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Rona Valley v. Twp of Clinton

7-6-77

Stenographic transcript of trial proceedings (Robert Hordon)

pgs. 77

MLCCO435S

SUPERIOR COURT OF NEW JERSEY
LAW DIVISION: HUNTERDOH COUNTY
DOCKET NO. L-29710-74 P.W.

A-2963-77

ROUND VALLEY, INC., a corporation of the State of Hew Jersey,
Plaintiff,
vs.

TOWNSHIP OF CLINTON, a Municipal Corporation of the State of -New Jersey, TOWNSHIP COUNCIL OF -CLINTON, and PLANNING- BOARD OF CLINTON,
Defendants.

Stenographic Transcript of Trial Proceedings

Place:
Hunterdon County Courthouse
Flemington, New Jersey

Date:
July 6, 1977

BEFORE: THE HONORABLE -THOMAS J. BEETEL, J.C.C.

TRANSCRIPT ORDERED BY:
ROGER CAIN, ESQ.

A P P E A R A N C E S :

STERNS, HERBERT & WEINROTH, ESQS.
BY: MICHAEL J. HERBERT, ESQ. aiKfe. JOEL H. STERNS, ESQ.
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EXHIBITS

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THE COURT: All right, gentlemen.

MR. STERNS: Yes, Your Honor. The next witness will be Dr. Robert Hordon.

May I ask, at this time, Your Honor, if there is any objection to. the items that were marked for identification during Mr. Akahasi's testimony being moved into evidence? That would be P-94, which was his report which I think we have agreed to; P-95, which is simply a radius map for reference, it has no probative value; P-96, the autumn, 1976, family budget and comparative index selected for urban areas of the U. S. Department of Labor; and P-97, the 1973 and f75 population estimates of the U. S. Bureau of the Census; P-98, the new one-family houses sold, U. S. Bureau of Census; and P-99, the State-wide housing allocation plan, for New Jersey, preliminary draft, Hew Jersey Department of Community Affairs. The plan was, of course, strictly illustrative, so he can point things out. The point is, it is already referred to in the record extensively.

MR. CAIN: I believe that Mr. Akahasi said it wasn't prepared by any particular person, for no particular purpose. So if it is just to show what is in white and yellow, what is in fifty miles

of Times Square or Columbus Circle, we have been over those and we have no objection.

(Whereupon, Exhibits P-94 through P-99, previously marked for identification, marked into evidence.)

THE COURT: Swear the witness, please.

MR. SUTTON: I believe that there is a Blau, Lasser exhibit.

MR. STERNS: The Blau, Lasser page is a page that was part of his report. I am willing to hold that until we can either get some go-ahead to substantiate it or drop it.

THE COURT: The whole report is admissible except Appendix E.

ROBERT M. HORDON, sworn.

MR. LEONE: State your full name and spell your last name.

THE WITNESS: Robert M. Hordon, H-o-r-d-o-n.

MR. LEONE: Place of residence?

THE WITNESS: Kendall Park, New Jersey.

MR, STERNS: Your Honor, with the consent of counsel, we have marked a number of exhibits to save time, and they all go at this point to the credentials. I will just ask the witness to identify them.

DIRECT EXAMINATION BY MR. STERNS:

Q Dr. Hordon, what is your occupation and profession? A I am Associate Professor in the Geography Department of Rutgers University, New Brunswick.

Q Do you have any special expertise?

A I teach courses in physical geography and fluvial geomorphology, f-l-u-v-i-a-l g-e-o-m-o-r-p-h-o-l-o-g-y.

Q Will you describe what that means?

A Fluvial geomorphology refers to land forms and other erosional and dispositional features that are related to streams, rivers and creeks. It is a water-related and land-form-related subject.

I also teach and do research in urban water resources management. I also have courses in environmental planning and land use systems.

Q How long have you been at Rutgers?

A I have been at Rutgers ten years.

Q Have you had teaching experience, or academic experience at other institutions of higher learning?

A I was a teaching assistant in my graduate program at Columbia for about two and a half years, and then came to Rutgers in 1967.

Q Let me interrupt you for a minute at this point, and ask if you can identify this document, some six

pages, which says Robert H, Hordon?

I (Document entitled "Vite[11] marked as Exhibit P-100 for identification.)

A Yes.

Q What is that? A This is my Vite form, a short form, and a long form with a list of publications and professional affiliations.

Q Is this included as part of your report which you have submitted in this matter?

A Yes, that was included as a part of P-31 at the time of my deposition, it was attached to the rear of P-31.

MR, STERNS: This has been marked as P-100 and I think counsel have a copy of this study.

THE COURT: All right.

Q Now, Mr. Hordon, going on, can we run over briefly your basic academic background, that is, what colleges you graduated from graduate degrees?

THE CCURT: Isn't that already given, it is already in this report, it is part of the record?

MR. STERNS: If that is satisfactory to you.

THE COURT: Any objections to those qualifications, without repeating all of them?

(No response.)

THE COURT: No objection, move along.

Q Dr. Hordon, have you written and published articles in the areas in which we are concerned in this matter, namely, water supply and specifically water supply in New Jersey? A Yes, I have. The articles, publications and papers are listed on the Vite. There have been a few additional ones since that time.

Q Approximately how many articles have you written? A The number of publications has been, that is both solo and joint authored, twenty three.

There was another one, number twenty four, which was a report to the Department of Community Affairs, that was released September, 1976 called "A Guide to the Environmental Aspects of the Local Planning Process." I was senior editor of that publication.

Q Of those twenty three or twenty four publications, do any of them bear on the questions of water supply and quality such as you addressed in your report? A Yes.

Q Approximately how many?

A At least half or more. Oh, I would say two thirds would bear, almost two thirds would bear on water-related issues.

Q How about the issue of whether they are water-related issues in the New Jersey area?

A Again, two thirds. The focus of research has been on the New York-New Jersey metropolitan area, with heavy emphasis on north and central New Jersey.

(List of publications marked as Exhibits P-101, A through L for identification.)

Q Now, 1 would ask you if you would review briefly what has been marked P-101, A through L, without getting in particular, if you could identify these by topic and if you can answer for all of them, whether they are articles or publications which you have authored?

A P-101-A, which was a conference of the American Water Resources Association, involved research into the responsive northeastern New Jersey water transfer network to the draught of the mid-sixties. In particular, the f62 through !66 period.

Q Let me ask you this, Dr. Hordon, I would be particularly interested in going through all of that in order to save time. You can all glance through them and they are all listed and what we marked P-101. Is that correct?

A Yes.

Q Could you just verify that these are indeed the articles referred to,that you have written them as a group?

A Surely.

MR, STEKNS: I assume, Your Honor and counsel, that the Vite is included in total in the record at this point, so that I don't have to examine it in detail?

THE COURT: Any objections, he identified these as outlined in the Vite?

MR. CAIN: The same one that was P-31 for identification at the deposition?

THE COURT: The same situation, yes,

MR. CAIN: We have already seen that.

THE COURT: So marked.

MR. STERNS: If I can assume t±a t it is in the depositions, you can assume that we have testified for everything in the Vite purposes for the examination, for expertise, if that is acceptable?

THE COUPVT: It is acceptable to me, how about Mr. Sutton?

MR. SUTTON: No objection.

THE COURT: Any objection to P-100 and 101 in evidence?

(No response.)

THE COURT: So marked,

(Whereupon, documents previously marked as E:diibits 100 and 101, A through L for identification,

marked into evidence.)

Q Have you had an opportunity to look through all of. those articles offered by you?

A Yes.

Q Included in the Vite referred to?

A Included in the Vite in P-31.

Q Just one other question, Doctor. Then at this point, that is, are you presently engaged in any research with reference to water problems in New Jersey, either water quality or supply? A I am engaged in four research projects of a part-time nature, particularly during the summer.

One of them is funded by the U. S. Department of Agriculture through Rutgers University, involving the development of a growth management plan for a community in Somerset County. I am a consultant on the water and sewerage facilities for this, which is a disciplinary project.

The second project is one that is involving the environmental impact analysis of the Manasquan Reservoir project in ibnmouth County, funded by the Department of Environmental Protection through Rutgers University. I am the water resources consultant for that one.

The third project is a project sponsored by the Engineering Foundation of the American Society of Civil

Engineers, relating to the delineation of ground water aquifers .in ;the North Atlantic Region, in conjunction with a civil engineering team at the Polytechnic Institute of New York. I am the geohydrolic consultant to this group.

Fourth, I am a consultant to the New Jersey Water Supply Master Plan, to the Head or Proj ect Engineer, Havens and Emerson in North Jersey, in Bergen County. That is the State-wide comprehensive master water supply plan for New Jersey, which is starting up now.

Q Dr. Hordon, one final question, can you define for us what is meant, what you would mean by the term water management, what does it consist of?

A Water management or water resources management, at first stroke would consist of water supply and waste water or water quality issues. So those would be the major constituents of water resources management.

MR. STERNS: At this point, Your Honor, pursuant to Rule 8, I would offer Dr. Hordon as an expert in water management plans.

THE COURT: Do you care to examine on. qualifications regarding this area of expertise?

VOIR DIRE EXAMINATION BY MR. CAIN:

Q Dr. Hordon, you have mentioned several things you have done since back in March. Suppose I start with the last one, the New Jersey State-wide water

research plan which you say is just now starting up. What is the purpose of that? A The purpose of the overall plan?

Q Yes, sir. ' A This is a one million dollar study of three years in duration, which began essentially in the spring of 1977, which is to look at the entire picture of water supply planning for the State of New Jersey.

There are five firms that are participating in this study, which is to look at the water resources, both surface and ground water, for the State, and also to look at institutional issues, hydrolic issues, anything pertaining to water supply for the State of New Jersey, for the next several decades. This is first just starting up at this time.

Q What prompted this study, was it some funding from the Federal government, or just the need for it, or what? A Well, the planning for this began by Governor Byrne several years ago. Along with this, Commissioner Bardin of the Department of Environmental Protection, particularly since most of the water systems in North Jersey are seriously overdrawing their reservoir yield.

Essentially the only thing that has kept north New Jersey going is the fact that there has been a very

wet period during the nineteen seventies. In order to prepare, for what will be the probable return of the drought some time certainly, the Governor and the respective commissioners decided to proceed with a comprehensive water supply study, since the last one was done in 1955, the so-called Tams or T-a-m-s study. It was felt that enough has occurred to New Jersey since 1955 to necessitate a look or study.

Q Then it was partly prompted by the '62 to '66 drought, you would say? A Very definitely. The deficiencies during that period were one would fear a drought close to that to occur. Again, the effect would be even worse because of the increased population in New Jersey since the early nineteen sixties.

Q What is their timetable on this study, what do they expect to have in information to force us to use that as a practical matter? A As recently as last week they are at the stage of recording all of the water consumption and water demand from the appropriate files in Trenton, and recording that, keypunching that information. I would say in terms of usability results it would be probably two years or possibly three.

Q I read and heard the term "critical areas." Is this one of the problems that they have, critical areas in terms of water supply, is this a term that is

used with respect to this study?

A Critical areas. Are you referring to critical areas like flood plains or flood prone land, that is callejd actual land areas or critical areas in the context of a critical issue?

Q I would say in terms of water supply?

A In terms of water supply, then yes, they would be addressing that, very definitely.

Q Now, you mentioned the North Atlantic Region Hydrology Consultant, does that include our area?

A Yes, that does. Well,it includes the States of Maryland, Pennsylvania, New Jersey, New York, Connecticut, Massachusetts and Rhode Island. In the non-coastal plain portions, that is what is referred to as the consolidated rock portions or northern New Jersey would fall within that region.

Q is that derived from already existing statistics or are there field studies being made say in our area, in support of this project?

A Given the scope of that particular project by the Engineering Foundation of the Society of Civil Engineers, no field work could be accomplished within the time frame.

It would be a review of existing ground water reports, maps, and of course interviews with the appropriate hydrologist and ground water geologist in the

respective district offices of the U. S. Geologic Survey. There would be no field delineation attempted for that size of region at this particular point in the project.

Q Are you familiar with the so-called non-degradation policy which the State has with respect to stream quality? A Yes.

Q Can you tell us what that means?

A There is an element of vagueness within the State EPA with regard to non-degradation policy. But this means that the water quality shall not be degraded below what is referred to as ambient conditions.

The difficulty is just with the definition of what is ambient.

There is, as I mentioned, some vagueness within the Department of Environmental Protection with regard to this.

Ambient conditions could mean a summertime average, could mean an annual average, could mean a minimum and extreme condition in July and August. This has not been exactly delineated by DEP.

Q Is-' it true that the State sets certain standards for stream quality? A The State sets certain standards which are then subject to review by the EPA, Environmental Protection Agency.

Q If your particular stream and the watershed

which we are studying is of a higher standard, is it a correct assessment of the non-degradation policy that you would not lower the standard of the stream, even down to the State's minimum standards?

A Yes, that would be the non-degradation policy.

MR. CAIN: Your Honor, in order to save time, I want to look at my notes. I think Mr. Sutton will have a couple of questions, if you permit.

THE COURT: Yes, go ahead.

VOIR DIRE EXAMINATION BY MR. SUTTQW:

Q Professor Hordon, you are a full time professor, are you not? A Yes.

Q You, I believe, testified that you had worked on certain of these projects. When did you do the work on these projects? A The work on the projects were done -- it would vary with each project, but it would be primarily in the summer and also during the year, whenever there aren't classes or labs.

This is fairly common for the faculty to have at least one day set aside for research during the work, during the year. Of course, some of these are done on weekends also.

So the work would be done primarily in the summer, but also spread throughout the year.

Q Now, for Round Valley, Inc., your "work was as a private consultant, is that not correct?

A That is correct.

Q And you worked on other projects also as a private consultant for corporations?

A That is not through the University.

Q That's correct, yes. A Yes, I have. Yes, I have worked as a private consultant to other non-University groups.

Q Have you worked for any private individual or corporation relative to the environmental impact of a PUD of this magnitude? A Yes, the work was through the Center for Urban Policy Research of the University, That was involving the Suburban Action Institute case in Mahwah, New Jersey, and I was engaged in that.

Then I was acting as a consultant to an institute of the University.

Q Is that the only other project?

A Involving a PUD, yes.

Q Have you worked on any projects in Hunterdon County before? J . A With Spruce Run and Round Valley in Hunterdon County, I would say I have been doing this since my dissertation, that goes back 1965.

In that context I have been looking, in particular, at the surface water resources of northern and central New

Jersey, including Hunterdon County, for over ten, twelve years.

Q In relation to what specific projects?

A The projects were projects sponsored by then the Organization of Water Resources research of the U. S. Department of the Interior, with regard to water supply, water supply within the New York-New Jersey metropolitan region. Also, waste water which was a separate project also with the same office of the Interior Department, again with the same regional focus.

By virtue of the people that were attached to that, I was the New Jersey consultant, so to speak, or my area was to focus on New Jersey.

Q Would it be correct to say that this was very broad, very general research? A Well, we had to get into considerable detail with regard to stream flows and letdown, release requirements, pipeline alternatives, demand components within Bergen County, the plans of Hackensack, Elizabethtown, Jersey City, Newark, because of the interconnection. It was substantially specific for this area and it had to be examined in order to arrive at the conclusions which were commissioned by the funding agency.

Q Did you visit Hunterdon County for this project? A Yes.

Q How many times have you visited Hunterdon County on various projects? A Since 1965, 1967, when it started.

Q That will be my first question, yes.

A It must have been at least a dozen times or more. I am not sure exactly, but at least there were a dozen times to the County.

Q How many times did you come to Hunterdon Coun,ty on this project? A On which project, I beg your pardon.

Q On the current project, the Round Valley project, that is, not to testify on depositions or in court, but your research? A I believe two or three to Hunterdon County, and about half a dozen plus to EPA offices in New York City and Trenton, for information and interviews with appropriate officials.

MR. SUTTCN: That's all the questions I have.

THE COURT: Anything else, gentlemen?

MR. CAIN: No further questions, Your Honor.

THE COURT: Then subject to whatever was brought out., I think the gentleman is admissible under Rule 8, hydrology, fluvial expert.

MR. CAIN: We don't question, or I don't question Professor Hordon's qualifications in terms of an expert. I may have some question as to the

weight of his evidence, as to the amount of time that he spent specifically on the streams in Hunterdon County.

THE COURT: That is going to the weight.

MR. CAIN: That goes to the weight, Your Honor. I am just making it noted for the record.

MR. SUTTON: The same would be correct insofar as I am concerned.

THE COURT: Proceed.

(Publication marked as Exhibit P-101-M.)

MR. STERNS: Your Honor, I noted one of the pile that I had neglected, it is marked as P-101-M.

DIRECT EXAMINATION CONTINUED BY MR. STERNS:

Q Can you identify this as one of your publications?

A Yes.

THE COURT: You have the report from the Professor?

MR. STERNS: I am going to that right now.

Q Dr. Hordon, at our request and direction, did you prepare two studies with regard to the subject litigation and the Round Valley, Beaver Brook project?

A Yes, I did, I prepared two studies.

(Study entitled Environmental Assessment of the Water Related Impacts of the Beaver Brook PUD marked as Exhibit P-102 for identification.)

Q I ask you, I show you one marked as P-102 dated March 11, 1977, a letter from you to Mr. Dishner of Round Valley. It is attached to a report entitled Environmental Assessment of the Water Related Impacts of the Beaver Brook PUD. I ask you if that is one of the studies that you prepared? A Yes.

(Study entitled Addendum number 1, Water Supply for Beaver Brook PUD marked as Exhibit P-103 for identification.)

Q Then, did you prepare a second study, and I show you a document already marked P-103, dated April 8, 1977, a cover letter to Mr. Dishner, including a document entitled Addendum number 1, Water Supply for Beaver Brook PUD? A Yes.

Q Are those two studies that you prepared?

A Those were the two studies that were prepared.

Q Let me just ask, were these the subject of examination at depositions of yourself?

A Wo, just the first one. At the time of the deposition, only the first report. The Water Supply Addendum was pre-prepared following the deposition.

MR. STERNS: I believe you received copies of it?

MR. CAIN: I don't remember, I am looking.

MR. STERNS: I represent that it was sent to

counsel on April 14.

Q, Turning to the first report, which is the one that is marked P-102, entitled Environmental Assessment of Water Related Impacts, could you describe first what materials you used in- preparing that report?

A The very first reports that we used were background reports that were furnished to me by Round Valley, Inc. The reports were essentially three, that was "A Planned Community" which was done by Rahenkamp, Sachs, Wells and Associates, dated December, 1973, a Round Valley feasibility report appendix 2, dated January, 1974, which included the reports of Richard Jesky, enginner, and Vincent McKeever, engineer,

Q What other documents?

A The other documents that were used on Round Valley-Raritan River Basin Water Quality Management Plan, Phase 1 Draft Document of the Department of Environmental Protectioii, August, 1976. A report entitled Ground and Surface Water Plan, Report 4, prepared by the Hunterdon County Planning Board, December, 1967. The Geology of Hunterdon County, prepared by the Department of Environmental Protection, August, 1970, and the larger version of that report called Special Report Wo. 24. That is the Geology and Ground Water Resources of Hunterdon County, prepared by Haig, Kasabach, that is a special report dated 1966.

Q Dr. Hordon, could you describe for us what was the purpose of this first report?

A The purpose of the first report, there were several objectives. The broad objective was to look at the water-related impact of a proposed PUD on a specific site in Clinton Township.

The second objective, which came out of that, was to attempt to assess what the probable impact would be, given a series of synergies or alternative development schemes for land use on the tract in question.

Other objectives were to look at the water supply and waste water facilities. The water supply, though, had to be developed in greater length in Addendum No. 1, just given the time frame that was available then.

Q Dr. Hordon, I note at page 3, Section 3 of your report, that you describe watersheds.

I ask you, did you bring any maps which would assist us and the Court in envisioning what these watersheds involve? A Yes, I did, I have brought four maps in varying scales.

Q Can^you point them out? They have all been marked, and if you can point them out, referring to the numbers, I guess two are up there.

(Five maps marked as Exhibits P-104 through P-108 for identification.)

•Q If you can point them out, referring to the numbers,, I guess two are up there, just tell us what they are, briefly? A The first map is a remote sensing photo mosaic.

Q If you can use the number,you are referring now to P-104? A P-104.

Q What is that? A That is a photo mosaic at a scale of one inch to eight miles, a photo mosaic using infrared and other special remote sensing film, taken from a satellite of the entire State of New Jersey.

Q Now, would you describe P-105?

A P-105 is a copy of a drainage basin map of New Jersey at the scale of one inch to four miles, showing the watersheds, the major watersheds and sub-watersheds within the State.

Q Now, turning to P-106, could you describe what that is? A P-106 is four topographic maps to the scale of one inch to 2,000 feet, which are put together to form a composite, to show Clinton Township and surrounding municipalities.

Q P-108? A P-108 is a blow-up of a scale of one inch to 1,000 feet of a portion of P-106, to show Clinton Township. The four maps show the same subject and P-104 is the broadest picture.

Q P-107? A 107 is the closeup of the conditions. The scale gets larger with each map.

Q I would ask you to refer to those papers, if you feel necessary, if you would describe the Raritan Basin? I would ask you, if you do choose to refer to a map, that you refer to the P-number, P-104, 105 or whatever.

With that in mind would you, describe the Raritan River basin which you refer in your report?

A Going to P-104, which is the photo mosaic map, this is taken from a satellite with a one inch to eight miles, consisting of many smaller photos which have been put together in what is called a standard photo mosaic.

The particular film that was used was for satellite elevation of more than 500 miles and focuses attention on the deep blue, which, of course, is water, and varying shades of red. It shows the varying types of vegetation, and also the geologic structure.

The two areas in question, the Round Valley, shows up and Spruce Run show up as very, very deep blue. This is because of the nature of the film that was used in the particular satellite view.

The virtue of this particular map, P-104, is that it shows essentially that the region, or at least New Jersey, in terms of its water supply, is fairly much of an island, with the only part of the State that is connected

to the mainland, would be the artificial boundary with New York State. Other than that, the State is completely surrounded by water, the Delaware on the west side, the Delaware Bay on the south, and the Atlantic Ocean on the east. The State is considered a peninsula.

If you care to liken it in terms of water supply, it is an island in terms of water supply planning on a macro or large scale level.

This is very, very useful to indicate just the availability of what would be the fresh water available within the State.

Another item that comes, of course, is the large number of lakes and reservoirs within northern New Jersey. This is because the State has been glaciated in the northern portion. That substantially affects the geo-hydrology portion of the State. That would be approximately one third to one fourth of the State would be included within that.

The area in question, of course, which is not delineated, but that is Clinton Township, lies — of course, both Spruce Pvun an4 Round Valley of course lie within Clinton Township.

So we would be in what is called the consolidated rock portion of New Jersey, as distinct from the coastal plain, which makes up the other 60% of the State. It also

indicates, of course, that the area is between two physiographic provinces, which are important for ground water purposes, that is the Piedmont province in the central part of the State, and the New Jersey highlands, which contain the oldest rocks found in the State, greater than 600 million years, as compared to the Piedmont section which, of course, are the shales, sandstones, and they have a geology of about two to five million years, of that order.

Q Now, are you going on to 105?

A Yes, P-105 how, on a scale of one inch to four miles. As a result of going with the scale change, our area, that is, the size of the sheet, goes up by a factor of four. So the map is four times the first map.

The purpose of this is, of course, the outline shows the Raritan River Basin. This is the largest basin entirely within the State of New Jersey. 1,100 miles of which is the sub-watershed called the South Branch, shown here in shaded red. That comprises approximately 276 square miles that makes up about 25% of the entire watershed,

The area shown in green is the Passaic watershed, which extends beyond the New Jersey-New York boundary, going into Rockland County, into New York State. That is the Passaic watershed shown in green lines, and the

Hackensack watershed shown with crosshatching in the brown.

The purpose of putting these two watersheds are very simple. Half the population of New Jersey is within the Passaic-Hackensack basin. The future water supplies of at least a portion is to serve the needs of the three and a half to four million people within Passaic-Hackensack basin, which would presumably come from the Raritan. The magnitude of which has not been fully authorized by the State.

But there is already a diversion from the Raritan basin to the City of Newark in the Passaic basin of an annual average of 10,000,000 gallons per day. The purpose of putting that on is, of course, that is a potential demand area for the Raritan basin.

Q Would you just briefly describe what you mean by diversion, since that is probably a term that will come up again? A The diversion refers to the actual acquisition of rural water from — well, a diversion actually refers to the acquisition of rural water, either surface or ground water, treating it, then distributing it into a pipline for ultimate consumption for the consuming residents of industry or whatever that may be. The diversion of 10,000,000 gallons per day, which now comes from the Raritan River through the City of Elizabeth to the City of Newark, is coming from the Raritan

River via the pipelines of the Elizabethtown Water Company, with their branch — rather, their filter plant at the confluence of the Millstone and the river at Bound Brook, or very close to the community of Bound Brook. Right now the contract calls for 10,000,000 gallons per day.

Q Please go on. A Therefore, the diversion refers to raw water, the water is, of course, treated by Elizabethtown to meet potable water standards, then is distributed.

As of now there is an unallocated portion of water available within the basin by virtue of the construction in the 1960's of Spruce Run and Round Valley, which have substantially, radically, changed the yield of the Raritan basin, without question.

The yield, in the absence of the reservpirs would be lower than 40 m.g.d. or million gallons per day, given the low flow characteristics varying parameters.

If given the existence, though, of Spruce Run with eleven billion gallons of storage and Round Valley with fifty five billion gallons of storage, the yield of the Raritan basin has now been determined to be either 250 or 280 million gallons per day, depending upon the drought of record that will be used by the State. That would either be the drought of the early nineteen thirties or the drought of the early nineteen sixties.

You have a difference of 30 m.g.d.,depending upon how conservative you wish or the State wishes to be.

There is then, out of the 250 or 280 m.g.d., there is a required 90 m.g.d. letdown that must be maintained, or flow at Bound Brook. You are using letdown and flow interchangeably.

More specifically, let's correct that, the letdown would be the minimum flow at Bound Brook, which must be 90 m.g.d. at all times until changed by the State.

That 90 m.g.d. is for the purposes of maintaining a minimum flow within the tidal part of the Raritan, which would be at least, from that point, about two miles from the confluence of the Raritan and Millstone through New Brunswick out to Raritan Bay, which is. about twenty miles.

In order to keep some water flowing in that channel for dilution purposes and quality, the State has mandated a 90 m.g.d. minimum flow, which is also one of the lowest within the State.

Q Go ahead, you can continue.

A The amount of water that is available for allocation right now, Elizabethtown Water has 70 m.g.d., Middlesex has an additional 20 m.g.d., for a total of 90 m.g.d. available. Another 90 must be the minimum flow. So that is 90 plus 90, which is 180, 250 minus 180 zero, yield

70 m.g.d. That is the amount that is presently unallocated. It is being kept in storage.

Presumably the Water Supply and Supply Council is authorized by the State to arbitrate and to allocate that water -whenever a customer or a water purveyor would apply for that water.

Q You want to move on now in your description, have you concluded your description of the Raritan basin?

A Yes, for our purposes.

Q Is there anything further that you want to show on the more detailed map with regard to that?

A Yes, if I could.

Q Let me say this, I am going to ask you, I think you have done it thus far, I am going to ask you to describe the Raritan basin, then I am going to ask you to describe the South Branch watershed. So if you want to do them both at the same time, that is perfectly acceptable? A Map number P-106, we have now changed our scale from substantially one inch to four miles, to one inch to 2,000 feet.

These are the standard seven and a half minute quadrangles. They were merely cut out and pasted together in this fashion.

The items on here, just for the purposes of reference, the red line indicates the boundaries of

Clinton Township. The photo reversion procedure, by the U. S, Geological Survey, shows the purple tinting. This has been photo revised in 1970 to show Spruce Run and Round Valley. High Bridge Borough, Lebanon Borough, Town of Clinton, are also delineated in red for reference.

The areas shown approximately on this map are the outlines of the R.V.I, tract, the Goble estate, 490 acres and the remainder on the western part of Route 31.

The R.V.I, estate is shown, of course, in purple, since the topography of the map dates to 1954. The Government in its revision merely goes by purple overlay to show the land use and changes, hydrological changes that have occurred since then.

The area shown in blue is the course of the South Branch shown by, of course, one line, although the river does have several islands in it. It was shown on this map as one blue line to show the generalized path of the South Branch. Two smaller tributaries were shown because they focus on the R.V.I, tract, that was the Beaver Brook, a portion of which comes from the tract and emptie,s through the Town of Clinton into the South Branch. Of course, Chambers Brook, which drains into, in particular, the Goble estate, and comes into the South Branch, very close to the Hamden intake.

The two items which axe slashed in yellow, I hope

would be visible. I will delineate them now, the Ramden intake which is 150 m.g.d., up from the South Branch to Round Valley.

The drainage of the Round Valley is only 5.7 square miles and it is totally inadequate to support the reservoir, which is the largest reservoir in New Jersey. It requires a pumped diversion from the South Branch. This pumping can occur whenever the river flow exceeds 40 m.g.d. as measured at the Stanton gauge, which is shown in yellow here, just a little bit belox* the boundary of Clinton Township.

Therefore, when the river flow is greater than 40 m.g.d., the water can be pumped from the South Branch into Round Valley for storage.

Just recently they have now opened a 108 inch pipeline to release some of the water for reuse downstream in the Raritan.

Those were the major features indicated. The only other yellow on the map is, of course, just the community names that are shown on P-106,

Q Okay. Now, is there anything on the more detailed 107 that you would want to talk about?

A 107 was more of an accurate index of 106. That is now at a scale of one inch to 1,000 feet.

The items shown on this are a more exact boundary

of the R.V.I, tract. For the purposes of clarity, the Borough of Lebanon is shown in red, High Bridge and, of course, the boundary of Clinton Township and the Town of Clinton, the Hamden station just showing at the lower portion of the map.

Also on this, although not indicated, would be in the extreme, the southern extreme, southern portion of Clinton, the sewer treatment plant that would be just within the boundaries of the Town of Clinton.

Q Now, does that then complete your description of the Raritan and South Branch as shown by these maps? A Yes.

Q Okay. I.would like you to basically speaking, would it be correct to say that what you have done by using the charts, could you describe in words Section 3 of your report, that is, the R.aritan and'South Branch watersheds, page 3? A Specifically that would be Roman numeral HI on page 3 of my report, yes.

Q Now going on to Section 4 of your report, that is entitled Regional Issues, and you categorize Regional Issues as water supply. Would you explain what you mean by that? A The regional issues for water supply involve essentially the fact that the Raritan basin is a source area for consumers,

not just within the basin. Therefore, the regional implications are that the reservoirs that have been built within the basin, a portion of their yield has been diverted to the Passaic.

Q So this is a diversion that you have already talked about. The regional issues you refer to the fact, as you have already testified, that water may go out of it into other watershed areas? A Yes.

Q Have you conducted an analysis of the South Branch, I am referring to page 7 to 9 of your report now, Water Quality in the South Branch?

A Yes, I have.

Q VJhat conclusions did you come to?

A The conclusions that I have arrived at with regard to water quality?

Q Yes. A With regard to water quality, or the fact that there have been — the State and the U. S. Geological Survey, other groups, too, have been making water measurements. Probably the most recent summary of these has appeared in the August, f76 draft document which was referred to earlier. That is the one that is called the Raritan River Basin Water Quality and Management Plan, Phase 1, or more technically, what is a 303-E plan as required under public law, 92-500, or the Water Quality Improvement

Act of 1972.

The 303-E plan, or the basin plan, discusses a number of issues, including the water quality and water supply aspects. The South Branch watershed is one part of that rather voluminous draft document.

Q Now, with regard to your analysis of the South Branch, did you also do a comparative study of the impact on water quality of various uses of the tract of land that is under consideration here, namely, the Goble tract, did you conduct such a study?

A I did conduct such a study. The initial objective was to try to assess what the probable impacts in quantity and quality would be of alternate land uses on site.

The most recent models that have been developed by EPA, which is the natural agency in this regard, does not allow one at this point in time to compare, directly compare, agricultural land use with residential, industrial, commercial land use.

Therefore, the only direct comparison that could be made now, giyen the state of the art, is to compare residential versus commercial, or residential versus industrial. Agricultural cannot be compared directly, it would have to be what 1 would call indirect.

Q Leaving aside for the moment the question

of agricultural, we will come back to that.

" What do you find, with regard to your analysis of comparative uses of this land and its effect on water quality, I take it from what you have said now that you are going to be comparing a PUD, which was described to you as approximately a 3,550 unit PUD as opposed to the PvOM, that is the present designation for planning on the Goble tract, that is designated by the Township of Clinton. Is that what you are comparing? A Yes, I was comparing the PUD proposal with the information furnished to me and the expected land use and density values that were given to me by Mr. Dishner and Mr. Rahenkamp. Then comparing it with an ROM plan, which made some fairly conservative assumptions with regard to impervious cover.

Q Would you please give us your analysis of that, including whatever assumptions you think would be important to our understanding? A Two components to the alternate land uses, one is a quantity part, one is a quality part.

The quantity part, which gets at the amount of runoff which is expected tq be generated, involves an assumption of annual precipitation which, of course, is a straightforward percent of impervious cover, which would be fairly exact for the PUD and had to be assumed for the ROM. The percent of impervious cover, given the ordinance in the Township for

ROM, was assumed to be 20% maximum building coverage, which was in accord with what was then the current regulations of the Clinton Township zoning regulations.

I added 30%. for parking lots, driveways, loading ramps and rights-of-way, to come to an impervious cover of 50%.

This was about 30% under EPA estimates for commercial land use, which would suggest a value of 80% impervious cover. That is what 1 first started out with, but then downgraded it to 507o total impervious cover because of the existing zoning regulations that govern the site.

Q Let me see if I understand you. VThat you are saying is that EPA would consider or allow for more cover than do the regulations of the Township of Clinton?

A For our purposes, if I may just clarify?

Q Please do. A For the purposes of estimating pollutant loading,' for the purposes of estimating runoff generation, EPA and other agencies have a variety of figures for different land uses. The one for commercial is about 80%, that they would estimate for impervious cover.

In my draft I started using 80%,, but then, upon consultation with Mr. Disher, who informed me about the zoning regulations, I then revised that downward to 50%, which, of course, was more conservative than the 80%.

Therefore, the impact would be upward.

Q, What is the significance of impervious cover?

A The impervious cover would, of course, diminish any possibility of ground water recharge on the particular site and would severely increase the amount of runoff that would be expected, both total runoff and peak runoff. There are two components of runoff, both would be increased by that amount of impervious cover.

Q Okay. Please go ahead.

A Thank you. The assumptions for the ROM then were based on impervious cover of 50%. The assumptions were based on the plans that were furnished to me and calculated out for the PUD, were approximately 21%. The exact numbers are on the report and I will round them out for the purposes of our discussion now.

It would be approximately 21% impervious cover. Therefore, the annual runoff, which is based on an equation that is an EPA equation, turns out to be approximately double. That is, the ROM is expected to generate in the absence of any control mechanisms, twenty two inches, or nearly half of the incoming precipitation of forty five inches per year.

The PUD, given that impervious cover and depression storage, is expected to generate about eleven and a half inches, or approximately half of what the ROM would be.

The major difference, of course, being the impervious cover.

Q What does that mean in practical terms, for example, to a concept like the degradation of the stream, what is the impact of 22 versus 11-1/2?

A This would be purely a quantity. This is a quantity, not a quality aspect, truly a quantity. That would mean that given these assumptions you would have to handle twice as much water from the ROM site as you would from the PUD site, purely in the numbers of gallons or in inches, but purely in a quantity term. That is approximately double that.

I also point out for clarification, that even though the ROM assumption of 50% impervious cover is more than two and a half times the PUD impervious cover of 21%, the runoff generated is not two and a half times, but actually double.

This difference is attributed to the nature of the estimated equation that was used by EPA, that is one reason for that.

The second part relates to the prediction of annual average pollutant loadings. This assumes, in this case, the EPA has really two categories. If I may dichotomize, there is a very sophisticated, elaborate, computerized stom water management model procedure which would presumably be

more accurate. That would require a much larger staff and would be way beyond the scope of this particular study.

As a result of the difficulties in dealing with that, the EPA, very recently, that is in the spring, 1977, released a report called what they call a Desktop Assessment. That is a model for estimating pollutant loadings which could be done with a simple hand calculator. Therefore, this was the type that was employed within the study.

The assumptions that go into this are the land use. Now, the land uses that were available by EPA were residential, commercial, industrial. The one that was used then in the PUD was, of course, with the residential.

The ROM was presumed to be closer to commercial than industrial. Therefore, the co-efficients that were employed were the commercial ones rather than the industrial ones. The pollutant loadings, or the pollutants that were indicated were BOD5 which is the biochemical and oxygen demands. The standard water quality variable, suspended solids, total phosphates and total nitrogen, these were the four pollutants that EPA was using in their particular study, ,,

Of course, the phosphates and the nitrate they were interested in for the purposes of eutrification or enrichment of water courses.

THE COURT: Can you tell me the approximate

Page you are on in your report?

THE WITNESS: Certainly, page 12. Page 12 of the report lists the respective land uses, the four water quality pollutants, the population functions.

Again, these are stipulated by the EPA model and you apply the respective population functions, given the density and values.

Then the fourth assumption is the street sweeping, which could have a very substantial impact. For the purposes of this, I use the default which was a sweeping interval of 20 days rather than any other value in that. Although one could go through with the other equations, I took the average annual precipitation of 45 inches per year, based on the thirty year period of 41 through 70. I developed an estimated population for the Goble tract of 24 persons per acre and assumed a street sweeping frequency for both land uses of 20 days, RCM and PUD. I applied a population function going into page 13 of the report and selected the pollutant loading factor which was given in the report.

I continued the assumption that the RCM would occupy 50% of the Goble estate under the RCM

zoning. My last assumption was that the area had, will have, separate storm and sanitary sewers. Then I went ahead and supplied it. The results indicate that the ROM site would be expected to generate a percentage increase of 154% over the PUD site in BOD loadings or organic pollutant loadings, 49% more in the phosphates, 48% more in the nitrogen, practically the same, about 8% less, the only category that showed up less were the suspended solids.

That is, the PUD would generate 8% more than the ROM.

The ROM site would be expected to generate a larger pollutant loading, which would then go into the receiving water course, namely, the South Branch of the Raritan.

Q So that what is your conclusion with regard to the degradation of the South Branch as compared between the proposed zoning of the Goble tract, ROM, and between a PUD use? A Between the PUD plan and the ROM, the PUD — to put it anotiier way, the ROM would be expected to generate substantially more potable loadings with the exception of suspended solids, given the model that was used.

Q How would the suspended solids be handled? A Suspended solids could be handled in a management

scheme by a series of detention basins, would be one method of handling that.

Q j Now, did you have a chance to review the R.V.I, proposal to see if detention basins were included in it? A Yes, I did review the R.V.I, material, in particular the background report called A Planned Community, by Rahenkamp[1]s firm. And the McKeever report or McKeever's report, which was incorporated along with Jesky's report.

That plan called for sixteen detention basins on both sides, which were to be an absolute integral part of the plan. Indeed, in absence of the performance specifications, very clearly I could not make a statement that the PUD or the Beaver Brook PUD would degrade the water environment,

Given the performance specifications which stipulate detention basins, I can then make that comment, that in the presence of those specifications, the development would not degrade the water environment.

Q Okay. Now, Dr. Hordon, you stated earlier that it was not possible to compare agricultural uses, as you have just done with ROM and PUD uses. Can you tell us briefly why it is not possible to compare, and also if you have -- I note your report does talk about agricultural runoff. I x-jould like to briefly have you address that

subject. A One of the reasons that one cannot compare the agricultural land use directly with the urban land use, had to do with the impervious cover assumption. VJhich, in the case of agriculture would, of course, be extremely minimal.

Therefore, the impervious cover is absent in that and the models cannot be used to directly compare.

In order to make some kind of assessment for what will be the impact, one would have to know the exact loadings of fertilizers that are put on, and at what time they would be put on. One can only make an assessment, by itself, one couldn't do a comparative basis reasonably on that.

Going through the literature, several items of which are referenced, several are referenced in the report on pages 14, 15 of my report. Several of what you might call standard references, the amount of pollutants generate^ by agriculture, naturally by implication, of course, to New Jersey and 1-Iunterdon County, certainly are very, very substantial. In particular, a majority of the pollutants are sediment. Without any question, sediment is considered without question a major pollutant by EPA and, of course, others.

This would be a major pollutant that would be expected from agriculture. Of course, also, the nitrates

which are soluble, will get in either as surface runoff directly to the receiving watercourse, or get into the grounjd water, go into solution. Since ground water sustains the flow of the stream, the nitrates will get to the surface water via the ground water. So the nitrates would come in from fertilizer applications, just given the fertiliser applications that the farmer puts on. The phosphate portion, the phosphates tend to be absorbed on wet soil particles which then go through the process of erosion and precipitation would be washed into the watercourse. Then the phosphates will get into the watercourse, not by solutiajn, but by being carried as sediment particles.

The magnitude of the nitrogen here, this varies enormously because of what is called the nutrient recovery rates. Here, depending on the time of the applications, that is rather crucial, in the instance of corn, there are many values for corn. They indicate that out of all of the nitrogen fertilizer put on the corn, the nutrient recovery or that portion that can be part of the uptake of the plant, is in the range of 30 to 70%. Splitting that would give you 50%. This would indicate that about 50% of the nutrient fertilizers put on would actually get into the com plant. The other 50% would get into either surface runoff or leached into the ground water. An unknown amount of that could also be what is referred to as

denitrified. That could get back to the atmospheric sink. The magnitude of that is unknown at this point.

Q Do you feel that you can make a comparison in your own mind between the possible degradation to be caused by agricultural use as opposed by the PUD use that you have been describing, and which has already been introduced as P-l, namely, the Rahenkamp land use plan?

A The major pollutant which, carries along with it several other pollutants in agriculture, would be sedimentation, which, very definitely, would be a major pollutant.

As long as you have sediment, you have the possibility of phosphates being absorbed onto the individual particles then, which would wash into the receiving watercourse. The nitrogen would come via solution.

Q Can you say which, in your opinion, might cause more problems for the watershed, if you have an opinion on that subject, an agricultural use such as you have described — A 1 would think the sediment would pro'bably be the most substantial. Corn is a row crop. It is open tilled and at this point, in my opinion, there would probably be sediment which would be a very substantial pollutant.

Q Moving on to another aspect, did you study the Clinton Township sewerage plant in relation to the impact of the South Branch and, of course, its relation to

the proposed Round Valley PUD site? A Yes, I did. A little less emphasis was given to the Clinton sewer plant than on the water supply issue. Partly because Taylor, Weissman and Taylor were going to go into a little more focus on the internal aspects of the plan.

Q With relation to the South Branch, what conclusions did you come to? A Many conclusions that I came to on looking at the files of the region and looking through what the EPA had and the files of the DEP in Trenton.

They simply show an unused capacity, average flow how of 0.6 m.g.d. as compared to a capacity design of 1.5 m.g.d.

Indeed, the applicant has a hydrolic capacity of 2.03 m.g.d., which, upon the completion of sludge digestors would indicate an even larger unused capacity.

So the applicant is right now operating at less than its hydrolic capacity.

I also looked at this, as is indicated at page 17, table 7, the Effluent Flow from the Clinton Sewer Plant, for calendar year,, 1976 as compared to the flow in the South Branch.

The values from the flow in the South Branch come from the operator's report, that is the monthly average. The effluent flow from the applicant come also from the

monthly operator's report.

I looked at that and made monthly dilution ratio comparisons. It turns out that the average for 1976, between the effluent flow and the flow in the South Branch, was of the order of 195 to 1, for an annual average.

An extremely daily minimum dilution ratio recorded on August 19, 1976, was a 55 to 1 ratio, that was the extreme low.

I looked at the BOD, biochemical oxygen demand, and suspended solid removal rates for the applicant, which is considered a secondary plant. The rates were well in excess of 907o. In fact, they were substantially higher than that.. Indicating that those were very, very good removal rates for a treatment plant. Indeed, some of the value of removals of the order of 95, 967o, certainly well above the 907,, which is stipulated.

Q What is the meaning of the dilution ratio, what does that tell us on table *11*

A Table 7 is saying, at that point that the amount of effluent flow to the flow in the South Branch, at the same point, is of the order of either 55 to 1 or an annual average of 195 to 1. That means that there is one part of treated effluent to 195 parts of raw water, which is of good quality, within the South Branch. That would be considered, just as a first approximation, to be very good

dilution ratios. Certainly compared to some samples on the Passaic, these are very, very, very substantial dilution ratios.

Some plants on the Passaic, if I just, without mentioning the specific plant, would have dilution ratios of less than 10 to 1, that is treatment plant effluent to flow, in the upper Passaic or portions of the upper Passaic,[1] 10 to 1 or 5 to 1. There are reports that they even have been lower than this.

So when I see a value of 55 to 1, which is extremely low for one day, this indicates that there is very substantial dilution of treatment effluent, which in itself is highly treated. I would value that favorably.

Q All right. Dr. Hordon, now with reference to this entire report, I note you have summary conclusions starting at page 16. I do not want you to repeat entirely those, but would you just briefly give us your major conclusions on this report with regard to the PUD proposal, and whether or not, in your opinion, it would cause degradation of the water supply for the South Branch system?

A I will start with the first. Given the performance specifications which were shown to me and \<n:itten in the various documents that were referenced, it is my opinion that there will not be degradation of the water environment. In particular, the performance specifications

include detention basins, they enumerate sixteen within the initial plan, scattered over the site. Those are considered to be very useful mechanisms or devices for retaining flood peaks, for acting as sediment traps for any of the storm water that is generated within the sites,and third, for acting as recharge ponds.

Now, the exact magnitude of how much can be recharge^, would require a more detailed on-site investigation. But given a look at the soils on the site, it is apparent that there will be that recharge. That will be a conservative statement, certainly.

The second observation or conclusion would be that the water that would be consumed on the site, about 75% of that, would be returned to the basin and, therefore, will not be, to use the term, lost, to the basin. This water that will be used would, of course, be treated, presumably treated, and would be available for reuse either further downstream or for reuse to be pumped out of the basin and to the Passaic-Hackensack basin. So, therefore, that is a very substantial portion.

Out of the estimated one m.g.d., 75% would be returned, which is the estimated sewerage flow that should be generated. 25% would either go back into the ground water recharge, or would be available as evapotranspired. It is a process of a combination of evaporation, transpiration,

that would be a second conclusion.

Also, with regard to the plant, the particular Clinton sewer plant is twenty five miles above the proposed confluence reservoir. Which would mean, assuming the confluence reservoir is finished, which would mean that there would be some assimilative capacity, some renovation of effluent within twenty five miles of the Clinton sewer plant.

THE COURT: You are pumping water from the sewer plant and you have a twenty five mile flow down until you get to the Hamden gate again, is that it?

THE WITNESS: I'm sorry, the Clinton sewer plant is above the proposed confluence reservoir. It is 11,000 feet above the Hamden intake, or a little bit, approximately a little bit more than two miles.

THE COURT: Does that mean that you are twenty seven miles then?

THE WITNESS: It is two miles upstream of the Hamden intake and twenty five miles upstream of the confluence reservoir where the North and South Branch would come together.

Because of the different characteristics of the reservoir, Round Valley Reservoir being a very

deep, cold reservoir, more on the idea of one that is referred to as a lithotrophic reservoir because of the depth and eutrification of that reservoir, which would differ from the confluence reservoir, which would be a smaller and shallower reservoir.

The twenty five miles of free flowing river act as an additional safety factor for the plant. That is very substantial river length of treated effluent.

THE COURT: This particular project or plant, to pump up to the Clinton thing, therefore, if it added anything to the environment, it would be coming back down and still be filtered by this length of travel?

THE WITNESS: Yes.

THE COURT: Anything else, did you cover all the summary now?

Q Is there any other point with regard to this entire report that you would like to make, that we left out? A Yes, some of the other performance specifications which I --

Q In other words, you are talking about the performance specifications that are set forth as proposals of the PUD? A That's right.

Q You have assumed that all of those — in

other words, your report, I think it states it clearly, are those all of the specifications which are laid out in P-l and P-4 that are already in this case as documents before the Court, that those are pre-conditioned to your making your conclusion which you have here, that there would be no degradation? A Yes, in the absence of those performance specifications I could not make that statement.

Q But Ttfith them, are you comfortable and confident with your conclusion? A Yes.

Q 1 would like now, Dr. Hordon, if I have left out any other major areas, this would be the time? I understand, I think the Court understands these performance specifications. If there is nothing further, I would like to move on to your second report. Take your time before you do that.

The environmental impact then, I gather, considering this whole project, in your first report was what? A The environmental impact would be that there would not be any significant degradation or any water related impact as a consequence of the development, as long as the performance specifications that I have seen are there.

THE COURT: All right, take a break now, Mr. Reporter.

(Whereupon, documents previously marked as Exhibits P-96 through P-107 for identification, marked into evidence. Whereupon, a short recess takes place.)

THE COURT: The April 8th report, gentlemen?

DIRECT EXAMINATION CONTINUED BY MR. STERNS:

Q Mr. Hordon, I would like to direct your attention now to what has been marked as P-103, and identified as your second report dated April 6, 1977. What does this report concern itself with? A The focus of report P-103, is to look at the issue of water supply for Beaver Brook PUD.

Q Could you please summarize the report, that is the purpose in writing it, the conclusions that you reached and whatever you feel is relevant, briefly, in terms of the methodology or sources you used to come to your conclusions? A The conclusion was that on-site, with in the 790 odd acres, would not be adequate to handle the estimated one m.g.d., but the off-site, that is beyond the R.V.I, site, the off-site water resources from the area would be more than adequate to handle the anticipated water demand in the PUD. In the process of doing that, an examination was made of Clinton Township's diversions and its ability to furnish some or all of the water.

In conclusion, to start out, in conclusion it was my opinion that water supply should not be considered a constraint in the development of the proposed PUD.

Q What alternate methods of water supply would you see as meeting the needs of the PUD?

A The alternate supplies could come from a variety, from a mix of sources. Some of the supply could come from on-site ground water. A second supply source would be the Town of Clinton system, which includes wells that are within Clinton Township, since there is an existing agreement between Clinton Township and the Town of Clinton with regard to the development of water. As a third possible source would be off-site surface water diversion, such as the South Branch of the Raritan. In that context, may I refer to a report which was not referred to earlier?

Q That you utilized to prepare this study?

A No, that was not included as a reference within Addendum number 1, the Elamand Popoff report.

Q if you describe what it is?

A The Elam and Popoff report is a comprehensive, area-wide x*ater plan, a summary released September, 1974.

Elam and Popoff is an engineering firm in New Jersey. In their summary to the Hunterdon County Board of Chosen Freeholders, they mentioned very specifically as a recommendation, may I quote?

Q Yes. A On page F-7, "Both the Spruce Run and Round Valley Reservoirs are located in Hunterdon County with the raw water at Round Valley readily available to the County as a primary source of supply.[11] There are other comments, and that was the main comment within the report.

Q What is the significance of that to this project? A That would mean that the surface water resources of Hunterdon County, including Spruce Run and Round Valley, would, in Elam and Popoff's recommendation, be available to the County.

MR. STERNS: May I ask that this be marked for identification? Since it has been referred to? It has got the heading, Board of Chosen Freeholders, Hunterdon County (Comprehensive Area-wide Water Plan Summary), as indicated by Elam and Popoff.

Since it has been referred to we might as well mark it.

MR. SUTTON: I have no objection to it being marked, but I wonder if copies could be supplied to us?

MR. STERNS: We will try to make them, certainly, between now and tomorrow morning.

Q Do you know, Mr. Hordon, what this is?

A It says the Board of Freeholders, Hunterdon County.

It was chartered by the Freeholder Board. This was a study authorized by the Freeholders of Hunterdon County with a contract to Elam and Popoff to make a survey of the water resources of the County.

O'teter resource survey marked as Exhibit P-108 for identification.)

Q Dr. Hordon, what you just referred to as the Hunterdon County study, talks about the additional resource of Spruce Ron and Round Valley as being available to the County. Are your conclusions about the adequacy of water for the Goble, for the Round Valley PUD, based on any considerations of the Spruce Ran and Round Valley Reservoir water? Is the source of water that is contemplated independent of that additional source?

A Actually the two off-site supplies would be either the ground water within Clinton Township, the surface water of the South Branch, or the reservoirs. In that since, I was just referring to off-site ground water and off-site surface water as being a potential source.

Q What I am getting at is that your opinion that with those sources you don't even have to reach into Round Valley or Spruce Run in order to meet the needs?

A For the magnitude of the PUD, the one m.g.d. could be easily furnished from the available water within Clinton Township. Given a set of conservative assumptions,

regarding the ground water availability within the Township, it would not be necessary to go to Spruce Run or Round Valley, although it is there.

Q How, can you describe how the Town gets its water now? A The Town of Clinton gets its water from a series of wells within both the Town, physically located within the Town, and also some wells within Clinton Toxmship.

They had an annual average diversion in calendar year 1976 of 0.85 m.g.d., as contrasted to a diversion rate granted by the Water Policy and Supply Council, for a maximum of 1.85 m.g.d. during any month.

Looking at the diversion, both on an average annual basis and on a maximum monthly basis, which would be figures one and two within my addendum, number one indicates that the average annual pumpage or the maximum monthly pumpage for the Town of Clinton is substantially under the diversion rate of 1.85. Indicating that water could be furnished to the PUD, were that to come about.

THE COURT: What page are you referring to in your report?

THE WITNESS: Figures one and two would be the very last pages in the addendum, number one. There are two graphs, as the very last pages. That would be page 19 and page 20.

THE COURT: All right.

Q Now, Dr. Hordon, you testified, of course, as to the adequacy of water.

Let's now speculate, hypothetieally, that in the event that at some point in time the population of Clinton Township grew so that the five wells presently in service did not have the capacity to serve the increased population.

I realize that this is hypothetical, but from your point of view as an expert geologist and hydrologist, is there anything that would prevent the Township from drilling additional wells, being constructed to serve that increased population? A No, wells could be drilled both on-site and off-site within the Township, and still be well within a conservative ground water yield for the Township. Therefore, an adequate supply could be obtained.

Q Dr. Hordon, is there anything further in the April report addendum number one, water supply, in the way of conclusion, that you would like to call attention to? A Yes, it would be very brief and simple. That is the ground water yield for Clinton Township or estimated to be in one report in 1967, 11 m.g.d. These have now been downgraded by another estimate in what is referred to as the Lord's report or Bulletin Number 74 of the Bureau

of Geology, which is referenced, the full title of which is referenced in the report to be less.

In summary, the ground water yield is estimated to be either 4.6 or 7.0 m.g.d. for the entire area, land area on the Township, based on either a dry year or what is called a normal year.

Q What does that fell us?

A That tells us that the diversion now in the Township is substantially less than either the 4.6 or the 7.0. Therefore, that additional water would be available from the Township.

Q Where is that found? A Page 16, table 4, in addendum one.

The summary numbers are 4.6 m.g.d. or 7.0.

Q Does that complete the highlights or summaries of this report, is there anything else you want to emphasize? A One further thing is that on the part of the Goble tract you have a series of formations as part of the Kittatinny limestone. It is subdivided into a number of different members of the Kittatinny limestone formation, which would be very good yielders. In fact, possible to furnish the entire supply with three or four wells, that would have a capacity of 200 gallons per minute, just from the on-site.

However, in my report, I was using m.g.d. per square

mile estimates, that tend to be conservative.

Mother feature which could not be quantified, but which should be indicated, is the existence of a fault which goes through the site. The presence of faulting would, of course, increase what is referred to as secondary porosity within the consolidated rock formations which would have a very substantial effect. Which would increase the yield very substantially.

- However, it would not be quantified within the scope of time available.

Q Does that complete your analysis of that report? A Yes.

Q Turning further, Dr. Hordon, I show you a report that was entitled Detailed Pveport and Outline on Water Resources Issued Surrounding the Round Valley Suit Against Clinton Township Zoning Board, by the South Branch Water Association, SeanReilly, Executive Director, May 26, 1977.

I ask you if, at my direction, you have reviewed and analyzed that report?

A Yes, I haye, but I have not submitted a written report.

Q But you have analysed and reviewed this since May 26? A Yes.

MR. STERNS: May we have this marked? This

is the report that was furnished us, which I asstune that you will use in your case?

MR. SUTTCN: Yes.

(Report by the South Branch Water Association marked as Exhibit P-109 for identification.)

Q Mr. Hordon, referring to what is now marked P-109, would you briefly, if you can, tell us what are the major points raised by that report and what is your evaluation of those points? What is your critique, or how they refer to these issues?

A The major point raised in the Water Supply report pertains to the philosophical assumption that only on-site availability of water can be used in the determination of water availability.

This, at the subdivision level, is a rather extreme position. One that, I think, has not been adopted by any court or by any regu]a tory body within any county or any municipality, any State, to my knowledge, at the subdivision level.

I would philosophically disagree with this presumption. It has been applied at the municipalit}^ level in terms of what would be referred to as ogenous or exogenous supplies of water, or local versus regional at the municipality level. Even that has run into some question as to whether or not that is a viable concept, the

so-called water crop concept, which is extremely interesting. That would mean that only the water available within the municipality can be used to furnish water. A court case in Florida, the Boca Raton case, September, 19716, indicated that Boca Raton attempted to apply this water crop theory. The appropriate court in Florida did not allow that, feeling that off-site, that is off the municipality, could come in to furnish water to the municipality].

To do so at the subdivision level, 1 think would be a little bit too extreme, in my judgment. It would mean the end of substantial clusters of towns and cities.

The notion of saving land within the watershed for the purposes of storage is, I think, a viable one, and it is a necessary one. But not to be applied specifically at the subdivision level.

The result would be, if you carry it through logically, that the area would have, depending on the particular geological formation, one dwelling unit per one acre, or one dwelling per two acres. In some cases, one per three or even one per four acres, you would have a proliferation of small, individual domestic wells, less than six inches in diameter. That would make it more difficult, probably to control the resources, the ground water resources in both quantity and quality.

Indeed, one advantage of a large diameter public well

is the fact that the irrespective authority or water purveyor, *cap.* drill deeper and can exercise greater caution by drilling deeper. You are then probably getting into better quality water rather than the shallower depths of a smaller domestic well. So the end result, were you to project this, would mean no more clusters, because it would take one, two, three, four acres to support one dwelling unit or for one commercial establishment would take twenty acres or more. That would lead to a sprawl over the landscape, that would be a consequence.

Q As I understand it, as I understand this report, let's call it the Reilly report at the moment, indicates that water, to supply a particular development, should be drawn only from the land of that development, is that it? A As I understand it, should be drawn - as I understand the Reilly report, the water should be drawn only from the site to support that development.

Q You have discussed that detail. I only want to ask you one more question with regard to it. To your knowledge, is there any scientific or expert support for that type of theory, even if it is a minority support? Is there anybody, that you know, that would espouse that theory in the scientific community, I am talking now about expertise in water and hydrology, etcetera.

A The ecale is important here. I think the scale is important. At the subdivision level,no. At the municipality level, it' is beginning to, although none immediately, no. At the County level there has been, yes. Cape May County, in its comprehensive plan which was adopted by the Board of Freeholders of Cape Hay County in 1977. They did adopt that position, but you are talking -- that is only water generated within the County.and can be used to furnish water to the County. This is a much larger land area, though, than a subdivision of 790 acres. You are talking about an entire county in the coastal plain, which would have much greater water resources. Therefore, I have not seen it adopted at the subdivision level.

Q Just even taking the municipal level, in your opinion, if you have an opinion on this, could the concept of water supply limited even to a municipality, be adopted in New Jersey? A I don't know of a case where it has been adopted by a municipality, no. I would say that.I don't know, although, to be fair, certain municipalities considering this as a kind of constraint on their development, *Xo* be in accord with the ground water resources, of that particular municipality. Or let's say, the ground and surface water resources of that municipality, were the municipality large enough that it would perhaps be available, yes, it has been considered. 1 think 1 would

prefer to use the term "being considered."[11]

Q , ! Mr. Hordon, is there anything else, in what we have referred to as, or what is P-109, the Reilly report, is there anything else that you would want to comment on, any other points that it makes, or is that the major point? A Just the numbers that are used. I would want to reiterate that the gallonage estimates that were applied to the site of 181 gallons per day were predicated on geologic formation information at the scale of one inch to 4,000 feet. That means that is a medium scale map. Therefore, that is a natural — 1 itfould think that the estimate would be on the conservative side. Indeed, the drought year values were used. It is my understanding from conversations with Drs. Kimball and Widmer, the State geologists, that the State in its probable release of Bulletin Ko. 74, the so-called Lord's report, with its ground water yields, will probably drop the .drought year estimate and use the normal year for planning purposes. Which would indicate then that the yields from the site would be that much greater.

Therefore, 1:he 181,000 gallons to be expected from the site is on the conservative side.

THE COURT: Even if you did that, would you be able to support it with what is on the site?

THE WITNESS: That's right.

THE COURT: You would.

Q, Even adopting the number 181,000, given the analysis you have done, would you still be able to support the development? A No, the 181,000 would not be adequate to serve the estimated population on the site, it would require off-site.

THE COURT: I want to go one more step. If you are using the drought year, or the normal year --

THE WITNESS: In either case.

THE COURT: The normal year, which would be what you would call the average, it would be substantially more, that would go for the Township, it would be little less than double?

THE WITNESS: Page 5, paragraph 2 of the estimate is 181,000 gallons per day to 275,000. That would furnish about.25% of the estimated population during an average year. That would, of course, not be sufficient.

Q Dr. Hordon, your testimony is that even with the 275, that you have projected, that you would have no trouble with off-site sources, meeting an admitted need without any jeopardy to the Town's water supply. Now, I am asking you to take the 181, which is the much narrower estimate, and ask you if, using the figure of 181 generated

on-site, plus the off-site resources that you have already talked to, would there be adequate water supply for this Round Valley development without jeopardizing the water supply of the community? . A Yes. Even using the 181,000 gallons, and the availability of the Town of Clinton and Clinton Township, there would be enough water off-site.

If I may clarify off-site, I am interpreting to include only now the Town of Clinton and Clinton Toxsnship. I am not referring to substantial off-site such as the Delaware River.

Q You are not referring to the resources of the Round Valle}*- Reservoir or Spruce Run?

A That opens an even larger amount. I am referring just to Clinton Township and the Town of Clinton.

THE COURT: You couldn't draw any water from the Delaware River, that is United States Supreme Court jurisdiction since 1791?

THE WITNESS: With regard to water from the Delaware, however, there is an unallocated portion from the Delaware and New Jersey is entitled to 100 m.g.d. It could only obtain now by virtue of the hydrolic efficiency of the Delaware and Raritan Canal, about 75m.g.d. So there is an additional 25 m.g.d. that could be obtained from

the Delaware and still fall within the purview of the Supreme Court decision.

THE COURT: With the United States Supreme Court's permission, and there has been a controversy between four States since 1791?

THE WITNESS: Very definitely, it would require authorization.

MR. STERNS: I have no further questions, Your Honor.

MR. SUTTON: Your Honor indicated -- is this an appropriate place?

THE COURT: Fine, I am prepared to do it if you are not prepared to go on, we can adjourn to tomorrow morning. It could be a convenient stopping point. In other words, you are not ready?

MR. CAIN: I can do some, there is a lot of information covered, Your Honor.

THE COURT: I will give you time.

MR. CAIN: There is one report that we have to see.

MR. STERNS: I will be glad to show you any report.

CROSS-EXAMINATION BY MR. CAIN:

Q Whichever figure you take, the dry year or normal year, whether you take 181,000 or you take 275, the

most the site can produce is 25%?

A The most the site can produce is 257o.

THE COURT: To the extent that it is a 75% type draw?

THE WITNESS: Yes, and partly no.

THE COURT: What is the no, partly?

THE WITNESS: Partly no, that is the unknown which I regret I cannot quantify within the time frame available. That is the limestone formations. The fault that goes through that area might very substantially double that estimate and reduce the amount that would be necessary from off-site.

Since those numbers were not available, I felt it best to stick to a very conservative estimate, but just hold open the possibility that there is a geologic formation that has been reported in the county, to be capable of yielding substantially more.

THE COUPVT: Is it true that there is an underground river that runs across New Jersey from Staten Island to the Delaware?

THE WITNESS: No. The only time that you can have underground streams would be in limestone formations where you have holes that could become large enough where the water would be between the

grains of the rock and that would be in actual faults within the consolidated formation.

Only in certain kinds of limestone would it be possible to have solution holes expand enough to literally — to have a stream.

In Howe Caverns you can get a boat with people on the underground stream, because there is a very cavernous type of limestone.

In New York State and in other places such as Carlsbad, there are other types of limestone where this fault does occur. It runs in a north-eastern direction, then runs over to the Delaware.

The fault that I am referring to now goes -- I don't have it pinpointed on the map, but it goes through, very approximately, along the Route 31 area through the site. That is, of course, along with the limestone, wherever you have one of these faults which go back to the faulting in that part of the State, the actual process of faulting. These are ancient faults, presumably, not seismo-logically active now. That would mean that the rocks are fractured very, very substantially, allowing that much more precipitation to infiltrate through the ground and literally be stored in the formation.

The magnitude of that would require a detailed, on-site investigation.

The fault is not a continuous fault, it is a local fault. That fault has developed over several hundred million years.

You were speaking about one coming over Staten Island, over the Delaware River. That would separate the Town of Hopewell and it could be related to that fault, but it would not go over to Staten Island, that is in a different physiographic province and would not be connected.

The only part that would be connected, you might say chronologically, would be the diabase ring dike and Round Valley would be of the same vintage, such as the Palisades, for example, and the Sourlands, the Watchungs. But that would be chronologically rather than structurally connected by the same fault. These would be very relatively smaller ones.

It is characteristic of the geology within this area. These have rather small features, where as out west, the faults are structurally hundreds of miles.

THE COURT: In Rosemont, many years ago, we had a very serious watercourse and we had to

.ocal "ells and d--- one large public
e ested the wells there, I don't
1 are familiar or not, the dye came
'are River?

SS: Where is Rosemont?

It is in Hunterdon Count y. south
north Sergeantsville. It is west
toward the Delaware River.
e dye would be put in the well
1e out in the Delaware River
'e was a fault and the testimony
fered at that time was that
Jersey.
There are many faults across
not familiar enough with that
napo fault in Bergen County.
gies are related though'
t in the Triassic basin during
ogic time.
you.
1 I make a comment, from my
to just some information
Kasabach's report, that
rred to for the geology
t the yield from the

Kittatinny limestone, industrial wells implying larger than six inches in diameter, has a medium yield for all wells within Hunterdon County of 250 gallons per minute, and an average yield of 414. It will take only about 700 gallons per minute to furnish one m.g.d.

It implies that three average wells could furnish the site. This was not used, that is that statement was not made in the report because it would require on-site investigation.

But the fact is that the limestone is capable of substantial yield and a fact that I think should be recorded.

THE COURT: You are familiar with I-fr. Rahenkamp's testimony, I assume, where he indicated that there would be no building over the so-called recharge limestone?

THE WITNESS: Yes, that area would be left as much as possible for detention basins, open basin recharge.

THE COURT: You already considered that in your opinion, would, you drill the wells there?

THE WITNESS: The wells -- the best wells would be dug, certainly, on the limestone, very definitely.

THE COURT: Wouldn't you destroy the recharge area?

THE WITNESS: Not from digging, no, it wouldn't destroy the discharge,

THE COURT: Wouldn't it lessen the supply, however, eventually, downstream?

THE WITNESS: Only about 25% of the water that would be consumed would be either evapotranspired from leakage which would go back to the ground. 75%, and these are standard estimates that are used in the standard test, 75% of the water would wind up as sewage.

This sewage would be treated and then releasejd immediately to the basin. So there would not be a loss.

The water would be available immediately for reuse. It could even be pumped into Round Valley or released to the confluence.

MR. SUTTON: Your Honor, may I just ask, if you know, I wonder whether you have another witness tomorrow whether this will take up the cross-e:;amination?

THE COURT: I wouldn't count on another witness tomorrow, let's finish one witness at a time.

(Whereupon, the Court stands in recess.)

CERTIFICATE

I, CHARLES R. SENDERS, Certified Shorthand Reporter and Notary Public of New Jersey, do hereby certify that the foregoing is a true and accurate transcript of the proceedings as taken stenographically by me at the time, place and on the date hereinbefore set forth.

CHARLES R. SENDERS, C.S.R.,
Official Court Reporter