effect
11 regard to unreported organic loading into the river [REDACTED]

12 A Yes, whatever the crops produce would be
13 of the organic loading, [REDACTED]

14 Q The same document which has been introduced
15 into evidence has indicated that there are presently, or as
16 of 1970, there are almost 700 head of beef in the Village of
17 Bedminster. Would that have an affect on unreported organic
18 loading of the river? A It would certainly have
19 some effect, it might have a considerable one if they were
20 [REDACTED]

21 [REDACTED] Well, let me direct your attention to Figure
22 12 which appears before page 40 in defendant's Exhibit 19
23 for identification,

24 Now, that figure shows assumed sources of
25 unknown pollution, does it not? A Yes, it does.

1 But very schematically.

2 [REDACTED] Q Does it show, schematically, an assumed source
3 of [REDACTED] pollution in the Bedminster area?

4 A [REDACTED], it is drawn so it is not very far from the
5 Bedminster area. But as I recall, that was meant to represent
6 the population concentrations near the junctions of the two
7 rivers rather than the Bedminster area, which is further north.

8 Q Which two rivers are you talking about?

9 A The--what is this? The North Branch and Lamington,
10 I'm not quite sure where Bedminster is on this map [REDACTED]

11 Q Well, it is true, is it not, that
12 [REDACTED] is located at the juncture of the North Branch and

13 River? A I wasn't aware of that. If it is, why it
14 is.

15 Q Now, in your testimony this morning with
16 regard to the second document which you discussed, Predicting
17 Future Growth of Organic Pollution in Metropolitan Area Rivers,
18 which I believe is Defendant's Exhibit 21, I believe that you
19 stated that your finding was that pollution increases as popu-
20 [REDACTED] ed. Would that be an accurate restatement?

22 Q Isn't it true that when you made the statement
23 with regard to pollution increasing as population increased
24 you were referring to gross pollution? A That's
25 correct.

1 Q And did you make the same finding with regard
2 to net pollution? A No, we did not.

3 [REDACTED] Could you explain to us what gross pollution
4 [REDACTED] Gross pollution is the total pollution that
5 is produced which might find its way into the streams prior
6 to treatment.

7 Net pollution would be the pollution that
8 actually did find its way into the streams after treatment.

9 Q So, would it be fair to say that gross pollu-
10 tion includes pollution which ultimately does not
11 in polluting the river because it goes through a [REDACTED]
12 treatment plant? A That is true.

13 Q What was your finding with regard to the
14 relationship between net pollution and population growth?

15 A We didn't make any such finding because we didn't
16 consider that there would be any specific--there should not
17 necessarily be any specific relationship of a quantity differ-
18 ential, and we didn't attempt to find out.

19 Q Did you find that net pollution had increased
20 [REDACTED] that you were studying over the course of time?
21 [REDACTED] I don't
22 know. My recollection is that it remained approximately
23 constant.

24 Q Now, isn't it also true that if a community
25 switches from using, or relying on septic tanks, and installs

1 a sewer system, while its gross pollution may increase that
2 its net pollution actually decreases? A It is not



not
It is/necessarily the case.

Let me direct your attention to page 3 of
5 Defendant's Exhibit 21. Do you have a copy of it? That is
6 Predicting Future Growth of Organic Pollution.

7 A Fine.

8 Q Oh, let me ask you to begin reading out loud
9 the paragraph at the bottom of page 2, and then continuing
10 on the end of the first sentence on page 3.

11 A "It may be thought that gross pollution
12 is pari passu with population growth or industrial
13 some combination of the two. In particular, the mechanical
14 demand of sewerage from homes should increase generally
15 proportionately to population. But there are some exceptions.
16 For example, if residential wastes are changed from septic
17 tanks to sewers, the indicated gross man made population
18 load will be increased while net population load reaching the
19 stream may be decreased."



I think you said--when you said population
pollution, did you not? Gross man made pollution?
22 Yes, yes. The gross man made pollution load would be
23 increased while net pollution load reaching the stream may be
24 decreased.

25 Q Thank you. Now, it was also your testimony

1 this morning, was it not, that as water and the loads which
2 it is carrying travel, that the BOD demand will decrease,
3 [REDACTED] influx of additional pollution? A Yes,

4 [REDACTED] Q Would that be correct? A Yes,

5 Q Now, if one were to have an area on a river
6 from which one drew water for water supply knowing that
7 BOD demand decreases as one goes down stream from the river,
8 wouldn't it then be logical to concentrate population
9 growth as far away from the water supply source as possible?

10 A As far as that one aspect is concerned, [REDACTED]

11 Q Now, have you at any time made a [REDACTED]
12 the Somerset County master plan to determine where
13 substantial residential and industrial growth in relation to
14 areas from which potable water is taken for water supply?

15 A No, I have not.

16 Q Now, General, you teach a course in Water
17 Quality Management, do you not? A Yes,

18 Q In that course do you discuss techniques for
19 controlling the quality of water? A To a limited

20 [REDACTED] limited extent, because there are economics and
21 [REDACTED] that are not technically qualified, so I

22 [REDACTED] very much about the techniques. They are only
23 generally alluded to.

24 Q Are there techniques which exist for dealing
25 directly with the quality of water? A Of course

1 there are many techniques dealing with the quality of water.

2 Q Is aeration one of them? A Yes,

3 Have you had experience in working with
4 aeration in terms of controlling the quality of water?

5 A Yes, I have.

6 Q Could you explain to us briefly how the
7 process of aeration works? A The process of

8 aeration is an experimental technique. Well, it is not
9 quite experimental because it has been applied in a few

10 cases for improving the oxygen concentration of streams by

11 mechanical means. This is done by mechanical aerators that

12 are placed in streams, or in some cases by bubbling

13 air or oxygen through the water. And by this means,

14 dissolved oxygen process is conditioned water, can be improved,

15 even though the biochemical oxygen demand in the stream is

16 relatively high.

17 Q Earlier in your testimony this morning, you
18 spoke of the relationship between street runoff and biochemi-

19 cal oxygen demand. There exists engineering and physical

20 techniques for dealing with runoff, do there not?

21 A Once it is concentrated, there are techniques which
22 may be applied. This is a matter that is not very much

23 developed, and there are very few instances you can find

24 where this has even been attempted.

25 Q Are you aware of the fact that Bedminster has

1 agreed to use swales, drains, settling and holding ponds in
2 order to maintain storm water runoff and in order to improve
3 the quality of it before allowing it to enter the Raritan
4 River? A I'm sorry, I am not aware of that.

5 Q Would swales, drains, settling and holding
6 ponds have the effect of improving the quality of runoff
7 before it were allowed to enter the Raritan River?

8 A I assume that they would, yes.

9 Q It is also technically possible to send storm
10 water runoff through a sewerage treatment plant, is it not?

11 A Yes. In fact, this happens involuntarily in many, if
12 not most, systems.

13 Q Now, are you aware of any sewer systems which
14 are being developed which are specifically designed to treat
15 the storm water runoff problem as well as the sewerage prob-
16 lem with regard to treatment? A These are being

17 studied. For example, Chicago has some very, very complicated
18 plans for treating storm water runoff which would be enormously
19 expensive and very complex; extremely controversial, though.

20 And they have never come to any definitive conclusion.

21 Q Are you aware of the so-called carousel system
22 which was developed in the Netherlands for treating both storm
23 water and sewerage effluent? A No.

24 Q Now, let me direct your attention to Defendant's
25 Exhibit 23, Assessing Organic Pollution from Agricultural,

1 Urban and Wooded Land. Do you have a copy of that in front
2 of you? We could both use this one together, I guess.

3 Could you tell me what your finding was with
4 regard to the relative biochemical oxygen demand of the
5 agricultural land and the residential land which you studied?

6 A Well, they are, roughly speaking, they are the same.
7 They are not--there wasn't a great deal of difference in the
8 agricultural land that we found and the single family resi-
9 dences that we tested.

10 Q Now, do you recall what densities the single
11 family residences were tested that you developed?

12 A They were perhaps quarter acres lots.

13 Q Quarter acre lots? A Quarter to
14 one half acre, I think. They were less than half acre.

15 Q Now, with regard to your study of BOD demand
16 with regard to the City of Morristown, in terms of studying
17 the demand which was produced to the organic load which was
18 produced, did you make any attempt to determine whether there
19 are any areas of the Morristown area which you were studying
20 which still rely on septic tanks rather than on sewerage
21 treatment plants? A I don't recall that information.

22 Most of this area, I think--the Township, itself--most of the
23 area was sewered. I think the outlying areas substantially
24 were septic tanks.

25 Q Did you at any time have occasion to compare

1 the--do you know what the density of development is in
2 Morristown? A Well, a large part of the Town we
3 have got--is quite closely--it is a small town, so that it
4 varies from multiple family dwellings down to a single
5 family dwelling and out into the suburbs. And of course,
6 all of the normal commercial establishments that go with it
7 were included in this.

8 Q Morristown has six and eight story apartment
9 buildings, does it not? A There may be some in the
10 center of town.

11 Q Did you make any attempt to determine the
12 relative organic loads created by apartment buildings of the
13 six and eight stories garden apartments or town houses?

14 A No, we have not got that far.

15 MISS THOMPSON: I have no further questions.

16 CROSS EXAMINATION BY MR. LANIGAN:

17 Q General, directing your attention first to
18 your background, did you, in the course of serving as the
19 Chief Engineer of the New York Worlds Fair Corporation, have
20 occasion to deal with the pollution created by the millions
21 of people that visited the Fair? A Yes, I did to a
22 certain extent. We did. We did have to consider that, right.

23 Q Did you design or implement programs to take
24 care of the pollution which might have been created by those
25 millions of people? A Only insofar as to get it into

1 the New York City sewer system.

2 Q Did you have occasion to consider the runoff
3 or the drainage facilities of the New York Worlds Fair?

4 A Of course we had to have drainage in this.

5 Q Did you treat that drain water in any respect?

6 A No.

7 Q What did you do with it? A It was
8 simply dumped out into the storm sewers and went out into
9 wherever it went, Flushing Bay, I suppose.

10 Q Was that potable water? A Oh, no.

11 It would be far from potable. It would be highly polluted.

12 Q Were there any possible means of ~~taking care~~
13 of that drainage at the Worlds Fair site? A Yes

14 mean of treating it?

15 Q Yes. A There were no practical
16 means, no, because the area was relatively--the area was
17 quite congested, and means were limited anyway. It would
18 have been a fantastically expensive thing to try to treat
19 that amount of highly polluted runoff.

20 Q Did you have any feeling or reaction as a
21 professional dumping that highly polluted water into the
22 Flushing Bay? A Since New York City was already
23 dumping at that time over half of its entire municipal sewerage
24 raw into the surrounding water shed, I did not feel that our
25 contribution would materially change the result.

1 Q So if the river was already polluted, you
2 weren't going to do that much more to it? A That
3 is quite correct in that case.

4 Q Now, with respect to Bedminster, you have
5 never really made any studies of Bedminster, have you?

6 A That's correct.

7 Q And as you stated in your deposition in
8 response to a question, which I represent to be a question
9 from your deposition dated June 5, 1972, which I asked,
10 "General, are you familiar with the Township of Bedminster?"

11 You answered, "Very little. No, I'm not
12 really familiar with it."

13 Is that still correct? A

14 Q You performed no studies with respect to
15 environmental impact statements or anything at the request of
16 the Township? A No.

17 Q Okay. Now, would you say as a general con-
18 clusion that because of the increased State effort over the
19 past few years, the quality of the water in the river is
20 getting better? A In the Raritan River?

21 Q Yes. A It is getting better largely
22 because of the fact that the city--that the State has never
23 diverted the water for water supply that they intended, and
24 as a consequence of leaving the water from Round Valley and
25 Spruce Run in the river, instead of diverting it to water

1 supply, this, I think, is primarily the reason why the water
2 quality has improved.

3 Q Where is the greatest source of pollution
4 in the Raritan, if you can point it out? A The
5 greatest source of pollution in the Raritan is probably the
6 urban runoff from the municipalities that are adjacent to it.

7 Q Like New Brunswick, Highland Park?

8 A Exactly.

9 Q Where the University is? A That is
10 right.

11 Q And you think that is getting better because
12 of the water from Spruce Run and Round Valley and [redacted] for
13 reasons? Are there any other reasons? A Well,
14 there may be other reasons, but I know that the dissolved
15 oxygen in Raritan Bay has improved, and various people have
16 taken credit for it. But I think the primary reason is
17 probably the fact that there is more water flowing in the
18 river.

19 Q Most of your studies of the Raritan and your
20 [redacted] were done in 1967, weren't they?

21 A Yes mean as far as pertains to the Raritan, itself?

22 Q Yes. A That's correct.

23 Q I read what I represent to be a question and
24 answer from your deposition of June 5, 1972, in which you were
25 asked--page 9.

1 "Question: Did you make any independent
2 investigation as to sources of pollution either at the mouth
3 or further on down the River?

4 "By Mr. English: You mean up the River?

5 "By Mr. Lanigan: Up the River, yes."

6 Your answer was, "Yes, I was saying that I
7 did in the Raritan River near its confluence with Millstone,
8 and all the information that we could obtain on the tributar-
9 ies of the Raritan and of the sources, known sources, of
10 pollution in the Raritan. Of known sources, those recorded
11 by the State of New Jersey, which, under law, is required to
12 issue permits for waste treatment, waste discharge
13 streams, both for industry and for municipalities. ~~And these~~
14 records are presumably all of the sources of pollution that
15 enter into the river.

16 "Question: Then you have a list of all the
17 known pollution that enters the Raritan?

18 "Answer: I had it five years ago. It is
19 presumably somewhere in the papers of one of my files.

20 "Question: This formed the basis of your
21 research, however, did it not?

22 "Answer: Yes, this raw materials for the
23 research.

24 "Question: And was that updated ever?

25 "Answer: No, it wasn't. The latest informa-

1 tion that I had--that research was terminated several years
2 ago, and the latest information that I have was for the year
3 1967.

4 "Question: Is that research going to form
5 the basis of your testimony?

6 "Answer: Part of it, yes."

7 So that can we conclude that the testimony
8 about the existing pollution in the Raritan is about seven
9 years old? A Yes, except that what I have been
10 talking about now is my general knowledge of the situation.

11 Q And, if anything, the River has gotten better?

12 A As a whole, yes. There has been an improvement.

13 Q Okay. You spoke in terms of pollution from
14 land, and just before we got into a discussion of Morristown,
15 I'm not sure I understood you, and I want to ask the question
16 for clarification. Did you say that there is twice as much
17 pollution from raw land? A From raw land?

18 Q Yes. A No, I did not say that.

19 Q You did not. I am sorry. A I said
20 there was roughly twice as much pollution from single family
21 housing or row crops as there was from raw land, from
22 undeveloped land.

23 Q Oh, I am sorry. And you spoke of, in the
24 Morristown report, identifying the source of pollution as
25 three small treatment plants? A Those were the

1 recorded sources of pollution.

2 Q And they were so-called secondary treatment
3 plants? A In all cases, yes.

4 Q Could you, in a brief sentence, tell me what
5 secondary means? A Secondary is distinguished
6 from primary. Primary treatment plants merely strain out the
7 major obstructions in waste and take out the sediments.

8 Q No one does that anymore, do they?

9 A No, that is primary. A secondary treatment, of
10 course, uses ordinarily biological treatment in addition to
11 this to produce a purified effluent.

12 Q What is the quality of that secondary
13 treated effluent? A It depends considerable what
14 you put into it. In terms of municipal waste, it is ordinarily--
15 it may have a BOD of, say, 25.

16 Q Is there a lot of that? Excuse me,

17 A And that suspended solids of perhaps the same amount.

18 Q Is there a lot of that in the Raritan right
19 now? A Secondary effluent?

20 Q Yes. A Yes, there is. The waste
21 treatment plants, the recorded waste treatment plants in the
22 Raritan are all, I believe, given secondary treatment.

23 Q Is there any way to make that better, say,
24 with a third type of treatment? A Yes, there are.

25 Q What is that called? A Well, that

1 and Vice President of the Johns Manville Corpora-
2 tion."

3 MR. LANIGAN: If the Court please, I hesi-
4 tate to interrupt counsel, but this is the first
5 I have heard that they are going to introduce the
6 deposition, especially of the plaintiff. And I have
7 no objection other than to try to find out in my own
8 mind why it may be that Mr. Smith will be appearing.
9 My understanding of the use of the depositions is an
10 aid rather than as testimony. Perhaps it won't be
11 necessary to call anyone from the plaintiff. Perhaps
12 counsel can enlighten me as to the purpose of reading
13 portions of a deposition on which no cross examina-
14 tion took place and which, up to this point had
15 not planned to call Mr. Smith.

16 THE COURT: You are not objecting to it, so
17 I won't rule on that. But you are--

18 MR. LANIGAN: Asking for the courtesy of a
19 clarification.

20 THE COURT: Requesting something by way of
21 an offer of proof, I think is a reasonable request.

22 MR. KENNEDY: Your Honor, we are using this
23 deposition simply to establish certain facts with
24 respect to the acquisition of the Allan-Deane tract
25 in Bedminster. I don't think that counsel will find,

1 cases. But it depends on the situation because you can only
2 say that universally we are going to have secondary waste
3 treatment. But economics and common sense are going to have
4 to determine how much further we are going to go in specific
5 areas. These things should be the subject of analysis. It
6 shouldn't be done blanketed across the nation.

7 Q Based on the assumption, General, if you
8 could channel runoff and treat it in one central spot, or
9 control it, is there any thesis for planned concentration of
10 development? A I am not sure I understand your
11 question.

12 Q Well, you have stated that runoff, if it
13 characterize it, in a haphazard fashion, going any way it
14 likes, creates, or causes and constitutes an unrecorded
15 source of pollution. A That is right.

16 Q Supposing it were possible to concentrate
17 that runoff, to channel it, to plan it. Is there any
18 desirability in doing that? A It would depend on
19 the circumstances, but if this is desirable or not, it is
20 ~~certainly~~ feasible to do this.

21 Q On doing that, you might identify or control
22 this previously unrecorded source of pollution?

23 A If you took the whole area, this is true.

24 Q So that is there any desirability in planned
25 concentrations of urban development with that planning taking

1 place? A It is certainly something that should be
2 considered.

3 Q Are you aware of any techniques which would
4 permit the recycling of waste water in terms of irrigation,
5 for example? A Yes. This is quite feasible. It
6 has been done.

7 Q Do you have an opinion as to the desirability
8 of doing that or approaching that problem? A I
9 haven't studied this particularly case, so I won't express an
10 opinion.

11 Q I see. But it is feasible? A It
12 is feasible. It has been done in certain cases.

13 Q What is the result in terms of pollution or
14 not polluting the atmosphere when that is done?

15 A If you purify an effluent to a reasonable degree and
16 then use it on irrigation for non-edible crops; say, for
17 cotton or golf courses, this can be done and has been done,
18 particularly in the West.



19 Q What is the net effect, then, on the environ-
20 ment? A As far as I know, the net effect is favor-
21 able.

22 MR. LANIGAN: Thank you. I have no other
23 questions.

24 REDIRECT EXAMINATION BY MR. ENGLISH:

25 Q General Whipple, you have just referred to

1 various forms of treatment as feasible. Did you use the term
2 "feasible" in the meaning as a matter of technology or as a
3 matter of economics and expense? A As a matter of
4 technology.

5 Q Would you regard it as relatively inexpensive
6 or relatively expensive to channel and treat all surface
7 runoff from an urban development? A I'd regard it
8 as extremely expensive. And the reason is that where as
9 sewerage comes from relatively uniform amounts, so that your
10 waste treatment plant can be geared to a certain flow, runoff
11 comes from extreme irregularity. By far the greater part of
12 the pollution from urban runoff comes from storm 
13 These diagrams that I have submitted indicate that 
14 the total magnitude of the pollution coming from storms is
15 by the far the greater sum total that occurs during the year.
16 At these times, of course, the volume to be treated is
17 extremely high. So that you would have to have a treatment
18 plant, either a treatment plant of many times that that you
19 would have to to treat the normal wastes, or else you would
20 have to have very substantial storage provisions in order to
21 store this and let it out more uniformly.

22 Moreover, in the storage provisions, you would
23 probably have to have provisions for artificial aeration
24 equipment in order to prevent this stored water becoming
25 septic and noxious.

1 So that people are beginning to realize how
2 much pollution comes from these municipalities, and it is,
3 from an engineering viewpoint, entirely feasible to treat it.
4 But from an economic viewpoint, it is usually found to be
5 enormously expensive.

6 Q Well, on your cross examination by Miss
7 Thompson, you referred to the difference between gross pollu-
8 tion in the stream and net pollution, as I heard you. Is the
9 difference of that the result of some kind of waste water
10 treatment system? A Yes. The difference between

11 gross and net is the pollution that is done away with in the
12 treatment processes.

13 Q So that--and is there an expensive factor
14 involved in reducing gross pollution to the level of the net
15 pollution? A Yes.

16 Q General Whipple, may I refer you to some
17 additional questions and answers in the deposition which
18 Mr. Lanigan took on June 5, 1972, and part of which he read
19 to you?

20 Beginning at page 13, line 4, and then tell
21 me, General, if I read this correctly.

22 "Question: General, with respect to the
23 research which you performed on the Raritan River, do you
24 have an opinion as to its existing state? Is it polluted?

25 "Answer: Somewhat polluted, yes.

1 "Question: In what respect?

2 "Answer: In particular studies measured by
3 biochemical oxygen demand, and it is always the case that
4 there are other forms of pollutants that usually come along
5 with this. This is the usual index of pollution. And while
6 this River is not such that you certainly are grossly pollu-
7 ted, at the same time it does have a considerable amount of
8 pollution in it which builds up rapidly as it gets to the
9 mouth.

10 "Question: Is it polluted in any particular
11 location rather than others?

12 "Answer: Yes. The lower portion of the
13 juncture with the Millstone, really, is a highly polluted
14 river.

15 "Question: That is at Bound Brook, New
16 Brunswick and further on down?

17 "Answer: Yes. It is highly polluted, and
18 not only in terms of biochemical oxygen demand, but extended
19 sediment, and it has been the source of infectious hepatitis
20 outbreaks in the past. So it obviously has pathogenic organ-
21 isms in it to a very high extent, and it is very highly pollu-
22 ted and a very difficult pollution problem in the lower por-
23 tion of the Raritan River.

24 "Question: What is it polluted from specific-
25 ally? Do you have an opinion?

1 "Answer: Yes. I know what it is polluted
2 from.

3 "Question: What?

4 "Answer: These are matters of record. It
5 is polluted from a variety of industrial and municipal
6 sources, and it is also polluted to a great extent by un-
7 recorded sources of pollution that accompany all large cen-
8 ters of population. And there are a lot of large centers
9 of population in this area. And accordingly, there are tre-
10 mendous sources of pollution."

11 Did I read that correctly, General?

12 A Yes, you did.

13 Q Now, I show you your paper which is B-22 in
14 evidence, which is entitled Predicting Future Growth of
15 Organic Pollution in Metropolitan Area Rivers. And I then
16 direct your attention, please, to page 20, where there is a
17 heading Discussion of Main Findings. Would you be able to
18 summarize for the Court the main findings which appear on
19 pages 20, 21 and 22? If you care to read some or all of it,
20 you can. If you can summarize it, why that would be satis-
21 factory.

22 MR. LANIGAN: If the Court please, I think
23 the report is in evidence. He said that he prepared
24 it, and it speaks for itself without being character-
25 ized once again by the witness.

1 THE COURT: I will permit the reading or
2 reference. The General is available for cross exam-
3 ination by each of you. You obviously studied the
4 material. I see no harm.

5 MR. LANIGAN: Thank you.

6 A The quantity of gross manmade pollution in the three
7 rapidly developing metropolitan areas--

8 Q Those were what, the Millstone River Basin,
9 the Upper Passaic and the Raritan River Basin?

10 A Yes. They are increasing with the population, but
11 not as rapidly. The total pollution entering the streams is
12 not generally increased during this period; that is
13 net pollution, because the increases in gross waste
14 largely counter-balanced by improvements in efficiency of
15 treatment of plants.

16 And then statistical analysis indicates that
17 gross pollution increased about 54/100 of one per cent for
18 each one per cent increase in population.

19 Then there was a reference to a table, indi-
20 cating how this worked out for the three different basins.
21 The population growth rate in the Upper Raritan is 4 per cent
22 annually, which is a very high growth rate, except that it is
23 not quite as rapid as the Upper Passaic and the Millstone.

24 And--

25 Q Did you project there what would happen if

Whipple - redirect

50

1 these growth rates continued for 20 years? A Yes.
2 The percentages may be taken from the hypothetical estimates
3 of what would happen if both present tendencies would con-
4 tinue unchanged for 20 years.

5 Q Both tendencies mean what, population growth
6 rate and the indicated growth rate in gross man-made pollu-
7 tion waste? A No. The population growth rate and
8 the efficiency of treatment. So that both keys continue to
9 increase for the same rate the next 20 years. The gross
10 man-made pollution in the basin would have increased to 1.85--
11 wait a minute. Those two tendencies are not correctly stated.

12 Oh, the two tendencies in question are the
13 population growth rate and the decreases in the gross pollu-
14 tion, not the treatment. The decreases in gross pollution
15 that characterize that area.

16 Q Is that related to your figure of an increase
17 in gross pollution of .54 per cent for each one per cent of
18 increase in population? A Yes. This is due to the
19 improvements in the industrial processes, presumably resulted
20 in reducing these wastes. If these tendencies continued
21 for 20 years, the gross pollution would have increased to about
22 1.85 of its present value, and increase of 85 per cent.

23 Q Now, what do you regard as the consequences of
24 that? A Well, I said, reading here, "The consequences
25 of such an increase are staggering to contemplate. An 85 per

1 cent in the known loading would amount to about 5,600 units
2 of waste. In the face of such a change, the waste treatment
3 plants would not only have to handle a proportionate 85 per
4 cent increase in the volume of waste, but would have to give
5 it virtually 100 per cent treatment, even to maintain the
6 current figures of the River, which is unsatisfactory. With
7 such an increased loading, it appears that it would be
8 impossible to obtain the desired dissolved oxygen levels by
9 any degree of treatment of the observed effluent alone."

10 Q Thank you, General Whipple, I show you
11 exhibit D-23, which is the paper on Assessing Organic Pollution
12 From Agricultural, Urban and Wooded Lands. And I would
13 direct your attention to the figure 1 and 2 photographs at
14 the end of that paper.

15 Directing your attention to Figure 2, what
16 does that purport to show? A This is the total
17 organic pollution loading, expressed in terms of pounds per
18 square mile of area comparing the six different water sheds
19 in wet weather and in dry weather.

20 Q All right. And Mile Run, you said, was an
21 urbanized area in New Brunswick with some industry?

22 A Yes.

23 Q And what was Beaver Dam? A Beaver
24 Dam was the housing area--

25 Q Single family residential?

1 A Single family residential. Six Mile Run and Big
2 Bear are agricultural--excuse me, they are--yes. They are
3 agricultural.

4 Q By agricultural, do you mean crops or
5 pastures or both? A Row crops in relatively flat
6 land.

7 Q And how does this--how do you compare the
8 gross loading from the agricultural areas with the Beaver
9 Dam, the single family residential area? A Of
10 course, this is done graphically. You have to give about
11 two thirds the weight to it. You have to give more weight to
12 the wet weather data. Statistically the wet weather days are
13 one third of the year. And so, to interpret it here, the
14 Beaver Dam area, which is housing, is shown to have somewhat
15 more pollution loading for the area than the average of the
16 two agricultural areas.

17 MR. ENGLISH: Thank you. I have no further
18 questions.

19 MISS THOMPSON: Your Honor, I do have one or
20 two more questions.

21 **CROSS EXAMINATION BY MISS THOMPSON:**

22 Q General Whipple, Mr. English directed your
23 attention to the discussion of main findings in Predicting
24 Future Growth of Organic Pollution in Metropolitan Area Rivers.
25 And after taking you through the statistical data, he stopped.

1 Could you read me the last paragraph? A "The above
2 statistical conclusion should not be interpreted as meaning
3 that the desired water quality standards cannot be met. They
4 can be, but only if planning is based upon systematic quanti-
5 tative analysis related to projected demographic and economic
6 projections. Moreover, studies must be made to determine
7 more accurately what the unrecorded pollution sources consist
8 of and which of them can be controlled or treated. Also,
9 consideration should be given to various alternatives, inclu-
10 ding industry aeration, which other studies have shown may be
11 economic alternative for treating polluted rivers."

12 Q With regard to your reference to analysis
13 based on projected demographic projections, have you at any
14 time determined what the Somerset County Planning Board
15 demographic projections are for the town of Somerville?

16 A No, I have not.

17 Q The town of Somerville is, in fact, in the
18 Upper Raritan Basin as you studied it, is it not?

19 A Yes.

20 MISS THOMPSON: I have no other questions.

21 RE-CROSS EXAMINATION BY MR. LANIGAN:

22 Q General, on redirect counsel read you a por-
23 tion of your deposition on June 5, 1972, page 14, in which you
24 spoke of large centers of population being tremendous sources
25 of pollution. Those population centers are New Brunswick and

1 Highland Park and so on, are they not? A These
2 are the largest ones, yes.

3 Q Are there any others? A Yes, of
4 course, Somerville, Bound Brook, Princeton, Hightstown.
5 They are all in the basin.

6 MR. LANIGAN: Thank you. I have no other
7 questions.

8 THE COURT: General, there are just a couple
9 of points I would like to clear up in my mind.

10 I believe you spoke of the discerned improve-
11 ment in the Raritan River water quality over the
12 recent years. And in your opinion, you attributed it
13 to the non-use of Round Valley and Spruce Run water
14 for water company distribution, I gather. Do I
15 understand you correctly? Are you saying that, in
16 effect, if you put ten pounds of something in 100
17 gallons of water, you have a heavier concentration
18 than if you put 10 pounds in 80 gallons. So if the
19 State had been pulling a percentage of the water, you
20 would find that the quality would be lower?

21 THE WITNESS: That's right.

22 THE COURT: Do water companies clean water
23 after they take it from the river sources, filter it
24 or make it chemically clean?

25 THE WITNESS: They do, and they usually have

1 to treat it chemically as well.

2 THE COURT: So that the pollution level at
3 the source is not fatal to its use for water distribu-
4 tion systems, or by water distribution systems for
5 human use and consumption?

6 THE WITNESS: Unless it goes too low. The
7 Upper Passaic River at certain times, the water has
8 become anaerobic and they have had to stop using it
9 for limited periods of time during droughts.

10 THE COURT: And you speak of aeration. Just
11 for my personal curiosity, are rapids a natural form
12 of aeration?

13 THE WITNESS: They are indeed. They have the
14 same effect as mechanical aeration; increasing the
15 air, the oxygen content of the water.

16 THE COURT: Thank you very much. Any further
17 questions?

18 MR. LANIGAN: No questions.

19 MISS THOMPSON: No questions.

20 MR. ENGLISH: Just one.

21 BY MR. ENGLISH:

22 Q Is there an element of expense involved in the
23 treatment of water by a water company before it is distributed
24 to its customers? A Yes, quite a lot. The water
25 companies have considerable expenses on account of chemicals

1 and installations required for treatment.

2 MR. ENGLISH: Thank you.


3 THE COURT: All right. We will take a recess,
4 the normal morning recess for the next 10 minutes.

5 (Whereupon a recess was taken)

6 MR. KENNEDY; Your Honor, we have some
7 portion of deposition transcript which we would like
8 to read into the record, the deposition of Asher C.
9 Smith taken in Newark, November 18th, 1971.

10 THE COURT: Approximately how many pages are
11 you planning to read?

12 MR. KENNEDY: Very brief, about 

13 THE COURT: If you were going to 
14 extended portion, I would get the transcript myself
15 and follow you.

16 MR. KENNEDY: Very brief. Beginning page 2,
17 lines 8 thru 14.

18 "Question: Are you connected in some way
19 with the plaintiff in this action, the Allan-Deane
20 Corporation?

21 "Answer: I am the President of the Corpora-
22 tion.

23 "Question: Do you have any position with the
24 Johns Manville Corporation?

25 "Answer: Yes, I am Director of Johns Manville

1 and Vice President of the Johns Manville Corpora-
2 tion."

3 MR. LANIGAN: If the Court please, I hesi-
4 tate to interrupt counsel, but this is the first
5 I have heard that they are going to introduce the
6 deposition, especially of the plaintiff. And I have
7 no objection other than to try to find out in my own
8 mind why it may be that Mr. Smith will be appearing.
9 My understanding of the use of the depositions is an
10 aid rather than as testimony. Perhaps it won't be
11 necessary to call anyone from the plaintiff. Perhaps
12 counsel can enlighten me as to the purpose of reading
13 portions of a deposition on which no cross examina-
14 tion took place and which, up to this point had
15 not planned to call Mr. Smith.

16 THE COURT: You are not objecting to it, so
17 I won't rule on that. But you are--

18 MR. LANIGAN: Asking for the courtesy of a
19 clarification.

20 THE COURT: Requesting something by way of
21 an offer of proof, I think is a reasonable request.

22 MR. KENNEDY: Your Honor, we are using this
23 deposition simply to establish certain facts with
24 respect to the acquisition of the Allan-Deane tract
25 in Bedminster. I don't think that counsel will find,

1 when I finish reading, any matter that is particularly
2 controversial, I might note that Mr. Smith is a
3 resident of Denver, Colorado, and of course is beyond
4 the reach of subpoena. It was always my understanding
5 that Mr. Lanigan did not expect to produce him here
6 in Court.

7 MR. LANIGAN: I respectfully submit that those
8 are matters which could have been, and can be and
9 should be, a matter of a stipulation. I am perfectly
10 willing to stipulate as to its acquisition and stipu-
11 late as to any of the facts surrounding the acquisi-
12 tion by Allan-Deane of its land in Bedminster.

13 MR. KENNEDY: Be that as it may, as the Court
14 noted, Mr. Lanigan is not objecting. I made an offer
15 of proof, and I think we, as far as convenience and
16 wasting time, I could have finished my reading by
17 now. I would like to proceed.

18 MR. LANIGAN: Thank you.

19 THE COURT: I understand the rule regarding
20 depositions. You can use the deposition of a party
21 for an officer of a corporate party, I believe the rule
22 says, for any reason, for any purpose. So you may
23 proceed if it is your choice to present the material.

24 MR. LANIGAN: No objection.

25 MR. KENNEDY: Page 3, line 17.

1 "Is Allan- Deane Corporation a wholly owned
2 subsidiary of Johns Manville Corporation?

3 "Answer: Yes.

4 "Question: What were the purposes of Johns
5 Manville in creating the Allan-Deane Corporation?

6 "Answer: The purpose of the corporation was
7 to own property to develop it.

8 "Question: And are the proposed developments
9 connected with the other activities of Johns Manville
10 Corporation, their manufacturing and selling activities?

11 "Answer: You mean does Johns Manville have
12 other developments?

13 "Question: Let me withdraw the question.

14 "Answer: Yes.

15 "Question: How would you describe the business
16 activities of Johns Manville Corporation?

17 "Answer: Johns Manville is a manufacturing,
18 distributing company that is in many businesses.

19 "Question: Now, is the uses to which Allan-
20 Deane proposes to devote its property directly related
21 to some of the other activities of Johns Manville, or
22 by contrast, is it simply a profit-making venture?

23 "Answer: It is an investment for Johns Man-
24 ville.

25 "Question: And the purpose of the investment

1 is to make some money for Johns Manville?

2 "Answer: Certainly."

3 And the last reading begins at page 5, line
4 17.

5 "Question: Now, I understand that Allan-Deane
6 actually acquired title to this land in Bedminster
7 Township in 1969?

8 "Answer: Yes, I believe that is right.

9 "And Allan-Deane also owns land in Bernards-
10 Township?

11 "Answer: Yes.

12 "Question: And its land in Bernards Township
13 adjoins its land in Bedminster, or in a sense is part
14 of the same tract?

15 "Answer: Right. Yes.

16 "Question: Approximately when did Allan-Deane
17 buy the land in Bernards Township?

18 "Answer: Approximately the same time.

19 "Question: Now, at the time the plaintiff
20 bought its land, did it know that the lands in Bedmin-
21 ster which it was buying were located in a five acre
22 minimum lot zone?

23 "Answer: Yes.

24 "Question: And what was the zoning in Bernards
25 Township with respect to land you bought there?

1 "Answer: Three acre.

2 "Question: What was the approximate price
3 per acre that you paid for land in Bedminster?

4 "Answer: It varied. I almost would have to
5 get the records to tell you for sure. Some of the
6 properties were part in Bedminster and part in
7 Bernards. So it is almost impossible for me to tell
8 you this without checking the records.

9 "Question: Well, without distinguishing
10 between Bernards and Bedminster, can you give me a
11 ball park figure?

12 "Answer: Yes. \$3,500 an acre, average.

13 "Question: That is the whole works?

14 "Answer: Average.

15 "Question: Incidentally, if I occasionally
16 used the word you, I am referring to the company, not
17 you personally.

18 "Answer: Right. Yes, I understand."

19 Thank you. That is all I have.

20 THE COURT: Thank you.

21 MR. ENGLISH: Mr. Larson?

22 P E T E R W. L A R S O N, being called as a witness on
23 behalf of the Township of Bedminster, is duly sworn and testi-
24 fied as follows:

25 DIRECT EXAMINATION BY MR. ENGLISH:

1 Q Where do you live, Mr. Larson?

2 A I'm a resident of Stanley Place, Chester Township,
3 Morris County, New Jersey.

4 Q What is your occupation? A I'm a
5 Executive Director of the Upper Raritan Water Shed Association.

6 Q How long have you held that position?

7 A I came to New Jersey in June of 1971.

8 Q And when you came to New Jersey, did you
9 immediately assume the position you described? A Yes,
10 sir.

11 Q Whereabouts is the office of the Upper Raritan
12 Water Shed Association located? A Our office is
13 located in the municipal building of Far Hills.

14 Q Does the association pay for its headquarters
15 there? A Yes.

16 Q Will you tell us, please, what your formal
17 education has been? A I'm a graduate of the
18 University of Massachusetts with a Bachelor of Science Degree
19 in Agriculture and Biology. And I got that in 1958, And I
20 graduated with an M.S. in Agricultural and Economics in June
21 of 1970.

22 Q And from what institution did you get your
23 M.S. degree? A From the University of Massachusetts,
24 Amherst.

25 Q What has been your employment and experience

1 since graduating from college in 1958? A In 1959
2 I was in the U.S. Army on training assignment in the Reserves.
3 Following that, continuing with the line of employment, I
4 joined the Cooperative Extension Service of the University of
5 Massachusetts, a branch office in Walpole, Massachusetts,
6 where I worked from that office in several different positions
7 for the next 11 years.

8 Q What general field of activity was the
9 Cooperative Extension Service working in? A It is
10 an educational agency utilizing funding from the U.S. Depart-
11 ment of Agriculture, the State University and the cooperating
12 counties. In this case there were four cooperating counties.

13 Q Was this an agricultural extension service?
14 A My position dealt with agriculture, with land use and
15 with community affairs in the conservation and resource
16 development field.

17 Q And did you hold that position up until the
18 time that you came to New Jersey in 1971? A Yes,
19 I did.

20 Q Prior to coming to New Jersey, had you had
21 any experience with a water shed association?

22 A Yes, sir.

23 Q What was that? A As a part time,
24 let us say extracurricular activity, my involvement was
25 beginning in 1960 with many environmental organizations. I

1 began work on the Charles River Water Shed Association in
2 the greater Boston area and became the coordinating director
3 of this as a part time job. I later assisted in the organi-
4 zation of several other water shed associations on the
5 Natural River, for example, the Merrimack River, the South
6 River, and became the President of the Blackstone River
7 Water Shed Association. And this position I held from 1968
8 until my move to New Jersey in 1971.

9 Q Whereabouts is the Blackstone River Water
10 shed located? A Southeast or South central Massa-
11 chusetts. It runs--the Blackstone River begins in the
12 Worcester, Massachusetts area, central Massachusetts, and
13 runs southward to Providence, Rhode Island and enters the
14 Atlantic at that point.

15 Q Will you describe for the Court what the
16 Upper Raritan Water Shed Association does? What are its
17 purposes and what are its activities? A The Upper
18 Raritan Water Shed Association is a 501C3 under the Internal
19 Revenue Service code, which basically means it is a charit-
20 able non-profit tax exempt educational institution. It is a
21 privately funded organization relying solely upon contribu-
22 tions and gifts which are in turn tax deductible to the
23 donor. And the work carried on by the Association in the
24 public interest demanded by the Internal Revenue Service code,
25 this work deals with the public affairs of communities and

1 with land owners and with everyday citizens in terms of
2 environment, environmental quality. Specifically, my focal
3 point as Executive Director is dealing with community planning
4 boards, boards of adjustment, mayors, councilmen and their
5 professional consultants as a land consultant in terms of
6 environmental quality and providing information and services
7 in an educational sense to all of these groups in a direct
8 manner in terms of telephone conversations, in terms of
9 attending meetings, and specifically in terms of educational
10 meetings which we sponsor and cosponsor with other groups
11 such as county planning boards, Rutgers University and other
12 water shed associations.

13 It is a broad spectrum educational consulting
14 service in terms of land use and water quality.

15 Q Was the Upper Raritan Water Shed Association
16 already in business before you became its Executive Director?

17 A Yes. The Upper Raritan Water Shed was formally
18 incorporated in 1958 and employed its first Executive Director
19 in approximately 1964, I believe.

20 Q Now, in connection with its work, has the
21 Upper Raritan Water Shed Association entered into any research
22 contracts with the Academy of Natural Sciences of Philadelphia?

23 MR. LANIGAN: If the Court please, if we have
24 completed the qualifications of the witness, I wonder
25 if I might make inquiry as to his status here today?

1 Up to this point, the two witnesses offered by the
2 defense have been public in character. The first,
3 the County Planning Director, I know is not being
4 paid to testify and is here, in fact, under subpoena.
5 The second witness, General Whipple, is, to my know-
6 ledge, not being paid to testify but may, from some
7 independent source, receive a donation to Rutgers.

8 I question, and really I seek clarification,
9 as to Mr. Larson's status, whether he is here as a
10 paid consultant, one employed by the Township as an
11 expert, or one as a Director of the Water Shed Associ-
12 ation, and whether that Association has been subpoenaed
13 or whether he has been subpoenaed. I have no objection
14 to his testimony, but I think for the record and for
15 what follows the Court and this courtroom should be
16 aware as to his capacity.

17 THE COURT: Do you have any objection to
18 eliciting that information at this point? It is, of
19 course, available through cross examination.

20 MR. ENGLISH: Shall I ask more questions? All
21 right.

22 Q Mr. Larson, have you been retained under any
23 contract by Bedminster to act as an expert witness in this case?

24 A No, sir.

25 Q Has there been any promise by Bedminster to pay

1 you for your testimony? A No, sir.

2 Q Do you regard your appearance here as with-
3 in the scope of the public education and consulting functions
4 which you have just described from the witness stand?

5 A I do.

6 MR. LANIGAN: Have you, or the Water Shed,
7 been retained by the Township to review the environ-
8 mental impact statement on the same substance or
9 with regard to the same testimony you are going to
10 give today?

11 THE WITNESS: I will have to answer that
12 indirectly by saying that we have been retained by
13 Bedminster's Committee on the project to review that
14 specific environmental impact statement along with
15 several other consultants.

16 MR. LANIGAN: What were you paid?

17 THE WITNESS: I believe the figure was in
18 the vicinity of \$3,000.

19 MR. LANIGAN: Is the subject matter of that
20 examination substantially similar to the testimony
21 you are going to give today?

22 THE WITNESS: The substance of the examina-
23 tion of the A.T. and the environmental impact state-
24 ment is based upon these very preliminary resource
25 inventory maps and information which I will be giving

1 testimony on. However, I would further qualify
2 that by stating that the process of environmental
3 impact review is far more complex than the foundation
4 which we are about to weigh.

5 MR. LANIGAN: When were you retained by the
6 Township to make this examination of the environ-
7 mental impact of the A.T. and the application?

8 THE WITNESS: Approximately October of 1973.

9 MR. LANIGAN: Do you know what source of
10 funds you are being paid with?

11 THE WITNESS: Not as a matter of direct know-
12 ledge, but as a matter of indirect knowledge. I would
13 state that it is the A.T. and the environmental
14 impact review formula which is under the Bedminster
15 ordinance which has required the applicant to provide
16 funds for this purpose.

17 MR. LANIGAN: That amount was substantially
18 in excess of \$50,000, was it not?

19 THE WITNESS: I could not say.

20 MR. LANIGAN: Did you utilize these charts
21 and make an examination of the Raritan and Raritan
22 Water Shed to inform the Township as to the impact
23 of the A.T. and the application?

24 THE WITNESS: I did.

25 MR. LANIGAN: I have no further questions.

1 BY MR. ENGLISH:

2 Q Mr. Larson, has the Upper Raritan Water Shed
3 Association entered into any research contract with the
4 Academy of Natural Sciences in Philadelphia?

5 A Yes, we have.

6 Q Do you know about how many specific contracts
7 have been made between the Water Shed Association and the
8 Academy? A To my knowledge there have been three

9 specific contracts.

10 Q And did some of those antedate your arrival
11 at your present position? A Yes, sir, two of these;
12 1967 and 1969.

13 Q As a result of the work which the Water Shed
14 Association engaged the Academy of Natural Sciences to per-
15 form, were any reports furnished to the Water Shed Association

16 by the Academy? A As a result of these contracts
17 we have received three reports; the first of these is the
18 Water Quality Studies.

19 Q I show you a document which is entitled Water
20 Quality Survey, Upper Raritan Water Shed for the Upper Raritan

21 Water Shed Association, Inc., Far Hills, New Jersey, August
22 and November, 1967, and ask you if you can tell the Court
23 what that document is? A This is a study that the

24 Water Shed Association paid the Academy of Natural Sciences of
25 Philadelphia to do, what amounts to a biological analysis of

1 the stream quality in the Upper Raritan Water Shed. The
2 methodology is described on page 5, and basically deals with
3 the process of indexing the types of animals, organisms found
4 in the stream as to their number of species and the diversity
5 of those species as an indicator of stream health. There
6 were 23 stations that were studied with conclusions about
7 each of the studied stations in terms of environmental quality.

8 The back page, page 22, contains chemical
9 data, and the final inside cover, facing page, contains a
10 map showing all of the stations and a color chart indicating
11 the healthy, healthy and rich, semi-healthy and polluted
12 sections of the water shed.

13 Q Is this document one of those which resulted
14 from a contract between the Association and the Academy?

15 A Yes, sir.

16 MR. ENGLISH: May I offer the document Water
17 Quality Survey, Upper Raritan Water Shed into evidence?

18 MR. LANIGAN: No objection.

19 MISS THOMPSON: Your Honor, it is my under-
20 standing that this document and additional documents
21 were prepared under the supervision of Dr. Ruth
22 Patrick, who is, herself, supposed to testify here.
23 And with regard to cross examination concerning the
24 document and any questions concerning their admissi-
25 bility, I would submit it ought to wait until the

1 person who supervised the study is actually here.

2 MR. ENGLISH: I think technically Miss
3 Thompson is correct. In making the offer, I was
4 proceeding on the assumption that there had been the
5 deposition that counsel for Allan-Deane took, and my
6 recollection is that Dr. Patrick had authenticated
7 and assumed full professional responsibility for
8 these documents at that time. But if counsel for
9 Cieswick objects, I think they are technically correct.
10 I will mark it for identification.

11 (Document referred to above received and
12 marked D-25 for identification)

13 Q Now, I show you another document, Mr. Larson,
14 and ask you if you can tell the Court what that one is?

15 A This document is entitled Water Quality Studies of
16 The Upper Raritan Water Shed for the Upper Raritan Water Shed
17 Association, dated May 1968 thru October 1969, conducted by
18 the Academy of Natural Sciences of Philadelphia, Department
19 of Limnology.

20 Q Mr. Larson, is this document you just identi-
21 fied prepared by the Academy for the Water Shed Association
22 pursuant to one of these contracts you have referred to?

23 A Yes. This is a result of the 1969 circa 1969, 1970
24 contract between the Water Shed and the Academy.

25 MR. ENGLISH: May I have the document

1 identified by the witness marked for identification?

2 (Document referred to above received and

3 marked D-26 for identification)

4 Q Now, Mr. Larson, I show you another document

5 and ask you if you can tell the Court what this one is?

6 A This is the Natural Resource Inventory of the Upper
7 Raritan Water Shed Association.

8 Q Not of the Association? A I'm

9 sorry, of the Upper Raritan Water Shed. It was done for the
10 Raritan Water Shed Association, again, by the Academy of
11 Natural Sciences of Philadelphia.

12 Q What is the date of that?

13 date of this document is July 1969.

14 Q Was this natural resource inventory prepared
15 by the Academy pursuant to a contract between it and the
16 Water Shed Association? A Yes, sir.

17 MR. ENGLISH: May I have the natural resource
18 inventory marked for identification?

19 (Natural resource inventory received and
20 marked D-27 for identification)

21 Q Now, Mr. Larson, did the natural resource
22 inventory prepared for the Association by the Academy of
23 Natural Sciences include material in addition to this verbal
24 report which has been marked Exhibit D-27 for identification?

25 A Yes, sir.

1 Q Generally what did the additional material
2 consist of? A Generally a series of maps which
3 describe the physical features of the Upper Raritan Water
4 Shed area.

5 Q Are those the maps which are displayed, after
6 a fashion, in the courtroom now? A We have in the
7 courtroom some of those maps. There is a total of approxi-
8 mately 18 maps in all. We have six maps here today.

9 Q Perhaps I should ask you to define or describe
10 the geographical boundaries of the Upper Raritan Water Shed,
11 which I assume is the area of land that your Association is
12 primarily interested in. A Yes. The Upper Raritan
13 Water Shed area is a 190 square mile land area, approximately
14 three per cent of the State of New Jersey's surface area,
15 it runs in the--the land area comprises all or parts of 20
16 municipalities. It is split into Somerset County, Morris
17 County, and Hunterdon County.

18 The township boundaries, starting from the
19 southeast corner of the Water Shed, run approximately the
20 northern fringe of Bridgewater Township along the Washington
21 Valley Ridge line of the Watchung Mountain Range, which is
22 just over the Bernards Township line up into Washington Valley,
23 along the ridge of the Watchung Mountain Range upwards to
24 Far Hills, and crossing from the Watchungs, the headwaters of
25 Mine Brook in Bernardsville center following the mountain

1 range around through the area known as the Mountain in
2 Bernardsville on upwards past the Ravine Lake Area to
3 Mendham Township, And it includes about half of Mendham
4 Borough.

5 It winds on up through Randolph Township up
6 to the Ironia section and then upwards to the area of Mine
7 Hill approximately at Route 80, and then comes down the
8 Water Shed boundary between the North Branch and the South
9 Branch down through Chester Tenship on the line with
10 Roxsbury and Mount Olive, splitting the line, the Town of
11 Chester, between the South Branch and the North Branch
12 Water Shed at that point, the Black River Water Shed at that
13 point. Coming down to Washington Township, down to
14 Tweeksbury Township and takes in about 90 per cent of
15 Tweeksbury Township. It then comes down to Clinton and
16 surrounds Readington, and then back down to Branchburg, a
17 section of Branchburg, back to meet the confluence of the
18 North Branch and the South Branch, which defines the Upper
19 Raritan Water Shed area.

20 Q What would be the names of the main streams
21 that flow through the Upper Raritan Water Shed that you have
22 just described? A The Upper Raritan Water Shed has
23 two principal streams; the North Branch of the Raritan, and
24 the Lamington River, which has another name in Morris County,
25 the Black River--Lamington and Black being the same stream,

1 different names in different counties. Those are the two
2 principal streams we are talking about.

3 In addition, there are several other
4 tributary streams to each of these. If you wish, I can give
5 you that detail.

6 Q Now, I show you another document and ask you
7 if you can tell the Court what this one is, please?

8 A This is still a fourth contract, which is still
9 incomplete in that the final bill has yet to be paid on it.
10 This is a study done by the Academy of Natural Sciences,
11 once again, the Department of Limnology and Ecology. The
12 study title is Upper Raritan Water Shed, Water Quality Survey,
13 1972 for the Upper Raritan Water Shed Association.

14 Q What is the date of this document?

15 A The date is March 1974.

16 Q The document in your hand is not really the
17 contract between the Association and the Academy. It is,
18 rather, the report resulting from the contract?

19 A This is a final draft report.

20 MR. ENGLISH: May I have the document marked
21 for identification?

22 (Document referred to above received and
23 marked D-28 for identification.)

24 Q Mr. Larson, may I direct your attention to
25 one of the maps which you told us is part of the natural

1 resource inventory, and in particular, to the one bearing the
2 number 2 and the heading Geology. Can you tell the Court,
3 please, what that map shows? A This map is a base
4 map upon which much of the information in the resource
5 inventory is derived. It shows the land area of the Upper
6 Raritan Water Shed on a base map of the U.S. Geological
7 Survey, which is at a scale of one inch equals 2,000 feet.

8 It shows in the background--it shows the
9 contour elevations, the standard of contour elevations. And
10 superimposed upon this map in many colors are interpretations
11 of the bedrock and surficial soil geology as to their forma-
12 tive base in geological history and their present features
13 in terms of the physical features of the Water Shed.

14 It further shows in terms of interpretation
15 that the area roughly in the Southern half of the Water Shed
16 on a line running approximately from Round Valley Reservoir
17 in the Southwestward corner of the Water Shed, diagonally
18 Northeastward, that at the point over to, roughly, using a
19 landmark of Ravine Lake and the Watchung Mountain Range, the
20 area Southeastward of this colored yellow on this map is an
21 area of the Piedmont Plateau. Basically, the geology of this
22 area rather comprises the triassic shale, and that is so keyed
23 with the Brunswick shale color on the identification of the
24 key to the map.

25 This area just described is the principal

1 portion of Bedminster Township.

2 Q Could I interrupt you? Could you indicate,
3 without a permanent marking, but for the edification of the
4 Court and counsel, the approximate boundaries of Bedminster

5 on this map? A Yes, sir. They show up in terms
6 of county lines and town lines. I will start in the--for
7 the purpose of the record, this is an approximation of the
8 Interstate Highway 78 and 287. These were put on this map
9 by more or less a guess work process because the topographic
10 sheets used for this survey pre-dated the actual construction
11 of those highways. They have since been superseded--in the
12 process of an expensive re-doing of these maps, [REDACTED]
13 necessitate quite a considerable cost, so this was not done.
14 These are the only inaccuracies that I will stipulate.

15 However, the boundaries of Bedminster Town-
16 ship run approximately on this dotted line, here, to the
17 Washington Valley corner around Pluckemin. You can follow it
18 Northwesterly to Far Hills, sharing the boundary with the
19 Raritan River; following the Raritan River to the confluence
20 of Peapack Brook, where we pick up the boundary, Peapack-Glad-
21 stone, which is cut out of the land area.

22 We go around along Peapack Brook, the boundary
23 of Bedminster, between Peapack-Gladstone, and follows 206, which
24 is a solid line highway which may be easier to see on some of
25 these other maps than on this particular one.

1 We pick up the county line, it comes on a
2 diagonal like this. That is the Northern boundary, also,
3 of Bedminster with Chester Township. We come along here,
4 along this county line, town line, to Pottersville. Then we
5 follow the Black River and Lamington River in this case
6 along the common boundary within Tweeksbury Township on down
7 to the Lamington River to the confluence of the North Branch,
8 and that becomes the other boundary, and we take off cross
9 country back over to Pluckemin, using the Chambers Brook,
10 following it down like this to the confluence, and pick up
11 Chambers Brook as the Southern boundary back up to its head-
12 waters and the boundary line once again which cuts back to
13 the ridge line of the Watchung Mountain Range.

14 Now, that is an approximate description.

15 Q Do the Watchung Mountains show up as any
16 particular color on this map, Mr. Larson? A Yes,
17 the Watchung Mountain Range is this sort of burnt orange
18 color, which is indicated on the key here as triassic basalt.
19 That is this area, here.

20 Q And it looks as though some light blue dots
21 are scattered through parts of Bedminster. Could you tell the
22 Court what they represent? A This area indicated
23 by these light blue dots is indicated on the map as river
24 drift. This is a geological phenomenon in that it is surficial
25 geology. What I mean is this was deposited on top of the

1 other bedrock of shale which underlies it. This river drift
2 results, according to the geology studies, from a glacial
3 outwash is that this Watchung Mountain range, back during the
4 era of glaciation, this mountain range served as a dam for
5 glacial Lake Passaic. This is an area ranged from Bedminster
6 up to Paterson, a huge lake. In the process of melting, the
7 glaciers, this water overflowed the dam at a place called
8 Moggy Hollow, and this is approximately the A.T. and the
9 site, by the way, for those that can identify the land area
10 that way.

11 Q Is Moggy Hollow also adjacent to a portion
12 of Interstate 287 in the Eastern part of Bedminster running
13 into Far Hills? A Yes. Moggy Hollow headwaters
14 start just above where 287 crosses Liberty Corner Road, or
15 Route 512 of Far Hills. That area is the scene, let us say,
16 of several waterfalls which are remnants of these glacial
17 eras.

18 The effect of that waterfall was to gouge out
19 a ravine. And in that ravine, which subsequent studies indi-
20 cate is somewhere between 50 and 100 feet deep, ground out of
21 shale, were redeposited layers of sand and gravel. And that
22 is what this river drift is all about. It is layers of sand
23 and gravel deposited in that ravine, ground out by these fast-
24 running waters back millions of years ago when the glaciers
25 were melting.

1 Q Just for the record, do I understand
2 correctly that the river drift you have described lies in
3 ~~Bedminster~~ Bedminster Township in approximately Bedminster Village in
4 a southeasterly direction more or less along and north of
5 the course of the North Branch River and down into Bridge-
6 water, or continuing down North Branch after it leaves
7 Bedminster and continuing also in a westerly direction up
8 Rockaway Creek, which flows into the Lamington River?

9 A Yes.

10 Q I call your attention to some dark blue, or
11 perhaps they are purple dots which lie in the central part of
12 Bedminster. Can you tell the Court what they represent?

13 A Yes. There are several groups of blue dots, ~~and~~
14 these relate to early drift which relates to leftovers, if
15 you will, of a glacier receding and melting. Analogous to a
16 bulldozer, a glacier moves earth in front of it as it is
17 progressing. As it recedes and melts away, the bulldozings
18 get left as a pile of earth. These blue dots represent this
19 type of formation of land formation in that they were put in
20 ~~place by a~~ glacier moving earth from some other point, most
21 likely to the north down across Bedminster and having dropped
22 there, it has melted and receded.

23 Q In terms of water, what, if anything, is the
24 significance of the river drift and the early drift?

25 A The significance is that the river drift is specific-

1 ally located in areas sort of like canyons below ground
2 having been filled up with gravel and sand. They inherently,
3 because of the soil structure, inherently hold more water
4 than the surrounding bedrock. Hence, they might be termed
5 aquifers, or areas which can store water. These are shown
6 on other maps for interpretive purposes.

7 Q Mr. Larson, may I direct your attention to
8 map number three, Ground Water Resources, and ask you to tell
9 the Court what that shows? A Yes, sir. This map
10 has the same base map as the other maps, the U.S.G.S. map,
11 for purpose of location. We have spoken about ~~Bedford~~
12 Township, the general area. We have as a key at the bottom
13 of the map three--four, rather, identifying colors.

14 The lightest blue is an excellent aquifer,
15 area.

16 Q Just let me interrupt you. What does the
17 word aquifer mean, Mr. Larson? How do you define it?

18 A A very simple definition would be an area from which
19 one could extract excellent water supplies.

20 Q By wells? A Principally by wells.
21 Continuing, the area previously described as
22 glacial drift is shown on the map in light blue context as
23 being an excellent ground water resource area.

24 The surrounding area, a little darker blue,
25 is termed good to excellent, and this is a representation of

1 mostly the shale areas found in Bedminster, Bridgewater and
2 parts of surrounding communities.

3 The next darker blue is only fair to good,
4 and this is representative of the larger part of the water
5 shed surrounding Bedminster. It is analogous to the granite
6 areas of the mountain ranges which run from Round Valley in
7 Clinton to Tweeksbury on up to Chester and Mendham.

8 The final area is shown in almost a black,
9 real dark blue, and that is represented as being a poor
10 ground water resource. And there are only a very few of
11 those areas in the water shed, notably the Watchung Mountain
12 ranges. Because of the basalt rock being extremely
13 this is a very poor ground water resource. Another
14 area in Readington Township, and the mountain around Round
15 Valley Reservoir. These are the poorest water resource areas
16 we have.

17 Q Well, what is the next map you would like to
18 talk about? A In terms of the use of this informa-
19 tion for environmental impact statement review, it is
20 necessary to next look at soils, the surface soils and their
21 interpretations for various land uses. And the characteris-
22 tics of soils are--that we are concerned about for urban
23 development purposes are basically will they wash away if
24 they are exposed to land clearing practices? Will utilities
25 be able to function if put in place? And that is a function

1 of slope. And thirdly, in terms of on site septic tanks, is
2 it feasible in terms of the characteristics of the soil?

3 I think I would prefer to take the area of
4 slope and K factor together. Perhaps we could start with the
5 K factor.

6 THE COURT: Why don't we start with that after
7 lunch? I think we have all absorbed enough for one
8 morning.

9 (Whereupon lunch recess was taken)

10 MR. ENGLISH: If the Court please, counsel are
11 agreeable to interrupting the testimony of Mr. Larson
12 to put on a couple of short witnesses who are
13 able to get rid of before we get back to Mr. Larson if
14 that is all right with the Court.

15 THE COURT: All right.

16 MR. LANIGAN: If the Court please, call Mr.
17 Darrington.

18 G E O R G E M. D A R R I N G T O N, is duly sworn and testi-
19 fied as follows:

20 DIRECT EXAMINATION BY MR. LANIGAN:

21 Q Mr. Darrington, where do you reside?

22 A I reside in the State of Pennsylvania, a town called
23 Chadsford. Would you care for an address?

24 Q No, thank you. By whom are you employed and
25 in what capacity? A I'm employed by Hercules

1 incorporated as a senior technical sales representative,
2 I currently work for their industrial systems department,
3 and more specifically the A.W.T. Systems, Incorporated
4 subsidiary.

5 Q What is your educational background?

6 A I hold a Bachelor of Science in Forestry from the
7 University of Toronto, Ontario, Canada; a Master of Science
8 in Forestry, specifically with science and technology from
9 the University of Washington in Seattle. I have also
10 completed substantial work towards my Masters in Business
11 Administration from both the University of Washington in
12 Seattle and the University of California in Berkeley.

13 Q Mr. Darrington, what is A.W.T. Systems, Inc.?

14 A A.W.T. Systems, Incorporated is a subsidiary corpora-
15 tion, 80 per cent owned by Hercules, Incorporated and 20
16 per cent owned by a New Jersey corporation, Procedyne Corpora-
17 tion, located in New Brunswick, New Jersey, that is in the
18 business of designing, manufacturing, installing and offering
19 services pertaining to sewerage treatment plants.

20 Q Do you design and manufacture these plants?

21 A Yes, sir, we do.

22 Q What do you call them? A These
23 plants are called tertiary physical chemical sewerage treat-
24 ment plants.

25 Q Are they so-called package treatment plants?

1 A Not really. Package would imply, shall we say, all
2 the same type. These are primarily custom engineered for
3 the specific job. However, we do have what I might call a
4 package of service to accompany these plants.

5 Q I show you a brochure and ask if you can
6 identify it? Tell me what it is. A Yes. This is
7 our A.W.T. Systems general brochure for mailing to interested
8 clients. It explains some of the details of our overall
9 operation.

10 MR. LANIGAN: I would like to ask that this
11 document be marked as PA-4 for identification.

12 THE COURT: It will be marked PA-4 for
13 identification.

14 (Document received and marked PA-4 for
15 identification)

16 Q Mr. Darrington, I show you another brochure
17 and ask if you can identify that? A Yes. This
18 brochure is provided by the Technology Transfer Division of
19 the Environmental Protection Agency, Washington, D.C., and
20 for general distribution, and it is a copy of their original
21 publication.

22 MR. LANAIGAN: I would ask that the brochure
23 entitled Physical Chemical Treatment, a New Process
24 for Treating Waste Water, be marked as PA-5 for
25 identification.

1 (Document referred to received and marked
2 PA-5 for identification)

3 MR. LANIGAN: If the Court please, I would
4 like to offer PA-4 and PA-5 into evidence from which
5 this witness will testify.

6 MR. BOWLBY: No objection.

7 THE COURT: All right. They will be
8 admitted.

9 (PA-4 and PA-5 for identification now
10 received and marked in evidence)

11 Q Mr. Darrington, very briefly, can you explain
12 in a non-technical manner the process which takes place in
13 terms of treatment of the sewerage in one of your systems?

14 A For our normal systems for residential development,
15 the general process would consist of an initial screening of
16 raw sewerage coming into the plant by some conveyance, usually
17 a graft sewer. The sewerage is then held in a surge tank,
18 which evens out the quality of the sewerage, and of course
19 accepts various surges and of course enables the plant to
20 draw from this large holding tank, if you will, at a uniform
21 rate. Thus you can process at a uniform rate throughout the
22 plant.

23 The second step, after the initial screening,
24 is chemical addition. We add various chemicals to achieve a
25 flockulation or settling of the pollutants that are within the

1 water, which of course goes on to the settling tank or
2 clarifier, which is, in essence, the third unit operation
3 within the plant.

4 The clarifier, the purpose of the clarifier,
5 is to allow the solids to settle to the bottom where they
6 are then collected. They are removed from the clarifier and
7 collected in a sludge hold tank. The supernatant liquid
8 then moves on from the clarifier through a final or tertiary
9 filtering process, which can be accomplished by several
10 devices, but in essence, the purpose is to remove the
11 residual suspended solid and biochemical oxygen demand
12 material, BOD, from the sewerage.

13 The final step, or I should say the second to
14 last final step, is a process, the process of taking the
15 sewerage from the clarifier, and of course, the final filter,
16 through a powdered or granular activated carbon. Normally,
17 for larger plants, the granulated activated carbon is used to
18 remove the dissolved organic material that is enabled to be
19 settled out in the normal settling process.

20 The final step, after going through the
21 granular activated carbon, consists of disinfection. The most
22 common process that we use is chlorination, which is generally
23 accepted nationally as one of the more common techniques. And
24 then of course discharge usually into some body of water or
25 flowing stream.

1 Q What is the quality of that discharged
2 effluent? A For typical plants we design, the

3 water will meet the following specifications; five day BOD;
4 less than five milligrams per liter.

5 Q Will you explain that? A BOD is
6 biochemical or biological oxygen demand. It is the amount of
7 oxygen required to break down the organics within the sewerage,
8 or in this case, treated water, and thus would give you a--if
9 you had a high amount of BOD, for instance, you would deplete
10 the oxygen, say, from a body of water that you discharged
11 into, such as a river or lake. A five day indicates the amount
12 of time that the test sample is taken for.

13 Q Whose standard is this? A This
14 particular standard is one that we have adopted at A.W.T.
15 because the majority of states that we have dealt with, I
16 should say, have felt that the five milligram per liter level
17 constitutes tertiary treatment, and generally, in most situa-
18 tions, is sufficient for direct discharge into lakes and
19 rivers.

20 Q Are you familiar-- A It is a very
21 clean water, if I might add. It is in essence 98 per cent or
22 99 per cent of the BOD is removed when it gets to that level.

23 Q Are you familiar with the State of New Jersey's
24 requirements in terms of BOD? A The requirements
25 vary as to location, and of course, the general type of sewerage

1 you are treating. Let me state that at this point we had
2 acceptance of these plants in this State wherein the design,
3 the original design, was to the five day, or five day BOD
4 level of five milligrams per liter.

5 In actual fact, we have one plant to stream
6 right now that is exceeding that by a substantial margin.

7 Q Where is that plant located?

8 A That particular plant is located in Freehold, New
9 Jersey.

10 Q With respect to your system, does it treat
11 the storm runoff ever in any respect? A Incidentally,
12 unless the water seeps into the system through infiltration,
13 that is, it seeps into a crack in the sewer or something of
14 that order. Incidentally, Mr. Lanigan, I did not complete my
15 response on the quality of the effluent.

16 Q I am sorry. Continue. You talked about BOD.
17 What other quality are there in terms of this effluent?

18 A One parameter people find is very important is suspended
19 solids. We normally remove to a five milligram per liter level
20 on suspended solids.

21 The third parameter that is normally measured is
22 phosphate level, and we remove down to .5 milligrams per liter
23 phosphates as phosphorus.

24 Q Is this removal in terms of the suspended solids
25 and the removal of the phosphates in accordance with accepted

1 State standards? A Based on the fact that the
2 State has accepted one complete plant and consensual approvals
3 in other cases, I assume that is the case, yes. I don't
4 believe the State, in too many instances, they don't
5 necessarily have a specific level you have to remove to.

6 Q They tend to do it on a case by case basis?

7 A Usually that is the case, yes.

8 Q You have looked, have you not, at the existing
9 effluence standards in the Township of Bedminster, which I
10 believe has been introduced as DC-9 into evidence. Have you
11 had occasion to form an opinion as to whether or not a system
12 designed by you could comply with those standards?

13 A After reviewing the standards adopted by Bedminster,
14 some of the major criteria we could certainly meet. Some of
15 the other criteria I would not be able to respond to because
16 I am not sure that these parameters are normally examined
17 where sewerage treatment is concerned.

18 Q What are some of those elements?

19 A Well, for instance, we do not normally test water, or
20 test effluent for items such as boron, cadmium, mercury.

21 Q Or for metals, for example? A That's
22 right.

23 Q Those are contained in the effluent standards?

24 A As I reviewed it, it did appear that they were, yes.
25 These are perhaps the guideline, or part of the guideline that

1 was adopted may have been some of the potable water standards
2 by the U.S. Public Health Service of 1962. I'm not sure about
3 that, though, Mr. Lanigan. That is an assumption.

4 Q Given the economics and the opportunity, is
5 it possible to comply with any of these other standards?

6 A Certainly. I believe they could be complied with.
7 Whether it would be economical to do so, I really couldn't
8 say.

9 Q Now, at the plaintiff's request, did you view
10 the plaintiff's property located in the Township of Bedminster?

11 A Yes, we did.

12 Q Have you given any consideration to the
13 tion of a sewerage treatment facility on that tract?

14 A Yes, we have discussed this on a cursory level with
15 the engineers for the project. And it was decided that although
16 we do not have any definition of the specific size of the
17 plant, nor the specific effluent quality that would be required,
18 we would be physically able to locate a plant on that site and
19 with good advantage,

20 Q Looking at plaintiff's exhibit PA-2, can you
21 describe in a general nature where such a plant would be
22 located? I show you a copy of plaintiff's exhibit PA-2.

23 A I take it this is the Town of Pluckemin, correct?

24 Q Yes. And I ask if you can tell, in terms of
25 words, describe for the benefit of the Court and the record

1 where you would locate such a plant? A We have
2 north direction here?

3 Q Yes. A In this case I believe it
4 would be in this area, and of course, the intersection of
5 278 and--

6 Q 287, I believe. A 287 and Route 78
7 is where, here?

8 Q Below. A Below here. All right.
9 And if I recall correctly, the intersection of Route 78 and
10 202, 206 is over in this location. The Raritan running this
11 way.

12 Q Perhaps if you looked at plaintiff's exhibit
13 PA-1 you could see the relationship to the surrounding highways.

14 A Oh, yes.

15 Q Looking at this exhibit, PA-1--

16 A As I recall, we were considering this particular plot
17 of land, here.

18 Q Would you describe for the benefit of the
19 record what quadrants of the plaintiff's property you are
20 pointing to? A To the northwest corner of a protrud-

21 ing section of land that appears to be primarily agricultural.

22 Q And in terms of locating the plant, what is
23 your proposal in terms of discharging any treated effluent?

24 A The matter that was discussed between us and the
25 engineers, the main thought was to run a pipe from the treatment

1 plant, assuming easements and concurrence by all agencies would
2 be obtained, from the plant to the North Branch of the Raritan.

3 [REDACTED] Thank you. Is it possible to do anything
4 else with the treated effluent other than to discharge it into
5 a stream? A Providing the appropriate agencies, be
6 that township, county or state, can give their concurrence,
7 the answer is yes, other techniques that may or may not have
8 been used in the State of New Jersey, but are in use elsewhere
9 in the country would consist of perhaps holding ponds wherein
10 you would have evaporation, percolation, spray irrigation.
11 Perhaps even from these holding ponds, if so desired, deep
12 well injection. I think those are the most common [REDACTED]
13 practices.

14 Q Now, assuming a land acreage of the plaintiff
15 of approximately 466 acres, 11 of which is zoned commercial,
16 and a proposed density of approximately five dwelling units
17 per acre, have you estimated, at the plaintiff's request, what
18 the total effluent produced would be from such maximum use?

19 A Yes, we have. As I recall, Mr. Lanigan, we were dis-
20 cussing the probability of multi family dwellings.

21 [REDACTED] That is correct. As contrasted to single--
22 single family or garden apartments. Based on 455 acres
23 to be utilized for residential at five units per acre, gives
24 us a total possible density of 2,275 units. If we are to
25 assume that the average occupancy per dwelling unit is three

1 persons and the generally accepted State guideline for
2 sewerage generated by an individual at 100 gallons per day,
3 this would give us 300 gallons per unit per day. Thus,
4 multiply that by our 2,275 units would give us a total esti-
5 mated sewerage generated of 6,800--excuse me, 682,500 gallons
6 per day.

7 The commercial property you were talking
8 about, some 11 acres, I believe the State guideline is
9 one/eighth of a gallon per square foot per day. If that is
10 correct, we have not as yet generated a square footage for
11 this particular property, but if we were to take an estimate
12 based on the type of shops you are considering, something in
13 the order of 16,500 gallons per day will be a reasonable esti-
14 mate, I believe.

15 Q Is your company able to design a system
16 capable of treating that volume of effluent? A Yes.
17 The total volume of effluent that the calculation would indi-
18 cate would be 699,000 gallons per day. The answer is yes,
19 our company is normally in the business of providing treatment
20 plants of lesser and greater size than approximately 700,000
21 gallons per day.

22 Q Have you designed similar systems elsewhere,
23 or proposed similar systems? A Yes, sir. We have
24 both proposed similar systems and we are in the process of
25 designing a few major systems of a larger size.

1 Q These are residential subdivisions?

2 A Yes, sir, they are.

3 Q Why have you not prepared any detailed
4 analysis as to what the particular dwelling units would pro-

5 duce on this property? A Specifically because the
6 developer, Allan-Deane Corporation, and the engineers, Donald
7 Stiers and Associates, have not as yet been able to define to
8 us the number of units that would be located on the property
9 nor the approximate occupancy level of the units that would be
10 placed on the property.

11 Q So you have used maximum figures in your
12 computations? A I have used figures that the

13 developer feels would be reasonable for the area.

14 MR. LANIGAN: Thank you, I have no further
15 questions.

16 CROSS EXAMINATION BY MR. BOWLBY:

17 Q I notice, in reading or hearing your qualifi-
18 cations, that you have a degree in Forestry. Are you licensed
19 by any professional engineering activities in New Jersey?

20 No, sir, I am not a licensed New Jersey professional
21 engineer. I am a member of the New Jersey--I do not recall the
22 name. New Jersey Waste Water Association. I have forgotten
23 the exact name, I'm sorry. The answer is no, I am not a
24 registered resident engineer.

25 Q Are most of your activities carried on in New

1 Jersey? A Do you mean mine, personally?

2 Q Yes. A I would estimate that
3 approximately 60 per cent of my daily activities for A.W.T.
4 Systems are oriented towards the New Jersey market, yes.

5 Q I notice that your title is a sales represen-
6 tative? A That's right, sir.

7 Q Does that briefly mean that you sell sewers?

8 A No, sir. It means that I am a representative market-
9 ing in all phases of marketing, I might add, for sewerage
10 treatment plants. Sewers would mean to me a line carrying
11 sewerage, perhaps.

12 Q Well, is your responsibility primarily
13 the marketing line rather than in the design line?

14 A That's correct, sir, yes.

15 Q Are you familiar with the general rule that
16 the effluent from a sewerage secondary plant should be no
17 more than one/tenth of the rate of flow in the stream to which
18 it is discharged? A I haven't come across that
19 specific number before, although I feel confident that some-
20 place in the State of New Jersey that rule would apply.
21 Dilution factor, as I understand it, as reviewed by the New
22 Jersey Department of Environmental Protection usually is
23 determined based on the specific case involved. The more
24 normal number I've heard in general discussion has been a
25 dilution factor of 7 to 1, or approximately 1/7, or 15 per cent.

1 Q Assuming a dilution factor of 7 to 1,
2 wouldn't you think it would be proper in designing a system
3 to first look at the rate of flow of the stream to which your
4 effluent is going to be discharged? A This cer-

5 tainly is a consideration, yes.

6 Q Have you done so? A Sir, we do not
7 claim to manufacture secondary treatment plants. So I am not--
8 I have not done sufficient research in the State of New Jersey
9 to determine the rules governing those particular plants. We
10 are producing tertiary treatment plants, and as a result, we
11 are not able to respond to dilution factors for secondary
12 plants.

13 In the case, what you are getting at, I believe,
14 certainly we would look at the stream. And I believe the
15 engineers have looked at the stream. The number that I have
16 heard--

17 Q Have you looked at it? A Have I
18 seen the river?

19 Q Yes. A The Raritan, North Branch?

20 Q Yes. A Certainly.

21 You examined the rate of flow in the North
22 Branch? A No, sir.

23 Q Has anyone from your firm done so?

24 A No, sir. This is not our normal line of duties. This
25 is normally accomplished by a professional engineer, usually

1 associated with an engineering company within the State.

2 Q Let us suppose the rate of flow is a little
3 less than it should be in the stream. Don't you think that
4 would be the first thing that your company ought to do is to
5 look at that rate of flow to see whether or not the effluent
6 can be handled by the stream? A This is not some-
7 thing for us to be decided, sir. This is to be decided by
8 the State of New Jersey Department of Environmental Protection,
9 by the county and by the township and any other governing
10 agencies that have jurisdiction. That is not something we can
11 decide.

12 Q It is a definitely limiting factor, is it not?

13 A Not necessarily. Not necessarily.

14 Q When isn't it? A I believe that in
15 some situations, and I can't speak specifically for New Jersey,
16 but I believe in some situations it may be deemed possible to
17 discharge high quality effluent and create a stream of its own.
18 I'm not sure if that is clear.

19 Q All right. Well, let us move on from that.

20 You have looked at the exhibit called PC-9,

21 Standards of Effluent Discharge to be Met in Township of

22 Bedminster? A If I might ask Mr. Lanigan, was this

23 the--yes, sir, I have.

24 Q When did you do that? A A moment ago,

25 perhaps a half hour or so ago.

1 Q Are you equipped by your education to pass
2 on the forty-some parameters set forth in these standards?

3 A No, sir, I'm not.

4 Q So you don't know whether or not your plant
5 would meet them or not, do you? A I have looked at--
6 I was able to specifically identify approximately of the 40,
7 if that is the correct number, approximately 5 or so that I
8 know we can meet.

9 Q But the other-- A The others I
10 would have to consult with our engineering department.

11 Q I see. And as I understand it, you ~~have not~~
12 definite--have been given no definite information as to the
13 quality or quantity of water in the North Branch River?

14 A No, sir, we have not received any information on that.
15 We have had, I might add, some verbal indication from the
16 engineers as to the volume as presented to them by the Depart-
17 ment of Environmental Protection. And I believe the quality
18 of the river, yes.

19 Q When did you view this property, actually
20 physically go on it? A Well, within the last week.
21 The specific day, I believe was last Thursday. I don't recall
22 the exact day. I believe it was last Thursday.

22 Q Is that the first time you had seen it?

23 A The first time I had personally seen it to inspect the
24 property for the suitability of a treatment plant, yes.

25

1 Q How far would you say that the closest edge
2 of this property is to the North Branch of the Raritan River?

3 A I would have to look at a map, but my estimate is--
4 and it is purely an estimate--is something on the order of
5 2,500 to 3,000 ~~thousand~~ feet. That is measured along what we
6 would consider a reasonable right of way or easement for such
7 an outfall line. There again I would have to refer you to
8 the consulting engineer for this.

9 Q Do you know who owns the property between
10 Allan-Deane's property and the Raritan River? A I
11 have no idea.

12 Q Is there a highway in between? I
13 believe there was a highway, yes, sir.

14 Q In your computation as to the feasibility of
15 such a project, did you consider the cost of the easements?

16 A No, sir, this is an area outside of our area of exper-
17 tise, if you will.

18 Q All you do is sell the plant, is that the idea?

19 A No, sir, it is not quite all. Certainly, we--as I
20 indicated before, we design in accordance with the parameters
21 outlined by the engineers a treatment plant. We will assist
22 them in obtaining the necessary approvals. We assemble what-
23 ever equipment we do not manufacture. And of course, we do
24 manufacture some equipment. We install it on turn key basis
25 and start up the plant for the client. And if appropriate, we

1 can offer an operation and maintenance agreement for that
2 plant for a period of time, usually not to exceed one year.

3 Q Don't you think it is important that there
4 be a way for the effluent from your plant to get to the
5 Raritan River? A If that is the decided course of
6 action for discharge, then yes, sir, certainly it would be
7 important.

8 Q Well, what are the alternatives?

9 A I think we have already indicated the alternatives,

10 Q I would like to hear them. A The
11 alternatives that I indicated before that would be possible,
12 perhaps--and here again, I can't give you expert testimony on
13 that point--but you have spray irrigation as one alternative,
14 evaporation percolation ponds as another. Those two can be
15 combined. Deep well injection is a third.

16 Q Have any of these alternatives ever been
17 installed by your company in New Jersey? A No, we
18 do not install those types of systems, sir. However, I can
19 say that in one particular case we will be going into what is
20 deemed a holding pond after the plant. It is sufficient to
21 hold three days of capacity prior to overflow of the ponds
22 into an intermittent stream.

23 Q Isn't it a fact that such lagooning or similar
24 systems to which you refer have never been approved by the
25 State Board of Health of the State of New Jersey?

1 A Sir, this is not normally termed lagooning. However,
2 I can't testify to that because I really don't know. I
3 really don't know what all of the approvals that the State
4 of New Jersey are.

5 Q Have you ever seen a system like that built
6 in the State of New Jersey? A A spray irrigation
7 or evaporation?

8 Q Yes. A Here again, I have not as
9 yet seen a spray irrigation system in the State of New Jersey.
10 As to whether or not one has been approved for installation,
11 I can't testify to that. I refer you to the State Department
12 of Environmental Protection for response to that question.

13 In the case of evaporation percolation ponds,
14 it would be reasonable to assume that there are some such
15 systems in the State, perhaps on the outflow side of a
16 secondary biological plant, perhaps.

17 Q You have made that assumption? A I
18 am making that assumption.

19 Q But you have never seen one? A I
20 am trying to recall. I can't recall a specific instance, no.
21 There is one situation, however, I can mention, and that is a
22 subsurface discharge system that was recently approved by the
23 State Department of Environmental Protection and has been
24 successfully operating for several months, if not more than
25 a year down in South New Jersey.

1 Q Where? A South Jersey, off the
2 Atlantic City Expressway. Specifically, Winslow Crossing.
3 In that particular case they have subsurface discharge, I
4 believe, and presumably they are meeting all specifications.

5 Q Now, the amount of units that were given to
6 you, Mr. Darrington, can you review that for me again, the
7 number of units that you assumed to get to the 699,000
8 gallons per day? A Yes. If we are to assume five
9 units per acre over a total acreage of 455 acres for resi-
10 dential construction, this would give us 2,275 dwelling units.
11 If we are further to assume an average occupancy of 3.0 per-
12 sons per unit at a volume of sewerage generated per person of
13 100 gallons per day, this gives us 682,500 gallons per day
14 coming from such a development. In the case of the--

15 Q Excuse me. I think I followed the rest of
16 your reasoning. Thank you.

17 MR. BOWLBY: That is all I have. Thank you.

18 REDIRECT EXAMINATION BY MR. LANIGAN:

19 Q How long have the Allan-Deane personnel been
20 discussing the possibility of a design of a sewerage treatment
21 facility with your company? A The earliest contact
22 I was able to find record of, I believe, was May of 1972.
23 That does not mean, however, that we hadn't been in contact
24 prior to that. It simply means that the only piece of informa-
25 tion on file dates back to that time.

1 Q So it is nearly two years ago?

2 A Yes, sir, it is.

3 Q Is there any possibility that this treated
4 effluent could be discharged in any stream on the plaintiff's
5 tract? A It is certainly physically possible.

6 Whether or not it is possible as determined by the governing
7 agencies is quite something else.

8 Q There is in fact a stream into which it
9 could be discharged, isn't there? A Yes, I believe
10 there is.

11 Q Are you aware of the sewerage treatment
12 facility across the street as part of the Department of
13 Environmental Protection--I'm sorry, as part of the Department
14 of Transportation? A Is this one that is currently
15 in operation now?

16 Q That is right. A I am only aware
17 of this through some information provided me by some other
18 people.

19 Q Do you happen to know where they discharge
20 their treated effluent? A No, sir, I do not.

21 MR. LANIGAN: Thank you.

22 RE-CROSS EXAMINATION BY MR. BOWLBY:

23 Q Do you know the rate of flow in the stream?



24 A No, sir, I don't.

25 BY MR. LANIGAN:

1 clarification? Are you referring to all housing
2 projects, low and moderate income?

3 Q Yes. What is the largest project of low
4 and moderate income housing-- A Seven million
5 dollars.

6 Q Now, have you prepared at our request an
7 analysis of the percentage of total costs of a housing pro-
8 ject represented by the various constituent elements that go
9 into it? A Yes, I have.

10 Q Is that the paper which you have put on the
11 exhibit board? A This is the chart I 
12 have some smaller copies of this as well if anybody .

13 Q Let me interrupt you. Perhaps for the record
14 we might offer the smaller copies into evidence.

15 MR. LANIGAN: I have no objection.

16 MR. BUCHSBAUM: I would like to first ask
17 the witness if he has prepared these charts himself.

18 THE WITNESS: Did I prepare this? Yes, myself.

19 MR. BUCHSBAUM: No objection.

20 THE COURT: All right, in evidence.

21 MR. ENGLISH: May I have a chart entitled

22 Cost Breakdown marked in evidence?

23 (Chart received and marked D-29 in evidence)

24 Q Mr. Hyerling, is the chart on the board a
25 blown-up version of the chart which has been marked D-29 in

1 evidence? A It is exactly the same.

2 Q All right. Now, will you tell us what this
3 chart shows? A Well, I broke the chart down into

4 the component parts of the project, breaking it up from the
5 acquisition of land, land purchasing, the actual--the land
6 preparation, land development, actual construction costs,
7 percentage construction costs broken down into the shell and
8 the mechanical and electrical components of the project.

9 Also brought in the factor of architecture, financing and
10 sales.

11 Q Are these the elements which are reflected
12 in the sales or rental price of a housing unit in such a
13 project? A I beg your pardon?

14 Q Could the reporter read the question back?
15 (Whereupon the pending question was read back)

16 A I'd say yes, on the promotion sales and advertising
17 would take care of that.

18 Q Well, I mean does your chart represent every-
19 thing that goes into the final cost that I would have to pay
20 if I were to purchase a unit in this housing project?

21 A Yes.

22 Q What kind of a housing development have you
23 assumed for the basis of your figures? A I have
24 taken three representative ones for this. I based it on, one,
25 a unit of 240 dwellings; another one 420; and third one, 150.

1 Q What kind of dwelling units were you thinking
2 of; single family houses, garden apartments? A I
3 was thinking primarily of town houses and also ground into
4 the larger one a mid-rise building of five stories.

5 Q What kind of units were in that mid-rise
6 building? A The mid-rise are primarily one and
7 two bedroom.

8 Q Apartments? A Yes. The low-rise
9 was a two, three and four bedrooms.

10 Q Now, will you please give us your breakdown
11 as shown on the chart? A I'd like to start with
12 the land first. This is a variable. It can run from 4 per
13 cent to approximately 10 per cent of the project, predicated
14 on where and when the project is being built. Some area land
15 values are much higher than others. That will run from 4 to
16 10 per cent of the total cost of the project. I arbitrarily
17 set a 6 per cent figure. I don't know exactly what the land
18 values are in Bedminster, but I think 6 per cent should cover
19 it, taking from that point to the actual construction work
20 and the land preparation.

21 Now, in the actual construction work, the
22 basic costs of the building, minus plumbing, heating and
23 electric, is approximately 34 per cent of the total cost of
24 the project.

25 The other large costs are mechanical and

1 plumbing, comprising approximately 22 per cent. If you want
2 a breakdown of that, I can give you that approximately.

3 **Electrical** breaks up 8 per cent.

4 The other figure which can also be a variable
5 is the site improvement, but I have taken, as I said before,
6 the three different projections and come up with a total cost
7 of the project and the total cost of site development, which
8 would be sewers, water, streets, drainage, and they come up
9 somewhere between 5 and about 8 per cent. But to strike up
10 a mean of the three, I pulled up 6 and $\frac{1}{2}$ per cent.

11 Landscaping, I put that in there, but I don't
12 know, some municipalities require landscaping and
13 not. It is a very small factor. It is only 5/10ths of
14 1 per cent.

15 Now, the next factor is the architecture and
16 engineering. This is almost a standard fee throughout the
17 country. Architects operate on approximately 6 per cent on a
18 project of this type.

19 The next figure, 4, financing, legal and
20 insurance, promotional sales and advertising, I took--came upon
21 these figures by the expertise of myself and associates of mine
22 in the company in setting up what it would cost to do for these
23 particular items. Financing is your interest and so on and
24 so forth; insurance, your insurance on the project to protect
25 it, and there is also a certain amount of legal fees. Promotion,

1 sales and advertising. Well, that is self-explanatory. And
2 the costs come up, not only for these three projects that I
3 have talked about, but for other projects where we--now, let
4 me preface it. Our company is not a developer. We don't do
5 any speculative work. But we have clients that might want a
6 project built, and we come up--the promotion, sales and
7 advertising from the figures we have given them and fed back
8 to our organization, it comes up to about 2 per cent of the
9 total project.

10 That makes up the entire chart. Now, over-
11 head and profit which, call it a developer or builder, what-
12 ever you might want, take the total and add 10 per cent to
13 the job, and that is where it will be. The total of all the
14 items plus 10.

15 Q On the chart and the item 1A under the heading
16 Construction, A is structural shell. You have an asterisk
17 and a footnote. Tell us about that, please?

18 A Assuming that a unit would be 1,200 square feet. If
19 the thing was increased, say, to 1,300 square feet or 1,320
20 square feet, to be specific, 10 per cent, increased by 10 per
21 cent, the cost would not vary too much. There would be an
22 increase of cost, but it would be too small to figure over the
23 total cost of the entire project to say at this time.

24 To go one step further, under the mechanical
25 and plumbing and electrical, should an apartment be increased

1 from 1,200 square feet to 1,300 square feet, assuming that
2 you have the same amount of plumbing fixtures, there would
3 not be any increase at all.

4 Under electricity, if the apartment would
5 increase, likewise from 1,200 to 1,300 square feet, you would
6 still have the same amount of electrical fixtures in the
7 thing and the same amount of outlets. It wouldn't make any
8 difference. Basically your cost would be in the general
9 construction field where you would be paying more for the
10 joists or sheeting or roof, whatever it may be overall, the
11 overall cost of the project wouldn't amount to too much.

12 Q If you increased the floor area by 10 per
13 cent, would you increase the total cost of the housing unit
14 by 10 per cent? A No, you would not. You wouldn't
15 because you would have to reflect the mechanical, electric
16 and plumbing at the same time. You can't do it. It wouldn't
17 cost that much.

18 MR. ENGLISH: You may cross examine.

19 THE COURT: Before you do, may we take five
20 minutes?

21 MR. ENGLISH: Sure.

22 (Whereupon a recess was taken)

23 MR. ENGLISH: I have concluded my direct
24 examination.

25 CROSS EXAMINATION BY MR. BUCHSBAUM:

1 Q Mr. Hymerling, when you gave a figure as to
2 the number of projects that you had worked on, how many pro-
3 jects have you worked on since 1930 that were low and moderate
4 income projects? A I'd say the two dozen or so
5 that we worked on were all moderate income housing.

6 Q Was that subsidized projects or private
7 market projects? A Three quarters of them were
8 subsidized projects.

9 Q When did you last work on such projects or
10 give a cost estimate for such projects? A Two
11 months ago.

12 Q Where was that project located?
13 A Princeton Township, Princeton municipal housing.

14 Q Was that done through a housing authority?
15 A Local housing authority. It was in conjunction with
16 the New Jersey Finance Agency in Trenton.

17 Q Are a good number of your projects done with
18 housing authorities? A I'd say 50 per cent of
19 them.

20 Q Now, with regard to the land cost specified
21 on D-29 in evidence, Mr. English suggested that we make it
22 clear that the chart to which you referred earlier is the same
23 chart, although a larger version, of D-29 in evidence. What
24 kind of cost did you have in mind that might affect the
25 percentage of land cost as a total of the whole?

1 A Well, the only variable would be the per acre cost,
2 and where the community, where the land lay. Now, if this
3 land was purchased in Princeton Township or Princeton Borough,
4 it would be much more expensive. We are doing a job now in
5 Princeton Borough of 76 units where the land cost was for 10
6 acres was \$450,000.

7 Q What kind of percentage would you come out
8 with in that case? A That case would be about

9 11 per cent. But by and large, most of the other projects,
10 you get away from Princeton Borough and Princeton Township,
11 they will be down. You can get land for some, oh, say
12 project which would need about 35 acres, you can buy the land
13 for \$225,000.

14 Q Let us assume first a land cost of roughly
15 \$10,000 an acre. What percentage would land cost then be
16 likely to be of total? A \$10,000 an acre?

17 Q Yes, sir. A I'd say the land cost
18 would not be anything more than 9 or 10 per cent maximum.

19 Q And how about \$20,000 an acre?

20 A \$20,000 would still be--say it is another per cent,
21 because the land is still one of the smallest factors of the
22 total cost of the project. You still have the building
23 construction, itself, which comes up to 60 some per cent.
24 Your finance charges, your architecture. They are going to be
25 about the same.

1 Q If land in Bedminster costs \$10, 20 thousand
2 dollars per acre, land cost would be 10 per cent of the total?

3 A Maximum.

4 Q What density did you have in mind when you
5 gave this cost breakdown? How many units per acre?

6 A It doesn't make any difference.

7 Q You mean it makes no difference whether there
8 is one unit on 10 acres as opposed to 10 units on 1 acre?

9 A No. Let me make a correction there. Whether it
10 makes one unit on 10 acres? Or what?

11 Q Ten units on one acre. A If
12 you are talking town house type construction, you
13 going to get one unit on 10 acres. This is predicated on
14 town house type construction.

15 Q What density are you referring to for town
16 house type construction? A I'd say about an
17 eighth of an acre a unit.

18 Q Eight units per acre? A Yes.

19 Q Supposing, then, it were mandated in the
20 zoning ordinance that you could only build at the density of
21 one unit per three acres. Would not that have an affect on
22 the land cost as related to the total project cost?

23 A One unit per three acres?

24 Q Right. A Naturally your land costs
25 are going to go up.

1 Q It would be, would you say, since this
2 density is 1/24th of the density you projected that the
3 increase in land cost in proportion to the total would be
4 substantial? A The construction cost wouldn't vary
5 that much, but the land cost would vary.

6 Q Right. Would you say that would be substan-
7 tial? A I still don't think it is going to exceed
8 12 per cent.

9 Q If you were to decrease the density allowed
10 by--to 1/24th of what you projected here so that you could
11 only have 1/24th as many units per acre, the land cost--

12 A I don't think land cost--land cost is not an important
13 variable in this thing. I think it is almost a constant.
14 You have got a gradation between, I'd say, 4 and a maximum of
15 12 or 14 per cent.

16 Q Well, supposing you have a unit cost of let
17 us say \$16,000 an acre. A Go ahead.

18 Q We build a density of eight units per acre.

19 A Yes.

20 Q What would be the land cost per unit?

21 A \$2,000 an acre.

22 Q Suppose you can only build, now, at a density
23 of one unit per acre? A You got \$16,000 an acre.

24 Q Isn't that a substantial difference in ultimate
25 cost? A But you are not talking the same ground

1 rules. Here you are talking about a town house, medium type
2 housing project. Now you are not going to get one unit per
3 acre on that type construction. So why raise the question of
4 that?

5 Q Why not? A I have never seen a
6 project like that.

7 Q How about three units per acre?

8 A I haven't seen three units per acre, not in a medium.
9 If you are talking about a housing project, that is different.

10 Q What do you mean by housing project?

11 A Some developers might come in and build 50 houses on
12 10 acres, individual houses.

13 Q We are talking now about town houses.

14 A We are talking about town houses, which is an entirely
15 different type premise.

16 Q So if the density were three units per acre,
17 you would say there would be no town house construction at
18 that kind of density? A No, sir.

19 Q So if the maximum density allowed under the
20 ~~Bedminster~~ ordinance were three units per acre, you would
21 expect no town houses to be built under that ordinance?

22 A I didn't think it would be.

23 MR. BUCHSBAUM: No further questions.

24 MR. LANIGAN: I have no questions.

25 MR. ENGLISH: No questions.

1 THE COURT: Thank you, Mr. Hymerling.

2 (Whereupon the witness is excused)

3 MR. ENGLISH: Mr. Larson?

4 P E T E R W. L A R S O N, having been previously sworn,
5 resumes the stand and testified as follows:

6 THE COURT: You are still under oath, Mr.
7 Larson.

8 BY MR. ENGLISH:

9 Q Mr. Larson, when the Court adjourned for lunch,
10 I think you were about to enlighten us about chart number 10,
11 the K factor. And I think my first question to you was what
12 is the K factor? What does it mean? A The K factor--
13 perhaps I should back off from my introduction of these maps
14 here and explain the basis of the information, the source of
15 the information.

16 You will note on each of the maps there is a
17 source credit, and it says U.S.D.A., which means U.S. Depart-
18 ment of Agriculture; S.C.S., which means Soil Conservation
19 Service. This is the result of a universal soil survey, which
20 the Federal Department of Agriculture has sponsored throughout
21 the country, and specifically to the New Jersey Soil Conserva-
22 tion Service headquarters in Somerset.

23 Now, Somerset County, Morris County, Hunterdon
24 County has each got its own soil conservation district. Each
25 one of those districts cooperating with the State has employed

1 a soil scientist, professional soil scientist, who has made
2 field surveys taking core samples of surface soils down to
3 the depth of bedrock, approximately 5 to 10 feet in most of
4 the area, and have taken these samples, of course, back to
5 the State laboratories and analyzed these as to their physical
6 and chemical properties. They have published this information,
7 and this is the basis of our resource inventory information.

8 This Academy of Sciences and their profession-
9 al land planner looked at this information, put it together
10 in an overlay map form--an overlay being one map placed on
11 top of another map--and the various interpretations
12 by this Soil Conservation Services information were
13 represented by colors. And the color representations are
14 shown on each of the charts as varying limitations, or ranges
15 of relationships.

16 In terms of the surface soils, then, we have
17 several different maps showing interpretive limitations about
18 the land. One of the first of these I would like to intro-
19 duce is the K factor. And for purposes of definition, K
20 factor--K relates to constant. This is a sort of a--well,
21 I'll try to simplify it.

22 K factor is an artificial assumption, if you
23 will, of how fast soil will erode. And it is derived in the
24 laboratory by taking a man-made aggregate of soils, a whole
25 bunch of different types of soils with different percentages

1 of sand, silt and clay, which makes up soil, and putting it
2 on a measured tray--I believe the tray is 37 feet long--at a
3 given slope. And it is a gradual slope. Then they introduce
4 a known amount of water up here, run the water through the
5 tray. By the time the water exits at the other end, a
6 measured amount of erosion takes place. So the K factor is a
7 relative measure of how much soil will erode with a constant
8 amount of water in a constant slope.

9 Q Excuse me. Will the K factor vary with
10 different types of soil? A Every soil has a differ-
11 ent K factor.

12 Q Are the K factors for different kinds of
13 soils derived, as you have stated, generally accepted by soil
14 scientists so that any soil scientist will use the same
15 numerical figure for the K factor of a given kind of soil?

16 A Yes. This is a national standard accepted by the
17 Federal Government.

18 Now, specifically in terms of this map number
19 10, there is represented here three ranges of K factor. Maybe
20 we can hold this chart up here briefly.

21 There are three color codes. The white
22 represents a low K factor. And I should state that the K
23 factor ranges from zero to approximately .35, or rather .40.
24 And the ranges on here are represented as low as being below
25 .4; medium, .24 to .37; and high, above .37. So we have a

1 range of erodeability, then, that relates to how fast the
2 soil will wash away. And these are represented by three
3 colors; the low being white, medium being the orange and the
4 high being the burnt orange or brownish color on the map.

5 Now, in terms of locating Bedminster at
6 approximately the center circular area of the center of the
7 map, Bedminster being totally contained within this water
8 shed, we have variable situations before us. The principal
9 factors of K factor, as far as Bedminster is concerned, re-
10 late to the type of soils that we have. Well, if we were to
11 look at the soils map, there is an extreme variation in the
12 type of soils present in Bedminster. This results from the
13 method by which they were put there by the glaciers. Most of
14 the soils in Bedminster are the result of being deposited
15 there by water or by glaciers having pushed them there from
16 somewhere else.

17 The areas with the highest K factor, those
18 of the brown and orange areas, are hence water oriented. They
19 were put there by water. That means they are easily moved by
20 water. Hence they can wash away quickly by more water.

21 If you look at the rest of the water shed
22 up stream, you will note that in the higher ground the land
23 sloping, elevation of about 600 to 800 feet difference between
24 Bedminster and Chester. This area has been literally washed
25 clean by the glacier. So most of the erodeables up here have

1 already been washed away and been deposited in Bedminster.

2 What this means in terms of further inter-
3 pretation is that the soils are very delicate in Bedminster
4 in that they will wash away easily. But they are also very
5 fine in texture, being related to what we would commonly
6 think of as clay as opposed to coarse ground sandy soil as
7 in the coastal plains or beach areas. This means they are
8 very sensitive environmentally speaking in terms of specific
9 site uses are concerned. We must key whatever densities
10 our land use changes from natural environment or agricultural
11 environment. We must key those to environmental impact
12 assessments. Hence that is the value of these maps, to look
13 at sites specifically.

14 Now, are there any questions on this? Maybe
15 we ought to offer this first.

16 Q Let us go on with the next one if you are
17 satisfied with your explanation. A Now, I think
18 we best look at slopes as the next map. We will try to build
19 a composite to illustrate the principle of overlaying environ-
20 mental factors one on the other.

21 Related to the K factor in terms of the next
22 map, which is erodeability, is slope. And slope relates to
23 the percentage of grade from level to vertical. Most of the
24 slopes in the water shed range between zero and 25 per cent.
25 And hence it is mapped--this map number six entitled Slopes.

1 The tones of gray to black are used, or
2 rather from white to black, white being zero to 2 per cent
3 slope. The least gray area is 2 to 6 per cent. The next
4 darker is 6 to 12. The next darker is 12 to 25, and the
5 darkest area is 25 per cent.

6 Generally Bedminster could be characterized
7 as flat land with a zero to 2 per cent in the southerly
8 portions, and rolling country of 2 to 6 per cent roughly just
9 to the north of Lamington Road, which runs across the middle
10 of Bedminster.

11 Then there are steeper areas in the Potters-
12 ville area and over towards Peapack-Gladstone. And the
13 slopes of the Watchung Mountain Range are perhaps the steepest
14 areas, close to 25 per cent, and possibly a few small sections
15 which may exceed that.

16 Generally speaking, in terms of slope, these
17 are similarly related to the erosion of soils from the type
18 of deposition by the glaciers at an earlier time in history.
19 And these have not changed since that time due to surface
20 erodeability any great manner.

21 The next map which combines the K factor and
22 slope is perhaps a better way of determining how sensitive an
23 area is to erodeability. Once again, Bedminster in the cen-
24 tral portion of the map--

25 Q May I interrupt you? This is Map 11?

1 A Map 11 entitled Erodeability of Soils. And the
2 derivation of this information is K factor modified by slopes.
3 Basically the methodology is--could be simply
4 stated that the steeper the land and the higher the K factor
5 the more susceptible to erosion the land becomes.

6 The color key in this map indicates this
7 relationship. The yellow being slight, relating slopes of
8 zero to 2 per cent and slopes 2 to 6 per cent with a low K
9 factor; the moderate being orange, indicates either slopes of
10 2 to 6 per cent with medium or high K factor or slopes of 6
11 to 12 per cent with low or medium K factors. Generally
12 means that the steeper the land the more erodeability.

13 The burnt orange, again, indicates severe,
14 with slopes of 6 to 12 per cent with high K and slopes in
15 excess of 12 per cent, generally.

16 All this simply says is that the most of the
17 area, the flat land of Bedminster, had slight erodeability
18 problems in that they relate largely to the stream corridor
19 areas, those areas adjacent to streams where the soil has
20 spread out on a flood plain area. The steeper sloped areas
21 have, because of the clay and the K factor relationship here,
22 the steeper the slopes the greater the erodeability. Hence
23 the Watchung Mountain Range in the eastern portion of the
24 township has a very high severe K factor. Many of the
25 ridge tops throughout the area have very high K factors. And

1 so do the stream valleys generally speaking have very high
2 **K factors**. Hence the determination.

3 **770** So we have an extremely mixed and variable
4 erodeability situation, which once again points out the
5 sensitivity of individual portions of the township and the
6 difficulty with generalization about standards dealing with
7 one tract of land as opposed to another tract of land. It is
8 just a situation of extreme variation and pointing out the
9 need in general for specific information about each site as
10 one progresses. Hence the need for the resource inventory to
11 be incorporated into the planning process.

12 Now, the next, and I think the final one that
13 we will examine, is the map 14 entitled Soil Limitations for
14 Septic Tanks.

15 Now, once again, the source of this informa-
16 tion is the Soil Conservation Service, and the key on the
17 chart indicates the white for slight or minimal problems with
18 septic tanks. This relates to the leaching field. Moderate
19 being the brownish color, and the red being severe limitation.

20 What does this chart say in terms of land use
21 ~~and in terms~~ of septic tanks specifically? The situation of
22 Bedminster, as you note with the coloration, is extremely
23 variable. We have a range of most of the southerly portion
24 of the township being in a solid red band. The northwesterly
25 portion of the township being quite variable with interspersed

1 bands of severe limitations surrounded by the brown color,
2 which is moderate limitations and interspersed with areas of
3 white, which are minimal problems.

4 Again, if you wish to cross-relate, go back
5 to the geology map. I can show you the relationship between
6 the method of deposition of the soils by the fact that these
7 are glacial gravel mounds in most of these situations--

8 Q Which situations are related to the glacier?

9 A The areas of slight limitations would be related to
10 glacial gravels rather deep, well-drained soils as opposed to
11 the red areas, which cross-correlate with the areas of very
12 tight clay soils, the most highly erodeable soils, etc.
13 These areas are very difficult because of their combination
14 of very tight soils, heavy clay soils and the fact that their
15 deposit, deposition being related to very shallow soils,
16 They are wet soils. Shallowness, the water table is a factor.

17 Incidentally, I might now define the method-
18 ology or description for these limitations. And that is that
19 the Soil Conservation Service, in cooperation with the various
20 engineering professionals throughout the country have come up
21 with some kind of a standard classification of soils and
22 their suitability for septic tanks and their leaching fields,
23 leaching being the removal of water from water of discharge
24 so that it will go away into the water table.

25 The limitations as defined by the red area,

1 severe limitations, are such that with a single family house
2 on a one acre lot with the amount of water that would be
3 discharged by that typical single family house, these areas
4 would be difficult, if not impossible, to design a septic
5 system to that amount of land that would function properly.
6 That is the generalization of their interpretations.

7 Q How big a lot of land were you referring to?

8 A As far as the S.C.S. definitions are concerned, a
9 one acre lot with a single family house you would have great
10 difficulty with an area of red making a leaching system work
11 properly.

12 In terms of utilization of this information
13 in Bedminster, talking with their planning board and develop-
14 ment of this ordinance that we are talking about in this case,
15 the new Bedminster zoning ordinance recognizes these severe
16 soil limitations, and through the process of environmental
17 impacts, these would be identified. And the minimum lot size
18 we are discussing with reference to septic tanks relates to
19 these factors. We have, I have suggested, in fact, to the
20 Planning Board and to the consultants that the minimum lot
21 size be increased on the basis of the percolation rate, the
22 infiltration rate--these are the engineering criteria for how
23 fast water will disappear from a point of discharge. Increasing
24 the lot size gives a greater opportunity to build a larger
25 system because the soils are tight. The water doesn't

1 disappear very fast. You need, therefore, to provide more
2 time and/or more distance horizontally in terms of land area.
3 This increases the amount of land significantly.

4 Q Let me interrupt you. Are you saying that
5 the size of a leaching field should be larger in soils with
6 a low percolation rate? A Exactly. Now, in terms
7 of specifics, it has been found by special studies in Bedmin-
8 ster Township, which I have also participated in and have
9 reviewed, that the amount of land necessary for a leaching
10 system could, in these red areas, actually approach or
11 exceed one acre of land just for the leaching system.

12 Now, it is generally accepted by
13 sional engineers with which I have familiarity, that
14 septic system is thought of as a--in terms of a biological
15 system--as a very fragile thing, and that over a time span
16 of perhaps 20 years the system will tend to malfunction if it
17 has not rusted. It may in fact be totally plugged up and
18 may, in fact, require replacement.

19 With that in mind, since the land use plan
20 for the area demands a framework, a philosophical framework
21 of low density and perpetuity, it is therefore necessary to
22 provide alternate sites equally suitable for septic tank
23 leaching fields. So the substitution effect, then, is to
24 make sure that one has enough land for not one system, but
25 two and that this land is suitably located and environmentally

1 sound as the first site.

2 Q How much land would you require for two
3 leaching fields for one house? A Generally one and
4 a half and three acres. And I would generalize by saying
5 that approximately two acres would be necessary for both
6 leaching fields and the surrounding buffer areas between the
7 septic system and wells, which would also be necessary on
8 site. So the total land area for this--again, the basis of
9 this map being a single family house on one acre would be
10 expanded by a factor of approximately three in order to come
11 out with some kind of a reasonable framework equivalent to
12 amenities one could find in these limited white areas
13 slight or moderate impact.

14 Q Have you finished explaining--

15 A I think we have covered enough on this particular
16 map. I was going to cross-relate--

17 Q Which map do you want to-- A That
18 is all right. Well, I was going to continue in terms of the
19 maps by going back to the water resources map since we brought
20 up the question of land planning and the relationship of lot
21 size.

22 Q You are now referring to Map 3, Ground Water
23 Resources? A I would refer to the ground water map
24 number 3, and in terms of the lot size and zoning densities
25 point out once again Bedminster in the center of the map being

1 basically--it is mostly shale. This has one water character-
2 istic as opposed to these other several areas.

3 According to references provided by the
4 Academy of Sciences and by the State Geologist's office and
5 in my own research, the shale area will yield a safe yield
6 of approximately 200,000 gallons per square mile per day.
7 This is the result of checking the well yield records. It is
8 safe, therefore, to generalize and say that one would require
9 between one and a half and three acres of land per single
10 family dwelling unit to supply an adequate water supply for
11 sanitary purposes. Therefore, this cross-correlation with
12 the septic tank and the well water supply factors is a rather
13 interesting accident, if you will, of the environment in that
14 the minimum lot size in Bedminster, because of these relation-
15 ships of water supply safe yield and the septic tank limita-
16 tions, it comes out to about three acres as the minimum
17 acceptable on site self-sufficiency, being the minimum soil
18 definition here for the single family to survive without
19 causing problems to the neighbors or drawing on the regional
20 source of water supply.

21 In terms of the more sensitive aquifer, as
22 mentioned earlier, the lightest blue color on this ground water
23 resource map, these are areas perhaps which we could draw an
24 exception to in terms of water yield. These would be probably
25 up to ten times higher than these gallonages just mentioned.

1 You could probably get a million gallons a day per square
2 mile from this aquifer. This could provide a basis for
3 wells for a commercial water supply company which could
4 serve the surrounding region up to its capacity. However,
5 then one gets into the other hangups of pollution and pro-
6 tection of that aquifer, since it is in fact underneath the
7 stream of the North Branch of the Raritan River. In fact,
8 it is recharged from that stream. Should one draw water from
9 that aquifer, it would be replaced by water from the stream.
10 Therefore, water quality in the stream is the key to the
11 water supply in that aquifer. We are talking about a relation-
12 tion in this aquifer to what we have described in terms of
13 regional relationship of water quality and quantity in the
14 term of the total water shed.

15 If I may go on to--maybe I ought to relate
16 over here to the most limiting water supply, the basalt areas.
17 These are areas with very, very limiting water supply.

18 Q Are you now referring to the Watchung Mountains?

19 A This is the Watchung Mountain Range, both the first
20 and second Watchungs. These could be characterized as solid
21 lava and have very few cracks in them. And it is cracks in
22 the bedrock which store water in fact vertically. Rock
23 becomes fractured over time through earthquakes and just plain
24 aging. And water gets into those cracks. And the more cracks
25 you have, the more storage you have underground. Hence when

1 one puts a well down into the well and intercepts a number
2 of cracks and withdraws the water for potable purposes.
3 There are very few cracks to store the water. Therefore,
4 there is very little water available in this kind of a situa-
5 tion.

6 The problem of regional relationships becomes
7 very clear at this point in that if you can't get water out
8 of a stone in this kind of a very tight rock situation.

9 Q Referring to the Watchung Mountains?

10 A The Watchung Mountain Range. Can you borrow water
11 over here in the glacial outwash plain, the highest blue area?

12 Q Which runs under the North Branch River?

13 A Which runs under the North Branch. Then we get into
14 the problem of where does the water come from? How much of
15 it is available? And all of this relates to the stream
16 hydrolysis. And how large is the water shed upstream? How
17 much water is available in the river? What is the quality of
18 that water? And what are all of these relationships?

19 So if I may just relate to water quality and
20 quantity simultaneously, I think I can point out this rela-
21 tionship rather quickly. We have a phenomenon in the water
22 shed of very dispersed population with a few village centers,
23 I would characterize, such as Bernardsville, such as Peapack-
24 Gladstone, concentration and the area around Mendham Borough.
25 If I may use the North Branch of the Raritan above, roughly

1 above the Far Hills through Pluckemin stretch to North Branch
2 in order to relate to the recharging of this potential
3 aquifer.

4 The area of Bernardsville discharges sewerage
5 at the headwaters of Mine Brook. Hence it depends upon the
6 stream of Mine Brook to both dilute that sewerage and carry
7 it away. This dilution factor has been used historically
8 as a matter of course in the sanitary engineering profession
9 to take care of the, let us say, leftover pollution that the
10 sewerage plants cannot take care of.

11 As we have continued to grow in terms of
12 density of population, we increase the total pollution
13 only take out a certain fixed percentage that is limited by
14 the state of the art of pollution control. So total pollution,
15 even though we have been taking out some, we have a leftover
16 which builds up. And this is important because in terms of
17 Mine Brook, a tributary to the North Branch at Far Hills, we
18 in fact have a situation of a spill-over effect. The brook
19 can no longer assimilate all of the waste matter that is left-
20 over from Bernardsville. And it is spilling over into the
21 North Branch.

22 We have a similar effect from Peapack-Gladstone,
23 and we have a similar effect from the Mendham Borough area
24 with its sewerage treatment plant. And our water quality
25 studies indicate that this spill-over effect is indeed severe

1 enough so that we have a situation in the North Branch
2 between Far Hills and the 206 bridge, roughly the upper
3 mid-point of this aquifer just previously described--

4 Q That is the bridge just north of Pluckemin
5 Village?

6 A Correct. We have at that point a situa-
7 tion with the North Branch, for all practical purposes
8 already thoroughly overloaded with nutrients, and that nutri-
9 ents being defined for this purpose in terms of nitrogen and
10 phosphorous. And a significant thing here is that if the
11 stream is loaded with nutrients and nitrogen and phosphorous,
12 what other unknowns in terms of heavy metals, in ~~fact~~
13 exotic chemicals, and perhaps viruses are present ~~and not~~
14 being treated by these treatment facilities upstream?

15 So the regional relationships have to be
16 considered when one considers the future use of this for
17 potable water supply purposes, since the recharging is
18 directed water from the stream. It would just be strained
19 like a sieve.

20 In terms of availability of water, to main-
21 tain a population density over time we have to consider how
22 much water is available within the region and relate to how
23 much is being used in the water shed to how much is being
24 supported. The relationship as seen here is quite variable.
25 Generally one could say, again based upon some information
from the U.S. Geological Survey, and a specific study by

1 Leopold and our own relationships of water gauging and our
2 own research, we could characterize the water shed as having
3 a yield, an average yield now of one cubic foot per second
4 per square mile.

5 Q The water shed you are referring to is the
6 Upper Raritan Water Shed? A That is the Upper
7 Raritan Water Shed, being analogous to most water sheds in
8 North Jersey. The streams are extremely flashy, flashiness
9 being defined as the tendency of runoff to leave the area
10 almost immediately after the rainfall hits the ground. It
11 runs off very quickly. The streams can be dry one minute
12 and you can have a thunderstorm and they would be several
13 feet deep in several minutes thereafter. Stream flow is
14 extremely variable,

15 Water quality is equally as variable as a
16 result of this rapid flushing action. The runoff from the
17 highland area described earlier in the geology map as the
18 granite type of area and shown on this Water Resources map as
19 the darkest blue as opposed to the black-poor areas. This
20 would be generally Mendham, Chester, Washington, Tweeksbury
21 and Readington. And it extends over to Bernardsville.
22 Wherever there is a higher elevation of 600 to 800 feet
23 relating to the beginning of the Appalachian province, the
24 geological province called the Appalachian province. The
25 runoff from these higher areas are extremely rapid and results

1 in this flash flooding throughout this water shed, and water
2 quality is, of course, related, as I said earlier, to that
3 rapid runoff.

4 The problem is if we are going to utilize
5 the concept of ground water storage as being less expensive
6 regionally than providing reservoirs such as Round Valley
7 to store water in between periods of rainfall and drought,
8 it is necessary to consider this kind of hydrology relation-
9 ship; how fast does the water run off? In consideration of
10 hydrology, one has to consider the soils, which I have
11 discussed earlier, the slopes, which we have discussed and
12 also the land cover and the percentage of that cover, in
13 various types being fields, forests or urbanization, being
14 different types of land cover.

15 Generally the area is forested and in fields
16 with very low density population centers interspersed, and
17 the environment is capable of absorbing the increase in run-
18 off and the increases in pollution from some of these small
19 centers.

20 Now, as we take a typical situation, or
21 relating runoff and pollution together, we would find, in
22 terms of Mendham Borough's runoff, that a higher percentage--
23 let me put it in specific terms. One of our studies shows
24 that the increase in phosphorous from the Mendham Borough
25 treatment plant is about 37 times the background relationship

1 of natural or non-point pollution. We have a concentration,
2 then, that runs down about five miles to Ravine Lake, and
3 Ravine Lake takes out most of this phosphorous and converts
4 it into organic materials, plants and so forth, which then
5 become algae and phytoplakton. This has still a spill-over
6 effect which comes down to pick up the Peapack-Gladstone
7 sewerage which, in terms of non-point pollution and the
8 relationship to all of these, we find that there is about
9 10 per cent of the nitrogen pollution coming in Burnette
10 Brook in Chester Township relating to septic tank facilities.

11 Q Burnette Brook flows-- A into the
12 North Branch at approximately the point of the bridge on
13 Mendham Road.

14 Q That is upstream from Ravine Lake?

15 A Yes. Now, the problem--let me finish with my relation-
16 ships here, if I may, in terms of the effects of non-point
17 versus point source pollution.

18 We have a similar phenomenon at the area
19 above the Peapack-Gladstone sewer plant. This is an area
20 which is largely single family houses mixed with agriculture,
21 mostly on septic tanks. We have an area, that area just
22 described, the greater Peapack-Gladstone area, which has a
23 high degree of stream pollution with no sewers. In fact,
24 below the sewer plant we have an improvement in some aspects
25 of water quality. However, there is a net effect of dilution

1 which accounts for that improvement in terms of BOD, but we
2 do have, in terms of nutrients, a vast increase of nutrients
3 which carries on down to Far Hills.

4 So, we have three regional--excuse me--three
5 sewerage treatment plants, secondary level would be character-
6 izing it as secondary level treatment plants, in this small
7 water shed portion.

8 Q Identifying-- A Identifying
9 Bernardsville, Mendham and Peapack-Gladstone as the three
10 plants. Each of these contributes pollution in terms of
11 nutrients and unknowns, other than BOD, etc., to the region.
12 And we have a net support effect which affects the potential
13 recharge of this aquifer and regional water quality.

14 Q The aquifer you are pointing to is the one
15 that runs essentially under the North Branch from approximately
16 Bedminster Village down towards the southern boundary of the
17 Township and beyond? A That's correct. Now, in
18 terms of the other side of the problem, the non-point pollu-
19 tion, the streams have a basic assimilative capacity, and we
20 discussed this in terms of dilution rate. And there are
21 various rules of thumb that we deal with in terms of dilution
22 rates. It is my opinion that the assimilative capacity of
23 our streams should be reserved for taking care of this non-
24 point pollution problem and not utilized as a matter of right
25 in terms of the discharge of sewerage as dilution for that

1 sewerage to carry away the waste. There should be, because
2 of regional water relationships, there should be no direct
3 stream discharge, but rather, in my opinion, there should
4 be some additional treatment which puts some, something
5 like land disposal in between the sewerage system at the end
6 of the pipe and the stream. This will assimilate a higher
7 proportion of the total amount of waste, specifically some-
8 thing around 50 per cent of the nutrients and the unknowns
9 such as viruses would be removed by soil disposal. Then we
10 could take care of the non-point wastes which come from
11 septic tank discharges, agricultural uses. We could take
12 care of this by the in-stream assimilative capacity. That
13 would effectively protect regional aquifers such as the one
14 from Far Hills on down underneath the North Branch. It would
15 also protect stream quality regionally for use for potable
16 purposes.

17 Now, in terms of regional water relationships,
18 one thing that has not yet been brought out is that it is a
19 matter of a State plan to build a reservoir some 4,000
20 surface acre reservoir downstream at the confluence of the
21 North Branch and the South Branch which flows westerly
22 around that North Branch water shed, the confluence being in
23 Branchburg Township. This surface reservoir will be potable
24 water fully for the State of New Jersey to serve communities
25 roughly along the Route 22 corridor easterly towards Newark.

1 This will provide a low flow retention; provide first of all
2 skimming of flood waters to refill Round Valley which will
3 then be released at low flow times to recharge that reservoir
4 and to provide a uniform flow of potable water to higher
5 density communities to the east. Then all of the relation-
6 ships we have been discussing with reference to water quality,
7 quantity, become vastly more important as we talk about a
8 future State reservoir.

9 Q Mr. Larson, are these maps you have been
10 talking about as well as the natural resource inventory and
11 the other reports from the Academy of Natural Sciences
12 available in the office of the Water Shed Association for
13 interested persons who may be having to prepare an environ-
14 mental impact statement? A Yes, they are. I
15 might add to that answer that my services are also available
16 to consult with anyone whenever it can be arranged in terms
17 of my schedule. And there is no charge for this service to
18 the public, and specifically to consultants. We have estab-
19 lished within the last year a resource center, and we have
20 a full time person available to provide information from our
21 library of resources and to provide additional consulting
22 aid and to seek out information to provide liaison with State
23 and Federal agencies and generally to be helpful in terms of
24 environmental information to whatever members of the public
25 should desire it, be that planning consultants or individual

1 land owners.

2 Q And this resource center is at the offices
3 of your Water Shed Association? A Yes, sir. It
4 is the same office.

5 Q Right. And did I understand you to say that
6 you personally are available to counsel with representatives
7 of developers who may be interested in environmental impact
8 problems? A Yes, that's correct.

9 Q Now, has your association made any effort to
10 have some/^{of}this basic natural resource information available
11 in municipal buildings within the water shed?

12 A Yes, we have.

13 Q And specifically, have you made such informa-
14 tion available to the township of Bedminster?

15 A Yes.

16 Q And did you participate in the preparation
17 of the materials which are available in the Bedminster Center
18 municipal building? A Yes, we did. We participated
19 with the Environmental Commission of Bedminster, who has done
20 a similar but more elaborate resource inventory for Bedminster
21 Township.

22 Q In your knowledge is that information with
23 Bedminster available to interested persons who may have to
24 prepare an environmental impact statement? A Yes.

25 Q Are you familiar with the document which has

1 been marked exhibit P-6 in evidence, which is the Master
2 Sewerage Plan for the Upper Raritan and Delaware Water Sheds,
3 prepared by Killam Associates? A Yes, I am.

4 MR. BUCHSBAUM: That is P-8.

5 Q Yes, P-8. Now, are you aware that the
6 authors of that report proposed a large regional sewerage
7 treatment plant on the southern boundary of Bedminster at or
8 near the confluence of the North Branch of the Raritan and
9 the Lamington River? A I am.

10 Q In your judgment what would have been the
11 effects on the water shed if that suggestion were to be
12 carried out? A There are several effects. The
13 largest effect in my view would be a collection of waste
14 water from headwaters communities, and by passing those land
15 areas, would in fact result in a loss of on site recharge of
16 water back to the water table. And the effect of that, in
17 low flow times, would be to lower the stream levels and hence
18 make less water available to on site wells. In addition, it
19 would weaken the water relationships, water quality relation-
20 ships to the region by discharging at one point a rather
21 heavy dose in terms of projected dilutions very strong in
22 nutrients, since it was a secondary treatment facility pro-
23 posed. And this would have been very close to the point of
24 upper most detection of water in the confluence reservoir,
25 and it would have more seriously jeopardized the reservoir

1 water quality and enhanced the possibility of eutrophication,
2 the aging and regrowth of weeds in that reservoir.

3 So as a regional plan, it is/^avery unsatis-
4 factory type of system.

5 Q Now, you referred in your recent answer to
6 the--I think the recharge of the ground water?

7 A Yes.

8 Q Describe for the Court what that process is?
9 How does it take place and what is its significance?

10 THE COURT: I would rather hear about it in
11 the morning. We will recess at this point until
12 9 o'clock.

13 Thank you.

14 (Court adjourned)

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21 I, MICHAEL N. VACCA, Official Court Reporter, hereby
22 certify the foregoing transcript of proceedings taken by me
23 on March 19, 1974.

24 Dated: *July 27, 1974* *Michael N. Vacca, C.S.R.*
25