

**STATE OF NEW MEXICO  
WATER QUALITY CONTROL COMMISSION**

IN THE MATTER OF PROPOSED AMENDMENTS  
TO 20.6.2 NMAC, THE COPPER MINE RULE

New Mexico Environment Department,  
Petitioner.

WQCC 12-01 (R)

**FREEPORT-McMoRAN**  
**REBUTTAL EXHIBIT BLANDFORD – 10**

Testimony of Thomas Neil Blandford, P.G.  
(November 1, 2007) (Excerpts)

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STATE OF NEW MEXICO  
WATER QUALITY CONTROL COMMISSION

WQCC 03-12 (A) and WQCC 03-13 (A)

IN THE MATTER OF:  
APPEAL OF SUPPLEMENTAL DISCHARGE  
PERMIT FOR CLOSURE (DP-1341) FOR  
PHELPS DODGE TYRONE, INC.

PHELPS DODGE TYRONE, INC.,

Petitioner.

TRANSCRIPT OF PROCEEDINGS

BE IT REMEMBERED that on the 1st day of  
November, 2007, the above-entitled matter came before  
the New Mexico Water Quality Control Commission, taken  
at the New Mexico State Capitol Building, Room 321, 490  
Old Santa Fe Trail, Santa Fe, New Mexico, at the hour of  
8:36 AM.

VOLUME 18

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(intentionally omitted)**

1 for some of these wells, those constituents are slightly  
2 less than halfway down the table.

3 I guess all that I would point out is that  
4 each of those constituents is exceeded for some of these  
5 wells even prior to leaching in that area. For example,  
6 Well 2-1, Well 2-6, 2-7, 6-4 and 6-5 exceed standards.

7 I guess the other thing I would point out with  
8 regard to preexisting water quality, prior to this data,  
9 in earlier reports, such as the Trauger report that we  
10 mentioned earlier, there is some -- very little, or in  
11 most cases, no groundwater quality data from within the  
12 mineralized portion of the ore body that Phelps Dodge is  
13 mining.

14 So while water quality prior to mining off to  
15 the west in the Big Burro Mountains may be very good,  
16 that doesn't mean that the preleached water quality at  
17 the mine was also very good, because it is a mineralized  
18 zone and you would expect higher concentrations of  
19 various constituents.

20 This is some of the earliest data that's  
21 available, and I think it tends to illustrate that, and  
22 we really don't have a lot of very early data for this  
23 region.

24 Q. Thank you, Mr. Blandford.

25 Have you heard or reviewed testimony from NMED

1 witnesses, including Ms. Menetrey and I believe  
2 Mr. Olson, to the effect that the Environment  
3 Department, or probably in some instances its  
4 predecessor, the Environmental Improvement Division,  
5 relied on representations by Tyrone in discharge plan  
6 applications that no groundwater contamination would  
7 occur, including groundwater directly below the  
8 facilities for which the applications were submitted?

9 A. Yes, I did hear that testimony.

10 Q. Are you familiar with Tyrone's initial  
11 discharge permit applications for the facilities at the  
12 Tyrone Mine?

13 A. Yes. I've read through the permit files for  
14 most or all of them.

15 Q. Do you agree with testimony on behalf of the  
16 Environment Department to the effect that the discharge  
17 plans -- the permit applications or the proposed  
18 discharge plans represented that there would be no  
19 groundwater contamination anywhere, including under the  
20 facilities?

21 A. No, I don't agree with that. In fact, I -- my  
22 opinion is exactly the opposite.

23 I think if you read the early record, as I  
24 have, the information clearly indicates that there would  
25 be an expectation of not only impacts to groundwater but

1 exceedance of groundwater standards beneath and adjacent  
2 to these leach facilities.

3 Q. Mr. Blandford, can you give us some specific  
4 examples that illustrate your view on this topic?

5 A. Yes.

6 I'll start with DP-166, which is -- what  
7 exhibit number is this, Mr. Moellenberg?

8 Q. Yes, Mr. Blandford, I believe you have in  
9 front of you Tyrone Exhibit 921, which is a set of  
10 documents used in the cross-examination of Mary Ann  
11 Menetrey. Is that right?

12 A. Yes.

13 Q. Are those the documents you're going to use  
14 for this testimony?

15 A. Yes, in part.

16 Q. And if you could, please, refer to the tab  
17 numbers of the specific documents you're referring to as  
18 you go through them.

19 A. First, I'm going to refer to Tab 12, and  
20 what's provided behind Tab 12 is a copy of the  
21 application to discharge, and the cover letter is dated  
22 March 23rd, 1981.

23 The second page is labeled "Proposed Discharge  
24 Plan for the Number 2 Copper Leach System."

25 It's my understanding this is the first

1 application for a leach system. There was a DP  
2 application prior to this for the Mangas Valley, but  
3 that was for seepage from the tailing.

4 Let's see. Specifically, in this document, I  
5 would turn back to page five -- well, actually, page  
6 four of the document, and some of the text here is  
7 already highlighted, but at the top of page four, the  
8 statement is made, "The infiltration rate from the  
9 Number 2 Leach dump is estimated to range from  
10 approximately 1,200 to 1,300 gallons per minute."

11 Just to put that number in perspective, the  
12 groundwater component of what's pumped from the Main Pit  
13 today is about 1,400 gallons a minute.

14 So here they are -- Phelps Dodge is making a  
15 statement to the Agency that the expected infiltration  
16 rate is really almost that of the total pumping rate of  
17 what we have from the Main Pit today.

18 Q. Mr. Blandford, can you tell by this  
19 application what is meant by "infiltration rate" as it's  
20 used here?

21 A. Yes, I believe it means the volume or rate of  
22 infiltration to groundwater.

23 Q. Thank you.

24 Please go ahead.

25 A. The next page, page five, down at the bottom,

1 there is a section labeled "Flow Characteristics of the  
2 Discharge," and the first paragraph of that reads,  
3 "Pregnant leach solution will infiltrate to the  
4 groundwater directly underlying the dump from the bottom  
5 of the leach dump. Infiltration will occur  
6 predominantly through faults and fractures in the rock  
7 and, to a lesser extent, through interconnected  
8 microfractures in the rock."

9 So there, there is an a clear statement that  
10 there is going to be seepage to groundwater beneath the  
11 dump, and the estimation of the rate of that seepage is  
12 1,200 to 1,300 gallons per minute.

13 I would note on the next page, page six, that  
14 there was actually some field testing done to assist  
15 Tyrone with estimating that infiltration rate. There  
16 are six test holes that they actually went out and  
17 measured the infiltration rate to assist them in coming  
18 up with this 1,200 to 1,300 gallons per minute value.

19 Turning over to page seven, again, there is a  
20 statement, "Infiltration rates from the leach dumps,  
21 which depend on the areas being leached, are expected to  
22 range from the 1,200 to 1,300 gallons per minute." And  
23 then they break it out according to a mined-out area and  
24 infiltration from a natural ground area that they are  
25 going to cover.

1           Turning over to the next page, page eight, is  
2 the expected quality of the seepage. So this is what  
3 they are expecting to seep to groundwater.

4           Just to note here, going down the list, the  
5 expected concentrations of copper and iron in pregnant  
6 leach solution are 1,000. The standard for both of  
7 those constituents is one, and so that's solution a  
8 thousand times standard.

9           Sulfate, 25,000 milligrams per liter. The  
10 standard is 600. So that's many times the standard, of  
11 course.

12           Total dissolved solids, 37,000. The standard  
13 is a thousand. And on down the list, very low pH, 2.4.

14           So I mean, in my opinion, clearly in this  
15 document -- and I don't know how it could be more  
16 clearly stated -- that Tyrone is saying they are  
17 expecting to leach this pile, the quality of the leach  
18 solution is very high total dissolved solids, very high  
19 sulfate, high copper, high iron, low pH, a portion of  
20 that fluid is going to seep to groundwater directly  
21 beneath the leach dump, and Tyrone's estimate of how  
22 much of that fluid is going to seep to groundwater is  
23 1,200 to 1,300 gallons a minute.

24           I don't see how anybody could possibly have  
25 thought that there would not -- not only be impacts to

1 groundwater beneath and adjacent to the facility, but  
2 also that groundwater standards would be exceeded  
3 directly beneath the leach dump.

4 I don't believe that anybody, either the  
5 Agency or Tyrone, was under that impression that there  
6 would be no groundwater impacts when they applied for  
7 this discharge plan.

8 Q. Mr. Blandford, are you familiar with the  
9 location of this facility that was covered by DP-166 and  
10 where groundwater flows in that area?

11 A. Yes, I am.

12 Q. Could you describe that for us?

13 A. The area that I'm talking about -- I'm going  
14 to refer to one of my previous exhibits. This is  
15 Exhibit Blandford 4.

16 The area that's being discussed is essentially  
17 the west side of the mine, the Number 2 Stockpile area  
18 between the Main Pit and Deadman Canyon. This was the  
19 application for the first stockpile that was constructed  
20 in that region.

21 Q. And what's your interpretation of groundwater  
22 flow direction in this area?

23 A. Groundwater flow today from this area is from  
24 the southwest to the northeast towards the Main Pit.

25 Now, the Main Pit cone of depression varied

1 over time, so the direction of groundwater flow could  
2 have been a little different than this prior to the  
3 formation of the cone of depression at the Main Pit.

4 Q. Mr. Blandford, are you familiar with the  
5 pollution controls that were proposed in the discharge  
6 plan and required under DP-166?

7 A. Yes.

8 The original plan?

9 Q. Yes.

10 A. Yes.

11 Q. Could you describe what those were in the  
12 original plan?

13 A. Well, essentially, there was a monitoring plan  
14 proposed and a contingency plan, such that if the  
15 monitoring wells in the vicinity of the stockpile showed  
16 increases in contamination, then there was provisions to  
17 invoke a contingency plan.

18 A little later on, there were exceedances of  
19 standards in some of those monitor wells, and the --  
20 really, the pollution control in that area, if you will,  
21 has been to maintain pumping at the Main Pit, which  
22 serves to capture groundwater from beneath the Number 2  
23 Stockpile area, and, currently, it's extracted and used  
24 as part of the mine process waters, but under closure,  
25 that water would be treated.

1 Q. Were there any facilities in the discharge  
2 plan for capture of these leach solutions or capture of  
3 groundwater?

4 A. Well, yes, certainly, there were different  
5 ponds, and some, you know, discussed in the discharge  
6 plan for capture of the leach solution.

7 Q. And do you know where they were located?

8 A. I do not offhand know where they all were  
9 located.

10 They were generally -- I know there is one on  
11 the -- I thought -- my understanding is there were some  
12 on the north and east side of the piles.

13 Q. Were those near the toes of the stockpiles?

14 A. Yes, they would have been at or near the toes  
15 of the stockpiles.

16 Q. Do you have anything to -- well, let me ask  
17 this: Would any of those pollution control facilities  
18 or capture facilities that you were just discussing  
19 prevent leach solutions from entering groundwater?

20 A. As of the early construction of this facility?

21 Q. Yes.

22 A. No. I believe that those -- there were  
23 collection facilities to collect the majority of the  
24 pregnant leach solution, the PLS, but the mine's  
25 estimate of what would not be captured by those

1 facilities and what would infiltrate to groundwater was  
2 1,200 or 1,300 gallons per minute.

3 The rate of application of raffinate at the  
4 top of the piles is far greater than 1,200 or 1,300  
5 gallons per minute.

6 Q. Thank you.

7 Mr. Blandford, do you have any other examples  
8 that relate to your view of these initial discharge  
9 plans?

10 A. Yes, I do.

11 The next example would be DP-286, which is the  
12 Number 3 Stockpile area.

13 Again, referring to Exhibit Blandford 4,  
14 the Number 3 Stockpile area is on the northern side of  
15 the mine stockpile unit, kind of northwest of the Main  
16 Pit.

17 Q. Have you reviewed the initial discharge plan  
18 application materials with respect to this facility?

19 A. Yes, I have.

20 Q. And what are your views regarding  
21 representations made in this application regarding  
22 contact of leach solutions with groundwater?

23 A. The expected or anticipated seepage of leach  
24 solutions at this facility is significantly less than  
25 was put forth for the Number 2 Stockpile, but they are

1 still significant; and the information provided by  
2 Phelps Dodge to the Agency would clearly indicate  
3 exceedance of standards both beneath and adjacent to the  
4 stockpile.

5 Q. Do you have a copy of that initial discharge  
6 plan application with you here today?

7 A. Yes, I do.

8 I believe that's been labeled as Tyrone  
9 Exhibit 928 in the new numbering system.

10 Q. I believe that's correct.

11 Could you, using that exhibit, give us some --  
12 well, first of all, are the documents contained in  
13 Exhibit 928 in the administrative record in this matter?

14 A. Yes, they are.

15 Q. And could you, using those exhibits, tell us  
16 what in these exhibits supports your view that you just  
17 gave?

18 A. Okay. I'm going to look at Exhibit 928, and  
19 I'm not going to go through the whole exhibit.

20 There is a lot of analysis that can be read,  
21 for anyone interested, about how the seepage to  
22 groundwater was estimated.

23 But on page 18, approximately halfway down the  
24 page, there is a section titled, "Groundwater Most  
25 Likely to Be Affected By the Seepage Discharge."

1 MR. DE SAILLAN: Excuse me. What page are you  
2 on?

3 MR. BLANDFORD: Page 18 of Exhibit 928.

4 MR. DE SAILLAN: Thank you, Mr. Blandford.

5 MR. BLANDFORD: Yes.

6 I would just read the first sentence there.  
7 "Some pregnant leach solution will infiltrate through  
8 the bottom of the leach dump into the groundwater  
9 directly underlying the dump bottom area."

10 And there is many -- a lot of other  
11 information in this document that makes it clear that  
12 seepage was expected, but I just selected that one  
13 sentence to read.

14 The other item I would point out, before we  
15 leave this particular document, is on page 27 of the  
16 same document, the first full paragraph there reads,  
17 "Actions to protect subsequent users in the Mangas  
18 Valley from harm will be made on the basis of the  
19 analyses of samples obtained from Wells 10 and 11."

20 I wanted to read this statement, because it's  
21 very similar to other statements provided in the early  
22 record for all the DPs, that when Phelps Dodge or Tyrone  
23 provided correspondence regarding impacts to groundwater  
24 and how groundwater was going to be protected, they  
25 consistently either directly state or imply that they

1 are considering groundwater at a place where another  
2 user would be using it. They are not talking about  
3 groundwater directly beneath the facilities.

4 So if there is a statement -- and there has  
5 been a number of them pulled out -- for example, in  
6 Ms. Menetrey's direct testimony, where there is a  
7 statement that Phelps Dodge says, "Impacts to  
8 groundwater will be limited," or "Impacts to groundwater  
9 are not expected to be significant," whatever the  
10 statement is, they are not talking about groundwater  
11 directly beneath the facility. They are talking about  
12 groundwater at a place where another user would be using  
13 that groundwater.

14 That, in my view, is the only consistent  
15 reading of the administrative record.

16 So, for example, with regard to DP-286, in  
17 particular, if you go on back a few pages, there is  
18 actually two -- there is a second document behind that  
19 first one that I was talking about, and both documents  
20 together are labeled as Exhibit 928.

21 This second document is a letter from  
22 Woodward-Clyde Consultants. It's document A-17 in the  
23 DP-286 administrative record.

24 This is a letter, basically, responding to a  
25 series of EID comments. So the application for the

1 discharge plan was submitted to the Agency, the Agency  
2 had questions about certain things, and Woodward-Clyde,  
3 who was a consultant for the mine at that time, is  
4 answering those particular questions in this letter.

5           Again, the letter is rather lengthy, but I  
6 would like to turn back to page six of that letter.

7           Yes, sir.

8           MR. SWAZO: Is that the letter that's dated  
9 March 6th, 1984?

10           MR. BLANDFORD: Yes, it is.

11           Page six of that letter is labeled at the top  
12 "Dilution of Seepage."

13           There is a comment from EID that the mine,  
14 through Woodward-Clyde, is responding to, and the EID  
15 comment is reproduced here, and it says, "The second  
16 paragraph of your August 19th, 1983, letter states that  
17 you do not feel that a groundwater model is warranted  
18 since processes such as dilution and sorption in the  
19 aquifer will reduce concentrations of contaminants. If  
20 these processes are to be invoked then they should be  
21 described and quantified."

22           So Woodward-Clyde is presenting their response  
23 to that comment.

24           And there is, let's see, one, two, three --  
25 there is four pages that respond to that comment, and

1 after the four pages, there is a -- there is a map  
2 that's labeled, if you can see it, Figure 1. So this is  
3 from the -- this is from the response letter.

4 So what Woodward-Clyde did, to respond to that  
5 particular comment from the Agency, is they made some  
6 computations of groundwater flow and mixing of the  
7 seepage beneath the stockpile with that groundwater  
8 flow.

9 The way they did it -- on that figure, you'll  
10 see kind of two polygons in the center of the figure.  
11 The center closed polygonal shape represents the  
12 approximate extent of the Number 3 Leach Stockpile as  
13 proposed, and the outer polygon is an area where  
14 Woodward-Clyde made some computations of groundwater  
15 flow and water quality.

16 So what they did is, first, they did a  
17 dilution calculation, they took the seepage and said  
18 what if that seepage was mixed with all groundwater  
19 beneath the facility, and they come up with a dilution  
20 factor of 1,700. But they really -- I think they  
21 realized that's not really an appropriate scenario and  
22 they move on to some more complex computations.

23 The second one is what I want to focus on.  
24 What they did is they took a line of vertical slices  
25 through the entire thickness of the aquifer downgradient

1 of the Number 3 Stockpile, and they used the hydraulic  
2 gradient, hydraulic conductivity, aquifer thickness,  
3 other information that they had available to them at  
4 that time, and they computed the rate of groundwater  
5 flow across that vertical slice, and they compute that  
6 volume to be about 540 gallons per minute.

7 So that's what they are saying is moving  
8 through the aquifer downgradient of the Number 3 Leach  
9 Stockpile prior to leaching. That 540 gallons a minute  
10 is provided on page eight of the letter.

11 And then they take their -- what they assume  
12 to be their worst-case seepage rate from beneath the  
13 stockpile of ten gallons a minute, and they assume --  
14 they say, "Well, all right, if that entire volume of  
15 seepage gets entirely mixed with this 540 gallons per  
16 minute of groundwater flow beneath the facility, what  
17 would the -- what would the dilution factor be? What's  
18 the effect of that mixing?"

19 And they come up with a dilution factor of 54,  
20 which basically means that the PLS that's seeping to  
21 groundwater would be diluted by a factor of 54, if it's  
22 completely mixed throughout the entire aquifer thickness  
23 downgradient of the Number 3 Stockpile. That's the  
24 computation that they did.

25 Now, to look at that in terms of computations,

1 I've prepared another exhibit.

2 Q. Mr. Blandford, have you done some computations  
3 of your estimates of groundwater quality using the  
4 dilution factors you've just discussed?

5 A. Yes, I have. That's provided in Exhibit 929.  
6 It's a one-page exhibit. It's a table, and the table is  
7 labeled, "Predicted Impacts to Groundwater at the Number  
8 3 Stockpile (DP-286) Based on Information Provided  
9 During the Application Process."

10 What I've provided in this table, I've had  
11 some selected constituents of PLS, this is what's going  
12 to be seeping to groundwater, I have the standard listed  
13 for the various constituents. The third column is the  
14 expected quality of stockpile seepage. This comes from  
15 a table in the application itself.

16 So, again, this is what the applicant is  
17 telling the Agency the quality of the seepage is going  
18 to be. TDS, 37,000, it's similar to many of the other  
19 applications.

20 Then the next column -- there are two columns,  
21 they are labeled "Predicted Concentration in Groundwater  
22 Approximately 500 Feet Downgradient of the Stockpile  
23 Toe."

24 So this vertical slice that they selected to  
25 do their analysis is about 500 feet north or

1 downgradient to the stockpile toe. So this is where the  
2 computation is being made.

3           There is a dilution factor of 54. So the way  
4 that that factor gets used is you take the expected  
5 concentration of the seepage and divide it by 54 to get  
6 the expected concentration of groundwater if that  
7 seepage was entirely mixed throughout the full vertical  
8 extent of the aquifer at that vertical plane they are  
9 looking at.

10           So they are looking over -- they are not  
11 looking at the top 20 or 30 feet, which our monitor  
12 wells typically monitor, they are looking at several  
13 hundred feet of saturated thickness, and the resulting  
14 values there of dividing by 54 are provided.

15           The first one for TDS, for example, is 685.  
16 Now, 685 is below the standard, but I have a footnote  
17 there that if you included background water quality that  
18 was measured and provided in the application, you would  
19 exceed standards.

20           And sulfate, again, is below standard, but if  
21 you consider background, the standards would be  
22 exceeded -- you exceed 600.

23           Going on down from there, fluoride, aluminum,  
24 copper, iron, manganese, zinc, you would exceed  
25 standards, and in many cases, by quite a bit, doing that

1 dilution calculation.

2           So this fourth column over is the computation  
3 that was provided to the Agency to look at this effect  
4 of dilution.

5           If you simply take what -- the analysis that  
6 Woodward-Clyde did and provided to the Agency, you would  
7 come to the logical conclusion that 500 feet  
8 downgradient of the leach stockpile, standards are going  
9 to be exceeded for all these constituents.

10           That's all information that's in the record  
11 and was provided as part of the application process.

12           If you didn't want to have -- I added another  
13 column to the right there, which is a computation that I  
14 made if you assume -- you want to look at half the  
15 aquifer thickness instead of the full aquifer thickness,  
16 and you can see the effect, it's essentially double.

17           So through reviewing this information, I just  
18 -- I really can't see how, again, anyone would have been  
19 under the impression that water quality standards were  
20 not going to be exceeded directly beneath and adjacent  
21 to the stockpile.

22           Again, I'll go back to comments when -- and,  
23 actually, let's go ahead and turn to one.

24           On the next page, page nine, and I'm going  
25 back to Exhibit 928, that very last paragraph, there is

1 some discussion about groundwater quality. This was --  
2 actually, a portion of this paragraph was quoted by  
3 Ms. Menetrey in her direct exhibit, and I'm going to  
4 read from NMED Exhibit Number 11, which is  
5 Ms. Menetrey's direct exhibit. I'm going to read a  
6 quote from page 15. This is a portion of Ms. Menetrey's  
7 discussion of this particular DP.

8 And it says here -- Ms. Menetrey's words were,  
9 "Tyrone stated further that, and then the quotation,  
10 'With a leachate flow of 10 gallons per minute, the  
11 mixed water'" -- and then she's added in parentheses,  
12 "'(groundwater and leachate) could show an increase in  
13 contaminants of approximately one to two percent and pH  
14 may be slightly affected. If complete mixing is  
15 accomplished the contaminant increases would not be  
16 detectable.'"

17 So this is an example -- the Agency has  
18 provided these comments, and they are saying that the  
19 context for these comments relates to groundwater  
20 directly beneath the leach facility, and I disagree with  
21 that.

22 These comments that Phelps Dodge made, or  
23 their consultants early on, are not referring to  
24 groundwater beneath the facility, they are referring to  
25 groundwater far away, typically at someplace where

1 another user would be using the groundwater. In this  
2 particular case, it's down the Mangas Valley.

3 So to compare that quote, if we go back to the  
4 full paragraph, which is provided on this page nine of  
5 Exhibit 928 in the letter I've been discussing, the full  
6 quote is, "As the plume migrates, the dilution ratio  
7 would likely increase until the plume totally mixes with  
8 groundwater. The effect of the leachate on pH of the  
9 groundwater would depend on the buffering capacity of  
10 the soil and groundwater that the leachate passes  
11 through. With a leachate flow of 10 gallons per minute,  
12 the mixed water could show an increase in contaminants  
13 of approximately one to two percent," and so on for the  
14 remainder of the quote.

15 So, clearly, at the start of the paragraph,  
16 they are saying "as the plume migrates." They are  
17 talking about there is a plume that exists at the leach  
18 facility and it's moving downgradient, and if you let it  
19 go far enough to a point where it would fully mix with  
20 groundwater, this is the context of the quote they are  
21 providing. They are not providing that analysis with  
22 regard to groundwater directly beneath the leach  
23 facility.

24 Q. Thank you, Mr. Blandford.

25 Do you have any other specific examples of

1 your point that the Tyrone discharge plan applications  
2 did not represent that there would be no impacts to  
3 groundwater underneath the permitted facilities?

4 A. I have one more, and this is from DP-435,  
5 which is, again, the Number 2 Leach Stockpile Complex.  
6 This is the Number 2A Leach System, which is north of  
7 the Number 2 Stockpile.

8 So, again, referring to Exhibit Blandford 4,  
9 the Number 2A Stockpile is this stockpile here, kind of  
10 due west of the Main Pit, again between the Main Pit and  
11 Deadman Canyon.

12 Q. Mr. Blandford, do you have some documents that  
13 you intend to use for your testimony on this discharge  
14 permit?

15 A. Yes. This is, I think, the last document in  
16 the packet which is labeled Tyrone 930 now, under our  
17 updated numbering system.

18 Q. Could you describe that exhibit for us?

19 A. Yes.

20 There is a cover letter here dated May 14th,  
21 1986; and the second page is labeled "Phelps Dodge  
22 Corporation, Tyrone Branch, Tyrone, New Mexico,  
23 Discharge Plan Number 2A Leach Dump," dated May, 1986.

24 Again, this is the original permit application  
25 for this Number 2A Stockpile.

1           Turning over to the fourth page of the  
2 exhibit, it's kind of the opening page of the document,  
3 labeled "Discharge Plan Number 2A Leach Dump," and  
4 halfway down the page, there is "Seepage Quantity," and  
5 just to read the first paragraph, "We have estimated  
6 that a maximum of 96 gallons per minute of pregnant  
7 leach solution will be lost through the dump base and  
8 pregnant leach solution ponds during leaching." And  
9 then they explain how they obtained the 96 gallons per  
10 minute number.

11           Again, this is just another example -- I mean,  
12 I already went through the example of the Number 3  
13 Stockpile, where the estimated seepage rate was 10  
14 gallons a minute, and so here is an estimate of, you  
15 know, a seepage rate of almost ten times that, and  
16 clearly this seepage would impact groundwater as well.

17           So this, to me, is a clear theme, looking  
18 through the early permits, that the information that was  
19 provided clearly indicates that there will not only be  
20 impacts to groundwater, but that groundwater would  
21 exceed standards directly beneath and adjacent to these  
22 leach facilities.

23           MR. HUTCHINSON: Excuse me, Madam Hearing  
24 Officer.

25           MS. PADILLA: Commissioner Hutchinson.

1 MR. HUTCHINSON: This eventually became  
2 discharge permit what number?

3 MR. BLANDFORD: 435.

4 MR. HUTCHINSON: 435.

5 MS. PADILLA: Thanks.

6 Missed that number, too.

7 Q. (BY MR. MOELLENBERG) Thank you,  
8 Mr. Blandford.

9 I'd like you to assume that the Water Quality  
10 Act and the Water Quality Control Commission Regulations  
11 governing discharge plans and discharge permits would  
12 not allow the Department to approve a discharge plan  
13 unless the applicant demonstrates that no groundwater  
14 underneath or downgradient of the proposed facilities  
15 would exceed WQCC groundwater quality standards.

16 A. Okay.

17 Q. Do you understand that assumption?

18 A. Yes.

19 Q. Based on your review of the application  
20 materials for DP-166, under the standard I've asked you  
21 to assume, in your view, could the discharge plan for  
22 DP-166 have been approved?

23 A. No, clearly not.

24 Q. Using the same assumption, in your view, could  
25 the discharge plan application for DP-286 have been

1 approved?

2 A. No.

3 Q. And, again, using the same assumption as to  
4 the approval standard, could the application for DP-435  
5 have been approved?

6 A. No.

7 Q. Mr. Blandford, have you heard or reviewed  
8 testimony from Ms. Menetrey on behalf of the Environment  
9 Department that if the Commission accepted Tyrone's  
10 proposal to use the MMD permit boundary to define the  
11 place of withdrawal of water for present or reasonably  
12 foreseeable future use for the Tyrone Mine, that would  
13 undermine requirements for abatement of groundwater  
14 across the Tyrone Mine site?

15 A. Yes, I had heard that testimony.

16 Q. Do you agree with that testimony?

17 A. I do not.

18 I think the Department has put forth, through  
19 several witnesses, that if Tyrone's proposal is  
20 accepted, that essentially that's going to lead to  
21 abatement measures being removed, a large zone of  
22 impacted water that, you know, we're just going to  
23 pollute and not do anything about it; and the reality is  
24 that that -- well, number one, Tyrone doesn't want to do  
25 that; and, number two, it's not even feasible.

1           If we're going to meet standards at the permit  
2 boundary, we have to have abatement measures inside the  
3 permit boundary. You can't wait until highly  
4 contaminated water gets to the permit boundary and then  
5 just deal with it then. It doesn't make sense  
6 economically or physically.

7           Really, if you look at many places, the  
8 location of the permit boundary relative to the  
9 stockpiles is very close.

10           For example, referring back to Blandford 4,  
11 the MMD permit boundary follows very close the toe of  
12 the Number 1 Stockpile, all the way down by the Number  
13 1A, 1B, 1C Stockpiles, around the south side, around the  
14 west side.

15           The permit boundary is not very far from the  
16 stockpile toes, so if we're going to meet standards at  
17 the permit boundary, we're going to need to maintain our  
18 capture systems for impacted water at the stockpile  
19 toes. It's not like we could move out 2,000 or  
20 3,000 feet and do something there. That would make no  
21 sense, and it's not even physically plausible at most  
22 locations.

23           Q. To further illustrate that point, are you  
24 familiar with reclamation and abatement measures already  
25 underway by Tyrone inside the MMD permit boundary?

1 A. I'm familiar with many of them, yes.

2 Q. Could you describe the ones that you're  
3 familiar with?

4 A. Well --

5 Q. At least some of them.

6 A. Yes.

7 There are a variety of groundwater capture  
8 systems, some both for regional water and perched water,  
9 which I discussed in my direct testimony, but there is  
10 also a large amount of ongoing reclamation work right  
11 now.

12 All of the tailing impoundments in the Mangas  
13 Valley either have been reclaimed or are in the process  
14 of being reclaimed. The Number 1 Stockpile is in the  
15 process of being reclaimed. That's on the east side.

16 There has been a large amount of regrading and  
17 covering which has already been conducted on the south  
18 side of the mine, and there is plans for other  
19 reclamation activities around the mine.

20 So there is a lot of measures that have  
21 already been implemented or are ongoing right now  
22 related to -- you know, that will assist with meeting  
23 abatement requirements at the MMD permit boundary.

24 Q. Have you heard or reviewed testimony by  
25 Mr. Marshall raising concerns regarding past excursions

**Pages 4392 – 4458  
(intentionally omitted)**

1 MS. PADILLA: Great. Thank you.

2 Mr. Jensen, thank you very much.

3 MR. JENSEN: Thank you.

4 MS. PADILLA: Okay. I think we can return now  
5 to questions of Mr. Blandford by the Commission.

6 I think we were on Commissioner Johnson.  
7 Would you like to continue?

8 MS. JOHNSON: Thank you, Madam Chair.

9 Well, I'm glad I had that chocolate mousse.

10 MR. BLANDFORD: I'm jealous.

11 MS. PADILLA: Me, too.

12 NEIL BLANDFORD

13 after having been previously duly sworn under oath,  
14 was questioned and testified further as follows:

15 CROSS EXAMINATION (CONTINUED)

16 BY THE COMMISSION:

17 MS. JOHNSON: Mr. Blandford, can we go to  
18 Exhibit 928, and during your testimony on this exhibit,  
19 you directed us to several places within it.

20 I'm looking right now at page nine of the  
21 March 6th, 1984, attachment, I think it is, and I made  
22 some notations during your discussion of this part, and  
23 it's the last paragraph on that page.

24 Are we looking at the same place now?

25 MR. BLANDFORD: Yes, I believe so.

1 MS. JOHNSON: And you were explaining that  
2 this language illustrated that the parties at that time  
3 were looking at -- I think the quote was applying the  
4 standards, quote, somewhere far away.

5 Do you remember that testimony?

6 MR. BLANDFORD: Yes, but I believe my  
7 testimony was that this was a quote selected by the  
8 Department, and my understanding of the application of  
9 that quote is that it's being implied that it was  
10 intended by Phelps Dodge, or their consultants, to apply  
11 to groundwater beneath the facility; and my point is  
12 that the consultants for Phelps Dodge at that time, in  
13 making this quote, certainly was not referencing effects  
14 to groundwater immediately beneath the facility.

15 MS. JOHNSON: Right.

16 And you used the comments that they were  
17 applying this concept to some point of withdrawal  
18 somewhere far away.

19 Is that -- but pursuing that, what -- can you  
20 just give me a little bit more detail in what you're  
21 conceptualizing here?

22 What do you mean by "somewhere far away," and  
23 what was -- what do you think was proposed in this  
24 language specifically, or in this discharge plan?

25 MR. BLANDFORD: Well, in this letter, which is

1 part of this DP record, my opinion is what they mean by  
2 this paragraph -- they don't say exactly how far away,  
3 but they say, "As the plume migrates, the dilution ratio  
4 would likely increase until the plume totally mixes."

5 And they don't say they think that's going to  
6 happen in one mile, two miles, ten miles. There is no  
7 reference there.

8 They are just saying that, clearly, your  
9 source of contaminants to groundwater is near surface,  
10 from the leach stockpile at the source, and as that  
11 contamination moves farther away from the source, there  
12 will be a greater amount of mixing with the groundwater;  
13 and that process of mixing, as the plume moves away from  
14 the source, is what this paragraph specifically refers  
15 to.

16 I don't know that when they wrote this  
17 paragraph they even had a specific distance in mind. I  
18 think they are describing a process, as the plume moves,  
19 it will mix, and if it's gone far enough to totally mix  
20 with the aquifer, this is what they expect.

21 MS. JOHNSON: Okay. So -- and this document  
22 reflects -- well, it's 1984.

23 This is in a letter that is developed sometime  
24 after the original proposed discharge plan, and  
25 presumably there were more negotiations after that.

1           Do you know where the -- if there -- or if  
2           there was a specific location at which they thought the  
3           plume would be totally mixed and you could meet  
4           standards agreed upon as a part of DP -- whatever number  
5           this discharge is --

6           MR. BLANDFORD: 286. DP-286.

7           MS. JOHNSON: -- 286.

8           MR. BLANDFORD: I don't recall reading a  
9           reference to where Phelps Dodge or their consultants  
10          proposed -- or thought that the plume would be entirely  
11          mixed.

12          Now, this is -- in this DP correspondence,  
13          there is some discussion about the trigger wells, which  
14          I mentioned, three miles downgradient, and this is the  
15          DP that there was some correspondence back and forth,  
16          back and forth, about where would groundwater standards  
17          have to be met, and I believe that some of those  
18          documents are provided in Exhibit 921.

19          MS. JOHNSON: So are you saying that, when the  
20          final discharge plan was approved, that there was no  
21          specific place agreed upon in that plan as a so-called  
22          point of compliance?

23          MR. BLANDFORD: I believe that's correct.  
24          What I'm saying is that I believe the mine's view of  
25          what they were doing was protecting groundwater for use

1 by subsequent users. They don't call out the specific  
2 nearest well, but you can discern that it's somewhere  
3 down the Mangas Valley.

4 As the Environment Department has already  
5 testified, they don't specifically state in these  
6 permits where the place of present or reasonably  
7 foreseeable future use is, so we have this -- this  
8 unknown about, "Well, where was it anticipated standards  
9 would be met?"

10 And my point here is that if you simply take  
11 the information provided to the Agency, you can clearly  
12 come to the conclusion that it wasn't the intent to meet  
13 standards immediately beneath the pile, because the  
14 information provided illustrates that standards would  
15 not be met beneath the pile, even if you assumed the  
16 mixing throughout the entire thickness of aquifer  
17 essentially right at the pile.

18 So I could see no way that the interpretation  
19 by the Agency or Phelps Dodge at that time could have  
20 been that standards would be met right beneath the pile.

21 So it doesn't say exactly where standards  
22 should be met, it's somewhere downgradient, but what it  
23 clearly implies is that it's not right beneath the pile,  
24 or even adjacent to the pile, I would say.

25 MS. JOHNSON: So is it your understanding,

1 then, that there was never any further effort to apply  
2 any kind of hydrogeologic analysis or contaminant  
3 transport analysis to determine where groundwater  
4 standards could be met? None of that was ever done?

5           You just went on your merry ways, with the  
6 Department having one view and Phelps Dodge having  
7 apparently another?

8           I mean, I don't -- I don't want this to be a  
9 loaded question, but there has clearly been a lot of  
10 confusion, and we've had questions and testimony about  
11 what went on to -- in between administering the site  
12 with individual discharge plans and seeming to go  
13 forward with apparently a meeting of minds, maybe not,  
14 and then transferring to DP-1341, where there is no --  
15 clearly no meeting of minds between the parties.

16           I'm still trying to figure out what went on  
17 and what the parties were thinking along the way, and if  
18 you can add anything to that discussion, it would be --  
19 I'd like to hear your views.

20           MR. BLANDFORD: Well, all I can say,  
21 Commissioner Johnson, is from Tyrone's side and their  
22 consultants, they are the ones that discussed protecting  
23 subsequent users, and there is documents where they talk  
24 -- in this area, they talk about down the Mangas Valley,  
25 but they don't provide a specific location or a specific

1 property owner or well location, but it's clear that, in  
2 Tyrone's eyes, they were -- in terms of where they would  
3 need to meet standards and make sure the standards were  
4 met, it was somewhere down the Mangas Valley, such that  
5 subsequent users were not affected.

6 I have not seen, other than some of the  
7 back-and-forth documentation regarding contingency  
8 plans, that direct -- you know, you don't see the Agency  
9 put out, "This is where we think standards need to be  
10 met," you know, "Right here is the point."

11 My point, in going back through this whole --  
12 this documentation, this early documentation, is that,  
13 well, the Agency has put forth the position that, you  
14 know, "We mean right below the pile, that's what we've  
15 always meant, there is really no question about that."

16 But if you just go back and look at the  
17 submittal and do the computations of what would this  
18 seepage mean for groundwater computations immediately  
19 beneath the pile, clearly nobody could have thought that  
20 standards were going to be met beneath the pile.

21 So I don't know what the Agency was really  
22 thinking of at that point, but I don't believe that they  
23 were thinking of meeting standards immediately beneath  
24 the facilities, which is the position that they are  
25 putting forth in this case.

1 MS. JOHNSON: I assume that the way -- that  
2 the activities at the discharge site, in terms of the  
3 use -- installation and use of pump-back wells and  
4 interceptor wells and trenches, and that kind of  
5 engineering, has evolved a lot since, say, 1984 when  
6 this language was being exchanged. Is that correct?

7 Or were those, you know, part of the  
8 engineered system right from the beginning?

9 MR. BLANDFORD: No, those would have been  
10 evolved. There were capture systems for PLS installed  
11 when the -- you know, when the piles -- prior to  
12 leaching, but there were not systems installed prior to  
13 leaching to intercept impacted groundwater that bypassed  
14 those primary capture systems for PLS.

15 Those were installed as groundwater quality  
16 was affected at monitor wells adjacent to facilities and  
17 concentrations were rising, and that's when the  
18 pump-back systems or trenches and things of that nature  
19 were installed.

20 MS. JOHNSON: So it seems like, if I'm  
21 understanding this whole process, both -- and I'm trying  
22 -- I think we're all trying to get our hands around  
23 what's happened technically, as well as in a regulatory  
24 sense, and the time line.

25 It seems like this was kind of a -- again, I

1 don't want to be facetious, but it seems like kind of a  
2 grand experiment; that nobody truly understood, when  
3 these systems were installed, the magnitude of the  
4 potential for impact to groundwater.

5 Is that a reasonable statement? I mean, we  
6 couldn't look out 10 or 20 years and envision that we're  
7 going to be where we are now?

8 MR. BLANDFORD: Groundwater directly beneath  
9 the facility, for example?

10 MS. JOHNSON: No, because I -- what you --  
11 your previous statement, what I keyed in on is that the  
12 pump-back wells were always part of the engineered  
13 system.

14 Obviously, you put leachate -- you know, you  
15 capture the leachate at the bottom of the pile and you  
16 pump it back and that's part of the engineered  
17 infrastructure.

18 But later on, as contamination started  
19 escaping and there were contingency plans implemented,  
20 that you would have to maybe put in a capture trench or  
21 some more capture zone wells outside of that in order to  
22 protect groundwater.

23 So, I mean, obviously, that -- well, maybe not  
24 so obviously, but what that seems to me to say is that,  
25 when these facilities were installed and engineered,

1 that you didn't envision that there was going to be any  
2 escape, but then there was, so you put in some more  
3 protection and you implemented contingencies, and, you  
4 know, it's an evolving process in terms of your  
5 understanding of how these systems interacted with this  
6 hydrogeologic setting, and that -- was that a part of  
7 why there was this lack of understanding from the start  
8 on where you were -- what water was protected, because  
9 the engineered system started expanding, it went from  
10 just -- not just the pump-back -- not just the leach  
11 site and the seepage and then the pump-back wells and  
12 then the capture zones beyond that, and then so on,  
13 trying to get a handle on the system and the groundwater  
14 contamination. So it evolved over time, is that what  
15 I'm hearing?

16 MR. BLANDFORD: Maybe partially correct, but I  
17 think what -- first of all, the primary capture systems  
18 at the toes of these stockpiles are not pumping wells,  
19 it's -- there is -- and in this case, 286, for example,  
20 there is weirs constructed at the surface and the  
21 stockpile was emplaced on top of a preexisting drainage  
22 network, and so as the PLS comes down, it drains towards  
23 the channels that would have been there naturally prior  
24 to emplacement of the stockpile. Those drain to a  
25 certain point, and then there is a concrete weir

1 constructed to capture that surface and very near  
2 surface flow. So there is not wells involved there in  
3 the primary capture system, it was just those weirs.

4 Yes.

5 MS. JOHNSON: Can I stop and ask just a  
6 question?

7 Then so I hearing you to say that you  
8 understood the existence and nature of the natural  
9 drainage channels underneath the site and that they were  
10 intended to be part of the engineered system, that you  
11 were taking advantage of those features to help focus  
12 the flow of leachate from underneath the piles? Is that  
13 what you're saying?

14 MR. BLANDFORD: Yes, absolutely.

15 By "you," I assume you mean Tyrone as opposed  
16 to me personally?

17 MS. JOHNSON: Yes. You, Tyrone.

18 MR. BLANDFORD: Yes, that's correct.

19 And then there was seepage that, over time,  
20 bypassed underneath those systems; see the impacts in  
21 monitor wells, which are not that far downgradient of  
22 the systems; and that's the point that corrective  
23 investigations and measures were basically kicked in.  
24 That's where pumping wells would come on line, perhaps  
25 additional trenches, things of that nature.

1 MS. JOHNSON: See, and this is the concept to  
2 me that -- it is important to me, because that's a big  
3 change right there from engineering a system that  
4 incorporates the natural hydrogeologic features, and  
5 then all of a sudden, "Oh, it's not working quite like  
6 we thought it would, and we're getting deeper  
7 infiltration, and it's escaping, so now it's going out  
8 here, and we have to put -- you know, expand --  
9 implement a contingency plan and expand the engineering  
10 in order to mitigate the groundwater contamination."

11 Was that what happened in that phase that you  
12 just described?

13 MR. BLANDFORD: Well, that capture would  
14 happen, but I don't -- it was never -- that seepage was  
15 never intended to be captured by the primary system.

16 In its discharge plan submittals, when there  
17 is discussion of seepage to groundwater, that's not part  
18 of the -- that's not intended to be captured as part of  
19 the plan that was put forward.

20 The primary PLS collection systems near  
21 surface may have been designed -- they are designed to  
22 capture most -- the vast majority of PLS applied -- or  
23 raffinate applied and turns into PLS. That's the  
24 solution that's processed to get copper. So the mine  
25 wants to capture as much of that as possible.

1           But what they are saying in the application  
2 is -- when you talk about seepage to groundwater, they  
3 are saying, you know, that we're going to apply this  
4 much PLS, but we're not going to be able to capture all  
5 of it, we're going to lose part of it, and this is how  
6 much we think we're going to lose.

7           At DP-286, it was 10 gallons per minute, you  
8 know, per 20-acre leach area, was their estimate of high  
9 infiltration. At 166, it was 1,200 to 1,300 gallons a  
10 minute.

11           So when I talk about seepage and PLS and what  
12 the mine was putting forward, that was never intended to  
13 be captured as part of the active mining process.

14           That's what they were telling the Agency that  
15 they expected not to capture, because it was going to  
16 seep into the ground and eventually go to groundwater.

17           MS. JOHNSON: So it was intended -- in your  
18 view, it was intended from the very beginning to use the  
19 aquifer -- at least this -- correct me if I'm getting  
20 this perspective wrong, but what I am hearing is that it  
21 was Tyrone's intent from the beginning to use all of the  
22 aquifer to dilute the impacts of the PLS that escaped  
23 your capture zone?

24           MR. BLANDFORD: That's correct.

25           It was their -- their intent and understanding

1 that they could impact groundwater beneath the  
2 facilities, that's what the seepage calculations show,  
3 and they acknowledged that they need to protect  
4 groundwater, but their understanding of the regulations  
5 and the law is that they protect groundwater at a place  
6 of -- a subsequent user, not right beneath the facility  
7 itself.

8 If they -- if their understanding was that  
9 they could not exceed groundwater standards beneath the  
10 facility itself, none of this would have ever gotten  
11 through.

12 I mean, how could it with these numbers? That  
13 just doesn't make sense.

14 MS. JOHNSON: Well -- yeah.

15 I mean, I guess I see a difference between  
16 impacting the groundwater immediately beneath the pile  
17 within what I would view as the engineered system and  
18 impacting the entire thickness of the Gila conglomerate.  
19 I mean, those two things are pretty far apart, and  
20 somewhere in there, there is -- something, it seems to  
21 me, went wrong, but that's just my view.

22 I think I've beat -- I think I've done enough  
23 with those, and I think I have a much better  
24 understanding of how all that worked and what the views  
25 were, so I really appreciate that discussion.

1 I'd like to just back up to another line of  
2 questioning and clarify a few things about testimony  
3 that you gave regarding the regional flow system and  
4 Mr. Johnson's testimony on his groundwater model that he  
5 did with the State Engineer's Office.

6 Actually, one other sort of clarification  
7 question before that.

8 Do you know whether there has been any study  
9 done that quantifies what the background concentration  
10 is of the various key parameters that you're looking at  
11 as being representative of mine activity, water quality,  
12 things like TDS, sulfate, manganese, those kinds of  
13 things?

14 Has there been any study to quantify what  
15 natural background is for those parameters in the  
16 various geologic units?

17 MR. BLANDFORD: I believe that some of our  
18 early groundwater reports -- by "early" for Daniel B.  
19 Stephens, I mean the mid-'90s -- speaks a little bit to  
20 some of those issues, but there is not, to my knowledge,  
21 a comprehensive water quality study, and that has been  
22 proposed as part of the stage one abatement plan, which  
23 is Condition 34 of DP-1341. We've proposed that such a  
24 study be conducted.

25 MS. JOHNSON: That would be a good thing.

**Pages 4474 – 4587  
(intentionally omitted)**