STATE WATER RESOURCES CONTROL BOARD

PUBLIC HEARING

THE LEGAL CLASSIFICATION OF GROUNDWATER APPROPRIATED UNDER

WATER RIGHT PERMIT 14853 (APPLICATION 21883) OF

NORTH GUALALA WATER COMPANY

MENDOCINO COUNTY, CALIFORNIA

TUESDAY, JUNE 4, 2002

9:00 A.M.

CAL/EPA BUILDING

COASTAL HEARING ROOM

SACRAMENTO, CALIFORNIA

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SACRAMENTO, CALIFORNIA

WEDNESDAY, JUNE 5, 2002, 9:00 A.M.

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CHAIRMAN BAGGETT: Good morning.

We are back for rebuttal testimony. I guess first up is Fish and Game.

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DIRECT EXAMINATION OF DEPARTMENT OF FISH AND GAME

BY MR. BRANCH

MR. BRANCH: I have five questions. Hopefully we will be fairly brief.

Mr. Custis, you mentioned in your written testimony that you analyzed 17 wells in the Gualala watershed. How many of those wells were extracting water from the Franciscan formation?

MR. LILLY: Excuse me, I am going to object. I don't think this is rebuttal. I don't hear that this is rebuttal.

MR. BRANCH: It was brought up on cross-examination yesterday. I would like to rebut that.

CHAIRMAN BAGGETT: I would overrule.

MR. LILLY: Does rebuttal apply to cross-examination, not just to what our witnesses bring in?

CHAIRMAN BAGGETT: Yes. Since I've been here it has.

MR. CUSTIS: All 17 of the wells were, based on my interpretation of the drillers' descriptions, were in

Franciscan bedrock.

MR. BRANCH: Do you have any documentation of that?

MR. CUSTIS: I have a printout of a spreadsheet, part of a spreadsheet that I have which has the descriptions.

MR. BRANCH: We're going to call this DFG Exhibit 26.

There was some discussion yesterday about the direction of groundwater flow in upstream from North Gualala Water Company's Elk Prairie well field. Have you made any projections as to the groundwater flow just upstream of that area?

MR. CUSTIS: Yes.

MR. BRANCH: In what projections have you projected those flows to be?

MR. CUSTIS: Generally in an east-west direction.

MR. BRANCH: Could you please walk us through your analysis?

MR. CUSTIS: In doing -- we talked about this a little bit yesterday. I relied on the Rau Associates report. It is December '97.

MR. BRANCH: We have a report here prepared by Rau & Associates, titled Stream Flow measurements on the North Fork Gualala River Near Elk Prairie. I will distribute those. We will call this DFG 27.

MR. CUSTIS: If you turn -- the page numbers are Bates stamped, my assumption, the number in the bottom. I got this off the archive file CD, so I assume this is a State Water Board number.

If you turn to Page 2182, there is a site map. What that shows is a topographic map of Elk Prairie and lower portion of the North Fork Gualala with the location and cross sections that were done, that were stream flow measurements and stage were taken during 1996, '97, the subject of this report.

On Figure 2, which is on Page 2187, Rau & Associates have calculated for -- this is a figure to the North Fork Gualala River profile. They have calculated a general slope of the water surface at approximately 0.32 percent.

MR. BRANCH: Which water?

MR. CUSTIS: This is the water surface at Elk Prairie and at --

MR. BRANCH: Ground or surface water?

MR. CUSTIS: This is surface water. And you can see there is in the middle of the drawing there is a notation of Production Well 4, Section 2. There is a break in slope. Below Production Well 4 there is a -- show the slope as being --

MR. BRANCH: Is the North Gualala Water Company Production Well 4?

MR. CUSTIS: North Gualala Water Company's Production Well 4, 0.24 percent.

What I did was take section -- if you read the document I believe that Section 1 on this map -- that is Section 1 '93. Section 1 in '97 moved, the section locations.

Essentially where Section 2 is, 1996, '97, that is SG 1 in Exhibit 14, Luhdorff & Scalmanini.

MR. BRANCH: Staff gauge one.

MR. CUSTIS: What I did was look at projecting. If you go 400 feet upstream from that you have staff gauge three.

MR. BRANCH: Is there a map or anything you can point to to help walk us through?

MR. CUSTIS: We can go to this figure, which was our Exhibit 25, to show the general location of things. What I did was to take staff -- the distance upstream, using this scale, upstream from staff gauge three to a point upslope or upstream, through the access to the canyon up marble five. That is approximately 500 feet upstream. I took another point that is right about at the edge of the map here that is approximately 700 feet upstream and calculated with that gradient what the water surface would be from the individual water surfaces recorded at SG 3. And then asked the question is this -- these points higher, are they higher or lower than their associated well points.

And except for one anomaly where the gradient at SG 1 was actually higher than the elevation was reported as higher than SG 3, you always had flow from the North Fork

Gualala River to Monitoring Well 5. They were always higher than the gradient.

MR. BRANCH: So there was essentially a groundwater elevation difference between the points upstream you are talking about and those downstream?

MR. CUSTIS: There was surface water elevation difference with the groundwater wells elevation difference, similar to what we have been doing here on these wells compared to SG 1, 2 and 3.

MR. BRANCH: For those of us with your technical knowledge, how does that correlate with the groundwater surface elevation?

MR. CUSTIS: What I believe happens is that as the groundwater discharges to the subsurface -- the purchase for doing this map is to show you have fairly shallow alluvium, sand and gravel encountered very close to the surface in this area, that groundwater discharges through the subsurface and then moves down along under Elk Prairie, and when it hits this cap, essentially a clay cap, it bends to the left and goes towards the river.

MR. BRANCH: How is the clay cap you are talking about demonstrated on this Exhibit 25?

MR. CUSTIS: What I did with the red dashed lines on Exhibit 25 is to try to draw approximate contours through the points on each individual well, taken off well logs. So we have points for Monitoring Wells 1 through 5, to the first significant sand and gravel layer and Pumping Wells 4 and 5. Just drawing the contours. These two points are essentially the same.

MR. BRANCH: The data for these contours, where is that taken from? Is that already an exhibit that has been entered into the record?

MR. CUSTIS: You can see it on the cross sections in Exhibit 14, and we have entered well logs, Pumping Well 4 and 5 and Monitoring Well 5 into the exhibits already because these were things we were going to talk about. The other well logs we --

MR. BRANCH: This data has been drawn -- would I be correct in saying this data has been from the Luhdorff and Scalmanini reports, well logs?

MR. CUSTIS: Yes.

That essentially is it unless you have a question.

MR. BRANCH: Thank you.

CHAIRMAN BAGGETT: Mr. Lilly.

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CROSS-EXAMINATION OF DEPARTMENT OF FISH AND GAME

BY NORTH GUALALA WATER COMPANY

BY MR. LILLY

MR. LILLY: Good morning, Mr. Custis.

While you have Exhibit DFG 25 up on the screen, I'm going to ask you two questions about that.

First of all, please just tell us what the red dashed lines are.

MR. CUSTIS: They are the depth in the well logs where you had a contrast between fine grained materials above and coarse grained materials below. So sort of top of the coarse grained aquifer, the aquifer material, or bottom of the fine grained materials. It is the same point.

MR. LILLY: So those two do not indicate the direction of groundwater flow, do they?

MR. CUSTIS: No. What they do is define a subsurface bank.

MR. LILLY: What they really define is the elevation of the difference between the fine sediment materials and the coarser grained, right?

MR. CUSTIS: They define the contour surface, the lines are the contoured surface, between material that is high permeability and material that is a low permeability.

MR. LILLY: Do you have any estimate of the relative permeability of those two materials?

MR. CUSTIS: What we have from Luhdorff & Scalmanini what the estimate is for the alluvium, which is 4,500 gallons per day per foot squared. In a clay material I would guess it is at least one or two magnitude less.

MR. LILLY: Is that clay or --

MR. CUSTIS: It is a mixture -- if you look at the well, it is a ML and CL in engineering silty clay or a clay.

MR. LILLY: No further questions.

CHAIRMAN BAGGETT: Have any redirect?

MR. BRANCH: No.

CHAIRMAN BAGGETT: Thank you.

Is North Gualala ready?

MR. LILLY: We will start out by calling Mr. Phillips for rebuttal.

Good morning --

MR. BRANCH: Can I have my witness back to consult before he begins?

CHAIRMAN BAGGETT: Are you interested in entering some exhibits into evidence? Let's finish that. I apologize.

Would you like to offer your exhibits?

MR. BRANCH: Yes. I would like to enter DFG Exhibits 26 and 27 into evidence.

MS. LEIDIGH: There was also 25.

MR. BRANCH: We offered that yesterday.

CHAIRMAN BAGGETT: We didn't accept it.

Twenty-five, 26 and 27, Mr. Lilly, any objection?

MR. LILLY: No objections.

CHAIRMAN BAGGETT: So entered.

Is that it?

Thank you.
Now.
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DIRECT EXAMINATION OF NORTH GUALALA WATER COMPANY
BY MR. LILLY
MR. LILLY: Thank you, Mr. Baggett.
Good morning, Members of the Board.
Good morning, Mr. Phillips.
Just to state the obvious, you are still under oath that you took yesterday in this proceeding.
Are you aware of that?
MR. PHILLIPS: Yes.
MR. LILLY: I do have a few rebuttal questions for you in response to some of the testimony Mr. Custis gave yesterday.
Have you read the written testimony that Mr. Custis has submitted for this hearing?
MR. PHILLIPS: Yes, I have.
MR. LILLY: Were you present both yesterday and today when Mr. Custis testified?
MR. PHILLIPS: Yes.
MR. LILLY: In particular have you read or have you reviewed DFG Exhibit 9, which actually is the big map for which a copy is just to the right of you there?
MR. PHILLIPS: Yes, I have.

MR. LILLY: Based on extensive fieldwork in the watershed of North Gualala River and particularly in the vicinity of the Elk Prairie, do you have any comments regarding the accuracy of this map that is DFG Exhibit 9?

MR. PHILLIPS: Yes, I do. Exhibit 9 is titled Geologic and Geomorphic Features Related to Landsliding, in part. The typical purpose for this type of map is surficial geology, presents landslides, soil deposits and those kinds of things. Only secondarily does it present any bedrock information. Valuable use for such a map is in planning purposes and administration of applications for things like timber harvest plans. After all, we don't want to place excavations, roadways, landings in active landslides, nor do we want to put any clear-cut-type logging features in areas that are highly susceptible to erosion.

So this map is very useful in those purposes. It has value for those purposes. However, it is not a bedrock geologic map. The bedrock geology is generalized. It shows on this plate here there are literally tens of square miles that are classified as Franciscan sandstone. This is the light green area east of the San Andreas Fault that shows no complexity whatever.

The Franciscan formation is extremely complex, both in its mode of deposition and its history of placement. It is post-depositional subduction. It's been subject to mountain building processes, tectonics and uplift as well as recent faulting through the San Andreas Fault zone. Those complexities are readily apparent on a typical bedrock geologic map. Faults, morphologies would be shown on those kinds of map. Groundwater in particular is a natural resource, and like other natural resources, it is controlled by the placement of that material, the occurrence groundwater is controlled by subsurface bedrock geologic conditions.

My work in the field, I have been able to spend quite a bit of time specifically in the area directly surrounding Elk Prairie and on both sides of the San Andreas Fault with specific concern on the east side of the fault within the Franciscan drain. In an area several miles surrounding the Elk Prairie I have been able to identify other geologic bedrock units that are not depicted on this map, specifically the Olson Ranch. It had been discussed yesterday. The Olson Ranch is mapped as an orange feature.

CHAIRMAN BAGGETT: Can you put the map up?

MR. PHILLIPS: I could see it down here.

The Olson Ranch formation is a younger formation than the Franciscan formation. It's postulated that it was placed on an old erosional surface and has since been dissected and most of that material has been eroded away and there are remnants left of that cap on the ridges in that area.

MR. LILLY: "That area" being where the orange is shown on this exhibit?

MR. PHILLIPS: Correct.

There are other plates to this map that project to the south. I believe two more plates that show, again, the same amount of area to the south. The Olson Ranch is also mapped capping the ranges to the south. It's noticeable that the Olson Ranch is not mapped anywhere near the Elk Prairie area from a superficial evaluation of the map and itself there is some geologic reason that that -- you would speculate that there may be a geologic reason that that Olson Ranch is not mapped. There could be other reasons, one of which was that it was not identified by the people out in the field, out in the field producing the map.

The area that I worked directly adjacent to Elk Prairie. Each and every one of the ridge tops that surround the Elk Prairie area, in fact, are capped by this Olson Ranch formation. The elevation of contact between the underlying Franciscan and overlying Olson Ranch varies from 600 feet to 800 feet to a thousand feet in elevation.

It's my opinion that the variation in the elevation of that contact is partially controlled by the structure in the area. The structure I mean that there are numerous faults within the area east of the San Andreas that I have worked in. I've identified on the order of 12 or more, more or less, fault features. A majority of those are definite fault features. They displace the Franciscan in some locations and appear to be displacing the Olson Ranch and would give some indication of the age of activity of those faults.

That is the kind of complexity that must be identified to look for natural resource. If you are looking for gold, oil, gas, groundwater, whatever it may be, the controlling conditions are those bedrock conditions. Groundwater is found in secondary permeability in Franciscan which is fractured, generally fractured sandstone and/or fault zones. This particular map is inadequate from a bedrock standpoint to provide that information.

MR. LILLY: And just as a general rule is there generally more fracturing in the Franciscan, in the parts of the Franciscan formation that are in close vicinity to the San Andreas Fault zone?

MR. PHILLIPS: My observations are that the Franciscan bedrock units adjacent to the Franciscan -- excuse me, to the San Andreas Fault zone, are highly fractured. However, there are ultimately the faults that are contained within the Franciscan also produce fractures. But from the observations in the field there are extensive fracturing as we progress towards the San Andreas Fault zone.

MR. LILLY: Just so we are clear, more fracturing the closer you are?

MR. PHILLIPS: Correct.

MR. LILLY: Just shifting for a minute or shifting next to another part of Mr. Custis' testimony. In Paragraphs 26 and 27 of his written testimony he discussed his theory that the base stream flows and river flows in the North Fork Gualala River and its tributaries may be maintained by the slope drainage of groundwater through the shallow soils and some minimal layer of weathered bedrock in the water shed.

Have you read that portion of his testimony?

MR. PHILLIPS: Yes.

MR. LILLY: Based on your fieldwork in the watershed of the North Fork Gualala River, do you have a response to Mr. Custis' theory on this point?

MR. PHILLIPS: Yes, I do.

MR. LILLY: What is that?

MR. PHILLIPS: The model or hypothesis that he presents is not supported by the actual conditions observed in the field.

MR. LILLY: Elaborate why that is.

MR. PHILLIPS: As I testified yesterday, I have had the opportunity to traverse more than 60 miles, linear miles, within this area directly. There are literally hundreds of miles of old skid roads, most of which are abandoned. There are also newly maintained roads cut through the entire area. The road excavations, even to the skid roads, are generally a dug filled situation, quickly cut on the uphill side. We have several feet to tens of feet high excavation with that material being in side cast onto the side of the hill, creating a path for trees or trucks or whatever goes through the forest area bringing out the lumber. I have been able to walk many of those.

Thus, able to observe the soil profile and weathered bedrock. Even as early as mid to late April a vast majority of those excavations were dry at the time of my observation. Essentially no free water within the soil or weathered bedrock column.

MR. LILLY: So do your observations then refute the theory from Mr. Custis that there would be sufficient saturation in shallow soils to maintain a base flow in the creeks and rivers from May through October?

MR. PHILLIPS: That is correct.

MR. LILLY: Why is that?

MR. PHILLIPS: If there -- if that soil column is dry at this time of year, from a one-year observation, if his theory were correct, I would predict that the Gualala River will then be dry soon this year. There are no other possible recharge area.

MR. LILLY: In other words, if there was not recharge to the river through the bedrock fractures that you have previously described?

MR. PHILLIPS: Correct.

MR. LILLY: Finally, Mr. Custis in his testimony states in Paragraph 31 that the permeability of the Franciscan formation is so low that significant recharge to the alluvium through the bedrock is unlikely.

And based on your work in the Franciscan formation, do you have a response regarding the permeability of the Franciscan formation?

MR. PHILLIPS: Yes, I do.

MR. LILLY: What is that?

MR. PHILLIPS: As I testified yesterday, I have extensive experience in siting geothermal production wells on hillside terrains in the Franciscan and geyser's area. Associated with each of those borings, a large oil and gas deep hole rig and require hundreds of thousands of gallons of drilling fluid for both safety purposes and medium to remove debris from the hole and to keep the hole stabilized as it is being drilled. That fluid is essentially hazardous waste. It must be contained within a hazardous waste facility on the side of the hill.

If the Franciscan formation were naturally occurring geologic barrier, the fluid then could be contained in an excavated sump with a berm around it. However, the

Franciscan is so highly permeable that requirements mandate that these sumps be lined, typically utilize a clay liner that is a minimum of two feet thick with essentially an impermeable liner. Otherwise it would be a high risk of that drilling fluid percolating down through the fractured rock and contaminating local aquifers.

MR. LILLY: When you say required, is that a State of California requirement?

MR. PHILLIPS: Generally the counties are the lead agencies, and they require minimum engineering standards that include state regulations.

MR. LILLY: Thank you.

I have no further questions for Mr. Phillips. I will shift over to Mr. Scalmanini. I propose we do a panel, cross-examination.

CHAIRMAN BAGGETT: That is fine.

MR. LILLY: Good morning Mr. Scalmanini. Just to remind you, you are still under oath, the oath you took yesterday for this hearing as well.

MR. SCALMANINI: Thank you.

MR. LILLY: If you can move the microphone a little closer, make sure the little green light is on.

MR. SCALMANINI: It is now.

MR. LILLY: Have you read the written testimony that Charles NeSmith has submitted for this hearing?

MR. SCALMANINI: I have.

MR. LILLY: Were you present when Mr. NeSmith testified during this hearing?

MR. SCALMANINI: I was.

MR. LILLY: I'm going to just read two sentences from his statement and ask you to then respond to those.

On Page 8, in the first full paragraph, first sentence of Mr. NeSmith's testimony states: In these statements, while acknowledging the significant difference in the permeability between the pertinent rock units, Luhdorff & Scalmanini appear to claim that the ability of the Franciscan bedrock to store and slowly release a large volume of water to the alluvium overrides this difference in permeability.

And then on Page 10, first full paragraph, first sentence, the testimony of Mr. NeSmith's testimony states: Conclusions one and two relate in part to Luhdorff & Scalmanini's premise that no significant seepage from the bedrock into the alluvium should be occurring where the permeability difference between the alluvium and bedrock is sufficient to form a subterranean stream.

Are you familiar with those parts of Mr. NeSmith's testimony?

MR. SCALMANINI: Yes.

MR. LILLY: Do you have a response to these statements?

MR. SCALMANINI: Probably have several.

MR. LILLY: Go ahead and give us your response, please.

MR. SCALMANINI: My first one is that I find it interesting to say that we have a premise that no significant seepage from the bedrock into the alluvium should be occurring with a permeability difference between the alluvium bedrock is sufficient to form a subterranean stream. If anything, our premise was the exact opposite of that.

Secondly, to consider the whole subject of permeability and its impact on flow, I think you need to back up in Mr. NeSmith's testimony a couple of pages from where you started, and go to Page 6. He says there, in what looks like the first full paragraph, that the total amount of water that may be released by a rock is mostly dependent on its permeability in the volume of pore space that contains that water. These are the major components of a rock's "coefficient of storage" often known as the storetivity, quote-unquote, or storage capacity, quote-unquote.

And fundamentally that description is completely technically flawed. Permeability has nothing to do with storage.

MR. LILLY: Just a minute. I will hand out what your colleague has put up on the screen, which we will then ask to be labeled as Exhibit NGWC 20.

I'm sorry, please go ahead. And if you talk about this on the screen, we are talking about the second page of Exhibit 20.

MR. SCALMANINI: While the figure that is illustrated is basically just that illustration of how earth materials have pore spaces that can hold water, the porosity of an earth material, which is just that, a measure of its pore space, is the sum of two fractions, one of which is called specific yield, and the other is called specific retention.

The specific retention is that portion of the pore space that can be occupied by water that will not drain out to the force of gravity, because basically capillary forces hold the water against the pore spaces. The other part of the porosity fracture is called specific yield, and that's the part that will drain out due to, basically, the force of gravity.

Permeability does not affect specific yield or specific retention. So the amount of water that will drain from a pore space in the subsurface is entirely dictated by the specific yield and specific retentions fractions of the total pore space and has nothing to do with permeability.

Now to be, I guess you could say, fair that the speed at which water will drain out of a rock has everything to do with permeability, but the amount that will drain out has nothing to do with permeability.

To go on, then, I've already said about the premise or premises, basically, not that storage or drainage from the bedrock will, quote, override permeability, but simply that it will flow, that there is large amount of water in storage, that is evidenced by high water levels which are evidenced by seeps and springs from the bedrock above and adjacent to the Elk Prairie.

MR. LILLY: To be clear, when you say "in storage," you mean in a Franciscan?

MR. SCALMANINI: In Franciscan, yes.

MR. LILLY: Go ahead.

MR. SCALMANINI: As we described in our direct testimony, all the groundwater contours at Elk Prairie point to the fact that there has to be flow from that direction to support the constant gradient which we'll talk about some more as we go along here this morning.

Basically, the bottom line is that the bedrock contact does not confine the flow of water to some channel that might be defined by that bedrock content.

MR. LILLY: On Page 9, in the first full paragraph, second sentence, Mr. NeSmith's testimony states it also means that a well installed completely in the bedrock will have ten times less the performance than a well installed in the channel, and thus will have a significantly reduced potential impact on the nearby stream compared to the well installed in the channel.

Are you familiar with that statement?

MR. SCALMANINI: Yes, I am.

MR. LILLY: Do you have a response to that?

MR. SCALMANINI: Yes.

MR. LILLY: What is that?

MR. SCALMANINI: Well, it is, I guess, fundamentally impossible to say just based on permeability that the impact of a pumped well will be more or less or the same than the impact of another well with different permeability, that the drawdown around the pumped well which ultimately equates to impact, whether pumping will have an impact on, in this case, a surface watercourse is a function of the pumping capacity and transmissivity of the aquifer, the duration of the pumping cycle, the distance of the well to surface watercourse in question, and the storage coefficient of the aquifer in which it is completed.

So, simply stated, if you lower the permeability as he did, by an order of ten, then everything else being equal, which it usually isn't when the permeability is increased by order of ten, but everything else being equal, then the drawdown in the pumped well in the lower permeability formation will be significantly greater than one with higher permeability. But what usually works out to be the case in lower permeability is that you probably have a lower pumping capacity because of the reduced yield of the formation, which means, using North Gualala Water Company as an illustration, to pump the same volume of water you need to pump for a longer period of time. When you pump for a longer period of time, you push the cone of depression farther and farther away from the pumped well, which means that it can get to the surface watercourse just like it can from a higher permeability formation.

All said, when you take all the factors into account, that whether you have high permeability or low permeability, you could have as a function of all the other parameters a smaller impact, a larger impact, or the same impact. It is impossible to conclude just by changing permeability that there is a greater probability for a smaller impact.

MR. LILLY: Moving forward in Mr. NeSmith's testimony, on Page 10 in the last paragraph, first sentence, that testimony states: Based on their analysis of the results of the Well 4 pumping test, Luhdorff & Scalmanini appear to assert another premise regarding the groundwater gradient, the concept of once percolated groundwater, always percolating groundwater.

Are you familiar with that part of Mr. NeSmith's testimony?

MR. SCALMANINI: Yes.

MR. LILLY: Do you have a response to that?

MR. SCALMANINI: Yes.

MR. LILLY: What is that?

MR. SCALMANINI: We didn't make any such assertions.

MR. LILLY: Could you please describe that in a little more detail?

MR. SCALMANINI: Well, basically, that as I think I said at one of the very opening remarks yesterday in presenting my testimony that fundamentally the question on the table is how does groundwater occur at the Elk Prairie. And groundwater in order to ultimately fit a description of flowing in a subterranean stream channel has to satisfy four tests. And if water ultimately gets into a channel and is confined in that channel and satisfies all those tests, regardless of where it came from, then it would fit the definition of subterranean stream channel.

As I concluded at the end yesterday, that while I think all the evidence suggests the fact that water has to be entering the alluvium beneath Elk Prairie from the bedrock and, therefore, it fails the last of the tests, that the bed and banks of the channel that can be mapped in the subsurface does not confine the flow. And so regardless of the source, whether it came from percolating groundwater, whether it came from stream recharge or wherever the water came from, that it doesn't hold its character if it changes the setting in which it occurs.

In this case if it were to enter and stay in the subterranean stream channel, then it would change from percolating to subterranean stream flow. In this case it doesn't.

MR. LILLY: Another -- on Page 11 of Mr. NeSmith's testimony near the top of the page states that basically under the Garrapata test, flow direction does not matter.

Do you have a response to that statement?

MR. SCALMANINI: Yes.

MR. LILLY: What is that?

MR. SCALMANINI: I basically have two. Number one, fundamentally all groundwater is flowing. It flows from locations of recharge to locations of discharge, whether that discharge is to a stream channel to well or to the ocean, wherever it might be going. And fundamentally there are no places where groundwater is totally stagnate. We have no gradient for flow. So, therefore, all groundwater, if it occurs in any setting is flowing. If the flow direction didn't matter, why have a test.

MR. LILLY: In essence the four-part test would become a three-part test?

MR. SCALMANINI: That is exactly right. You can basically say, if you have a channel and there is water in it, it is under the permitting authority or jurisdiction of the State Board because flow direction would make no difference.

Now, if you go farther and you mentioned Garrapata and others have as well, and the copy that I have is downloaded also, but I think this is on Page 5, if the little brackets indicate page numbers.

MR. LILLY: Before you do that I'll just get you the exhibit that has the official copy, then you can just get the page number.

MR. SCALMANINI: That is fine.

MR. LILLY: I have handed you Permittee Exhibit 6, if you can just use that so we all have the same page numbers it would help.

MR. SCALMANINI: Reading from Section 3.1 at the bottom of the Page 3. It says: A channel or watercourse, whether surface or underground, must have a bed and banks which confines the flow of water. If we are going to have a bed and banks that confines the flow of water, then it seems that those bed and banks that pretty much dictate the direction of flow within said channel. And I should say in the quote I just read was quoting Garrapata, which in turn was quoting L.A. versus Pomeroy.

MR. LILLY: Now I'm going to shift over to the testimony from Mr. Custis for this hearing.

Have you read Mr. Custis' written testimony for this hearing?

MR. SCALMANINI: I have.

MR. LILLY: Were you present when Mr. Custis testified yesterday and today for this hearing?

MR. SCALMANINI: Yes.

MR. LILLY: Mr. Custis has testified that there are, in his opinion, only two possible means by which recharge to the aquifer in the Elk Prairie could occur. It is specifically in Paragraph 25 he describes these two mechanisms as, first, subsurface flow from the subterranean channel alluvium upstream and then, second, recharge from the surface water through the sand and gravel bed of the stream channel.

Now I'm going to ask you about each of these, and I will start by asking about the second of these alleged recharge mechanisms, that is recharge from surface water through the sand and gravel bed of the stream channel.

Do you have any comments regarding the validity of Mr. Custis' opinion which are stated in Paragraphs 28 and 29 of his testimony about the alleged recharge from the surface water through the sand and gravel bed of the stream channel?

MR. SCALMANINI: Yes.

MR. LILLY: What are those comments?

MR. SCALMANINI: Well, it would take quite a bit of time. You refer to Paragraphs 28 and 29. As you read the entire testimony, it basically says in response to a question that precedes Paragraph 26 that the following paragraphs, 26, 27, 28 and 29, support his testimony that the two recharge mechanisms that you referred to were employed. It should be clear that neither Paragraph 26 nor 27 even discusses either of those recharge mechanisms. It talks about how the bedrock -- excuse me, weathered bedrock and soils can discharge to the stream in other places.

Paragraph 28 describes the types of gravels in the river and in the upper part of the aquifer system beneath Elk Prairie. And it basically sets a stage for the fact that there is connectivity between the stream and the aquifer system. There is no debate about that. I think everybody here recognized that the groundwater flows into in certain places and flows out of -- excuse me, groundwater discharges to the stream basically freely, particularly at Elk Prairie.

What I found interesting -- I don't know if you can get it back up -- but DFG 25 that was up this morning --

MR. LILLY: We don't have that C&D in the computer, but I think everyone has a copy of this.

MR. SCALMANINI: Interestingly, without producing any numbers he described how -- he said that the water levels in the stream as one went up into the vicinity of the gravel bar to the east of Monitoring Well 4, would be higher than the groundwater measurements at that location. There is no data to support that, either calculated or measured or anything else. But what is interesting is he also said from that location that water would recharge into the aquifer system to support gradient from -- in other words to maintain the high gradient from the north, northeast side of Monitoring Well 4 to support the discharge of water to the stream to the south, southwest.

He also mapped that there are from 37 to in excess of 50 feet of clays from the ground surface down in that vicinity based on his interpretation of well logs. So he is fundamentally expecting water to leave the surface watercourse up at the far right corner of his Exhibit 25 and infiltrate through 50ish feet of clay to support this gradient, which runs counter to -- absent -- recognize that there are no numbers to support that, he is expecting that phenomenon to take place. That doesn't make fundamental sense.

Secondly, his written testimony discusses the interpretation of surface water stream gauging and groundwater measurements in November of 1997 when the river was observed to be at a higher stage than the closest measured groundwater elevation.

Now the data that he picked to do that show that the river was higher. What he failed to say was that the river was about less than one inch to less than two inches higher than the stream for a brief period of time in November 1997.

MR. LILLY: You mean than the level of the monitoring well? You said than the stream.

MR. SCALMANINI: I'm sorry. The stream was less than one to less than two inches higher than the level of the monitoring well. So we had a very flat but slightly reversed gradient.

He also failed to recognize nor at least acknowledge that as one moved anyplace else on the Elk Prairie during that time period that groundwater was predominantly discharging to the stream at all other locations. So such as there was a little bit of water that might have been entering the aquifer at that location, it was circularly immediately discharging back into the stream system just downstream, or it was forming what might be commonly recognized as bank storage.

If you switch to another picture here.

MR. LILLY: Let me hand out what you have put up there. You can tell us what this is. It will be labeled as NGWC 21.

Go ahead.

MR. SCALMANINI: The concept of bank storage is well recognized in the literature. What we have prepared as figure number -- say again, please.

MR. LILLY: It is Exhibit NGWC 21.

MR. SCALMANINI: NGWC 21 is a figure extracted from a commonly used textbook authored by Freeze and Cherry called Groundwater Hydrology. It illustrates the primary focus should be basically on Figure C, but we'll start with A, which is a cross section through idealized stream which shows common flow conditions with the stream at the lower elevation, groundwater higher elevation and groundwater then discharging toward the stream under those kinds of hydraulic conditions.

When the stream stage rises, as it did in November of '97, then the stream, of course, is higher than the groundwater, and there is a potential for the stream to store some water in the banks adjacent to the river for a short period of time. That's commonly been measured with hydrographs as are illustrated with Figure C, that the storage goes up in response to the fact that the stream floods. And then the storage drains back out when the stream subsides after the flooding event.

The hydrographs at Elk Prairie support exactly that concept at the location that Mr. Custis chose in November of '97 to illustrate this recharge concept. He said that he calculated water levels upstream that were higher than Monitoring Well 4 that were farther inland when he didn't produce any numbers to support that. At locations where this very flat gradient reversal took place, the stream stage did not get high enough to reverse the gradient all the way to the inland groundwater levels.

In fact, if you look carefully at the hydrographs that are illustrated in our Figure 7, 8 and 9 from yesterday's testimony, we don't even go there to say we can't do that. You can have the groundwater which is most inland in this case reflected by the measurements in Production Well No. 4 and then Monitoring Wells 2 and 4 are farther inland yet, but you can see that the entire system responds by upwards of a couple of feet. So the inland water level when the stream stage comes up, goes up also.

To think that a couple of inches of flat gradient reversal near the stream is going to produce enough head to drive water all the way to the inland park of the aquifer system during a few weeks in November of one year to then support a continuously discharging groundwater system for the rest of the year is a little far-fetched.

Lastly, although this really relates to his concept more of the fact that there is recharge from a point bar, I find it rather interesting that this entire stream system for over a hundred miles of mainstream and tributaries can be a gaining reach, meaning the groundwater is discharging into the reach. We get to one unique location at the eastern edge of Elk Prairie and it turns into a locally losing reach and instantly turns back into a gaining reach as soon as it passes that point. It seems like we conveniently identify a losing location for the purposes of trying to create some recharge to support a groundwater discharge farther downstream.

MR. LILLY: Just so we are clear, you say "we have," are you really saying Mr. Custis has?

MR. SCALMANINI: Yes. "We" wouldn't include me in that particular case.

MR. LILLY: Just while we are on that, Mr. Custis this morning used some estimates of stream stage from a Rau report and came up with at least an opinion that at some point around the turn there, what he calls the point bar, the stream stage may have been higher than the elevations in Monitoring Well 4.

Do you have a comment on that and particularly on whether or not even if those elevation estimates were, in fact, accurate, whether or not two elevation points can determine a flow direction?

MR. SCALMANINI: Well, in the strictest sense, if that is all you have, they could. But basically it takes a complete network of monitoring in groundwater to determine what a precise groundwater flow direction is, and that is what we attempted to do as I testified yesterday, by putting a complete and geometrically organized network in place on the Elk Prairie to define what the gradient was, not just take two points and say the water is automatically flowing from the higher to the lower elevations.

And then my other comments I already said, basically, which is that, A, there is no numbers, B, it's speculation to say that it would be higher than anything measured in MW-4 because there is no numbers on the stream to say that it ever was or could even be calculated to be higher than what was MW-4.

And lastly, as I will show with the contour maps here in a minute, it is a little questionable how that can take, recharge through the 50ish feet of clay and support this constantly discharging groundwater system throughout the Elk Prairie on a year-round basis.

MR. LILLY: Just one point I wanted to clarify. There was one data point that Mr. Custis referred in his testimony from stream gauge one on January 24th, 1997, that he says shows that there was a flow on that date from the stream into the aquifer.

Can you comment on that data point?

MR. SCALMANINI: I sure can.

If anything in all the testimony that caught me a little off guard was probably that data point. If you examine that data point, it shows that, at least as reported, the water level in the stream at SG-1 was higher than that water level in that stream upstream, which means that the stream would have to be flowing uphill to counter that condition. That is physically impossible.

So frustrated by that, we examined then a little more carefully all the rest of the data, thinking there was a possibility we had a typographical error, because it is impossible for water to flow uphill to a river.

So we went all the way back through the entire record, all the way to the field notes by the person who took the measurements. And that number that is there is what is written down. The consensus of everybody associated with this is that it is probably an error by two feet, that it says 34.33 feet and it should be, to be consistent with all the rest of the measurements, 32.33 feet. There is nothing to support that and nothing recapturable to verify that. So it is a unique piece of data that certainly if you take it in collection with all the rest of the measurements it would suggest that there is a very anomalous reversal of gradient both with regard to the stream and groundwater and the stream and itself, meaning it says that the stream should be flowing back to the east at that location and that is not possible. The data without question is not correct, that single data point.

MR. LILLY: Now I'm going to shift over to the -- you have kind of gotten into this because there is some overlap between the two theories. But the other theory that Mr. Custis has put forth for possible recharge to the Elk Prairie aquifer is that there is, quote, subsurface flow from the subterranean channel alluvium upstream.

Do you have any comments regarding this or the validity of this opinion of Mr. Custis?

MR. SCALMANINI: Yes.

MR. LILLY: What are those?

MR. SCALMANINI: They are multiple. The first of which I think I've already said, and that is there are no data points, no measurements, no computed values, no contour for flow, nothing that supports that in this record. So I can't comment on whether it is right or wrong. There is none to support it.

Secondly, if I could walk through -- let me back up one. This would be Figure 7 from my testimony yesterday. And as you hopefully recall, Figures 8 and 9 have generally the same orientation. So wherever you are on Elk Prairie as you walk through the year of intense study in 1997 and subsequent year since, the measurements of inland groundwater levels are always higher than they are closer to the creek or river than they are in the river itself. So, basically, when you look at the spacing of these water level measurements, there is always a gradient for groundwater discharge going from the north side of Elk Prairie to the south toward the river. Something has to maintain that.

Then moving forward to the next figure, which is also extracted from my testimony yesterday, we contoured --

MR. LILLY: This is Figure 11 from your testimony.

MR. SCALMANINI: Yes. We have contoured those lines of equal groundwater elevation. And you can extract from contours. Contours underground are just like contours above groundwater. They are basically -- water flows perpendicular to those contours just like the land surface slope is perpendicular to surface contours. So we can define verticular that there is a flow direction that is perpendicular to those contours. It has nothing to do with the thickness of clays as was pointed out earlier, et cetera. It simply is water flows downhill from high head to low head, whatever it is contoured to be.

To examine the concept of whether or not flow can be coming from either the point bar or otherwise from upstream, I have prepared two sets of groundwater contours to illustrate how the stream actually behaves and then how it would have to behave to support the Custis theory. So the first of these --

MR. LILLY: I will interrupt and I will distribute NGWC 22, and Exhibit NGWC 22 is also up on the screen.

MR. SCALMANINI: I will introduce for later purposes the fact that there is dense, dark areas of closely spaced contours on the north side of the boundary of Elk Prairie, which are hypothetical contours at a gradient of 0.25 which is the same gradient that has been used -- was used in Garrapata, and has been used here as an assumption for a flow gradient in the bedrock. We will talk about that later.

The focus here should be on the blue contours that are shaped around the North Fork Gualala River at Elk Prairie and immediately to the east of it. It's been, I'd say, unanimously testified to by everybody that base flow in the North Fork Gualala River is maintained by a discharge from the surrounding earthen materials, all the soils and weathered and unweathered bedrock. There is a discharge which supports a gaining reach and sustained base flow throughout the year.

By fundamental definition the shape of groundwater contours to discharge to a surface stream has to be convex when looking at a downstream direction. In other words, water flows across the contours at a 90-degree angle. They have to be shaped in such a way that water will then flow across them and into the river in order to support this flow that is going into the river.

So I have taken the gradient of the stream at approximately one foot intervals, then shown where the groundwater would be in contact with the stream, and interestingly how with real measurements which are shown in black contours at Elk Prairie how the shape of those contours, based on real measurements, conforms with the concept of a gaining reach. In other words, the curvature of the contours is such that it's convex in a downstream direction and flow is going across the contours and towards the stream channel.

Also, as one approaches what I will call the western end of the northern boundary of the subsurface channel, the contours are for all practical purposes parallel to or very closely to parallel to that northern boundary, which means the groundwater has to be coming from someplace on the north side of those contours to satisfy the flow requirement that that constant gradient that is shown by Figure 7 from my testimony yesterday on an ongoing basis. That is what the picture needs to look like, and it clearly conforms with the actual shape of measured groundwater contours at Elk Prairie.

Now if you examine the Custis approach --

MR. LILLY: Should we go forward to the --

MR. SCALMANINI: Next figure.

MR. LILLY: This will be Exhibit NGWC 23.

MR. SCALMANINI: I've superimposed on here in red the shape the contours need to take in order to have either, A, a losing reach from the stream as he suggests at his point bar located at the east end of Elk Prairie or to support a flow direction that would come down this subsurface channel and somehow get onto the north extreme end of the alluvium at Elk Prairie and then turn and flow to the south as it's been measured to do.

As you can see, the shape of the red contours to support a discharging stream or a recharging stream, one where the surface water is recharging groundwater, is exactly the opposite of a stream which is gaining. The contours are shaped in a concave direction as one looks downstream. So they are the exact opposite of what has to be the case for the stream to be gaining throughout that area.

Secondly, after forming the red contours in a concave shape to illustrate how a losing reach would behave, then ultimately those same groundwater contours need to somehow be connected to the real measurements, which, again, are the black contours. So the groundwater would have to turn, roughly speaking, on the order of 90 degrees in order to match with that.

MR. LILLY: When you say ground, you mean the groundwater contours?

MR. SCALMANINI: The groundwater contours would have to turn. The groundwater flow direction would also have to turn about 90 degrees.

And lastly, yesterday Mr. Custis said that there could be some water discharging from the bedrock, but he thought it was a very small amount. For any water to discharge from the bedrock to the north, there have to be contours perpendicular to that flow direction. So fundamentally if you want to take the eastern most contour, it would have to be concave shape as I've shown relative to the downstream flow direction in the stream, and then it would have to make an abrupt turn, basically form like the figure seven in order to accommodate any flow at all from the north. And then as I said a minute ago, the contours, as one proceeds to the west and to the southwest, would have to turn abruptly to join the real measurements.

MR. LILLY: I think we better clarify. When you say "Figure 7," we may think you are referring to a different exhibit. Do you mean that the right most red contour would look like a numeral seven?

MR. SCALMANINI: Yeah, that is correct.

MR. LILLY: Please just explain whether or not absent some different subsurface feature that would affect the permeability, whether these sharp corners or changes in the red contours are possible under groundwater situations.

MR. SCALMANINI: Basically, they are not.

MR. LILLY: Why is that?

MR. SCALMANINI: The biggest single reason why it is not in a setting like this is that all the measurements show that the flow in the North Fork Gualala River at the low end of Elk Prairie is higher than that flow in the stream at the east end of Elk Prairie. And what this meaning, the recharge mechanism suggested by Custis, says is that somehow the upstream portion of the system, the under flow and the stream discharge, will produce enough water by discharging into groundwater and then reappearing a few hundred yards downstream at a higher flow rate without any new water coming in from any place. That is pretty magical and it would be very desirable in someplaces where we are water short, but it would basically fail the fundamental conservation of mass in that it makes water from no new location. The river would replenish itself at a higher rate, and that is impossible.

MR. LILLY: Now let's go forward in Paragraph 31 of his testimony, Mr. Custis' testimony states, significant groundwater recharge to the subsurface alluvium through bedrock is unlikely because of the low permeability and low water yielding capacity of the tightly fractured sandstone graywacke bedrock.

Are you familiar with that statement?

MR. SCALMANINI: Yes.

MR. LILLY: Do you have any comments in response to that statement?

MR. SCALMANINI: Yes.

MR. LILLY: What are those?

MR. SCALMANINI: Basically that despite the low permeability and so-called low water yielding capacity of the tightly fractured sandstone, it is possible for sufficient flow to discharge from that formation to support the kind of observed increases in stream flow that have been measured in the vicinity of Elk Prairie.

And to support that we have basically conducted a similar Darcian flow analysis to that that has been described by him and referred to in the Garrapata analysis or testimony.

MR. LILLY: Please go ahead and describe that analysis. I will hand out our last rebuttal exhibit which is NGWC 24, and Exhibit NGWC 24 is now up on the screen.

MR. SCALMANINI: Well, in NGWC 24 I have summarized two forms of Darcy's Law. Darcy's Law is the fundamental premise on which the whole science of groundwater hydrology is based, developed in the 1850s or '60s. The entire science has come forward from there. It basically recognizes that flow in a porous media is equal to its hydraulic conductivity, meaning the porous media's hydraulic conductivity, times the gradient, which we talked about a lot in here times the cross sectional area through which flow can take place.

MR. LILLY: That is the first formula, Q=KiA?

MR. SCALMANINI: That's right.

Mr. Custis used this formula to calculate some discharge from soils in weathered bedrock. There was some discussion yesterday about how he interpreted well yields to ultimately get to a hydraulic conductivity. There is, I'll call it, another form of Darcy's Law which eliminates the need to try to interpret what the saturated thickness is by interpreting well completions in the well logs. That simply is that flow is equal to aquifer transmissivity times the same gradient times the width across which flow is taking place. Transmissivity is simply by definition the product of hydraulic conductivity and saturated thickness. So they are the same equation, but man is able to either test for or estimate aquifer transmissivity more easily than he is hydraulic conductivity in the subsurface.

So as you go to the bottom of the figure, at Franciscan -- in the Franciscan bedrock at Elk Prairie it is possible to estimate aquifer transmissivity using the same indirect method that Custis used, which is cited in Driscoll, which is one of Fish and Game's exhibits.

MR. LILLY: For the record it is Exhibit DFG 17.

MR. SCALMANINI: Actually, the method was developed long before Driscoll edited that book. It was developed by an investigator and documented in some work by the Department of Water Resources in Livermore Valley in the 1960s. Regardless of that, the equation that transmissivity is equal to 1,500 times the specific capacity of the well is a reasonable approximation. The originally developed number was actually 1,460. But regardless of that fine-tuned detail, again, it is an estimate.

And so using the same approximate specific capacity for wells concluded in the bedrock of around a quarter of a gallon per minute per foot of drawdown, one would get an aquifer transmissivity of around 400 gallons per day per foot of aquifer width. And that is a reasonably low number for these kinds of formations.

The assumed gradient that was used in the Garrapata and was referred to in this matter and was drawn by us at the north side is about 0.25. It is an extremely steep gradient in most groundwater situations but in the kinds of low permeability materials such as the Franciscan bedrock, and it is not unreasonable. And when you compare how those gradients plot out on a map to the fact that you can see water discharging across rather steep faces, it is not unreasonable to think that it is approximately what the gradient is.

Lastly, if one looks at the flow width, meaning the length of the flow along the sides of the channel on both sides of Elk Prairie, both sides of the North Fork Gualala River at Elk Prairie, it is about 8,000 feet of length. And using, then, Darcy's Law to compute that, you can come up with about 800,000 gallons per day or a little over one cfs as an approximate flow. And that is about the same as what is discharging into the gaining reach, the increase in flow in the North Fork Gualala River as one passes Elk Prairie from east to west.

MR. LILLY: Is that last statement based on the flow measurements that Mr. Cawood did at EP-1 and EP-s?

MR. SCALMANINI: That is correct.

MR. LILLY: Now, I was going to ask you about Exhibit DFG 25 and clay layers, but I think you already responded to that.

Do you have anything more to say about that?

MR. SCALMANINI: I don't think so.

MR. LILLY: Last thing is Mr. Custis made some testimony about the occurrence of spring and seeps in the North Gualala watershed.

Do you have a response to that?

MR. SCALMANINI: I was kind of struck by the words along the lines that I would have thought I would have seen them. I was on the field trip on, I think it was, April 8th of this year. I have to tell you, I marveled at the lack of questions. But I always marveled at the fact that nobody wanted to go off-site.

MR. LILLY: By off-site, you mean off the North Gualala property?

MR. SCALMANINI: Property. Except to get there. And there was no venturing to the north or to the east in the watershed to look at or potentially look at any of the kinds of things such as were illustrated in the photograph which is about Figure No. --

MR. LILLY: I think it was Figure 12.

MR. SCALMANINI: I will take your word for it.

-- 12 of my testimony yesterday.

MR. LILLY: And the map which was 13.

MR. SCALMANINI: Yeah. The map was 13, and it showed that the locations of seeps and discharges to the north and to the east of Elk Prairie.

When one drives up the road that is on the north side of the North Fork Gualala River, there is abundant vegetation of the type that is suggestive of groundwater supporting that vegetation throughout, I will call it, the watershed on the north side. And when Mr. Custis said, "I thought I would have driven through them." I was sitting in the back thinking you were driving through them. They are all along the side of the road as you go up there. It is not continuous ferns and grottos of that type. But it is intermittent throughout the area as one goes up is a function of where fractures are located is my best estimate.

MR. LILLY: Did you actually see water in addition to seeing the wet-type of vegetation?

MR. SCALMANINI: You can see water as I described yesterday from small to large discharges at the surface. Again, what we are talking about as far as our testimony, there is a subsurface flow from that same formation into the alluvium at Elk Prairie from north to south, but you can see evidence of that aboveground as well from small seeps or reasonably large stream discharges.

MR. LILLY: So the seeps are not the flow into the Elk Prairie, they are just indicators of the presence of water in the fractures and the bedrock?

MR. SCALMANINI: And the discharge from those fractures, yes.

MR. LILLY: I have no further questions, and I would like to offer Exhibits NGWC 20 through 24 into the record.

CHAIRMAN BAGGETT: We should wait until cross.

MR. LILLY: I was just afraid I would forget. If you can remind me, that will be good.

CHAIRMAN BAGGETT: I will remind you.

Do we have much cross? If so, we will take a break.

Let's just take a break anyway, then it is going to rebuttal and redirect. So let's take ten minutes.

(Break taken.)

CHAIRMAN BAGGETT: Back on the record for cross-examination by Fish and Game of North Gualala.

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CROSS-EXAMINATION OF NORTH GUALALA WATER COMPANY

BY DEPARTMENT OF FISH AND GAME

BY MR. BRANCH

MR. BRANCH: Mr. Phillips, DFG Exhibit 9 demonstrates a bedrock canyon surrounding Elk Prairie; is that correct?

MR. PHILLIPS: Yes.

MR. BRANCH: Do you dispute that a bedrock canyon is surrounding the Elk Prairie area?

MR. PHILLIPS: No, I do not.

MR. BRANCH: You were speaking of the permeability of Franciscan complex and also speaking of some geothermal wells?

MR. PHILLIPS: Yes.

MR. BRANCH: How far from Elk Prairie were those?

MR. PHILLIPS: I would guesstimate 75 miles, a hundred miles. They are inland east of the Santa Rosa Valley.

MR. BRANCH: You mentioned also some skid roads, some road excavations and mentioned those were all dry excavations?

MR. PHILLIPS: Yes.

MR. BRANCH: From your observations?

MR. PHILLIPS: Yes.

MR. BRANCH: Did you submit any data or evidence to back up those observations?

MR. LILLY: I'm going to object that that mischaracterizes his testimony. His testimony is evidence, so I think the question needs to be clarified.

MR. BRANCH: I said any supporting evidence, any evidence to support his observations.

CHAIRMAN BAGGETT: I'll overrule.

MR. PHILLIPS: No, I have not.

MR. BRANCH: Mr. Scalmanini, you discussed a bit the issue of groundwater flow being confined within the channel, correct?

MR. SCALMANINI: I don't think I did talk about groundwater flow being confined within the channel.

MR. BRANCH: There is an issue of whether groundwater is confined within the channel; that's a major issue in this hearing.

MR. SCALMANINI: I will agree with that, the fact that it is not confined within the channel is what I discussed.

MR. BRANCH: Right.

Do you have your testimony in front of you?

MR. SCALMANINI: I do.

MR. BRANCH: I refer you to Figure 10 attached to your testimony, Luhdorff & Scalmanini illustration.

MR. SCALMANINI: Okay.

MR. BRANCH: This generally demonstrates some groundwater elevation gradients and some arrows generally showing the direction of groundwater flow, correct?

MR. SCALMANINI: That's correct.

MR. BRANCH: This groundwater flow does not -- is not demonstrated on this exhibit as flowing back into the bedrock, is it?

MR. SCALMANINI: No, not at least at the north side where it's been investigated the most, no.

MR. BRANCH: South of the stream, there is no data on this figure, is there, for any groundwater flow direction?

MR. SCALMANINI: That's correct.

MR. BRANCH: I have the same questions for Figure 11. Do these groundwater flow charts demonstrate any flow back into the bedrock?

MR. SCALMANINI: No. That would be very, very speculative at best. They show flow away from the bedrock to the north. I should say from the --

MR. BRANCH: There is no data south of the stream, is there?

MR. SCALMANINI: Yes, that is correct. There is no data east of Elk Prairie or west of Elk Prairie either.

MR. BRANCH: Finally Figure 14, these arrows you demonstrate as flow coming out of the bedrock, correct?

MR. SCALMANINI: That's correct.

MR. BRANCH: There is no flow going back into the bedrock?

MR. SCALMANINI: That is correct.

MR. BRANCH: There is no data south of the North Fork Gualala River?

MR. SCALMANINI: That's correct.

MR. BRANCH: There was an exhibit submitted earlier, North Gualala Water Company Exhibit 24, the Darcian flow analysis you have.

MR. SCALMANINI: Yes.

MR. BRANCH: For the Figure W you have 8,000 feet for the channel sides?

MR. SCALMANINI: That's correct.

MR. BRANCH: I'll refer you to, I guess, North Gualala Water Company Exhibit 23. Could you direct me to where the channel sides are on this diagram? You measured --

MR. SCALMANINI: I'll describe it verbally and then I will point to it on the figure.

MR. BRANCH: You mentioned the flow width as being 8,000 feet from EP-1 to EP-2. EP-1 and EP-2 are labeled on this exhibit.

MR. SCALMANINI: That would be both sides of the river from, I'll call, the west end of Elk Prairie on the north side to -- I don't remember exactly, beyond the -- slightly beyond the east end of Elk Prairie up into the vicinity of either SG-4 or EP-1, where that is -- I'm sure EP-1 where Cawood's measurements were made, and then on the south side from, I'll say, about the east end of the Elk Prairie up to the same location where Cawood's upstream EP-1 measurements were made.

MR. BRANCH: This was measured on both sides of the stream, then?

MR. SCALMANINI: Yes.

MR. BRANCH: So do you have any data for the south side of the stream?

MR. SCALMANINI: No. I followed the same approach that Custis did in analyzing the support from basic flows, basically both sides of the stream are logically discharging stored water to support a gaining reach.

MR. BRANCH: That is a projection?

MR. SCALMANINI: Well, it's not a projection. It's an observation that the bedrock complex -- we both did the same thing. The bedrock complex contains water whether it is in just the soil as he said or in the weathered complex or the rest of the fractured complex, but it is on both sides of this canyon as you just asked Mr. Phillips about. It is logical that the kinds of gradients and the kinds of aquifer transmissivity that are approximately present in that location, that that material will discharge on the order of a cfs which is consistent with the observed gain in flow through the reach that I just described.

MR. BRANCH: I have no further questions.

CHAIRMAN BAGGETT: Does Pete?

Gary, do you have any questions?

Barbara?

MS. LEIDIGH: I have a few.

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CROSS-EXAMINATION OF NORTH GUALALA WATER COMPANY

BY STAFF

MS. LEIDIGH: Mr. Phillips, toward the end of your testimony you were talking about sealing off the bedrock when you are doing work in the bedrock?

MR. PHILLIPS: Yes.

MS. LEIDIGH: You talked about this drilling fluid if you want to avoid having seep into the bedrock. What material is the drilling fluid?

MR. PHILLIPS: Each of the drill companies have their own proprietary type of components that they use. Generally it is a bentonite clay. It is water and bentonite clay as the typical drilling fluid. There are all kinds of additives they put in to help support the well structure as it is being drilled, additives. There is foam additives. There is also contamination from the drilling itself, oil, gas, diesel ends up getting mixed in in those fluids and so on.

MS. LEIDIGH: Probably the reason for sealing off is because of the hydrocarbons that get in there, the diesel and gasoline and other materials like that?

MR. PHILLIPS: It is classified as a hazardous waste material. And if it is contained in those quantities, it must be protected from the environment. The environment must be protected from that material.

The reason it is sealed is -- reason they use an imported seal of some kind is typically a clay liner, impermeable clay. The material has to be located in some location, has to run through a laboratory to determine its suitability. It has to be gathered, trucked, imported to the site, and then it has to be placed by a contractor. That placement is such that you have to have an engineer on-site doing investigation, observation, to determine that it has been placed in proper -- placed properly in compliance with the design.

But the reason all that is done is that the Franciscan formation is so highly permeable that it is not a naturally occurring geologic barrier in and off itself. Therefore, any fluid that is placed on it has to be isolated from the permeable zone of bedrock.

MS. LEIDIGH: Would you have to do that if you were working in harder rock, as well?

MR. PHILLIPS: At each individual location you identify the geologic structures. If they are not naturally occurring geologic barriers, yes, you must put in a liner of some kind. That is correct.

MS. LEIDIGH: I think my other questions are for Mr. Scalmanini.

Mr. Scalmanini, as I understood your testimony you are saying that the water that goes into the alluvium in the Elk Prairie area was coming from a hillside to the north that was fractured Franciscan formation. Is that correct?

MR. SCALMANINI: I basically said that there is and needs to be sufficient flow from the north, which says from that formation without particularly characterizing it, as far as fractured or otherwise, how it is allowing that water to yield, that to support, I'll call it, perennial gradient particularly through that dry part of the year, basically a perennial gradient for flow to the south, so some water needs to come from someplace to support, that the only plausible source is from the north. There could be other recharge in the system at different times of the year to support that gradient throughout the great bulk of the year, all but the rainiest of months, meaning flood-type conditions in the stream, there needs to be a source coming from someplace. All the contours point to the fact that it must be from the north.

MS. LEIDIGH: How much water would you assume is stored in that area that would drain into the Elk Prairie area?

MR. SCALMANINI: Stored in the bedrock?

MS. LEIDIGH: Yes.

MR. SCALMANINI: I won't speculate without doing some calculations.

MS. LEIDIGH: You don't have any calculations to tell you how much mass of earth there is, how much mass of rock and how much water might be stored in it?

MR. SCALMANINI: No. That's probably an estimable calculation. But fundamentally our focus was on flow directions and pumping impacts at the Prairie, not where's it coming from. And so I didn't get into, I'll call it, the mass of the, I'll call it, the earth materials that form the north part of the watershed/recharge area to the alluvium and try to calculate how much water would be in storage under high or low head conditions or anything like that, no.

MS. LEIDIGH: Do you have any idea how long it would take to drain out all of the water in the bedrock that is above the Elk Prairie area?

MR. SCALMANINI: Well, at a discharge rate that is something on the order of one cfs coming from two sides and the way we looked at the bounds in the vicinity of Elk Prairie, assuming similar a gradient and similar conductivity or transmissivity, that more would come from the north side than the south just because the flow path or flow area is greater on the north than the south at Elk Prairie. You would be draining at the rate of, let's say, something in the order of a half of a cfs to two-thirds. That's on the order of an acre-foot a day.

That means that on a year-round basis you would be draining something like 3- or 400 acre-feet out of the mass of the north. That is not a lot of water when you look at the gradients that we had in the last of the two not -- not the last two, but the two contour maps that we put up this morning to show the steepness of the gradients at 0.25 up into the Franciscan formation. So even at relatively low storage coefficients, there is specific yields. The draining out 3- or 400 acre-feet in the year would not, I guess, with the amount of, I'll say, surface area and thickness of saturation up there likely drain it all out.

So in order to answer your question specifically, how long would it take to drain it all out without any replenishment, but there is replenishment each year in the wintertime, probably close to forever because there is recharge that occurs to that material, and it is draining at approximately the rate I just said. And so it's unlikely to completely "drain all out."

MS. LEIDIGH: I guess that is all I have.

Thank you.

CHAIRMAN BAGGETT: Paul.

MR. MURPHEY: I have several clarifying questions on North Gualala exhibits. On NGWC Exhibit 24, the Darcian flow, bedrock to alluvium at Elk Prairie, about halfway down the page, equals 1,500 and then an asterisk and SC.

Can you define SC?

MR. SCALMANINI: Specific capacity.

MR. MURPHEY: Thank you.

Also on NGWC Exhibit 22 you have approximately contours of equal bedrock groundwater elevation at gradient equals 0.25.

What data did you look at to come up with the location and shape of those contours?

MR. SCALMANINI: The -- none. That basically is used in this proceeding by others, citing back to Garapatta and approximate gradient in the bedrock was 0.25. It was assumed there; it is assumed here. So purposes of staying consistent and not speculating about some other gradient, I assumed the same way.

What is depicted there on five foot intervals is what a gradient of 0.25 would look like. It is extremely steep. As you know, the closer contours are, the steeper the gradient. For illustration purposes if I did a five foot contour at Elk Prairie, there wouldn't be but one contour line because the contours are much, much flatter. So they are at five-foot spacing in the bedrock to show how steep a gradient of 0.25 would be. And to get some contours on the Prairie, they're at one-foot contour intervals.

There is no observations other than the fact that, as far as the shape goes, the shape is basically a rounded off shape of the bedrock contact at the edge of the alluvium. As one goes, as I talked about before, up the road along basically the toe of that contact, that you can see discharge out the face of that material at various locations. And so I would suggest that that kind of a steep gradient is probably there. There is water that in some places you almost classify as a waterfall. It is too much to be picturesque as a waterfall. You can hear water cascading down the face where it discharges from a much higher elevation. So that suggests, again, this very steep gradient. Whether or not it is 0.25, is speculation. But it's a reasonable estimate in that kind of step terrain and that kind of material.

MR. MURPHEY: Also on that figure you have blue contour lines that are approximate contours of equal groundwater elevation. Two of the northernmost blue lines, which are north of MW-4, you have 36 with question marks on there and then another blue line.

I was wondering what data points did you use to contour those.

MR. SCALMANINI: I didn't. As I said my purpose in drawing the ones that are blue was to illustrate the shape and nature of a contour that would have to be present for a gaining reach to exist. Basically I wanted to show first and foremost the curvature that needs to be there to dictate the flow direction toward the stream as compared to away from the stream. And then ultimately, and I went a little upstream to tie into the fact that it's been testified to by basically everybody, that there is a groundwater discharge component that supports the base flow of this stream, the discharges to the stream. There has been gauging of the stream to show that it increases in flow in a downstream direction. So it is by everybody's observation a gaining reach. So the contours need to be shaped as I've shown.

Once I drafted it to show the same kind, but that is not the testimony purposes, but the shape of those contours needs to be the same as you just keep going upstream, basically, as far as water is discharging, groundwater is discharging to support it. As I got into the vicinity of Elk Prairie, we had real data at the monitoring wells and the production wells and at the stream gauges. And so I simply tried to conform or basically ask the question does the gaining reach contour shape conform with the shape of the contours as actually measured.

And the answer is yes, and that is why I tied the blue to the black. But everything east of basically MW-4 is extrapolation or basically for illustration purposes. It is not based on hard data. It just needs to have that shape is the primary point of drawing it as it is drawn because the water is discharging into the stream, groundwater discharging into the stream.

MR. MURPHEY: Thank you.

I have no further questions.

CHAIRMAN BAGGETT: Any redirect?

MR. LILLY: Just a couple.

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REDIRECT EXAMINATION OF NORTH GUALALA WATER COMPANY

BY MR. LILLY

MR. LILLY: Mr. Phillips, Ms. Leidigh asked you about the slurry, drilling slurry storage ponds. It just wasn't entirely clear, but do the regulations -- let me try again.

Are there situations where geologic formations have sufficient natural barriers? I am not talking Franciscan, but in other formations are there sometimes situations where there are sufficient natural barriers that the two-foot clay layer is not needed?

MR. PHILLIPS: Yes.

MR. LILLY: Can you just elaborate in your experience when that can happen?

MR. PHILLIPS: They're very unique and seldom occur. I personally am not familiar with one although I think the Bakersfield area has, speculation in some of the landfills there that there may be some naturally occurring geologic barriers.

That answer is just for an area that would be investigated for hazardous waste or some kind of waste facility. There are, in fact, naturally occurring geologic barriers that do exist, yes.

MR. LILLY: So the point is that the regulations do not require the two-foot clay layer for this type of pit in all different types of geologic formations?

MR. PHILLIPS: If the naturally occurring substrata will meet the permeability requirements or impermeability requirements, then no liner is needed.

MR. LILLY: In the Franciscan your experience is that the liners are needed?

MR. PHILLIPS: In my experience I have not seen anywhere in the Franciscan that would come close to meeting the standard.

MR. LILLY: The standard for no liner?

MR. PHILLIPS: Correct.

MR. LILLY: Mr. Scalmanini, your Darcy's Law calculation, I believe it is Exhibit 24.

MR. SCALMANINI: Yes.

MR. LILLY: I think Mr. Murphey or maybe Ms. Leidigh, I'm sorry, I've forgotten which one. Somebody asked you about basically the assumption about the gradient. If the -- I'm going to shift over to transmissivity. You have calculated transmissivity of 400 gallons per day per foot?

MR. SCALMANINI: Yes.

MR. LILLY: That is based on an average specific capacity of the wells of 0.265, I think it is, gallons per day per foot?

MR. SCALMANINI: Per minute per foot, but that's okay.

MR. LILLY: Gallons per minute per foot. I'm still learning. If, in fact, the transmissivity of the Franciscan formation in the vicinity of Elk Prairie were higher -- let me ask this way.

Could the transmissivity of the Franciscan formation in the Elk Prairie be higher than the 400 gallons per day per foot?

MR. SCALMANINI: Yes.

MR. LILLY: Please elaborate why that is.

MR. SCALMANINI: Well, it's entirely -- evapotransmissivity in a formation like this is entirely a function of, I'll say, how broken, fractured or otherwise compromised the primary Franciscan permeability are. And so it is possible particularly in proximity to a major fault system such as the San Andreas rip zone that this material could be more fractured than what would be encountered at a distance from here where this average well yield reported in, I think it was, Parfitt and Germain was observed. So it is possible that it is higher.

MR. LILLY: Finally, just to clarify, I think you testified that the springs and seeps that you observed in the Elk Prairie area were intermittent. We just need to get clarification.

When you say intermittent, do you mean intermittent spatially over the terrain or do you mean intermittent in time?

MR. SCALMANINI: I mean intermittent spatially. In other words, as you drive up, that is what I was trying to describe, as you drive up the road from Elk Prairie to the east, it is not like a constant wall of vegetation. But there are at intermittent locations or discontinuous locations there are evidence of the types of vegetation that I was describing, which is evident of groundwater discharging to support that type of vegetation.

MR. LILLY: Thank you.

I have no further questions.

CHAIRMAN BAGGETT: Have any cross on the redirect?

MR. BRANCH: No.

CHAIRMAN BAGGETT: Barbara.

Exhibits.

MR. LILLY: You beat me to it.

I would like to offer Exhibits NGWC 20 to 24.

CHAIRMAN BAGGETT: Any objection?

If not, they are admitted.

That concludes the case in chief.

At this point I don't feel we need oral closings. We will have written briefs. So maybe we can discuss those for a minute.

From the time issue. I guess the first question is the transcript.

We can go off.

(Discussion held off record.)

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REPORTER'S CERTIFICATE

STATE OF CALIFORNIA)
) ss.
COUNTY OF SACRAMENTO)

I, ESTHER F. SCHWARTZ, certify that I was the official Court Reporter for the proceedings named herein, and that as such reporter, I reported in verbatim shorthand writing those proceedings;

That I thereafter caused my shorthand writing to be reduced to typewriting, and the pages numbered 206 through 271 herein constitute a complete, true and correct record of the proceedings.

IN WITNESS WHEREOF, I have subscribed this certificate at Sacramento, California, on this 26th day of June 2002.

____
ESTHER F. SCHWARTZ
CSR NO. 1564