

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NABORS DRILLING TECHNOLOGIES USA, INC.,

Petitioner,

v.

MOTIVE DRILLING TECHNOLOGIES, INC.,

Patent Owner

CERTIFIED COPY

IPR2022-00288

Patent No. 9,865,022 B2

CM#38496.527US01

and

IPR2022-00289

Patent No. 10,726,506 B2

CM#38496.528US01

DEPOSITION OF L. BRUN HILBERT, JR., Ph.D., P.E.

TAKEN ON JANUARY 6, 2023

BY REMOTE VIDEOCONFERENCE TECHNOLOGY

REPORTED BY:

LYNETTE MARIE NELSON, CSR NO. 11585, RPR  
CRR, CRG, CCRR, REALTIME SYSTEMS ADMINISTRATOR  
JOB NO. 23-118908

**SG** THE SULLIVAN GROUP  
OF COURT REPORTERS  
SULLIVANCOURTREPORTERS.COM  
PHONE 855.525.3860 | 323.938.8750

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2  
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD  
4  
5

6 NABORS DRILLING TECHNOLOGIES USA, INC.,

7 Petitioner,

8 v.

9 MOTIVE DRILLING TECHNOLOGIES, INC.,

10 Patent Owner

11 CERTIFIED COPY

12 IPR2022-00288

13 Patent No. 9,865,022 B2

14 CM#38496.527US01

15 and

16 IPR2022-00289

17 Patent No. 10,726,506 B2

18 CM#38496.528US01

19 DEPOSITION OF L. BRUN HILBERT, JR., Ph.D., P.E.

20 TAKEN ON JANUARY 6, 2023

21 BY REMOTE VIDEOCONFERENCE TECHNOLOGY

22  
23 REPORTED BY:

24 LYNETTE MARIE NELSON, CSR NO. 11585, RPR  
CRR, CRG, CCRR, REALTIME SYSTEMS ADMINISTRATOR  
25 JOB NO. 23-118908

1           DEPOSITION OF L. BRUN HILBERT, JR., PH.D., P.E.,  
2    taken by the Petitioner, commencing at the hour of  
3    9:02 a.m. Central Standard Time on Friday, January 6,  
4    2023, remotely held via videoconference technology,  
5    before Lynette Marie Nelson, Certified Shorthand  
6    Reporter in and for the State of California.

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

THE SULLIVAN GROUP OF COURT REPORTERS

2

1 APPEARANCES:

2 For the Petitioner:  
3 HAYNES AND BOONE, LLP  
4 BY: ANGELA OLIVER, ESQ.  
5 BY: JONATHAN R. BOWSER, ESQ.  
6 2323 Victory Avenue, Suite 700  
7 Dallas, Texas 75219  
8 (214)651-5000  
9 angela.oliver@haynesboone.com

10 For the Patent Owner:  
11 BAKER BOTTS L.L.P.  
12 BY: CLARKE STAVINOHA, ESQ.  
13 BY: CHAD WALTERS, ESQ.  
14 BY: JAMES WILLIAMS, ESQ.  
15 2001 Ross Avenue, Suite 900  
16 Dallas, Texas 75201-2980  
17 (214)953-6500  
18 clarke.stavinoha@bakerbotts.com

1

I N D E X

2

3

WITNESS: L. BRUN HILBERT, JR., PH.D., P.E. PAGE

4

EXAMINATION

5

BY MS. OLIVER

6

7

BY MS. OLIVER

123

8

9

E X H I B I T S

10

MARKED FOR IDENTIFICATION

PAGE

11

Exhibit A Fig. 1 annotated, excerpt 1

90

12

Exhibit B Fig. 1 annotated, excerpt 2

75

13

14

15

16

17

18

19

20

21

22

23

24

25

THE SULLIVAN GROUP OF COURT REPORTERS

1 REMOTE DEPOSITION; FRIDAY, JANUARY 6, 2023

2 9:02 A.M. CENTRAL STANDARD TIME

3 | -o0o-

4 MR. STAVINOHA: This is Clarke Stavinoha with  
5 Baker Botts, LLP, on behalf of patent owner,  
6 Motive Drilling, Inc.

7 With me today will be my colleagues  
8 Chad Walters and James Williams.

9 MR. BOWSER: And for petitioner, it's  
10 Jonathan Bowser and Angela Oliver, and we represent  
11 Nabors Drilling Technologies USA, Inc.

12 (Witness sworn.)

13 | THE WITNESS: Yes, I do.

14 THE STENOGRAPHER: Thank you.

15 | //

16 | //

17 | //

18

19

20

21

22

23

24

25

THE SULLIVAN GROUP OF COURT REPORTERS

1 L. BRUN HILBERT, JR., Ph.D., P.E.,  
2 HAVING BEEN DULY SWORN BY THE CERTIFIED SHORTHAN  
3 REPORTER, WAS EXAMINED AND TESTIFIED AS FOLLOWS:

## EXAMINATION

5 | BY MS. OLIVER:

6 Q. Good morning, Dr. Hilbert.

7 A. Good morning.

8 Q. My name is Angela Oliver, and I'm counsel for  
9 the petitioner in this case as we just mentioned. I  
10 will be asking you questions today about your  
11 declarations in IPR2022-00288 and IPR2022-00289.

12                   Would you please state your full name for the  
13 record.

14 A. My name is Lawrence Brun Hilbert, Junior.

15 Q. Thank you.

16 Is there any reason why you would not be able  
17 to answer my questions today fully, accurately, and  
18 honestly?

19 A. No. I'm able to answer them.

20 Q. And you understand that during today's  
21 deposition, you're under oath and providing sworn  
22 testimony just as if you were in court?

23 A. Correct. I understand that.

24 Q. As I mentioned, I will be asking you questions  
25 about your declarations. If you don't understand one of

1 my questions, just let me know. And if you understand  
2 my question or if you answer my question, I assume you  
3 understood the question. Is that fair?

4 A. Yes, that's fair.

5 Q. Your counsel may object to questions throughout  
6 this deposition. But unless your counsel instructs you  
7 not to answer a specific question, you are required to  
8 answer my questions. Is that understood?

9 A. I understand that, yes.

10 Q. The court reporter will prepare a transcript of  
11 today's deposition. And so just to ensure that we have  
12 a clear record, please answer each question with a  
13 verbal "yes" or "no." Please don't use "uh-huh" or head  
14 movements. Is that okay?

15 A. I'll try to remember that, yes.

16 Q. I understand. Thank you.

17 Also, to ensure a clear record, I'll ask that  
18 you just let me finish my questions before you start  
19 answering. Just because the court reporter may have  
20 trouble accurately recording who is speaking if we're  
21 both talking. Is that understood?

22 A. Yes, it is.

23 Q. We will plan to take a break about once an  
24 hour, and once it gets to be about noon Central, we will  
25 break for lunch as well. But if you need a break any

1 time other than that, would you agree to just let me  
2 know?

3 A. Yes, I will. Certainly.

4 Q. All right. During the part of this deposition  
5 where I'm asking you questions, you're not permitted to  
6 speak with your counsel about the substance of your  
7 testimony, including your declaration and your  
8 deposition today. Do you understand that?

9 A. Yes, I do.

10 Q. Where are you located today?

11 A. I'm in the offices of Baker Botts in Dallas,  
12 Texas.

13 Q. Are you alone in whatever room you're in at  
14 Baker Botts?

15 A. No, Mr. Stavinotha is on the other side of the  
16 monitors from me. I can't really see him very well.

17 Q. Do you agree not to communicate with  
18 Mr. Stavinotha -- sorry, Stavinotha about the substance of  
19 your testimony until this deposition is complete?

20 A. Correct, yes, I understand that.

21 Q. All right. What equipment are you using for  
22 this deposition today?

23 A. A laptop has been provided to me without -- I  
24 guess I have a keyboard and a couple of monitors. And  
25 I -- in full disclosure, I have a cell phone here to

1 control my hearing aids --

2 Q. Okay.

3 A. -- if I need to adjust volumes, but I'm not  
4 using it to check emails and text while you're asking me  
5 questions.

6 Q. Thank you.

7 Do you have hard copies of any of the documents  
8 from these proceedings in front of you today?

9 A. Yes, I do.

10 Q. Just so that we stay on the same page during  
11 the deposition, would you agree to not use those  
12 documents and then use the ones that we will provide  
13 digitally to you through the chat window?

14 A. Yes. I have practice using Zoom and can  
15 download those documents to the desktop where I can use  
16 those.

17 If we are in the case of looking at multiple  
18 documents, may I use a hard copy? These are clean and  
19 were provided me this morning. That way I can flip back  
20 and forth and see both documents, for instance, if we're  
21 looking at a declaration and have to go back to a  
22 patent, it might be easier just to use one hard copy and  
23 one on the screen.

24 Q. Sure. Yeah, that's completely fine.

25 A. Okay.

THE SULLIVAN GROUP OF COURT REPORTERS

1           Q.    And you've already confirmed that those are  
2    clean copies.  They don't have any notes from you or  
3    anyone else on them?

4           A.    That's correct.  There's nothing on them.  
5    They're clean copies.

6           Q.    Great.  Thank you.

7                   Do you have any other notes in front of you  
8    today either in hard copy or on your laptop?

9           A.    No.

10          Q.    While we're doing this deposition today, I ask  
11    that you just not have any other documents open on the  
12    laptop that you have provided.  As I mentioned, I'll  
13    share the documents with you through the chat window and  
14    you can download them; is that okay?

15          A.    Yes, that's works.

16          Q.    All right.  And do you have any chat windows  
17    open on your laptop?

18          A.    Not the laptop.  It's just on the monitor.  
19    Laptop is over on the other side of all of this stuff.  
20    Just the chat box for the Zoom meeting with you.

21          Q.    Thank you.

22                   Okay.  Have you been deposed before?

23          A.    Yes, I have.

24          Q.    How many times?

25          A.    Over 30.

1           Q.    Have you been deposed in connection with any  
2 other inter partes review, IPR proceedings, or post  
3 grant review, PGR, proceedings?

4           A.    Yes, I have been deposed in such matters.

5           Q.    To your knowledge, has any other court or  
6 tribunal ever excluded or stricken your testimony in any  
7 case for any reason?

8           A.    No, not to my knowledge.

9           Q.    You were retained by Motive Drilling  
10 Technologies, Inc., to provide testimony in these two  
11 cases; correct?

12          A.    That's correct.

13          Q.    So during today's deposition, if I refer to  
14 "Motive," do you understand that I'm referring to  
15 Motive Drilling Technologies, Inc.?

16          A.    Yes, I do.

17          Q.    Had you heard of Motive prior to being asked to  
18 testify in these cases?

19          A.    Not in detail. I was aware of them. I've  
20 worked in the petroleum industry a long time, and I've  
21 come across their name a couple of times. But I've not  
22 done -- I've not performed work for them before. And  
23 not intimately familiar with them prior to being  
24 retained in this matter.

25          Q.    Have you ever served as an expert witness for

1 Motive's parent company, Helmerich & Payne?

2 A. That's kind of a confusing question because of  
3 the nature, I guess Helmerich & Payne owned or acquired  
4 some or part of Motive. I've heard of them, but I have  
5 not -- I've not done work for them except in these  
6 matters.

7 Q. Are you serving as the expert witness for the  
8 patent owner in the parallel district court litigation  
9 involving the '022 and the '506 patents?

10 A. Currently, I'm consulting on that.

11 Q. Who did you meet with to prepare for your  
12 deposition today?

13 A. Mr. Stavinotha.

14 Q. Approximately how long did you meet with  
15 Mr. Stavinotha to prepare for your deposition?

16 A. I've been here for a couple of days. I've been  
17 here Tuesday and Wednesday. And we've met for a few  
18 hours each day. "A few hours" being three to four  
19 hours. Occasionally, to answer your question fully,  
20 occasionally other people have popped in and I've met  
21 them. Mr. Williams and perhaps another attorney. But  
22 the bulk of the discussions were with Mr. Stavinotha.

23 Q. Great. So let's talk a little bit about your  
24 background.

25 You're currently employed at Exponent; correct?

THE SULLIVAN GROUP OF COURT REPORTERS

12

1           A.    Exponent, Incorporated, that's correct.

2           Q.    And what are your responsibilities in that  
3        role?

4           A.    I'm a principal engineer, and I have a group of  
5        people that report to me. My work comprises both  
6        research and development, nonlitigation matters for  
7        clients who contract with us. And then expert work in  
8        other retentions. That's my role at Exponent.

9           Q.    And how long have you been at Exponent?

10          A.    Approximately 26 years. I arrived there in  
11        1996. So 26, 27 years.

12          Q.    Prior to working at Exponent, how many oil  
13        companies or oil and gas companies did you work for?

14          A.    Prior to going to work for Exponent, I worked  
15        for Exxon Production Research Company in Houston, Texas.  
16        From 1981 to 1992 in the drilling and completions  
17        department.

18          Q.    And what were your responsibilities in your  
19        role at Exxon?

20          A.    Applied research and developments, sort of  
21        consulting with Exxon affiliates' operating affiliates  
22        around the world that actually do the drilling. And at  
23        Exxon Production Research Company in Houston, as I said,  
24        we did applied research in casing, tubing, well  
25        development, well construction, well design, and taught

1 courses around the world on drilling, completions  
2 technology, hydraulic fracturing.

3 My training from Exxon as -- I characterize  
4 myself as a mechanical and petroleum engineer as a  
5 result of that work and my continuing work at Exponent.

6 Q. Did your responsibilities at Exxon include  
7 designing well paths?

8 A. Yes, it did.

9 Q. I'm sorry. I didn't mean to interrupt you.

10 A. It did. Yes, I had the opportunities to both  
11 evaluate and more -- more commonly evaluating a  
12 well-bore path rather than designing one. The operating  
13 affiliate drilling engineers generally design the well  
14 path, for example. And then if there were issues with  
15 those or they were very difficult conditions, they would  
16 call upon the researchers at Exxon Production Research  
17 to do applied research for them or solve their problem.

18 Q. Would you consider yourself an expert  
19 particularly in designing well paths?

20 A. Yes.

21 Q. And how many well paths do you think that  
22 you've designed over the course of your career?

23 A. I've been involved with or helped to design  
24 probably 40 to 50 different -- for different wells, 40  
25 to 50, something like that. I don't do that on a daily

1 basis because of the work I do in consulting and at  
2 Exxon, maybe 40 to 50.

3 Q. Great. Thank you.

4 So let's talk a little bit about your  
5 declarations that were submitted in these cases.

6 So Dr. Hilbert, you provided testimony in both  
7 of these IPRs involving the '022 patent and the '506  
8 patent; correct?

9 A. That's correct.

10 Q. Just to be clear, IPR2022-00288 involves  
11 U.S. Patent No. 9,865,022; correct?

12 A. That's correct.

13 Q. And IPR2022-00289 involves U.S. Patent  
14 No. 10726506; correct?

15 A. That's correct.

16 And when I look over to the side here, I'm  
17 looking at the hard copies following what you say.

18 Q. If I refer to the "'022 IPR," you'll understand  
19 that I'm referring to IPR2022-00288; correct?

20 A. That would be correct, but I would probably be  
21 much more aware of it if you just said the '022  
22 declaration and the '506 declaration. I follow it by  
23 those last three numbers of the patent number.

24 Q. Yeah. We can do that. That sounds great.

25 Okay. Did you prepare your declarations in the

1 '022, the '022 declaration and the '506 declaration?

2 A. Yes, I did.

3 Q. I'm going to share the '022 declaration with  
4 you in the chat window. So give me just one second.

5 I just sent it so let me know whenever you have  
6 that open.

7 A. Received it and saving it to the desktop, I  
8 think.

9 Yeah, there it is. It's opening.

10 I have it.

11 Q. Is this your '022 declaration?

12 A. It is, yes, it is.

13 Q. And would you turn to page 100 of your '022  
14 declaration.

15 A. Yes, I'm there.

16 Q. Is that your signature on this page 100?

17 A. Yes, it is.

18 Q. And did you sign this '022 declaration on  
19 October 20th, 2022?

20 A. Yes, I did.

21 Q. Great. All right.

22 So I'm going to next share with you your '506  
23 declaration. So give me one second.

24 Okay. I just sent that so let me know whenever  
25 you have it open.

1           A. Yes, I have it.

2           Q. Great. Is this your '506 declaration?

3           A. It is. Yes.

4           Q. And would you turn to page 92 of your '506

5 declaration.

6           A. Yes, I'm there.

7           Q. And again, is this your signature here?

8           A. Yes, it is. It is.

9           Q. All right. And did you sign this on

10 October 20th, 2022?

11           A. Yes, I did.

12           Q. Great. Do you recall about how much time you

13 spent preparing these declarations in the '022 and '506

14 cases?

15           A. The writing of it took a little bit more than a

16 month of time spread -- spread maybe out a couple of

17 months, I would say. And then I can't recall when I've

18 actually been retained. But I think that was in 2021.

19 So a lot of work has been spread out over quite a bit of

20 time. But the focus of writing these was done over a

21 couple of months.

22           Q. And did you prepare the first draft of each of

23 these declarations?

24           A. I was provided the -- some of the legal

25 language in the front portion of it. And then reviewed

1 that and made revisions to it as I saw fit, kind of a  
2 template for that. And then the rest of it was drafted  
3 by myself and interactions with Mr. Stavinoha.

4 Q. And did anyone at Exponent provide comments to  
5 you or talk with you about the substance of your  
6 declaration?

7 A. Yes.

8 Q. Who -- who did you speak with or who provided  
9 comments to you on these declarations?

10 A. It was primarily Dr. Julian Hallai,  
11 H-A-L-L-A-I. He reports to me. He is a managing  
12 engineer that we hired two or three years ago. And he  
13 is -- got a Ph.D. in naval architecture, offshore  
14 engineering, and he reviewed documents, synthesized some  
15 of the information, and reviewed my reports with me.

16 At times, we have, at Exponent, a quality  
17 management system in which if I write a report, we have  
18 a technical reviewer such as Dr. Hallai. And then I end  
19 up approving it, but it also includes reviews by my  
20 editorial staff and other -- other people in that -- and  
21 that's a formalized system. That's not somebody  
22 assisting me. That's a formalized system for quality of  
23 the documents.

24 Q. Did Dr. Hallai draft any portions of either of  
25 your two declarations here?

1           A. No, I wouldn't say so. He made some editorial  
2 comments, and I revised some things where he may say  
3 this is not clear. I've reviewed this other document  
4 and this doesn't seem clear to me. Then we would -- I  
5 would revise that.

6           Q. How many hours would you say that Dr. Hallai  
7 spent working on your '022 and '506 declarations?

8           A. I would say just recalling, maybe 40 hours on  
9 each of those, something less than the couple of months  
10 that I worked on them. But I would say that's probably  
11 the amount of effort that he put into each of those.

12          Q. And why did Dr. Hallai not sign your  
13 declarations?

14          A. He's not responsible for writing it. I was  
15 responsible for writing the document and for the  
16 opinions of those documents -- that I expressed in those  
17 documents.

18          Q. And so you said that you spent months working  
19 on these two declarations. Is that in terms of hours?

20           So I'm not sure how many hours are in a month.  
21 But however many hours are in a month times a couple?  
22 Would that be accurately reflecting how much time you  
23 spent on these declarations?

24           MR. STAVINOHA: Objection. Form.

25           THE WITNESS: When I -- when I referred to a

1 couple of months, I have many other matters that I'm  
2 working on at the same time. So over the couple of  
3 months of each of these documents in their printed form,  
4 the finalized portion, I would say that that would be  
5 maybe 80 hours on each one over the period of a couple  
6 of months. I would drop it for a while then come back  
7 to it. You know, probably how you work, similar thing.

8 BY MS. OLIVER:

9 Q. And did you have any disagreements with  
10 Dr. Hallai about the positions taken in your  
11 declarations?

12 A. Not in this matter. Sometimes, we disagree but  
13 not in this matter.

14 Q. So did you -- sorry, scratch that.

15 Did you adopt all of Dr. Hallai's  
16 recommendations regarding these two declarations?

17 A. No. They were -- they were primarily  
18 editorial, make this clearer, those sorts of comments.  
19 There weren't any disagreements on the context and  
20 opinions generally. So the answer is no. If we  
21 didn't -- didn't adopt all of them.

22 Q. Great. And you mentioned a few minutes ago  
23 that Exponent has a quality review process; correct?

24 A. Yes, that's correct.

25 Q. Would you explain a little more about that

1 process?

2       A. We have a -- just -- just to ensure that our  
3 work is technically accurate to the extent that we can  
4 make it involving really very, very technical matters as  
5 we do, we have that review process that includes, for  
6 example, the author of a report signing off on that.  
7 Well, I shouldn't say that. The author of a report  
8 submits that online, and then our editorial reviewer  
9 makes sure that it's in a format that we like or a  
10 format that was provided to us.

11       In some cases, like these, we are provided with  
12 a format with the paragraph numbers and that sort of  
13 thing. And he made sure -- and reviews that editorial.  
14 Then we have the technical reviewer such as Dr. Hallai.  
15 And he approves that the document as it's going out is  
16 technically meets -- he's approved that. And then in  
17 the end, a principal reviewer such as myself, since I'm  
18 a principal engineer at the firm, has the final sign-off  
19 on it. That may be the author or it may be another  
20 principal in the firm with some knowledge of these types  
21 of things but is not the expert who reviews it for our  
22 limitations language that we have in a paragraph. And  
23 just generally, meets the standards of our quality  
24 system.

25       Q. I see. Okay.

1                   So the person with the final say during the  
2 quality review process is the principal reviewer?

3                   A. Yes, that's correct.

4                   Q. And were you the principal reviewer with  
5 respect to the '022 and '506 declarations?

6                   A. That's correct.

7                   Q. And that means that you reviewed both of these  
8 declarations before they were submitted?

9                   A. I wrote them and reviewed them and -- and  
10 the -- I'm the principal reviewer on these because in  
11 certain situations such as these highly technical  
12 matters, it's difficult for another principal without  
13 that background to come in and fully understand it and  
14 take the time to fully understand it so we could have a  
15 provision for somebody like me, I wrote the report, but  
16 I have, as I said, editorial review and technical review  
17 to ensure that the document meets our standards. And  
18 then I have the final sign-off.

19                   Q. So next, I'm going to share a few more  
20 documents with you through the chat window so that you  
21 have them easily accessible for you. The first --

22                   A. Okay.

23                   Q. -- I'm going to share Exhibit 1001 from the  
24 '022 IPR, that's the '022 patent.

25                   So give me just one second.

1           A.    Yes.

2           Q.    I just sent that file.  Let me know when you

3 have it downloaded.

4           A.    Yes, it's downloaded.

5           Q.    Great.

6           A.    And I have it open.

7           Q.    Thank you.

8                   So this is U.S. Patent No. 9865022.  Do you

9 recognize this patent?

10          A.    Yes, I do.

11          Q.    And if I refer to the "'022 patent" during

12 today's deposition, will you understand that I'm

13 referring to U.S. Patent No. 9865022?

14          A.    Yes, I will.

15          Q.    All right.  Now I'm going to share Exhibit 1001

16 from the '506 IPR, that's the '506 patent.  I just sent

17 that.

18                   Let me know when you have it open.

19          A.    It's open.

20          Q.    This is U.S. Patent No. 10726506.  Do you

21 recognize this patent?

22          A.    Yes, I do.

23          Q.    And if I refer to "'506 patent" today, will you

24 understand that I'm referring to U.S. Patent

25 No. 10726506?

1           A. I will.

2           Q. Great. Thank you.

3                   I'm now going to share with you Exhibit 1005,

4                   also called Budiman, in the chat window.

5                   I just sent that. Please let me know when you

6                   have it open.

7           A. I have it open.

8           Q. This is U.S. Patent No. 8892407 to Budiman,

9                   et al. Do you recognize this patent?

10          A. Yes, I do.

11          Q. Today if I refer to "Budiman," will you

12          understand that I'm referring to U.S. Patent

13          No. 8892507?

14          A. Yes, I refer to it and most commonly remember

15          it by Budiman.

16          Q. Great. And you understand that that is

17          Exhibit 1005 in these two cases?

18          A. Yes, I understand that. But that's not the way

19          I remember it.

20          Q. Totally understand. Thank you.

21          And you understand that Budiman is Exhibit 1005

22          in both of the two IPRs; correct?

23          A. Yes, I understand that.

24          Q. Thank you.

25          I'm now going to share Exhibit 1006, also

1       called "Pirovolou" in the chat window.

2               Okay. I just sent that so let me know when you  
3 have it open, please.

4       A. It's open. I have it.

5       Q. Great. So this is U.S. Patent Application  
6 Publication No. 2010/018-5395 to Pirovolou, et al.

7               Do you recognize this publication?

8       A. Yes, I do.

9       Q. Similarly, if I refer to "Pirovolou," will you  
10 understand I'm referring to U.S. Patent Publication  
11 2010/018-5395?

12      A. Yes, I will understand that.

13      Q. And you understand that Pirovolou is  
14 Exhibit 1006 in both of these two cases?

15      A. Yes.

16      Q. Thank you.

17               All right. I'm now going to share Exhibit 1014  
18 in the chat window.

19               Okay. I just sent that. Would you please let  
20 me know when you have it open.

21      A. Yes, I have it. It's open.

22      Q. Thanks.

23               If I refer to the "landmark user guide" today,  
24 will you understand that I'm referring to the excerpts  
25 of this landmark user guide contained in Exhibit 1014?

1           A. Yes, I will understand that.

2           Q. And you understand that the landmark user guide  
3 has been submitted as Exhibit 1014 in both of the two  
4 cases?

5           A. Yes, I understand that.

6           Q. Great. I'm now going to introduce through the  
7 chat window Exhibit 2012 which is the claim construction  
8 memorandum and order. Give me one second.

9           Okay. I just sent that. Let me know whenever  
10 you have it open.

11          A. I have it open.

12          Q. And if I refer to this today as the "claim  
13 construction order," will you understand that I'm  
14 referring to this document?

15          A. Yes, I will.

16          Q. And you understand that this has been submitted  
17 as Exhibit 2012 in both of the cases today?

18          A. Yes, I understand that.

19          Q. Thank you.

20           Are you aware that the '506 patent is a  
21 continuation of the '022 patent?

22          A. Yes, I'm aware of that.

23          Q. So you understand, then, that the specification  
24 of the '022 patent is the same as the specification of  
25 the '506 patent other than the claims of each patent and

1 the section titled "Cross-Reference to Related  
2 Applications"?

3 A. I haven't performed an analysis word by word.  
4 I have certainly reviewed both '506 and '022 patents,  
5 but I'm aware that the specifications are generally the  
6 same.

7 Q. So if I refer, then, today to the specification  
8 of the '022 patent, you will understand that the  
9 '506 patent has generally the same disclosure?

10 A. Generally the same disclosure; correct, yes. I  
11 would -- we will have to go and -- if I think it's  
12 different or if I think there is a difference, I will be  
13 sure to mention that I disagree or we can look at the  
14 word. But they're generally the same.

15 Q. That sounds great. Thank you.

16 So next I would like to look at your '022  
17 declaration. And do you still have access to that on --  
18 from the file I downloaded for you? Or I sent you?

19 A. Yes.

20 Q. Let's look at paragraph 18 of your '022  
21 declaration. And this starts on page 11 if that helps.

22 A. Materials considered?

23 Q. Yes.

24 A. Yes, I have that.

25 Q. This is a list of documents that you considered

1 in preparing your declaration; correct?

2 A. That's correct.

3 Q. Are there any other documents that you  
4 considered in preparing your declaration?

5 A. No, I don't believe so. As part of my process,  
6 these types of matters, I have access to Society of  
7 Petroleum Engineers' library of papers. I keep up the  
8 current technology. And so I read papers from time to  
9 time. But these are the documents that I relied upon.

10 Q. And does this also include any documents that  
11 Dr. Hallai relied upon in his analysis?

12 A. Yes, he probably reviewed all of these as well.

13 Q. Did Dr. Hallai review any other documents that  
14 are not listed here?

15 A. Not that I'm aware of.

16 Q. Did you confirm with Dr. Hallai whether he  
17 reviewed any other documents?

18 A. Yes. He would -- he would, in fact, bring them  
19 up to me if he thought it was relevant. And I don't  
20 recall him bringing up anything that was not on this  
21 list that was relevant to our discussions.

22 Q. Did you specifically ask him just to confirm  
23 that there was nothing else that should be listed here?

24 A. Yes, I would ask him, have you seen anything  
25 recently that might help? And he would -- and that's

1 part of his duty is to assist me in these matters and  
2 this -- this would be a complete list of the things that  
3 he reviewed that were relevant to writing the report.  
4 Declaration, excuse me.

5 Q. Let's look quickly at your '506 declaration.

6 A. Yes, it's up.

7 Q. Great. Let's look at paragraph 18 of that  
8 declaration.

9 A. Yes.

10 Q. So these are the documents that you considered  
11 in preparing this '506 declaration?

12 A. Yes, that's correct.

13 Q. Are there any other documents that you  
14 considered in preparing this declaration?

15 A. It would be the same as the '022 and as we  
16 talked about before, the specifications of both patents  
17 are roughly the same, generally the same. So these  
18 documents have similarities. I can't remember if  
19 they're identical lists, but these -- same answers I had  
20 before. These are the documents I relied upon.

21 Q. Great. And so then for both of the  
22 declarations, the '022 declaration and the '506  
23 declaration, are there any documents that other  
24 reviewers at Exponent considered?

25 A. No. I don't believe so. I really was just me

1 and Dr. Hallai.

2 Q. And is there a process in place during the  
3 quality review procedure that would ensure to list any  
4 documents that any reviewer considered?

5 A. Yes, we maintained files, folders, project  
6 files, project folders. And if there was important  
7 information that -- that was relevant and we wanted to  
8 consolidate it into one place, we have those documents.  
9 And those documents are on our files.

10 Q. Let's turn back to your '022 declaration.

11 A. Okay.

12 Q. Let's look at paragraph 15.

13 A. 16?

14 Q. I'm sorry, 15, 15.

15 A. 15.

16 All right. Yes, I have that up.

17 Q. What is your understanding of the meaning of  
18 the term "person of ordinary skill in the art"?

19 A. That is -- that is a -- there is a definition  
20 of it, and there's a definition applicable or defined by  
21 the parties in the matter. That's one definition.

22 But essentially, it is a person of education  
23 and experience who would be able to understand the  
24 content of the specifications claims of the patents in  
25 the matter and the prior art in the matter at the time

1 of the publication of the patent at the subject of the  
2 matter.

3 For example, in these two patents, '022 and  
4 '566 [sic], those have priority dates of -- I believe  
5 it's June 2013. And so the POSITA would meet those  
6 requirements of expertise, technical expertise,  
7 education, and experience for that time period.

8 Q. Thank you.

9 Let's now turn to paragraph 2 of your '022  
10 declaration.

11 A. Yes, I'm there.

12 Q. So you state in this first sentence of  
13 paragraph 2 that the petition challenged Claims 1  
14 through 6, 9, 10, 13 through 18, 21, and 22 as allegedly  
15 being unpatentable; is that correct?

16 A. You read that correctly.

17 Q. Thank you.

18 Let's flip one page earlier and look at the  
19 table of contents on page 3 of your '022 declaration.

20 A. Yes.

21 Q. Let's look at Section 7, "Detailed Obviousness  
22 Analysis." Do you see that?

23 A. Yes, I do see that.

24 Q. Which claims of the '022 patent have you  
25 addressed in this declaration?

1           A. As you know or as you just pointed out to in  
2 the other paragraph, there are grounds which address  
3 various claims of the '022 patent. I addressed Claims 1  
4 or certain elements of Claims 1 and 13 in this table of  
5 contents, the Limitations 1.2 and 13.2; in No. 2,  
6 Limitations 1.3 and 13.3; in No. 3, Limitations 1.4 and  
7 13.4; and No. 4, 1.5 and 13.5.

8           And then there's a subject heading B,  
9 "Dependent Claims," in which I've addressed Claims 9 and  
10 21, which are dependent on 1 -- Claims 1 and 13  
11 respectively, I believe.

12          Q. And did you decide which limitations of  
13 Claims 1 and 13 to include in your declaration?

14          MR. STAVINOHA: Caution the witness not to  
15 reveal any communications with counsel.

16          You can answer the question to the extent you  
17 can do that without revealing any communications with  
18 counsel.

19          THE WITNESS: Yes, I reviewed all claims of the  
20 patents and reviewed all of the specification of the  
21 patents. And I will speak in plural for the '022 and  
22 '506 patents because they have that generally same  
23 specifications and similarities in the claims.

24          I reviewed all of those and then as we worked  
25 through the report and started the draft report, then we

1 refined with Mr. Stavinoha which we should address,  
2 which ones we should address in final -- in the final  
3 version of the report.

4 BY MS. OLIVER:

5 Q. And did Dr. Hallai have any involvement in  
6 deciding which limitations to address in these  
7 declarations?

8 A. No. Per my recollection, I was responsible for  
9 that.

10 Q. So did you consider the analysis provided by  
11 Dr. Shubert with respect to the limitations that you  
12 have not addressed in your declaration?

13 A. I was aware of them certainly. I read his  
14 declaration and I've read his deposition. And so I was  
15 aware that he may have addressed others of the claims  
16 that I have not addressed in my declaration.

17 Q. Did you have any disagreements with  
18 Dr. Shubert's analysis of the claims or limitations that  
19 you do not address in your declarations?

20 A. I don't -- since they don't appear in my  
21 declaration, I can say that maybe I disagreed with some  
22 of his conclusions, but I focused on what I have in  
23 my -- as those claims and my analysis ended up in the  
24 final report.

25 Q. But as of right now, you can't think of any

1           particular disagreements that you had with the analysis  
2           provided by Dr. Shubert of claims and limitations that  
3           you have not addressed in your declarations?

4           MR. STAVINOHA: Object to form.

5           THE WITNESS: Correct. That's correct. My  
6           total focus has been on preparing for this deposition is  
7           what's in my declarations. So the other stuff I'm -- I  
8           don't recall.

9           BY MS. OLIVER:

10          Q.     Thank you.

11          Were there any limitations or other dependent  
12         claims that you had addressed in a preliminary form but  
13         then decided not to address in the final version of your  
14         declarations?

15          MR. STAVINOHA: Caution you, Dr. Hilbert, not  
16         to reveal any communications with counsel. But you can  
17         answer the question to the extent you can do it without  
18         doing that.

19          THE WITNESS: Well, to the extent I reviewed  
20         all of the claims and, as I just said a moment ago, the  
21         petition had claims or addressed claims that are not in  
22         my final declarations, we discussed, generally speaking,  
23         claims. And in the process of those discussions, it was  
24         decided that the final product that both declarations  
25         that I have here, those are the declarations that I felt

1 I had strong opinions on and ended up in the  
2 declarations.

3 BY MS. OLIVER:

4 Q. And what you've said just now about which  
5 limitations and claims were addressed versus not  
6 addressed, that testimony applies with respect to both  
7 declarations; is that correct?

8 A. Yes, that's correct.

9 Q. For the limitations and claims that you have  
10 addressed in both of your declarations, did you develop  
11 the arguments on the alleged nonobviousness of the  
12 challenged claims in both of your declarations?

13 MR. STAVINOHA: Form.

14 THE WITNESS: Repeat the question one more  
15 time, please.

16 BY MS. OLIVER:

17 Q. Sure. I'm sorry.

18 For the limitations and claims that you have  
19 addressed in both of your declarations, did you develop  
20 the arguments on the alleged nonobviousness of those  
21 limitations and claims?

22 MR. STAVINOHA: Form.

23 THE WITNESS: Yes, I developed those arguments.  
24 I came to the opinions that I share in this report,  
25 these declarations.

1 BY MS. OLIVER:

2 Q. Did Dr. Hallai help you develop those opinions?

3 A. I would say not. As I said, he reviewed those  
4 for technical content and to some extent editorial to  
5 make things clear. But I was the -- the primary person  
6 that came up with those opinions.

7 Q. Did Dr. Hallai suggest any other arguments that  
8 were not ultimately included in your declarations?

9 A. I don't believe so.

10 Q. Let's look at -- again, at your '022  
11 declaration. And let's take a look at paragraph 31.  
12 3-1.

13 A. Yes. I'm there.

14 Q. Thank you.

15 Do you see in this paragraph your statement  
16 that objective evidence of nonobviousness, also referred  
17 to as secondary considerations of nonobviousness, should  
18 be considered when evaluating whether a claimed  
19 invention would have been obvious?

20 A. Yes, I see that.

21 Q. Did you consider any secondary considerations  
22 evidence when reaching your opinions on the obviousness  
23 of the challenged claims?

24 A. No, I believe in both of these declarations, we  
25 do not address or had not come to opinions on secondary

1 considerations or secondary indicia.

2 Q. Are you aware that the patent owner has argued  
3 that the claims are nonobvious based on secondary  
4 considerations evidence?

5 MR. STAVINOHA: Objection. Beyond the scope.

6 THE WITNESS: I don't recall that specifically.  
7 I did not address that in my declarations.

8 BY MS. OLIVER:

9 Q. So just to confirm, you have not considered  
10 anything about secondary considerations?

11 A. Not at this time.

12 Q. Thank you.

13 All right. Let's continue discussing your '022  
14 declaration.

15 And just for reference, for the most part  
16 today, I'm going to refer to the '022 declaration based  
17 on our conversation that they're generally substantively  
18 the same between the '506 and '022 declarations. Is  
19 that okay?

20 A. I understand that and that's fine with me.

21 Q. Thanks. Easier not to jump between files.

22 Let's turn to paragraph 37 of your declaration.

23 A. Paragraph 37?

24 Q. Yes.

25 A. Correct? Okay.

1           Q.    Correct.

2           A.    Yes, I'm there.

3           Q.    Do you see that in this paragraph you discussed  
4   the Target Path 104 with respect to Figure 1 of the '022  
5   patent?

6           A.    Yes, I see that.

7           Q.    What is your understanding of the term "target  
8   path" as described in the '022 patent?

9           A.    My understanding, of course, there's the  
10   definition in the middle of paragraph, Target Path 104  
11   may -- quote, may be defined by a well-planned seismic  
12   data and/or other information suitable for delineating  
13   the path through the formation 102, unquote. But the  
14   target path is a well plan -- is a planned path  
15   developed by an engineer, drilling engineer, or  
16   petroleum engineer that is termed the target path or  
17   I'll call the well plan.

18           Q.    Is the target path along an intended target of  
19   the bore hole -- bottom hole assembly?

20           A.    Yes, ask that question again, please.

21           Q.    Yeah. I'm sorry.

22           Is the target path along an intended target of  
23   the bottom hole assembly?

24           MR. STAVINOHA: Objection. Form.

25           THE WITNESS: The target path is a hypothetical

1 predrilled path. And the intention, of course, by the  
2 drilling engineer and others involved in that process is  
3 for the bottom hole assembly to trail along that path,  
4 that target path.

5 BY MS. OLIVER:

6 Q. And where did the target path -- scratch that.  
7 Let me try again.

8 Where is the target path intended to be  
9 directed to?

10 A. Ultimately, the target path is to a formation,  
11 a geologic formation that has the assets to be developed  
12 by the operator, the drilling engineer, and the operator  
13 that has high trocar bonds, oil and gas, water, within  
14 that formation. Or more than one formation but  
15 certainly a formation that holds oil and gas reserves.  
16 That's the target.

17 Q. So the target path intersects a target; is that  
18 correct?

19 A. The target path, as I said before, is a  
20 preplanned hypothetical path that is intended and the  
21 objective of that intention is to intersect a geological  
22 formation that has the oil and gas reserves.

23 Q. So a target path might have multiple targets on  
24 it within a formation?

25 A. Within a formation, one given formation, it

1 depends -- well, I don't know that I would characterize  
2 that as multiple targets. That path may intersect a  
3 length of the geological formation, the target, whether  
4 it's a horizontal well, if it's a horizontal well, it  
5 will be in the path for -- it will be in the formation  
6 for a longer distance to recover more oil and gas  
7 reserves. It intersects it at a vertical angle, and  
8 it's a shorter path within the formation. But I would  
9 consider those both the targets and not multiple targets  
10 within a formation. It would be in one formation.

11 Q. Can you just help me understand how a person of  
12 skill in the art understands the term "formation"?

13 A. "Formation" is -- a person of skill in the art,  
14 a POSITA, would understand in this context that a  
15 formation is a geological stratigraphic unit within the  
16 earth in general. And it may or may not hold oil and  
17 gas reserves.

18 In this particular context, it target -- the  
19 target is a geological form, formation, which holds oil  
20 and gas reserves. That's how I believe that a POSITA  
21 would understand that.

22 Q. So does the formation just represent one layer  
23 of the earth?

24 A. A geological formation being specific would be  
25 one layer. That's correct.

1           Q.    So if you had multiple layers in the earth, you  
2 would have multiple formations?

3           A.    Yes. There are instances in petroleum  
4 engineering where a producer will drill through multiple  
5 formations holding oil and gas reserves and produce oil  
6 and gas from each of those formations. And they're  
7 separate layers.

8           Q.    And what is the purpose of doing that?

9           A.    To recover more oil and gas reserves.

10          Q.    So in that circumstance where you're drilling  
11 into multiple formations, would you have multiple  
12 targets?

13          MR. STAVINOHA: Object to form.

14          THE WITNESS: If you are, you would have  
15 multiple formations which are target formations and one  
16 could refer to that as multiple target formations,  
17 multiple targets, yes, I will -- that would be fine.  
18 There's multiple target formations.

19          MS. OLIVER: I'd like to talk to you more about  
20 this topic, but I realize we've been going for about an  
21 hour and I promised you I'd give us breaks about every  
22 hour. So is now a good time to take a ten-minute break?

23          THE WITNESS: That's fine with me.

24          MS. OLIVER: We'll go off the record and we'll  
25 be back on the record -- it's 11:03, let's say 11:13?

1 THE WITNESS: Fine with me.

2 MS. OLIVER: Thank you so much. Appreciate it.

3 THE WITNESS: Thank you.

4 (A recess was taken.)

5 BY MS. OLIVER:

6 Q. Dr. Hilbert, during the break, did you speak  
7 with counsel about the substance of your testimony?

8 A. No.

9 Q. Thank you.

10 Okay. I'd like to return to our discussion  
11 about the target path that's discussed in the '022  
12 patent.

13 So you mentioned earlier that the oil and gas  
14 reserves that are trying to be obtained are located in a  
15 formation; correct?

16 A. That's correct.

17 Q. And I just want to make sure I'm using the  
18 correct terminology. So is the location in the earth  
19 where the oil and gas reserves are located called a  
20 formation?

21 A. Generally, yes.

22 Q. There's not like a smaller subset of a  
23 formation where the reserves are located?

24 MR. STAVINOHA: Objection. Form.

25 MS. OLIVER: I can rephrase that.

1 BY MS. OLIVER:

2 Q. Is there a different name specifically for the  
3 location within a formation where the reserves are  
4 located?

5 A. There can be other names for them like horizon.  
6 Some petroleum engineers, geologists, and operators  
7 refer to a formation as a horizon. That's just  
8 terminology that's used.

9 But within a formation, I don't want to go off  
10 into a dissertation about geology, but the rock  
11 formations are heterogenous and the porosity and the  
12 formation character of the rock is not continuous and  
13 the same all over the formation. So based on seismic  
14 data and other data from other wells in the area, you  
15 can determine that for a given formation, there will be  
16 spots of higher productivity and other locations of  
17 lower productivity. So it's not the same in the entire  
18 formation. It varies.

19 Q. I see. Okay.

20 So when a person of skill in the art is looking  
21 at a target formation, is that an XYZ coordinate precise  
22 location?

23 MR. STAVINOHA: Objection. Form.

24 THE WITNESS: Generally speaking, in the  
25 context of petroleum engineering, as I indicated before,

1 if you're drilling a vertical well only, that could be  
2 determined by an XYZ coordinate in the earth. If you  
3 are specifying a horizontal well or designing a  
4 horizontal well, it might be at the same depth along  
5 that path. But that will, of course, have different  
6 XY coordinates because it's along a line. And so it  
7 depends. But that's the description of what it means to  
8 depend.

9 BY MS. OLIVER:

10 Q. So would it be more accurate, then, to refer to  
11 a target formation as a zone?

12 A. I don't think that I would say it's accurate.  
13 But I would say it's -- it's similar to horizon  
14 formation, a zone is also referred to an area of volume  
15 of rock that has a -- oil and gas reserves, a zone, I've  
16 heard used, horizon, zone, formation. All the same.

17 Q. So what volume of rock are we talking about  
18 here?

19 Let me rephrase that.

20 What volume of rock would typically be  
21 encompassed by a target formation?

22 MR. STAVINOHA: Beyond the scope.

23 Counsel, is this related to a particular  
24 opinion that he's offered in his declaration?

25 MS. OLIVER: This is related to the

1 understanding of a target path.

2 THE WITNESS: A zone would constitute a volume  
3 of rock within the formation. Hypothetically, it can --  
4 it can range over a wide range of volumes. As I said,  
5 it may not be continuous. It may be cut by faults. And  
6 become discontinuous. So to try to define a volume  
7 would not be useful. It's more identified by the  
8 reservoir engineers, petroleum engineers.

9 BY MS. OLIVER:

10 Q. So just to be clear, a hydrocarbon target is  
11 not just a single point in the ground; correct?

12 A. Generally speaking, hypothetically, it's not a  
13 single point. But the purpose of the target path, the  
14 drilling plan, is to make as much contact with the  
15 formation, the well bore, as possible so you can produce  
16 as much as you possibly can.

17 Q. Is there any advantage to having the target  
18 path hit a certain portion of a hydrocarbon target  
19 versus another portion?

20 A. The role of a reservoir engineer is to define,  
21 identify for drilling engineers where those targets may  
22 be. And that's based on other data like seismic data as  
23 we just talked about in the '022 declaration and in the  
24 patent. They refer to those target plans and the target  
25 formation.

1           Q.    So when planning a path to obtain oil and gas  
2 reserves, the preplanned target path would intersect the  
3 hydrocarbon target; correct?

4           A.    That's the objective. The objective of the  
5 well plan target path to meet that well plan objective  
6 is to -- is to meet that target zone, if you will, using  
7 that target formation, target zone, target horizon. And  
8 produce oil and gas from that target.

9           Q.    And in the case of a multiple formation set of  
10 target hydrocarbons, would the preplanned target path  
11 intersect each of the target hydrocarbons?

12           MR. STAVINOHA: Objection. Form.

13           THE WITNESS: That would be the objective.

14 BY MS. OLIVER:

15           Q.    So could we look at Figure 1 of the '022  
16 patent?

17           A.    If you can point me to the page. I believe I'm  
18 there, but just to be consistent, let me know the page  
19 you're looking at.

20           Q.    Sure. Sure.

21           This is Exhibit 1001, and it's the label page 3  
22 of 21 is at the bottom.

23           A.    Hold on one second. Are you referring to my  
24 declaration or the patent itself?

25           Q.    I'm sorry, just the patent itself.

1           A. And this is Exhibit 1001 is the '022 patent?

2           Q. Correct.

3           A. And we're looking at Figure 1?

4           Q. Yes.

5           A. I have it.

6           Q. Thank you.

7                   So do you recall that reference number 102 in  
8 this Figure 1 is referred to as the formation?

9           A. Yes, I believe that's correct. Yes. But let  
10 me -- let's -- let me just -- if you don't mind, can I  
11 look at the hard copy --

12           Q. Yes.

13           A. -- that I have in front of me.

14                   Just make sure that the reference number 102, I  
15 want to be sure that I characterize -- the one -- the  
16 '022 patent refers to 102 as the formation.

17           Q. So in Figure 1, the entire box is reference  
18 102; correct?

19           A. That's correct.

20           Q. Does that mean that oil and gas reserves are  
21 available in this entire box?

22           A. I don't think that the specification of the  
23 patent states that. And a POSITA would know that the --  
24 as I said before, the rock is heterogenous so there  
25 could be more oil in one place than another. There's no

1 scale on this figure.

2 So, you know, as we know from -- or as I know  
3 as a POSITA working in this area, oil and gas wells can  
4 be 1,000 feet underground to 30,000 feet underground.  
5 And so to make these sort of hypothetical figures, it's  
6 not to scale at all. And it's highly distorted. But  
7 the 102 is a formation. There's no specificity in the  
8 patent itself about where the oil and gas is within this  
9 area in this volume of rock.

10 Q. So do you recall that reference number 104 in  
11 Figure 1 is referred to as the target path?

12 A. Yes, that's what's referred to in the patent,  
13 the '022 patent.

14 Q. Where does the bore hole of the Target Path 104  
15 begin?

16 A. It is not shown in the figure. Of course I'm  
17 assuming, and that's my assumption, that it's going from  
18 left to right. So it enters this block of formation 102  
19 on the left and continues on horizontally approximately  
20 horizontally 104, the dashed line to the right. But the  
21 origin of the well bore would be at the surface.

22 Q. Okay.

23 A. Of the earth. Surface of the earth.

24 Q. If you could keep this Figure 1 accessible but  
25 then also look at paragraph 37 of your declaration.

1           A. Yes, hold on one second. I will -- let's do  
2 this: Let me look at the hard copy of my declaration.

3 And what paragraph?

4           Q. 37.

5           A. 37.

6           Yes, I'm at 37.

7           Q. Do you see in the middle of paragraph 37 your  
8 statement that says -- that starts with, "In addition to  
9 Target Path 104, Figure 1 depicts"?

10          A. Yes, I see that.

11          Q. The rest of that statement says, Figure 1  
12 depicts Paths 108, 110, 112, 114, 116, and 118, all of  
13 which are possible convergence paths from a Point 106  
14 representing a current or future bottom hole assembly  
15 BHA location to the Target Path 104.

16          Did I read that correctly?

17          A. Yes, you read that correctly.

18          Q. Is Point 106 illustrated in Figure 1 of the  
19 '022 patent?

20          A. No, it's not visible.

21          Q. What is your understanding of where Point 106  
22 is?

23          A. My understanding of 106 is at the left-hand --  
24 you see all of the paths, 108 to 118. And to the  
25 left-hand side of Figure 1, they all meet at essentially

1 the same location. And that, to me, is Point 106. And  
2 I think a POSITA would understand that's what is meant.

3 Q. So are Paths 108 through 118 in Figure 1 each  
4 called a convergence path because they converge with  
5 that Target Path 104?

6 MR. STAVINOHA: Objection. Form.

7 THE WITNESS: I can't get -- I can't get into  
8 the mind of the patent writers, but I would say that  
9 that is true that each of those paths, the objective of  
10 each of those paths is to get at or near the planned  
11 Path 104. And so each of these may be getting near  
12 Path 104, and it's called convergence path in my opinion  
13 because they are trying, not necessarily in order, in  
14 any specific order, but attempting to develop well bore  
15 paths or drill paths that get near Path 104, near or on  
16 104.

17 BY MS. OLIVER:

18 Q. Will you look at the next paragraph of your  
19 testimony here. It's paragraph 38.

20 A. Yes, I'm looking at it.

21 Q. Do you see the sentence in the middle that  
22 starts with "For example, if the bore hole is being  
23 drilled and the BHA is off of the target path"?

24 A. Yes, I see that.

25 Q. What does "off of the target path" mean?

1           A. It's at or near the Target Path 104.

2           Q. The rest of that sentence says, "If the bore  
3        hole is being drilled and the BHA is off of the target  
4        path, a cost comparison may be used to determine the  
5        best convergence path in terms of cost."

6           Did I read that portion of the sentence  
7        correctly?

8           A. Yes, you did.

9           Q. Is it your understanding that each of the paths  
10       in Figure 108 through 118 has an associated cost?

11           MR. STAVINOHA: Object to form.

12           THE WITNESS: Yes, each of those paths would  
13       have some cost.

14           BY MS. OLIVER:

15           Q. I just want to come back briefly to the first  
16       portion of that same sentence regarding off of the  
17       target path.

18           I believe you just answered a minute ago in  
19       response to the question what does off of the target  
20       path mean, you stated that it's at or near the Target  
21       Path 104. If a path is at the target path, is it off of  
22       the target path?

23           MR. STAVINOHA: Form.

24           THE WITNESS: In the context of the patent,  
25       when I say at or near, there is a margin of error that

1 these paths are at the end of each of those paths, they  
2 may be in a margin of error to the Target Path 104. So  
3 at or near means within a region of the path, of the  
4 Target Path 104. That's what I mean by -- "off" is a  
5 term that I interpret to mean close to or on the path.  
6 Off -- off doesn't necessarily mean that it's separated  
7 from 104. It's at or near 104.

8 BY MS. OLIVER:

9 Q. I would like to talk a little bit more about  
10 the cost of the path in Figure 1. So would you please  
11 turn to the '022 patent itself. And would you look at  
12 Column 3.

13 A. Yes, I'm at Column 3.

14 Q. And would you look at line 23, please.

15 A. Yes, I see that.

16 Q. And do you see the first sentence starting at  
17 line 23 that says the process of calculating the cost of  
18 a path may involve identifying any of a number of  
19 different types of cost such as a distance cost, a  
20 sliding cost, a curvature cost, a time cost -- I'm  
21 sorry. Scratch this, I read the wrong portion. This is  
22 not --

23 A. That's what I was just going to -- I was just  
24 going to say I'm not seeing what you're reading.

25 Q. I think you're going to tell me that I did not

1 read that correctly.

2               Okay. Let's actually look at line 23 this  
3 time.

4               Okay. This says, By calculating a monetary  
5 value, e.g., a value in the United States dollars for a  
6 particular segment of a path, e.g., a unit of measure  
7 such as a foot, and adding up all of the segments for  
8 the path, a cost can be identified for a particular  
9 path.

10              Did I read that correctly this time?

11              A. Yes, you read that correctly.

12              Q. So is it your understanding from this passage  
13 that the total cost of a particular path is obtained by  
14 adding up the respective cost of each segment of the  
15 path?

16              A. That's what that -- that's what that sentence  
17 states. In my -- in my understanding.

18              With focus on the word "a cost can be  
19 identified," there are many types of costs associated in  
20 the patent specification, but for this sentence here, it  
21 does say, as you read it, for a particular segment and  
22 adding up all of those segments on the path, a cost can  
23 be identified for each particular path.

24              Q. Okay.

25              A. Yes.

1           Q. Let's look -- return briefly to your '022  
2 declaration and look at paragraph 39.

3           A. Yes, I'm at paragraph 39.

4           Q. And in this paragraph, you discuss Figure 3 of  
5 the '022 patent; correct?

6           A. Yes.

7           Q. So in the second sentence of paragraph 39, you  
8 state that the method 300 may be used to identify  
9 multiple possible convergence paths, narrow the  
10 identified paths to a single best path based on cost and  
11 select that path as the path to be used.

12           Did I read that correctly?

13           A. Yes, you read that correctly.

14           Q. So is it your understanding that the objective  
15 of Figure 3 from the patent is to determine the best  
16 path as the path that meets the cost parameters?

17           A. One second. Let me read that again.

18           MR. STAVINOHA: Lynette, I had an objection to  
19 form to that last question. I don't know if you caught  
20 that.

21           THE STENOGRAPHER: It was not audible.

22           MR. STAVINOHA: I will be louder next time.

23           THE STENOGRAPHER: Thank you.

24           THE WITNESS: Sorry. In the sentence itself  
25 and as per the patent and per the Figure -- Figure 3, it

1 selects the path based on cost. It says it's not clear  
2 when we say that path is used, that path, I think at the  
3 end, our foot selected path, that path is the one that  
4 is produced from that flow chart based on those costs.  
5 But there are other -- as you see in the other boxes of  
6 Figure 3, there are other criteria for selecting a path.  
7 But ultimately, cost is used as a selection process.

8 BY MS. OLIVER:

9 Q. So then let's turn to the next paragraph in  
10 your declaration, paragraph 40.

11 A. Yes.

12 Q. And in this paragraph, you're discussing  
13 Figure 4 of the '022 patent?

14 A. Yes.

15 Q. And do you see in Figure 4, which you've  
16 reproduced in your declaration -- sorry. Scratch that.

17 Do you see in Figure 4 of the '022 patent that  
18 the total cost for paths is identified in Set 410?

19 A. Yes, I see that.

20 Q. And is it your understanding from Figure 4 that  
21 the total cost of a path is always based on three  
22 particular costs, specifically the offset cost, the  
23 curvature cost, and the time cost?

24 A. That's one embodiment in the specifications.  
25 There could be other criteria, other cost criteria, and

1 other criteria in general. And Figure 4 in that  
2 embodiment, it does list offset cost, curvature cost,  
3 and time cost. But in my opinion, there are other  
4 criteria to base the selection of the paths.

5 Q. So in some circumstances, then, could an  
6 embodiment exist where not all three of these costs that  
7 are shown in Figure 4 are used?

8 A. Yes. That is to say the claims identify that  
9 claim limitations include at least one of those costs so  
10 there could be more or less than those three identified  
11 in Figure 4.

12 Q. Let's talk about a later portion of your  
13 declaration now. Would you please turn to paragraph 56  
14 of your declaration.

15 A. 5-6?

16 Q. Yes. And this is section 5F of your  
17 declaration; correct?

18 A. I see it. I'm there.

19 Q. Thank you.

20 So do you see that you have construed two terms  
21 in the '022 patent?

22 A. Yes, that's correct.

23 Q. Would you please identify which terms that you  
24 have construed in this '022 declaration?

25 A. Yes, I can. Number 1, calculating by the

1 computer system an offset distance for drilling by the  
2 BHA each of the geometric convergence paths connecting  
3 the bottom hole assembly location to the target drilling  
4 path.

5 And No. 2 on page 43, determining by the  
6 computer system a drill path curvature associated with  
7 drilling each of the geometric convergence paths by the  
8 bottom hole assembly.

9 Those two terms, I have construed.

10 Q. And are those the same terms that you construed  
11 in the '506 declaration?

12 A. I believe so, but let me check for  
13 thoroughness.

14 I think the structure of my report is  
15 essentially the same, maybe not the same pages but  
16 should be essentially the same.

17 Yes.

18 Q. So looking again at your '022 declaration in  
19 paragraph 57.

20 A. Yes.

21 Q. You have specifically construed the term  
22 "offset distance"; is that correct?

23 A. Correct.

24 Q. And you have construed "offset distance" to  
25 mean an offset distance of a geometric convergence path

1 relative to the target drilling path; is that right?

2 A. Let me see. I hesitate to go on memory.

3 I'm looking at paragraph 57 in the first  
4 sentence, should be construed to mean an offset distance  
5 of a geometric convergence path relative to the target  
6 drilling path consistent with the ordinary meaning of  
7 the phrase in light of the specifications of the '022  
8 patent. That's my -- that's what I have construed.

9 Q. I would like to briefly talk about  
10 Exhibit 2012, which I shared with you earlier. This is  
11 the claim construction order from the district court  
12 litigation.

13 Would you mind pulling that up and letting me  
14 know whenever you have it.

15 A. Exhibit 2012.

16 Yes, I have it. I have pulled it up.

17 Q. And would you look at pages 10 and 11 starting  
18 at page 10.

19 A. Yes, I'm at page 10.

20 Q. Do you see the top of page 10, the first line  
21 says, "The parties' positions"?

22 A. Yes, I see that.

23 Q. And do you see that underneath that header on  
24 page 10, "The Court discusses the '022 and the '506  
25 patents"?

1           A. Yes, I believe I see that.

2           Q. And if you will look at the sentence that is --

3 starts on page 10 but then goes on to page 11, do you

4 see that sentence?

5           A. It begins with H&P responds?

6           Q. The next sentence right after that one. It

7 begins with "For support."

8           A. Yes.

9           Q. And that sentence says, "For support, H&P

10 points to the declaration of its expert, Dr. Hilbert";

11 correct?

12          A. Yes. I see that.

13          Q. Are you the same Dr. Hilbert that's being

14 referred to in that sentence?

15          A. Yes, that's correct.

16          Q. And did you submit a declaration in the

17 District Court proceedings about claim construction?

18          A. Yes, it's been quite a while, but I remember

19 that I had submitted a declaration in that matter.

20          Q. And in the declaration in the District Court

21 case, did you construe the terms "offset distance" and

22 "drill path curvature"?

23          A. Honestly, I can't recall, but I'm fairly

24 certain I did not. Fairly certain.

25          Q. But you are construing those two terms in this

1 case; correct?

2 A. In the IPR, yes.

3 Q. Why did you not construe those terms in the  
4 District Court litigation but you are construing them in  
5 the IPRs?

6 A. Because of the nature of the specifications in  
7 the '506 and '022 patents, I believed that it was  
8 important to further construe or to construe those two  
9 terms.

10 Q. And how was that different than the need to  
11 construe those terms in the District Court proceedings?

12 A. I can't recall specifically what led me to that  
13 decision. But of course, the IPRs came later. In the  
14 process of reviewing those patents, I believe those two  
15 terms in particular were important to responding to the  
16 petitions.

17 Q. So were you the one that decided which terms to  
18 construe in the District Court litigation?

19 MR. STAVINOHA: I'm going to counsel the  
20 witness not to reveal the content of any discussions  
21 with counsel.

22 You can answer to the extent you're able to do  
23 it without revealing the substance of your  
24 communications with counsel. But otherwise, I'd  
25 instruct you not to answer.

1                   THE WITNESS: Please ask the question again.

2 BY MS. OLIVER:

3                   Q. Sure.

4                   Were you the one that decided which terms to  
5 construe in the District Court litigation?

6                   A. I can't recall the details of that process. As  
7 I sit here right now. And I'm being perfectly honest  
8 about that. I don't recall that. You know, these are  
9 two different processes, and at the time that the  
10 declarations and the construction was done back in 2021  
11 or so, I can't recall the details of that process,  
12 except that I recall the IPRs because they're more  
13 recent. And it seemed like those were important terms  
14 to me at that point in time.

15                  Q. So were you the one that decided which terms to  
16 construe in the IPRs?

17                  MR. STAVINOHA: Same caution, Dr. Hilbert. You  
18 can answer to the extent it doesn't reveal  
19 communications with counsel.

20                  THE WITNESS: Yes, I believed that those two  
21 terms were important to my analysis of the petitions and  
22 the claims in the matter.

23 BY MS. OLIVER:

24                  Q. Would you look at your '022 declaration again.  
25 And this should be on the same page, page 39.

1           A. Page 39, yes. Oops, wait. Let me get to  
2 page 39.

3           Okay. I'm at page 39.

4           Q. Do you see Footnote 1 on page 39?

5           A. Yes, I see it.

6           Q. Do you see the second sentence of Footnote 1  
7 that says, "The District Court construed the terms  
8 disputed by the parties to have their ordinary meaning"?

9           A. Yes, I see that.

10          Q. And now let's look at the top of this same  
11 page, paragraph 56 of your declaration.

12          A. Yes, I see that.

13          Q. You state in paragraph 56 that you have  
14 interpreted the claims in accordance with the ordinary  
15 and customary meaning as understood by one of ordinary  
16 skill in the art; is that correct?

17          A. Yes, you read that correctly.

18          Q. Did you also construe the terms in the  
19 District Court litigation according to their plain and  
20 ordinary meaning?

21           MR. STAVINOHA: Objection. Relevance.

22           THE WITNESS: I believe so. I believe so. I  
23 mean, as I said before, that was some time ago, but I  
24 believe that would be correct. That's the way that I  
25 viewed it.

1 BY MS. OLIVER:

2 Q. So why did you believe it was necessary in the  
3 IPRs to provide a specific construction of these two  
4 terms when you were construing the terms according to  
5 the plain and ordinary meaning?

6 A. In the petitions, I believe that those two  
7 terms needed to be construed as I did in light of the  
8 content of the petitions, Dr. Shubert's declaration, and  
9 in reading claims at the heart of these matters  
10 themselves. And believed that, in my opinion, I needed  
11 to further define them or construe them at the time that  
12 I was writing these IPR declarations.

13 Q. Let's turn a couple pages later in your  
14 declaration to paragraph 62.

15 A. I'm at paragraph 6-2, 62.

16 Q. And in this section, you are discussing the  
17 term "drill path curvature"; is that correct?

18 A. That's correct.

19 Q. And at the end of this paragraph 62, you state  
20 that the term drill path curvature in Limitations 1.3  
21 and 13.3 should be construed to mean an overall  
22 curvature of a given geometric convergence path; is that  
23 right?

24 A. That's correct. You read that correctly.

25 Q. Would you please explain what "overall

1 curvature" means.

2       A. In the specifications of the '022 patent and  
3 the '506 patent, it uses, for example, overall curvature  
4 to mean, for example, average curvature. So while a  
5 drill path might have many twists and turns, the overall  
6 average would be different than individual twists and  
7 turns in a given path so the overall curvature, as I  
8 understand the '506 and '022 patents, look at the  
9 overall curvature but also maximum or peak curvatures,  
10 dogleg severity, which is also a curvature, but overall  
11 curvature is also considered. So they have defined  
12 several curvatures, one is the overall curvature and the  
13 specification uses, as an example, average curvature.

14       Q. So I just want to be clear on one point: In  
15 paragraph 62, you say an overall curve in that sentence  
16 that we just discussed; right?

17       A. That's correct.

18       Q. Can you keep a thumb on that page and then flip  
19 over to the end of paragraph 65, this is kind of  
20 located --

21       A. I see paragraph 65. I have it.

22       Q. So toward the top of page 47, you say that a  
23 POSITA would have understood that the claimed drill path  
24 curvature is the curvature of the convergence path as a  
25 whole; is that right?

1           A. Yes, in the context of the limitations, that's  
2 what I referred to, that a POSITA would understand in  
3 the context of the limitations the patent writers are  
4 referring -- would have understood that the claimed  
5 drill path curvature is the curvature of the convergence  
6 path as a whole.

7           Q. Just to be clear, when you say "as a whole,"  
8 you mean the same thing as you meant when you said  
9 overall curvature?

10          A. Yes.

11          Q. Is overall curvature a term of art that is  
12 commonly used in the oil and gas industry?

13          A. I believe so.

14          Q. So since that's a term of art in the industry  
15 in your opinion, how would someone calculate the overall  
16 curvature of a path that has multiple curves?

17          A. I didn't perform that analysis specifically in  
18 this declaration or in these declarations. I was guided  
19 by the response guided -- I was responding to the  
20 arguments put forth in the petitions, IPR petitions, and  
21 in reading the '506 and '022 patents came upon several  
22 terms for curvature and specifically the overall  
23 curvature or the average curvature. And I did not make  
24 an analysis of precisely how to calculate that. And  
25 I -- you would not be able to find that in my

1 declaration. I did not perform an analysis nor have I  
2 defined mathematically how to calculate that. That  
3 hasn't -- that analysis has not been performed yet.

4 Q. But you said the term "overall curvature" is a  
5 term of art?

6 A. It can be -- a term of art in looking at an  
7 actual drill path curvature, there are doglegs, there  
8 are bends, et cetera, that can be characterized by  
9 curvature as they have done in the '022 and '506  
10 patents. But an overall curvature would be the overall  
11 curvature of a path or a selected path in a drill -- in  
12 a drilled path.

13 Q. So you said that the term "overall curvature"  
14 is commonly used in the industry; correct?

15 A. I believe so, yes.

16 Q. What unit of measurement would overall  
17 curvature be measured in?

18 A. Curvature is measured in the change in angle of  
19 the path at two points divided by the length of the path  
20 between those two points. And so those units would be  
21 angular measurement divide by length.

22 Q. So since overall curvature is commonly used in  
23 the industry in your opinion, how would a POSITA in the  
24 industry calculate overall curvature?

25 A. For example, the angles tangent to the ends of

1 the path calculated by the length of that path. So you  
2 would get a change in angle divided by the length of the  
3 path. And there are many ways to do that and I haven't  
4 performed an analysis of how that's done for the  
5 purposes of this declaration.

6 But in the -- in the patents themselves, they  
7 refer to overall curvature as, for example, average  
8 curvature. And so I have not performed an analysis of  
9 how to calculate that specifically, average curvature.

10 Q. So is your understanding of the term "overall  
11 curvature" based on how that term is used specifically  
12 in the '022 and '506 patent?

13 A. I have specific focus on the '022 and '506  
14 patents and have construed what that means in the  
15 context of those specifications. But I recognize that  
16 knowing what I know as a POSITA about how a well is  
17 drilled physically and how one calculates things, I  
18 recognize that there is an overall curvature.

19 Q. So outside of the context of the '022 and '506  
20 patents, is there a standard way to calculate overall  
21 curvature in the industry?

22 MR. STAVINOHA: Object to form.

23 THE WITNESS: There's no -- there's no  
24 standard, I believe. There -- there are many papers  
25 written about curvature, dogleg curvature, drilling

1 horizontal wells, drilling vertical wells and -- and  
2 different engineers and scientists may approximate and  
3 calculate the curvature over a given path differently.

4 The overall idea of overall curvature is known,  
5 well known. But the -- calculating it may vary from  
6 place to place, from engineer to engineer. So I don't  
7 believe there is a standard way of doing it. There are  
8 approximations that people commonly use.

9 BY MS. OLIVER:

10 Q. So in the context of the '022 and '506 patents,  
11 the only example that were given of how to calculate  
12 overall curvature is the average curvature; is that  
13 right?

14 A. In the specifications of those patents, there  
15 are other examples of -- and I believe that's also in my  
16 declaration, of determining the peak curvature, dogleg  
17 curvature, and how that may vary using a concept of a  
18 window of looking at different lengths of the drill path  
19 and assessing what those values are.

20 Q. So specifically focusing on overall curvature  
21 and how it's used in the '022 and '506 patents, are  
22 there any examples of how overall curvature is  
23 calculated other than the example of an average  
24 curvature?

25 A. May I search through my --

1           Q. Of course. Take your time.

2           A. -- declaration, and I may ask if I can search  
3 through the '022 patent itself.

4                   I'm looking for a specific area, specific to my  
5 declaration.

6                   Yes, I'm on page 49 of my '022 declaration.

7                   Paragraph 68. And if one reads down to the bottom of  
8 paragraph 68, quote, in Step 606, the peak curvature of  
9 the path is identified, dot, dot, dot, using a defined  
10 window, for example, a window spanning a defined number  
11 of feet to identify dogleg severity.

12                  And I interpret that to mean that they, in the  
13 process of that system or method 600, Figure 6, the  
14 patent writers specify looking at various curvatures by  
15 looking at a window to focus or enlarge the length of  
16 that path. So they can -- the smaller -- the smaller it  
17 is, if you've got -- if that path is very squiggly, the  
18 smaller that window captures one of those squiggles as a  
19 dogleg severity. If you enlarge that, then you would be  
20 able to get a different value of curvature, as they  
21 explain in -- at or about Column 11, lines 30 to 35, and  
22 further, Column 11, 36 to 40, and so forth.

23                  Q. So is it your position, then, that peak  
24 curvature is the same thing as overall curvature?

25                  A. In the context of these patents, by -- well,

1 no, I think the straightforward answer is no, peak  
2 curvature is not overall curvature. It depends on the  
3 circumstances and the specific example, an exemplary  
4 drill path may have -- may be squiggly as I, you know,  
5 term it. And focusing on one of those squiggles will  
6 give you one curvature. Then if you open -- which would  
7 be associated with one arc of that curve.

8 And then if you opened that, you may get many  
9 squiggles and you would be looking at the peak of all of  
10 those little squiggles, and then if you opened that  
11 further, you would have an overall curvature which is  
12 termed in the -- or as an example in the patent average  
13 of that window length.

14 Q. So is peak curvature an example of overall  
15 curvature?

16 A. I don't believe so. If you had -- if you had  
17 constant curvature in a window, peak would be the same  
18 as the overall, for example, hypothetically. But in  
19 general, no. The peak would be different than the  
20 overall curvature.

21 Let me specify or correct.

22 It would have the same units because curvature  
23 is curvature, change in angle over change in length.  
24 But it would not be the same values necessarily.

25 Q. So in a hypothetical situation where the window

1 for the peak curvature is the entire path from beginning  
2 to end, would the peak curvature be the same as the  
3 overall curvature?

4 A. Hypothetically, I think one could envision some  
5 circumstance in which it would be identical, only  
6 numerically. But that is not the intent, of course.  
7 But that's a -- hypothetically, you could have, for  
8 example -- if the window has one arc in it, then the  
9 peak curvature may be the same as the overall curvature  
10 because it's only got one arc. It's only got one dogleg  
11 or curve in that window. And then that peak would be  
12 the same as the overall, which would be the same as the  
13 dogleg by just focusing on one curve -- curve section.

14 Q. Okay.

15 MS. OLIVER: So I see the clock and I'm trying  
16 to be mindful of our break. We've been going for  
17 another hour. Is now a good time for you to take  
18 another ten-minute break?

19 THE WITNESS: Sure.

20 MS. OLIVER: So it's 12:14. Let's go off the  
21 record and we will come back on the record at 12:24.  
22 Does that work?

23 THE WITNESS: Is that fine?

24 MR. STAVINOHA: That work for you?

25 THE WITNESS: Yes, works for me.

1                   MR. STAVINOHA: All right. Sounds good.

2                   (A recess was taken.)

3 BY MS. OLIVER:

4                   Q. Welcome back, Dr. Hilbert.

5                   A. Thank you.

6                   Q. During the break, did you speak with counsel  
7 about the substance of your testimony?

8                   A. No, we had no conversation like that.

9                   Q. Let's go back to paragraph 62 of your  
10 declaration, the very end of that paragraph.

11                  A. Page 44?

12                  A. Yes, I'm there.

13                  Q. So in this paragraph, you provide your  
14 construction of the term "drill path curvature" as  
15 meaning an overall curvature of a given geometric  
16 convergence path; correct?

17                  A. Yes. That's correct.

18                  Q. Just to confirm that I understand correctly,  
19 what is your understanding of what overall curvature  
20 means?

21                  MR. STAVINOHA: Objection. Asked and answered.

22                  THE WITNESS: Per the definition or the  
23 construction that I have suggested, and I construe it to  
24 mean the overall curvature of the entire path not just a  
25 point within it, but the overall curvature. And one

1 example would be the average curvature over that path.

2 But that's the entire path is what that comes down to.

3 BY MS. OLIVER:

4 Q. Let's consider a hypothetical example.

5 So let's say that a path has two curves, and  
6 the first curve has a curvature of 10 degrees, and the  
7 second curve has a curvature of 20 degrees. Would the  
8 average curvature of that path as a whole be 15 degrees?

9 MR. STAVINOHA: Objection. Form.

10 THE WITNESS: I haven't performed that  
11 analysis. I don't want to pull out pencil and paper and  
12 do that math. That's -- that, I think what you are  
13 doing, is an arithmetic average of those two values.  
14 But that assumes that both are constant arcs with no  
15 line in between, straight line in between them  
16 connecting them. It would be looking like an S, two  
17 curves of each S. And I don't know that that would be  
18 the same as the overall curvature because I've performed  
19 no analysis of what they mean, what the patent writers  
20 mean and within the bounds of the intrinsic evidence  
21 what it means by an average.

22 An overall curvature is an average, an overall  
23 curvature is the overall curvature of the overall path,  
24 convergence path specifically. But how that average is  
25 calculated or how that overall is calculated, I don't

1 know. I'm not prepared to address that. I haven't  
2 performed the analysis. Except as what I read in the  
3 intrinsic evidence in the specification.

4 BY MS. OLIVER:

5 Q. So a person of skill in the art reading the  
6 specification of the '022 patent would not understand  
7 how to calculate an overall curvature?

8 MR. STAVINOHA: Objection. Mischaracterizes  
9 testimony.

10 THE WITNESS: No, that's not what I meant.

11 A person of skill in the art would know how to  
12 go about potentially developing a method to calculate  
13 overall curvature. But I think that could vary -- a  
14 method for doing that could vary from engineer to  
15 engineer.

16 I can think of, as I said before in my previous  
17 testimony here, a couple of ways to interpret average, a  
18 couple of ways to compute an average over the distance  
19 or window. But I don't know -- there is an average  
20 specified by the patent writers. But they had not  
21 implemented a calculation procedure. And so one would  
22 be left to calculate that themselves.

23 BY MS. OLIVER:

24 Q. Dr. Hilbert, I'm going to share in the chat  
25 window a new exhibit that you have not seen. So give me

1 just one minute.

2               Okay. I just sent it. Let me know when you  
3 have that open.

4               A. Yes, I have it.

5               MR. STAVINOHA: For the record, I'm going to go  
6 ahead and object to this new exhibit based on relevance,  
7 hearsay, authenticity.

8               MS. OLIVER: Sure.

9               And I will start by offering the exhibit up,  
10 which is -- this is marked as Exhibit B as a deposition  
11 exhibit. This is an annotated copy of Figure 1 of the  
12 '022 patent, the annotations have been added by  
13 petitioner's counsel.

14               (Exhibit B marked for identification.)

15 BY MS. OLIVER:

16               Q. Dr. Hilbert, do you recognize the number at the  
17 top of this document referring to the patent number as  
18 9,865,022?

19               A. Yes, I recognize that.

20               Q. And that's the '022 patent number; correct?

21               A. That's correct.

22               Q. And other than all of the annotations added in  
23 color, do you recognize the rest of what is in this  
24 document as Figure 1?

25               A. Other than the color annotations, I recognize

1 that as being Figure 1 of the '022 patent.

2           What I'm trying to do here is to rotate it.

3           But I think we can -- if I can't figure it out, I can --

4           I can speak to it or testify to it if necessary.

5           Q.    Please take your time to figure out how to  
6           rotate it. I can't read things sideways, so I don't  
7           expect you to.

8           A.    Oh, here we go. That was easy. Okay.

9           Yes, I have rotated it. So -- in landscape.

10          Q.    Great.

11          I will just say, again, that all of the  
12         annotations in color have been added by petitioner's  
13         counsel. Do you understand that?

14          A.    Yes, I understand that.

15          Q.    Typically, Dr. Hilbert, this is something what  
16         we would just present to you in person at a deposition.  
17         But since this is a remote context, we have to do this a  
18         little bit differently. Just so you understand.

19          A.    That's fine. I understand.

20          Q.    So looking at this Exhibit B, do you see  
21         Path 118, which has been circled in purple?

22          A.    Yes, I see that.

23          Q.    How many curves are in Path 118?

24          MR. STAVINOHA: Objection. Beyond the scope.

25          THE WITNESS: In my opinion, the rendering that

1 I'm looking at with the long dashes indicates two  
2 curves. Or two sections that are curved.

3 BY MS. OLIVER:

4 Q. And where are those curves located on Figure --  
5 excuse me, where are those curves located on Path 118?

6 MR. STAVINOHA: Objection. Beyond the scope.

7 THE WITNESS: Generally speaking, one to the  
8 left and one to the right.

9 BY MS. OLIVER:

10 Q. Is the first curve located in Path 118 at the  
11 location where we have added in purple the number 118-B?

12 MR. STAVINOHA: Objection. Form. Beyond the  
13 scope.

14 THE WITNESS: That portion appears to have some  
15 curve from 118-B.

16 BY MS. OLIVER:

17 Q. And is the second section of curvature in  
18 Path 118 located at what we have marked in purple as  
19 118-C?

20 MR. STAVINOHA: Form. Beyond the scope.

21 THE WITNESS: That would also appear to be a  
22 curve segment or section or arc.

23 BY MS. OLIVER:

24 Q. Do you see Path 108, which has been circled in  
25 red?

1           A. Yes, I do.

2           Q. How many curves are there in Path 108?

3           MR. STAVINOHA: Objection. Form, beyond the  
4 scope.

5           THE WITNESS: It would appear that there is one  
6 curved portion, an arc.

7 BY MS. OLIVER:

8           Q. And is that one curve located at what we've  
9 marked in red as 108-B?

10          A. B, as in bear, or B, as in Brun, yes. There's  
11 a curved section at or near the annotation 108-B.

12          Q. So how would a person of skill in the art  
13 measure the overall curvature for Path 118?

14          MR. STAVINOHA: Objection. Beyond the scope.

15          THE WITNESS: I've not performed that analysis.  
16 It's -- in the specification of the patent, it gives,  
17 for example, the overall curvature, being the average  
18 curvature of that path, 118, for example. And I -- as I  
19 testified earlier, I've not performed an analysis to  
20 determine what average -- how you would calculate that  
21 average. But it would be the average, the overall  
22 curvature would be, for example, the average curvature  
23 of that entire path.

24          There are two curves in it. I don't know,  
25 there are many ways of attempting to approximate an

1 overall curvature or calculate an overall curvature.  
2 And I haven't performed that analysis. But you would --  
3 given that path, 118, there would be a number that would  
4 represent an overall curvature that may or may not be  
5 the same as the other curves drawn in that path,  
6 hypothetically.

7 BY MS. OLIVER:

8 Q. So would one way to calculate the average  
9 curvature of Path 118 be to take the average of the  
10 curvature of 118-B and 118-C?

11 MR. STAVINOHA: Objection. Beyond the scope.

12 THE WITNESS: I don't know. I haven't  
13 performed that analysis to see if that -- if that would  
14 make sense to me. It might to another engineer, but  
15 that -- there are other ways to do that and I haven't  
16 performed that analysis to see which of those makes  
17 sense.

18 BY MS. OLIVER:

19 Q. So let's take a look at Path 108 in this  
20 figure.

21 A. Yes, I see that.

22 Q. Would the average curvature of Path 108 be the  
23 curvature of 108-B's curve?

24 MR. STAVINOHA: Beyond the scope.

25 THE WITNESS: I don't know. I haven't

1 performed that analysis. There would be many ways to  
2 compute or calculate that, and I haven't developed an  
3 opinion in my declaration or declarations on how to do  
4 that, how one would calculate that. So I can't say -- I  
5 don't have an opinion on whether the curvature at 108-B  
6 would be the overall curvature.

7 BY MS. OLIVER:

8 Q. Does the '022 patent explain how to calculate  
9 an average curvature?

10 A. The specifications, as I testified earlier,  
11 have a -- Columns 8 -- or Columns 11, I think it's of  
12 the '022 patent, refers to a procedure for using a  
13 window. And so they don't provide a -- I can understand  
14 that there is that specification that they use for the  
15 window for looking at the peak curvature and an overall  
16 curvature and a dogleg severity. They provide those  
17 examples in the embodiments in the specifications. That  
18 would be one way to do it. But I don't -- I don't know  
19 what goes into calculating that from the window.

20 Q. So looking again at Exhibit B, the annotated  
21 version of Figure 1, would the peak curvature of  
22 Path 108 be the curvature of the curve at 108-B?

23 MR. STAVINOHA: Objection. Beyond the scope.

24 THE WITNESS: I don't know. I don't think I  
25 can -- it depends -- it depends on if that arc is a arc

1 of constant radius or if it's broken up into several  
2 arcs that have different radii of curvature. And so I  
3 can't speak to whether what would be in that rendering  
4 the peak curvature. Because it may change from point to  
5 point on that arc as it's not clear and it's not in  
6 the -- in the patent specification, it doesn't say that  
7 that is a curve of constant curvature or if it has a  
8 variable curvature.

9 BY MS. OLIVER:

10 Q. So in a hypothetical example where a path has  
11 one curve and that curve is an arc of constant radius,  
12 would the curvature of that curve be the peak curvature  
13 of that path?

14 MR. STAVINOHA: Objection. Form, beyond the  
15 scope.

16 THE WITNESS: I haven't performed that  
17 analysis. And -- and it would depend on the -- as  
18 demonstrated or proposed in the specification, it would  
19 depend on the length of that window, whether -- whether  
20 that is the peak curvature, if it was a constant  
21 curvature, I -- it would be just based on this little  
22 hypothetical situation. Of course, if it's a circle  
23 connected to two lines, an arc of a circle has constant  
24 curvature. But I can't tell that from this figure. And  
25 depending on what that window size, I think the

1 curvature, the overall curvature may change, the peak  
2 curvature may change, depending on that window. But,  
3 for example, a circle has a constant curvature. That's  
4 about all you can say from this.

5 BY MS. OLIVER:

6 Q. Again, looking at Exhibit B, which is the  
7 annotated version of Figure 1, do you see Path 114?

8 A. Yes, I do.

9 Q. Does Path 114 contain any curves?

10 MR. STAVINOHA: Objection. Beyond the scope.

11 THE WITNESS: It does not -- it does not appear  
12 to, but it could be a very large arc, but it appears to  
13 be a straight line. I don't -- I do not believe that --  
14 in the specification to the patent, let me -- let me do  
15 this. I look -- I don't know that they specify in the  
16 patent that it's a straight line or not. But if I may  
17 have a moment to look for 114.

18 BY MS. OLIVER:

19 Q. Sure.

20 A. One of the nice things, of course, is that this  
21 is searchable. And we don't have to spend all day  
22 reading it. This won't take long, I don't believe. It  
23 will take as long as I need.

24 As I recall in the patent, having looked  
25 through here this time, I don't see in this

1 specification that it is defined as a straight line.

2 But it appears that it may be a straight line maybe.

3 I'll go back to that figure. Okay.

4 Q. So assuming that Path 114 is a straight line,  
5 would the overall curvature of that straight line path  
6 be zero?

7 MR. STAVINOHA: Beyond the scope.

8 THE WITNESS: By definition, a straight line  
9 has no curvature. And if it's a straight line, then it  
10 would have zero curvature hypothetically.

11 BY MS. OLIVER:

12 Q. Let's move back to the '022 patent itself. And  
13 would you mind looking at Figure 1 of the '022 patent.

14 A. Figure 1 of the '022 patent, yes, I'm there.

15 Q. And this is the same figure we've just been  
16 discussing in Exhibit B but without the annotations;  
17 correct?

18 A. That's correct.

19 Q. You mentioned earlier today that one possible  
20 way that someone might calculate an overall curvature is  
21 to look at the very beginning point of a path and the  
22 very end point of a path; is that correct?

23 A. That could be.

24 Q. How would you measure the degrees from the  
25 beginning of a path to the end of a path?

1                   MR. STAVINOHA: Objection. Beyond the scope.

2                   THE WITNESS: I haven't performed that  
3 analyses, that analysis for these patents. The  
4 specifications don't -- don't limit it to a method about  
5 how you would do that. But it would be the --  
6 generally, from the beginning point to the end point.

7                   Is that somebody's alarm going off or I thought  
8 I heard a siren.

9 BY MS. OLIVER:

10                  Q. I'm sorry, that's the police driving by outside  
11 my office. I apologize.

12                  A. The curvature is defined mathematically  
13 speaking, not within the specification of the patent,  
14 but mathematically speaking, the change in direction or  
15 change in angular direction of the path at -- between  
16 two points. And you calculate, you could calculate  
17 the -- what I was speaking to today, was calculating the  
18 change in angle between those two points or across those  
19 two points and dividing by the length path, generally  
20 speaking.

21                  In practice, there would be data that would  
22 tell you the inclination and azimuth measured at those  
23 two locations and you would calculate that change in  
24 angle and divide it by the length of the path. That's  
25 one method, and there may be many other methods to do

1 so.

2 Q. Let's look at Figure 4 of the '022 patent.

3 A. Yes.

4 Q. Do you see that Step 406 in Figure 4 says  
5 identify curvature cost?

6 A. Yes.

7 Q. Is overall curvature the same thing as  
8 curvature cost?

9 A. I don't know. I don't believe it is. There's  
10 a cost associated with a curvature. It doesn't specify  
11 right there. I believe in the specifications in the  
12 description of 406, they might provide that. You can  
13 point me to that, that would be fine. But it doesn't  
14 say so there. It's -- curvature would be different than  
15 curvature cost, numerically.

16 Q. And just briefly, then, let's look at Column 10  
17 of the '022 patent. And let's look at line 62.

18 A. Column 10, line 62.

19 Q. And this may have been what you're referring  
20 to.

21 Do you see the sentence that starts with "The  
22 curvature cost addresses"?

23 A. I'm in the '022. Line 52?

24 Q. 62. I'm sorry.

25 A. 62.

1               Okay. And you read "The curvature cost  
2 addresses"?

3               Q. Yes.

4               A. Yes, I see that.

5               Q. Would you mind -- would you mind reading  
6 starting with that sentence through the end of that  
7 column for the record?

8               A. "The curvature cost addresses the costs  
9 associated with curves in the path. Such costs" -- oh,  
10 I'm sorry, to the end of the paragraph?

11              Q. Yes, please.

12              A. "Such costs include reaming, casing  
13 requirements, the impact of friction on later well  
14 segments and similar costs. Curvature costs may be  
15 viewed as a mixture of friction, impact, steerage  
16 issues, and launch penalty."

17              Q. Is that what you were referring to or thinking  
18 of when -- scratch that.

19               Is this what you were referring to when you  
20 said that curvature cost considers other factors?

21              A. Yes. My own personal knowledge as a POSITA  
22 and, of course, the description in the specification  
23 here.

24              Q. Thank you.

25               So I would like to next turn to paragraph 57 of

1 your declaration. And this is on page 39 if that's  
2 helpful.

3 A. Okay.

4 Q. Would you -- this is -- scratch that, sorry.

5 In this paragraph, you're addressing your  
6 understanding of the term "offset distance"; correct?

7 A. That's correct.

8 Q. And you state in the first sentence of this  
9 paragraph that offset distance should be construed to  
10 mean an offset distance of a geometric convergence path  
11 relative to the target drilling path; is that right?

12 A. That's correct. That's what I wrote.

13 Q. Is it your opinion that a path has only one  
14 offset distance?

15 A. Yes, it is.

16 Q. Where is that idea reflected in the  
17 construction that we just read?

18 A. My use of the words "an offset distance."

19 (Stenographer interruption/technical  
20 difficulty.)

21 (A lunch recess was taken.)

22 BY MS. OLIVER:

23 Q. Welcome back, Dr. Hilbert.

24 A. Thank you.

25 Q. During the lunch break, did you speak with

1       counsel about the substance of your testimony?

2       A.     No, I did not.

3       Q.     Thank you.

4               So before the break, we were talking about the  
5 term "offset distance"; right?

6       A.     I recall that, yes.

7       Q.     And you stated that your conception of the term  
8 "offset distance" means that there can be only one  
9 offset distance for each path; is that right?

10      A.     That's -- that's correct.

11      Q.     So let's turn to the '022 patent if you will.

12     And let's look at Column 13.

13      A.     All right. I'm at -- I'm at Column 13.

14      Q.     If you look at line 25, do you see that this is  
15 the limitation that we've been discussing?

16      A.     Yes. I believe that is.

17      Q.     And do you see it says, "calculating by the  
18 computer system an offset distance:?

19      A.     Yes, I see that phrase.

20      Q.     Is your opinion that a path can have only one  
21 offset distance based on the use of the word "an" in  
22 this limitation?

23      A.     Yes. And my review of this specification, but  
24 in particular, yes, an offset distance; correct.

25      Q.     Can we turn back to Column 3 of the '022

1 patent?

2 A. Yes. I'm there.

3 Q. And let's look at line 2 through 5.

4 A. Yes.

5 Q. Do you see the sentence beginning with, "for

6 example, from a distance"?

7 A. Yes.

8 Q. Would you please read that sentence for the

9 record.

10 A. "For example, from a distance perspective,

11 Path 108 has a greater length than Path 116. And much

12 of that length is farther from the Target Path 104 from

13 the target path of 110."

14 Q. Thank you.

15 So by saying that much of the length of a path

16 is farther away, does that suggest that different

17 portions of a path may have different offset distances?

18 A. I haven't analyzed the specifications of the

19 patent to determine that precisely. What I can say is

20 that the -- since I haven't done any analysis on that, I

21 can't say that there was a thought process that there

22 were points calculated, and in the end, there's only

23 one -- in the end of whatever that analysis is, there's

24 only one offset distance. That's the way that I viewed

25 that.

1 Q. So can you explain to me how a person of skill  
2 in the art would calculate an offset distance for a  
3 path?

4 A. I would only be able to do that hypothetically.  
5 But in my opinions, I believe that I express that the  
6 offset distance is the distance between the convergence  
7 path and the target path. It may be that it's one --  
8 it's an offset distance. So it's the distance from the  
9 end point, I think, in my opinion, the end of the path  
10 to the target point, the point at which you are trying  
11 to achieve getting close to or at the target path.

12 Q. Dr. Hilbert, I'm going to share another new  
13 exhibit with you that you have not seen before. So give  
14 me one minute and I'll put that in the chat window.

15 A. Okay.

16 Q. I just sent it. Let me know whenever you have  
17 that open.

18       A.    Actually, I see two new things I think that are  
19 there.  No, that's one -- must be my deposition.  The  
20 one from you must be Deposition Exhibit A.

21 (Exhibit A marked for identification.)

22 THE WITNESS: Let's see.

23 Yes, I see it.

24 BY MS. OLIVER:

25 O. This is an annotated copy of Figure 1 of the

1       '022 patent which has been marked as Exhibit A for  
2       purposes of this deposition. And the annotations have  
3       been added by petitioner's counsel.

4                    MR. STAVINOHA: I'm going to object to this on  
5       relevance, authenticity, hearsay.

6       BY MS. OLIVER:

7       Q.     Dr. Hilbert, do you see at the top of that file  
8       the patent number U.S. 9,865,022?

9       A.     Yes, I do.

10      Q.     And do you understand that's the patent number  
11     of the '022 patent?

12      A.     Yes, I do. It is.

13      Q.     And other than the annotations that have been  
14     added in red, do you recognize the rest of Figure 1 as  
15     being Figure 1 of the '022 patent?

16      A.     Yes, I do.

17      Q.     And you understand the annotations added in red  
18     have been added by petitioner's counsel?

19      A.     Yes, I understand that, that you represent  
20     that.

21      Q.     Do you see reference number 104 that's been  
22     circled in red?

23      A.     Yes, I do.

24      Q.     And that represents the target path; correct?

25      A.     That's correct. As we -- as I testified

1       earlier today.

2       Q.     And do you see that Target Path 104 has been  
3       annotated with A2 through G2?

4       A.     Yes, I do see that.

5       Q.     All right. And do you see Path 108 that's also  
6       been circled in red?

7       A.     Yes, I do.

8       Q.     And you also see that Path 108 has been  
9       annotated with A1 through G1?

10      A.     Yes, I understand that you're representing that  
11       those -- those red numbers are associated with Path 108.

12      Q.     Looking at this annotated version of Figure 1,  
13       would you please explain how to calculate the offset  
14       distance of Path 108?

15            MR. STAVINOHA: Objection. Beyond the scope.

16            THE WITNESS: I haven't analyzed how a proposed  
17       calculation method for determining offset distance. I  
18       interpret or construe as I've shown before or talked  
19       about before, there is one offset distance between each  
20       of the convergence paths and the Target Path 104. I do  
21       not know and I'm not prepared to explain the calculation  
22       method for how that distance is precisely calculated,  
23       just beyond -- beyond the scope of the work that I did  
24       for my declaration. But in my opinion, it is one --  
25       it's one offset distance corresponding to some as yet

1 undetermined points on the car point or characterizing  
2 the convergence paths to the target path.

3 BY MS. OLIVER:

4 Q. Is offset distance a standard calculation in  
5 the industry?

6 MR. STAVINOHA: Objection. Form.

7 THE WITNESS: It's a term that I -- in my  
8 opinion, a POSITA would understand. It is not a  
9 standard, that is to say the American Petroleum  
10 Institute and other books one might have on well design,  
11 for example, may define it differently. But I don't  
12 think there's any standard way to do it. It's left up  
13 to the interpretation of the POSITA or the engineer.

14 BY MS. OLIVER:

15 Q. So there's no typical way in the industry to  
16 calculate offset distance?

17 A. Not to my knowledge. It depends on the  
18 objective in this -- in this particular case, the  
19 objective is to find the distance between the  
20 convergence paths and the target path. And so depending  
21 on how you want to do that, you could come up with a  
22 number that represents that. But I don't believe that  
23 there is any, quote/unquote, standard method to do that.

24 Q. Does the '022 patent describe how to calculate  
25 offset distance?

1           A. Not specifically in my recollections of reading  
2 it and in my declaration is there a specification on how  
3 to do that. It's merely that it's from the convergence  
4 path to the target path.

5           Q. So looking at this annotated version of the  
6 Figure 1 that we have as Exhibit A, is there an offset  
7 distance from what we have marked as A-1 to A-2?

8           MR. STAVINOHA: Scope.

9           THE WITNESS: One would only hypothetically  
10 and, for example, say that there is a distance between  
11 the Points A-1 and A-2. But I don't know that we are  
12 showing a precise location of where A-1 is nor where A-2  
13 is.

14 BY MS. OLIVER:

15           Q. I'm sorry, I'm not sure I understood that.

16           So is A-1 in this annotated figure a point on  
17 Path 108?

18           A. I don't know what was in the head of the people  
19 who put those on there. But if you say that it's a  
20 point on Path 104 by definition, there's no -- there's  
21 just the A2 is standing out there in space by itself but  
22 not pointing to a distinct point on the path.

23           Q. So let's assume that A1 is a distinct point on  
24 Path 108 and that A-2 is a distinct point on Path 104.  
25 Is that okay?

1           A. Hypothetically, we can accept that hypothesis.

2           Q. Okay.

3           A. Or assumption that there are points that it's  
4 representing.

5           Q. So would the distance between A-1 and A-2 in  
6 that hypothetical represent a distance between Path 108  
7 and Path 104?

8           A. It could have a length, yes. A length  
9 connecting two points so it would have a length.

10          Q. And let's assume that E-1 is also on Path 108  
11 as a distinct point and that E-2 is a distinct point on  
12 Path 104 as a hypothetical. Is that okay?

13          A. Hypothetically, there could be points that you  
14 would assume on Path 108 and Path 104 that are on those  
15 paths and the coordinates of those would be on those  
16 paths.

17          Q. And would the distance between E-1 and E-2 be  
18 less than the distance between A-1 and A-2?

19           MR. STAVINOHA: Objection. Beyond the scope.

20           THE WITNESS: Only if you assume that all of  
21 those lines are in two-dimensional space on a flat plane  
22 of paper. Bearing in mind that it could be three  
23 dimensions going into or out of the page. And so then  
24 it would -- it would be impossible to tell from this  
25 rendering which is longer relative to each other.

1 BY MS. OLIVER:

2 Q. But it would be possible that the length of E-1  
3 to E-2 is less than A-1 to A-2?

4 A. If it's defined as in the same plane, that's  
5 possible to make that interpretation. But it's  
6 impossible given that I know that drilling paths are  
7 generally three dimensional and have another component  
8 coming out of the paper. So to make that analysis  
9 requires many assumptions that I can't make because of  
10 the -- because of that rendering. It's a very, very  
11 hypothetical situation.

12 Q. So in a three-dimensional example, is it  
13 possible to have a set of points on one path -- let me  
14 start that over.

15 In a three-dimensional example, is it possible  
16 to have a point on a first path and a corresponding  
17 point on a second path where the distance between those  
18 two points is longer than a second point on the first  
19 path and a second corresponding point on the second  
20 path?

21 MR. STAVINOHA: Objection. Form. Beyond the  
22 scope.

23 THE WITNESS: Hypothetically and theoretically,  
24 yes.

25

1 BY MS. OLIVER:

2 Q. So is an offset distance measured in length?

3 A. Distance is generally defined as a length. So  
4 I interpret it as a length; although, I don't think that  
5 the claims limit it to a length. I mean, as we  
6 discussed in some of these other associated costs, the  
7 cost of an offset length, the cost of curvature,  
8 et cetera, that there could be other definitions for  
9 offset. But if you specify offset length or offset  
10 distance, you would be thinking of a length in some  
11 measurement of length and units of length.

12 Q. So since it's possible for two paths to have  
13 sections that have different lengths between the two  
14 paths, how would you calculate an offset distance in  
15 that circumstance?

16 MR. STAVINOHA: Objection. Form.

17 THE WITNESS: Describe what you mean by  
18 "sections."

19 BY MS. OLIVER:

20 Q. Sure.

21 So we can take the example that we were  
22 discussing earlier. So if you can look at this  
23 annotated version of Figure 1 and look at Paths 104 and  
24 108 and assume these are in a three-dimensional space to  
25 account for the situation you were referring to, you

1 stated earlier that in the three-dimensional context, it  
2 would be possible for the distance between A-1 and A-2,  
3 for example, to be longer than the distance between E-1  
4 and E-2; correct?

5 MR. STAVINOHA: Objection. Form.

6 THE WITNESS: Hypothetically, I stated that  
7 before if it's in two dimension and giving a set of  
8 assumptions, that could be true.

9 BY MS. OLIVER:

10 Q. And that could be true in three dimensions as  
11 well?

12 MR. STAVINOHA: Objection. Form.

13 THE WITNESS: Based on the previous assumption  
14 describing sections as you have described them, yes, you  
15 could -- that would be true. That could be true.

16 BY MS. OLIVER:

17 Q. And so in that circumstance where that could be  
18 true, how would you calculate the offset distance  
19 between those two paths?

20 MR. STAVINOHA: Objection. Form.

21 THE WITNESS: Hypothetically, each of those  
22 lengths would be different and you could compare those  
23 two lengths.

24 BY MS. OLIVER:

25 Q. And which one of those two lengths would be the

1 offset distance?

2 A. In my opinion that I've discussed previously,  
3 that we don't calculate multiple offset distances. You  
4 have one offset distance that you have defined for the  
5 procedure and the specifications although there's not  
6 really a procedure for doing that as I've discussed  
7 before. But while theoretically and hypothetically, you  
8 can compare two -- two points to two points on the  
9 target path and on the hypothetical convergence path.  
10 One would have to convert that in some way. I don't  
11 know.

12 But you -- in the end, you have just one offset  
13 number. And how that offset number is calculated, I'm  
14 not prepared to opine on because I've not done that  
15 analysis. All I know from my analysis of the patent is  
16 that it's one number characterizing the offset distance  
17 between the con- -- a convergence path or paths and  
18 Target 104.

19 Q. Would you please help me understand how you  
20 would convert the offset distance to be just one number?

21 A. No, I can't in this deposition. I haven't  
22 performed that analysis so I haven't, say, made an  
23 example showing how that would be calculated. I simply  
24 haven't done that. All I'm doing within this  
25 declaration is responding to the arguments of the

1 petition.

2 Q. So you are construing the term "offset  
3 distance" as just one offset distance for each path;  
4 correct?

5 A. That's correct.

6 Q. Are you able to explain how you can determine  
7 the one offset distance?

8 A. Regardless of how you characterize it, I  
9 don't -- I haven't performed an analysis to determine  
10 how I would want to, say, calculate it. But regardless  
11 of how it's calculated, it's just one offset distance  
12 characterizing that path to the Target Path 104. And I  
13 can't, as I sit here today, explain to you how I would  
14 do that. Because I have not done that analysis.

15 Q. Well, let's look at the '022 patent a little  
16 further, then.

17 Would you look at Figure 5-A, please, of the  
18 '022 patent.

19 A. Yes. I will bring it up.

20 Figure 5-A. Yes.

21 Q. Do you see Step 508 in Figure 5-A?

22 A. Box 508?

23 Q. Yes.

24 A. Yes.

25 Q. Do you see it says "identify distance of

1 segment from target path"?

2 A. Yes, I see that.

3 Q. Can you explain how that identification of the  
4 distance is performed?

5 A. An explanation would only be exemplary.

6 Hypothetical, the specification does not prescribe a  
7 detailed methodology for that. But there is a paragraph  
8 for Box 508 that discusses breaking down or breaking  
9 down a path into segments of length and then identifying  
10 a -- for 508, identify distance of segment from target  
11 path. It does not specify precisely how to do that. It  
12 just says that for each of those segments, there's an  
13 offset. Didn't say offset distance but there is a  
14 distance for each of those segments to the path, target  
15 path.

16 Q. Does Figure 5 refer to an overall offset  
17 distance?

18 MR. STAVINOHA: Object to form.

19 THE WITNESS: No, it doesn't read that in  
20 Figure 5. There's no -- there are no words saying  
21 overall offset distance in Figure 5A.

22 BY MS. OLIVER:

23 Q. Is there anything in the '022 patent or  
24 '506 patent specifications that explains how to  
25 calculate an offset distance of a path as a whole?

1           A. I don't believe that there is any description  
2 of -- the two words "overall offset distance" -- the  
3 three words, excuse me, "overall offset distance," I  
4 don't believe appears. We can look. And you can show  
5 me if there is, but I don't believe -- similar to  
6 overall curvature, I don't believe that there is an  
7 overall offset distance that I can remember as I sit  
8 here right now.

9           Q. Let's turn to Column 13 of the '022 patent,  
10 please.

11          A. Yes, I'm there.

12          Q. Let's look at lines 25 through 28.

13          A. Yes. I'm there.

14          Q. This is the same limitation that came --  
15 contains the term "offset distance" that we've been  
16 discussing?

17          A. That's correct.

18          Q. Do you see the language in this limitation that  
19 says "connecting the BHA location to the target drilling  
20 path"?

21          A. Yes, I do.

22          Q. What does that language modify in this  
23 limitation?

24          A. One second. The offset distance. It's telling  
25 you --

1 Q. And why --

2 A. -- from where to where.

3 Q. Why does that modify an offset distance?

4 A. It's telling you that there is an offset

5 distance. And that offset distance connecting the

6 bottom hole assembly location to the target drilling

7 path is the way that I read it.

8 Q. Why wouldn't that language beginning with the

9 word "connecting" modify the word "geometric convergence

10 path"?

11 A. Well, I guess it's -- I consider it to be -- I

12 consider it to be describing the offset distance, which

13 is a characteristic of the distance between bottom hole

14 location, which is on the drilling path, or the

15 convergence path, and the target path. So, yes, in some

16 respect, I would agree that it's modifying convergence

17 path, but an offset path is really that one distance.

18 And I'm saying that it's -- they're then showing what

19 that distance is connecting. So in a sense, yes, part

20 of that is the convergence path.

21 Q. I understand. Thank you.

22 Okay. Let's turn back to your '022

23 declaration. Let's look at paragraph 105.

24 A. Almost there.

25 Okay. 105 is at the top of the page on

1 page 79.

2 Q. Do you see the first sentence in paragraph 105  
3 that says, "A POSITA would not have been motivated to  
4 modify Pirovolou to minimize deviation from geologic  
5 targets because there is no deviation to minimize"?

6 A. Yes, I do. I see that. You read it correctly.

7 Q. Is that conclusion based on your reasoning from  
8 two sentences later that says, "Each of the possible  
9 trajectory calculated in Pirovolou begins from the same  
10 position and ends at the target"?

11 A. Yes. That's correct.

12 Q. You have read Pirovolou in its entirety;  
13 correct?

14 A. Yes, I recall that I did.

15 Q. And you are comfortable testifying about what  
16 Pirovolou discloses?

17 A. As comfortable as I can be, yes.

18 Q. Is it your position that Pirovolou's paths  
19 always intersects the target?

20 A. In Pirovolou, he discusses two points, A and T.  
21 There are other places in Pirovolou where he discusses  
22 an intermediate point, I believe it is, B, as in "Brun."  
23 So A to B unspecified and T could be points on those  
24 paths. But his analysis, or at least my opinion of his  
25 analysis, he is going from a Point A to, for example, a

1 Point T. But there could also be an intermediary --  
2 intermediate Point B.

3 Q. And your position is that Pirovolou's paths  
4 always intersect the target, whether that's B or T?

5 MR. STAVINOHA: Object to form.

6 THE WITNESS: I would have to take a look at  
7 Pirovolou's patent to recall what his definition of that  
8 intermediate point is. But his solutions, in my  
9 opinion, or paths that he describes go from a point to  
10 another predetermined point, whether that's Point B or  
11 Point T.

12 BY MS. OLIVER:

13 Q. So let's look again at paragraph 105 in your  
14 declaration. The last sentence before Figure 3, do you  
15 see that?

16 A. Yes.

17 Q. And do you see it says, "As seen below, each of  
18 optional Trajectory 28 and 30 in Figure 3 below  
19 intersects the Target T"?

20 A. Yes, I see that.

21 Q. So is your conclusion that there is no  
22 deviation to minimize based on this reasoning that the  
23 paths always intersect the Target T?

24 A. Yes. That's my conclusion.

25 Q. Would you mind pulling up Pirovolou for just a

1 minute? We have not looked at it today. It is --

2 A. That's -- go ahead.

3 Q. It is Exhibit 1006.

4 A. Okay. I have it. Yes.

5 Q. Would you look at paragraph 36.

6 A. Yes, I'm there.

7 Q. Do you see the sentence in the middle of the

8 paragraph starting with "as illustrated in this

9 example"?

10 A. I see that.

11 Q. Would you mind reading that sentence for the

12 record.

13 A. Yes.

14 "As illustrated in this example, the

15 Trajectory 28 may have been a traditionally selected and

16 planned path and may have resulted in Well Bore 2

17 failing to strike Target T due to the drilling

18 limitation of the particular installation."

19 Q. Do you understand that sentence to mean that,

20 in some examples, Trajectory 28 may not strike the

21 Target T?

22 A. If it's a trajectory, yes. He's describing

23 that there may be, hypothetically or exemplary, a

24 Trajectory 28 being drilled that fails to strike the

25 Target T.

1           Q. Let's turn to paragraph 110 of your  
2 declaration.

3           A. 110.

4           Q. Are you there?

5           A. Yes, I'm here.

6           Q. Do you see where you have emphasized the phrase  
7 "total measured depth of all of the well trajectories"  
8 in this paragraph?

9           A. Yes, I see that.

10          Q. What would "measured depth" mean to a person of  
11 skill in the art?

12          A. The length of drill pipe between two points.

13          Generally, the total measured depth on the length of  
14 drill pipe from the surface, where the drill bit or  
15 bottom hull assembly is at that time. So it is the  
16 length of drill pipe as opposed to a vertical depth  
17 which is just the depth below the surface as a straight  
18 line rather than a drilling path.

19          Q. Do you see the sentence in paragraph 110 of  
20 your declaration in the middle of the paragraph that  
21 starts with "Thus, a POSITA would have viewed"?

22          A. Yes, I see the beginning of that sentence.

23          Q. And do you see the following sentence that  
24 says, "Pirovolou's method, however, already takes depth  
25 into account"?

1           A. Yes, I see that.

2           Q. And immediately after that sentence, you have

3        quoted a portion of Pirovolou's paragraph 31; is that

4        correct?

5           A. Yes, that's correct.

6           Q. And that quoted portion of Pirovolou's

7        paragraph 31 refers to depth; correct?

8           A. And we're speaking of the -- within -- within

9        the parenthesis?

10          Q. Yes. That's correct.

11          A. Drilling conditions and formation

12        characteristics may include data related to formation

13        evaluation, properties, comma, drilling measurements,

14        comma, such as depth, et cetera. But yes, such as

15        depth; correct.

16          Q. So what type of depth measurement is it

17        referring to -- is Pirovolou referring to in that

18        sentence?

19          A. I would have to refer to Pirovolou's -- we

20        would need to go to that specific sentence in Pirovolou

21        rather than me guessing.

22          Q. Sure. We can do that.

23          A. There's obvious -- there -- go ahead.

24          Q. I was going to say if it's easier for you, we

25        can turn to paragraph 31 of Pirovolou.

1           A. Yeah, I think we -- well, clearly, still up but  
2 let me grab it.

3                   Paragraph which did you say?

4           Q. It's paragraph 31.

5           A. 31. Okay. Hold on one second and I will find  
6 that.

7                   Yes, paragraph 31.

8                   It does not specify which depth he is speaking.

9                   It merely says such as depth, drilling conditions, and  
10 formation characteristics may include data related to  
11 the formation of valuation properties, drilling  
12 measurements such as depth, temperature, drilling fluid  
13 pressure, drilling fluid density and drilling fluid  
14 flow, rate of penetration and a number of others.

15                   It does not specify in that sentence whether he  
16 is speaking of total measured depth or vertical depth.

17           MS. OLIVER: I don't have a lot of questions  
18 left to cover. But I know that we're approaching about  
19 an hour. So maybe let's go ahead and take a break if  
20 that's okay with you. And then we can come back and  
21 hopefully wrap things up.

22           THE WITNESS: Certainly.

23           MS. OLIVER: Let's take a ten-minute break.  
24 It's 2:36 Eastern. Let's be back at 2:46 Eastern.

25                   (A recess was taken.)

1 BY MS. OLIVER:

2 Q. Welcome back, Dr. Hilbert.

3 A. Thank you.

4 Q. During the break, did you speak with counsel  
5 about the substance of your testimony?

6 A. No.

7 Q. Thank you.

8 Okay. Let's turn to paragraph 112 of your  
9 declaration.

10 A. Yes, I see it.

11 Q. And in the first sentence of paragraph 112, you  
12 conclude that a POSITA would not have had a reasonable  
13 expectation of success in making the combination;  
14 correct?

15 A. That's correct. That's what it reads.

16 Q. And is that because, as you say in the next  
17 sentence, Budiman describes a complex optimization model  
18 involving optimizing an objective function?

19 A. That's correct.

20 Q. Can you explain what an "objective function"  
21 is?

22 A. An optimization theory? It's a mathematical  
23 method, a function is developed having a number of  
24 parameters or variables that describe the state in  
25 general of a system. In this case, the drill pipe and

1 the drilling process.

2                   And then you perform essentially approximations  
3 of that function or that function itself and taking  
4 partial derivatives of that function to optimize the  
5 solution to that function given prescribed conditions  
6 which are called constraints.

7                   And so that's what an objective function is,  
8 describe the state of the system and then you try and  
9 find the optimal solution from that objective function  
10 by a mathematical process of taking partial derivatives,  
11 according to constraints, solving it according to  
12 constraints.

13                Q. So are objective functions commonly used to  
14 solve optimization problems such as minimizing costs?

15                A. Reasonably often. It is a mathematical  
16 technique. Optimization is a broad category of  
17 mathematical subjects. And optimization theory can be  
18 used for optimizing cost or optimizing strength of a  
19 material or many other things. Optimizing a certain  
20 desired result.

21                Q. So what makes Budiman's use of an objective  
22 function so complex as you say in paragraph 112?

23                A. Well, in Budiman, he has many parameters that  
24 go into that objective function. Some of those  
25 parameters in particular, or embodiments as I understand

1 reading Budiman, may be based on probability and the  
2 statistics of data or it would be called a stochastic  
3 method to characterize uncertainties.

4 So while a POSITA might understand the use of  
5 an objective function and the use of optimization  
6 theory, trying to determine, from reading Budiman, how  
7 that might apply to or present a motivation to combine  
8 or modify Pirovolou, I think, in my opinion, would be  
9 difficult and would lack a reasonable expectation of  
10 success from reading his patent.

11 Q. I see.

12 So would you look at Budiman, if you will.

13 That's Exhibit 1005.

14 A. I have it up on my screen.

15 Q. Would you look at the bottom of Column 4  
16 beginning with the sentence that says "these  
17 uncertainties."

18 A. I see that, yes, at the bottom. It begins with  
19 "these uncertainties."

20 Q. I'm going to read the sentence, make sure I  
21 just read it correctly.

22 "These uncertainties and the well trajectory  
23 evolve over time and can be considered directly within  
24 an optimization model which may include a Markov  
25 decision process-based model otherwise known as a

1       stochastic dynamic programming model, SDP."

2               Did I read that correctly?

3       A.    You read that correctly.

4       Q.    Is this what you were referring to a minute ago  
5 when you said "stochastic"?

6       A.    Yes, that's correct.

7       Q.    Okay.

8       A.    That's where I was referring to stochastic.

9       Q.    I just wanted to make sure I understood that  
10 word.

11               In your opinion, would a person of ordinary  
12 skill in the art know how to compare distances between  
13 points on two paths?

14               MR. STAVINOHA: Objection. Form.

15               THE WITNESS: Repeat the question, please.

16 BY MS. OLIVER:

17       Q.    Sure.

18               In your opinion, would a person of ordinary  
19 skill in the art understand how to compare distances  
20 between points on two paths?

21               MR. STAVINOHA: Objection. Form.

22               THE WITNESS: Well, we don't -- you haven't  
23 defined in general what path is. But I would expect a  
24 POSITA or somebody skilled in the art that has a  
25 mechanical engineering or petroleum engineering to have

1 taken a course which teaches them how to calculate  
2 distances between points. And whether those are on two  
3 different curves or paths, as we will call it, would be  
4 something that I would expect somebody to know how to do  
5 if they have that degree, bachelor's degree in math --  
6 in mechanical and petroleum engineering.

7 BY MS. OLIVER:

8 Q. So let's take a look for a minute at  
9 Exhibit 1014, which I shared with you earlier today.

10 A. Yes, I have it up.

11 Q. Would you look at page 213. And if you're  
12 looking at the PDF version, that's PDF page 44.

13 A. Okay. I'll go there.

14 Page 44, yes, I see it.

15 Q. Are you familiar with this Exhibit 1014?

16 A. Generally, yes. Of course, I have reviewed  
17 this document before. But, yes, I'm familiar with  
18 Landmark and some of their products.

19 Q. Are you familiar with the software that's  
20 discussed in this user guide?

21 A. Generally, yes.

22 Q. Is that software something that someone  
23 planning a well path would have used to assist with  
24 their well path planning?

25 A. I believe so.

1           Q.    Would someone using that software have relied  
2 on this user guide to understand how to use that  
3 software?

4           A.    I'm sorry. Ask that question again.

5           Q.    Would someone using the Landmark software have  
6 relied on this user guide in Exhibit 1014 to understand  
7 how to use the software?

8           A.    I believe so. If I interpret your question  
9 correctly, if an engineer is using the software and he  
10 has a question in his mind about how to use the  
11 software, he goes to the user guide. So, yes, this  
12 would be used to assist a person using the software to  
13 use it effectively and correctly.

14          Q.    So looking at page 213 of this document that we  
15 just pulled up --

16          A.    Yes.

17          Q.    -- do you see that -- I'm sorry.

18          A.    Yes, I see it.

19          Q.    Do you see that the title of this page is  
20 "Viewing A Proximity Report"?

21          A.    Yes, I see that.

22          Q.    And do you agree that this proximity report  
23 measures the distance between two well paths?

24          A.    From reviewing the document, that's my  
25 understanding, yes.

1           Q.    Let's switch now back to your '022 declaration.  
2   I'm sorry to make you jump around.

3           A.    '022.  No, that's fine.  However you want to do  
4   this.

5                Okay.  I'm there.

6           Q.    Can we look at paragraph 123 of your  
7   declaration.

8           A.    Yes, I will get there.

9                Okay.  I'm there.

10          Q.    Do you see Figure 1-B from Budiman that you  
11   have included in this paragraph?

12          A.    Yes, I do.

13          Q.    And do you see the variable called "drilling  
14   time" in Figure 1B?

15          A.    Yes, I do.

16          Q.    And do you see the arrow pointing from  
17   "drilling time" to "cost" in Figure 1-B?

18          A.    Yes, I do.

19          Q.    So is it your understanding that the arrow  
20   means that drilling time influences the cost of drilling  
21   a well?

22          A.    Yes, it's not the only thing that -- that  
23   drives the cost of drilling a well.  Drilling time is  
24   one of -- as you can see in this spider chart, I'll call  
25   it a spider chart, is one of many, many parameters or

1 many, many influences on the cost. But drilling time is  
2 one of them.

3 Q. So based on your experience in the industry,  
4 how does drilling time influence the cost of drilling a  
5 well?

6 A. The -- for example, the rig -- an operator most  
7 frequently rents the rig from a rig company, and that is  
8 rented or leased at an hourly rate so the longer you're  
9 drilling, the higher the cost to rent that rig would be  
10 an example of how drilling time would influence the  
11 cost.

12 Q. Let's return to the Budiman patent if you will,  
13 Exhibit 1005.

14 A. Yes, I'm there. It's open.

15 Q. Would you please look at Column 6 starting at  
16 line 2.

17 A. I'm looking at it.

18 Q. Do you see the sentence beginning with "each  
19 time one"?

20 A. Yes, I do.

21 Q. Would you mind reading that sentence and the  
22 sentence right after it for the record.

23 A. Yes.

24 "Each time one or more parameters is changed,  
25 new candidate solution is generated and an objective

1 score is calculated. Objective score may be cost,  
2 stability of success, total time to drill the well,  
3 et cetera."

4 Q. Thank you.

5 Do those two sentences mean that the total time  
6 to drill the well is being calculated?

7 A. I don't know that I can say definitively that  
8 it's being calculated -- repeat the question one more  
9 time, please, make sure I answer the correct question.

10 Q. Sure.

11 Do those two sentences that you just read mean  
12 that the total time to drill the well is being  
13 calculated?

14 A. In my understanding, Budiman is, as we  
15 discussed a moment ago, constructing this objective  
16 function in which time may -- drilling time may be one  
17 of the variables in that objective function. And so  
18 that objective function and the variables within it are  
19 constrained to meet certain parameters, like curvature,  
20 more time, more costs, or rate of penetration or -- or  
21 operating time of pumps, et cetera, et cetera. So those  
22 many, many parameters are in.

23 Subject to those constraints, one of the  
24 objective scores within that set of constraints may be  
25 cost. So to me, it's not -- that's -- that's part of

1 overall structure of the function -- governing function.  
2 But it's not calculating -- it may not be, in my  
3 opinion, calculating the time for each of the -- of a  
4 drill path. It just comes out with a cost based on  
5 those constraints.

6 I don't think Budiman says that he's  
7 calculating the cost of each and every path. It's just  
8 an output from his system, his method using that  
9 stochastic dynamic method of the objective function.

10 The result of that objective function is a path  
11 that can meet cost constraints and a number of other  
12 constraints.

13 Q. So looking at those two sentences that you read  
14 in Column 6, lines 2 through 6, what does the word  
15 "objective score" mean?

16 A. I don't know. I would have to search this  
17 patent again to remind myself if he defines "objective  
18 score." That wasn't part of my analysis.

19 I am certainly aware of people having scores  
20 to -- to rank certain values of variables. But I don't  
21 know exactly what he means by "objective score." We  
22 would have to look. If you can -- if you would like to  
23 direct me to an area that defines it, I don't recall.  
24 But I think I understand what he's getting at generally.

25 Q. Let me just direct you to Column 2 of Budiman

1 starting at line 18.

2 A. Column 2, line 18.

3 Yes, I see that.

4 Q. And would you just -- this is a long paragraph.

5 So would you just take a moment to read lines 2 --  
6 sorry -- Column 2, lines 18 through 31, and let me know  
7 when you're finished.

8 A. Okay. I've read that.

9 Q. So do you see in that paragraph, there are  
10 three concepts: One, a decision -- excuse me, one,  
11 decision variables; two, constraint equations; and  
12 three, an objective function?

13 A. Yes, I read that.

14 Q. Can you help me understand where the total time  
15 to drill the well fits into those buckets?

16 MR. STAVINOHA: Objection. Form.

17 THE WITNESS: One of the decision variables in  
18 Item 1 might be time, drilling time, or total drilling  
19 time in theory. For drilling the path that he is trying  
20 to solve for.

21 Time may appear in the constraint equations.  
22 It may constrain the amount of time that you want to  
23 drill. And of course, the objective function may  
24 have -- may be dependent upon a time, such as drilling  
25 time. So time would be in there in some form or

1 another -- in some form if the user decides to use  
2 drilling time as one of the variables to solve for and  
3 constrain.

4 BY MS. OLIVER:

5 Q. And so where does the concept of an objective  
6 score that we saw in Column 6, where did that fit into  
7 the concept of decision variables, constraint equations,  
8 and then objective function?

9 MR. STAVINOHA: Form.

10 THE WITNESS: I don't recall, as I sit here  
11 right now, seeing the objective score defined in here.  
12 I would only be speculating if I said I did.

13 BY MS. OLIVER:

14 Q. Let's just return briefly to Column 6.

15 So do you agree with me in Column 6, line 4,  
16 that Budiman says an objective score is calculated?

17 A. Yes, I agree that that's what it reads. It  
18 reads at line 4, an objective score is calculated.

19 Q. And do you agree that the following sentence  
20 says, The objective score may be cost, probability of  
21 success, total time to drill the well, et cetera?

22 A. Yes, you read that correctly.

23 Q. So the total time to drill the well is -- can  
24 be an objective score?

25 A. Yes, that would be my understanding of the

1 sentence. It would be one of many objective scores, but  
2 total time to drill the well could be one.

3 Q. Okay.

4 MS. OLIVER: Clarke, I think that may be all  
5 the questions I have. Would it be okay if I have just  
6 about five minutes to look through my notes and make  
7 sure I've not missed anything?

8 MR. STAVINOHA: Sure.

9 MS. OLIVER: Let's go off the record now at  
10 3:13 Eastern and we will come back by 3:18.

11 (A recess was taken.)

12 MS. OLIVER: Let's go back on the record.

13 I'm finished with my set of questions so at  
14 this time, I have nothing else to ask.

15 THE WITNESS: Thank you.

16 MR. STAVINOHA: If you will give us about  
17 15 minutes, let me take a look at my notes and we will  
18 see if we have any questions for Dr. Hilbert.

19 MR. BOWSER: That sounds good. So what time is  
20 that, 3:34 Eastern?

21 MR. STAVINOHA: Let's say 3:35 Eastern.

22 MR. BOWSER: All right. See you then. Thank  
23 you.

24 (A recess was taken.)

25 MR. STAVINOHA: All right. We are ready to go

1 back on the record whenever everyone else is.

2 MS. OLIVER: We are ready.

3 MR. STAVINOHA: Dr. Hilbert, thank you for your  
4 time today. We have no further questions. We can go  
5 off the record.

6 THE WITNESS: Thank you.

7 THE STENOGRAPHER: I just have to ask if there  
8 are any other pertinent matters or stipulations that you  
9 need on the record?

10 MR. STAVINOHA: We will reserve the right to  
11 read and sign. Other than that, no stipulations from  
12 us.

13 THE STENOGRAPHER: Thank you.

14 (Discussion held off record.)

15 FURTHER EXAMINATION

16 BY MS. OLIVER:

17 Q. Dr. Hilbert, when I came on the record earlier  
18 on my first session, I forgot to ask if you had spoken  
19 with counsel about your testimony during the break  
20 earlier today.

21 A. No, we did not.

22 MS. OLIVER: All right. Thank you very much.

23 I also want to say thank you very much for your  
24 time today. It's been a pleasure talking to you.

25 THE WITNESS: Thank you very much.

THE SULLIVAN GROUP OF COURT REPORTERS

123

1 MS. OLIVER: Thanks. We can go off the record.

2 - - -

3 (Deposition was concluded at 2:37 p.m.)

4 - - -

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

THE SULLIVAN GROUP OF COURT REPORTERS

124

1 DEPONENT'S CHANGES OR CORRECTIONS

2 Note: If you are adding to your testimony, print the  
3 exact words you want to add. If you are deleting from  
4 your testimony, print the exact words you want to  
5 delete. Specify with "Add" or "Delete" and sign this  
6 form.

7 DEPOSITION OF: L. BRUN HILBERT, JR., Ph.D., P.E.

8 CASE: NABORS DRILLING V MOTIVE DRILLING

9 DATE OF DEPOSITION: JANUARY 6, 2023

10 PAGE LINE CHANGE/ADD/DELETE/REASON

11 \_\_\_\_\_

12 \_\_\_\_\_

13 \_\_\_\_\_

14 \_\_\_\_\_

15 \_\_\_\_\_

16 \_\_\_\_\_

17 \_\_\_\_\_

18 \_\_\_\_\_

19 \_\_\_\_\_

20 \_\_\_\_\_

21 \_\_\_\_\_

22 \_\_\_\_\_

23 \_\_\_\_\_

24 \_\_\_\_\_

25 Deponent's Signature \_\_\_\_\_ Date \_\_\_\_\_

**Declaration Under Penalty of Perjury**

4 I, L. BRUN HILBERT, JR., Ph.D., P.E., the  
5 witness herein, declare under penalty of perjury that I  
6 have read the foregoing in its entirety; and that the  
7 testimony contained therein, as corrected by me, is a  
8 true and accurate transcription of my testimony elicited  
9 at said time and place.

13 (city) (state)

19 L. BRUN HILBERT, JR., Ph.D., P.E.

1 State of California )  
2 ) ss  
3 County of San Diego )  
4

5 I, LYNETTE M. NELSON, CSR No. 11585, RPR, CRR,  
6 CCRR, CRG, duly licensed and qualified in and for the  
7 State of California, do hereby certify that there came  
8 before me on the 6TH day of JANUARY, 2023, via remote  
9 videoconference technology, the following named person,  
10 to-wit L. BRUN HILBERT, JR., Ph.D., P.E., who was duly  
11 sworn to testify the truth, the whole truth, and nothing  
12 but the truth of knowledge touching and concerning the  
13 matters in controversy in this case; and that he was  
14 thereupon examined under oath and his examination  
15 reduced to typewriting under my supervision; that the  
16 deposition is a true record of the testimony given by  
17 the witness.

18 I further certify that pursuant to FRCP Rule  
19 30(e)(1) that the signature of the deponent:

20 (X) Was requested by the deponent or a party  
21 before the completion of the deposition;

22 ( ) was not requested by the deponent of a  
23 party before the completion of the deposition.

24 I further certify that I am neither attorney or  
25 counsel for, nor related to or employed by any of the

THE SULLIVAN GROUP OF COURT REPORTERS

127

1 parties to the action in which this deposition is taken,  
2 and further that I am not a relative, employee of any  
3 attorney or counsel employed by the parties hereto, or  
4 financially interested in the action.

5 CERTIFIED TO BY ME on this 12TH day of JANUARY,  
6 2023.

7   
8

9 LYNETTE M. NELSON,  
10 CSR No. 11585, RPR, CRR, CCRR,  
11 CRG, REALTIME SYSTEMS ADMIN.

12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

THE SULLIVAN GROUP OF COURT REPORTERS

128

<b>Exhibits</b>	<b>1-B</b> 116:10,17	<b>108-B</b> 78:9,11 80:5,22	<b>15</b> 30:12,14,15 73:8 122:17
<b>Hilbert Jr., Ph.D.</b>	<b>1.2</b> 32:5	<b>108-b's</b> 79:23	<b>16</b> 30:13
<b>Exhibit A</b> 4:11 90:20,21 91:1 94:6	<b>1.3</b> 32:6 63:20	<b>11</b> 27:21 58:17 59:3 69:21, 22 80:11	<b>18</b> 27:20 29:7 31:14 120:1, 2,6
<b>Hilbert Jr., Ph.D.</b>	<b>1.4</b> 32:6	<b>110</b> 49:12 89:13 107:1,3,19	<b>1981</b> 13:16
<b>Exhibit B</b> 4:12 75:10,14 76:20 80:20 82:6 83:16	<b>1.5</b> 32:7	<b>112</b> 49:12 110:8,11 111:22	<b>1992</b> 13:16
<b>-o0o-</b> 5:3	<b>10</b> 31:14 58:17,18,19,20, 24 59:3 73:6 85:16,18	<b>114</b> 49:12 82:7,9,17 83:4	<b>1996</b> 13:11
<b>0</b>	<b>100</b> 16:13,16	<b>116</b> 49:12 89:11	<b>1B</b> 116:14
<b>022</b> 12:9 15:7,18,21 16:1,3, 11,13,18 17:13 19:7 22:5,24 23:11 26:21,24 27:4,8,16,20 29:15,22 30:10 31:3,9,19,24 32:3,21 36:10 37:13,16, 18 38:4,8 42:11 45:23 46:15 47:1,16 48:13 49:19 52:11 54:1,5 55:13,17 56:21,24 57:18 58:7,24 60:7 61:24 64:2,8 65:21 66:9 67:12,13,19 68:10,21 69:3,6 74:6 75:12,20 76:1 80:8,12 83:12,13, 14 85:2,17,23 88:11,25 91:1,11,15 93:24 100:15,18 101:23 102:9 103:22 116:1,3	<b>1001</b> 22:23 23:15 46:21 47:1	<b>118</b> 49:12,24 50:3 51:10	<b>2</b>
	<b>1005</b> 24:3,17,21 112:13 117:13	<b>1005</b> 76:21,23 77:5,10,18 78:13,18 79:3,9	<b>2</b>
	<b>1006</b> 24:25 25:14 106:3	<b>118-B</b> 77:11,15 79:10	<b>31:9,13 32:5 57:5 89:3</b> <b>106:16 117:16 119:14,</b> <b>25 120:2,5,6</b>
	<b>1014</b> 25:17,25 26:3 114:9,15 115:6	<b>118-C</b> 77:19 79:10	<b>20</b> 73:7
	<b>102</b> 38:13 47:7,14,16,18 48:7,18	<b>11:03</b> 41:25	<b>2010/018-5395</b> 25:6,11
	<b>104</b> 38:4,10 48:10,14,20 49:9,15 50:5,11,12,15, 16 51:1,21 52:2,4,7 89:12 91:21 92:2,20 94:20,24 95:7,12,14 97:23 99:18 100:12	<b>11:13</b> 41:25	<b>2012</b> 26:7,17 58:10,15
	<b>105</b> 103:23,25 104:2 105:13	<b>12:14</b> 71:20	<b>2013</b> 31:5
<b>1</b>	<b>106</b> 49:13,18,21,23 50:1	<b>12:24</b> 71:21	<b>2021</b> 17:18 61:10
	<b>10726506</b> 15:14 23:20,25	<b>13</b> 31:14 32:4,10,13 88:12, 13 102:9	<b>2022</b> 16:19 17:10
	<b>108</b> 49:12,24 50:3 51:10 77:24 78:2 79:19,22 80:22 89:11 92:5,8,11, 14 94:17,24 95:6,10,14 97:24	<b>13.2</b> 32:5	<b>2023</b> 5:1
<b>1,000</b> 48:4		<b>13.3</b> 32:6 63:21	<b>20th</b> 16:19 17:10
		<b>13.4</b> 32:7	<b>21</b> 31:14 32:10 46:22
		<b>13.5</b> 32:7	<b>213</b> 114:11 115:14
			<b>22</b> 31:14

THE SULLIVAN GROUP OF COURT REPORTERS

Index: -o0o--22

<b>23</b> 52:14,17 53:2	122:10 <b>3:18</b>	67:12,13,19 68:10,21 101:24	<b>80</b> 20:5
<b>25</b> 88:14 102:12	122:10 <b>3:34</b>	<b>508</b> 100:21,22 101:8,10	<b>8892407</b> 24:8
<b>26</b> 13:10,11	122:20 <b>3:35</b>	<b>52</b> 85:23	<b>8892507</b> 24:13
<b>27</b> 13:11	122:21	<b>56</b> 56:13 62:11,13	<b>9</b>
<b>28</b> 102:12 105:18 106:15, 20,24	<b>4</b> <b>4</b> 32:7 55:13,15,17,20 56:1,7,11 85:2,4 112:15 121:15,18	<b>566</b> 31:4 <b>57</b> 57:19 58:3 86:25	<b>9</b> 31:14 32:9
<b>2:36</b> 109:24	<b>5A</b> 101:21	<b>9,865,022</b> 15:11 75:18 91:8	
<b>2:46</b> 109:24	<b>40</b> 14:24 15:2 19:8 55:10 69:22	<b>5F</b> 56:16	<b>92</b> 17:4
<b>3</b>	<b>406</b> 85:4,12	<b>6</b>	<b>9865022</b> 23:8,13
<b>3</b> 31:19 32:6 46:21 52:12, 13 54:4,15,25 55:6 88:25 105:14,18	<b>410</b> 55:18	<b>9:02</b> 5:2	<b>A</b>
<b>3-1</b> 36:12	<b>43</b> 57:5	<b>6-2</b> 63:15	<b>A-1</b> 94:7,11,12,16 95:5,18 96:3 98:2
<b>30</b> 10:25 69:21 105:18	<b>44</b> 72:11 114:12,14	<b>600</b> 69:13	<b>A-2</b> 94:7,11,12,24 95:5,18 96:3 98:2
<b>30,000</b> 48:4	<b>47</b> 64:22	<b>606</b> 69:8	<b>A.M.</b> 5:2
<b>300</b> 54:8	<b>49</b> 69:6	<b>62</b> 63:14,15,19 64:15 72:9 85:17,18,24,25	<b>A1</b> 92:9 94:23
<b>31</b> 36:11 108:3,7,25 109:4, 5,7 120:6	<b>5</b> 89:3 101:16,20	<b>65</b> 64:19,21	<b>A2</b> 92:3 94:21
<b>35</b> 69:21	<b>5-6</b> 56:15	<b>68</b> 69:7,8	<b>accept</b> 95:1
<b>36</b> 69:22 106:5	<b>5-A</b> 100:17,20,21	<b>7</b>	<b>access</b> 27:17 28:6
<b>37</b> 37:22,23 48:25 49:4,5, 6,7	<b>50</b> 14:24,25 15:2	<b>7</b> 31:21	<b>accessible</b> 22:21 48:24
<b>38</b> 50:19	<b>506</b> 12:9 15:7,22 16:1,22 17:2,4,13 19:7 22:5	<b>79</b> 104:1	<b>accordance</b> 62:14
<b>39</b> 54:2,3,7 61:25 62:1,2,3, 4 87:1	23:16,23 26:20,25 27:4, 9 29:5,11,22 32:22 37:18 57:11 58:24 60:7 64:3,8 65:21 66:9	<b>8</b> 80:11	<b>account</b> 97:25 107:25
<b>3:13</b>			<b>accurate</b> 21:3 44:10,12

THE SULLIVAN GROUP OF COURT REPORTERS

Index: 23-accurate

<b>accurately</b> 6:17 7:20 19:22	9:1	<b>answers</b> 29:19	<b>arguments</b> 35:11,20,23 36:7 65:20 99:25
<b>achieve</b> 90:11	<b>alarm</b> 84:7	<b>apologize</b> 84:11	<b>arithmetic</b> 73:13
<b>acquired</b> 12:3	<b>alleged</b> 35:11,20	<b>appears</b> 77:14 82:12 83:2 102:4	<b>arrived</b> 13:10
<b>actual</b> 66:7	<b>allegedly</b> 31:14	<b>applicable</b> 30:20	<b>arrow</b> 116:16,19
<b>added</b> 75:12,22 76:12 77:11 91:3,14,17,18	<b>American</b> 93:9	<b>Application</b> 25:5	<b>art</b> 30:18,25 40:12,13 43:20 62:16 65:11,14 66:5,6 74:5,11 78:12 90:2 107:11 113:12,19, 24
<b>adding</b> 53:7,14,22	<b>amount</b> 19:11 120:22	<b>Applications</b> 27:2	<b>assembly</b> 38:19,23 39:3 49:14 57:3,8 103:6 107:15
<b>addition</b> 49:8	<b>analyses</b> 84:3	<b>applied</b> 13:20,24 14:17	<b>assessing</b> 68:19
<b>address</b> 32:2 33:1,2,6,19 34:13 36:25 37:7 74:1	<b>analysis</b> 27:3 28:11 31:22 33:10, 18,23 34:1 61:21 65:17, 24 66:1,3 67:4,8 73:11, 19 74:2 78:15,19 79:2, 13,16 80:1 81:17 84:3 89:20,23 96:8 99:15,22 100:9,14 104:24,25 119:18	<b>applies</b> 35:6	<b>assets</b> 39:11
<b>addressed</b> 31:25 32:3,9 33:12,15, 16 34:3,12,21 35:5,6, 10,19	<b>analyzed</b> 89:18 92:16	<b>apply</b> 112:7	<b>assist</b> 29:1 114:23 115:12
<b>addresses</b> 85:22 86:2,8	<b>and/or</b> 38:12	<b>approaching</b> 109:18	<b>assisting</b> 18:22
<b>addressing</b> 87:5	<b>Angela</b> 5:10 6:8	<b>approved</b> 21:16	<b>assume</b> 7:2 94:23 95:10,14,20 97:24
<b>adjust</b> 9:3	<b>angle</b> 40:7 66:18 67:2 70:23 84:18,24	<b>approves</b> 21:15	<b>assumes</b> 73:14
<b>adopt</b> 20:15,21	<b>angles</b> 66:25	<b>approving</b> 18:19	<b>assuming</b> 48:17 83:4
<b>advantage</b> 45:17	<b>angular</b> 66:21 84:15	<b>approximate</b> 68:2 78:25	<b>assumption</b> 48:17 95:3 98:13
<b>affiliate</b> 14:13	<b>annotated</b> 75:11 80:20 82:7 90:25 92:3,9,12 94:5,16 97:23	<b>approximately</b> 12:14 13:10 48:19	<b>assumptions</b> 96:9 98:8
<b>affiliates</b> 13:21	<b>annotation</b> 78:11	<b>approximations</b> 68:8 111:2	<b>attempting</b> 50:14 78:25
<b>affiliates'</b> 13:21	<b>annotations</b> 75:12,22,25 76:12 83:16 91:2,13,17	<b>arc</b> 70:7 71:8,10 77:22 78:6 80:25 81:5,11,23 82:12	<b>attorney</b> 12:21
<b>agree</b> 8:1,17 9:11 103:16 115:22 121:15,17,19	<b>answering</b> 7:19	<b>architecture</b> 18:13	<b>audible</b> 54:21
<b>ahead</b> 75:6 106:2 108:23 109:19		<b>arcs</b> 73:14 81:2	<b>authenticity</b> 75:7 91:5
<b>aids</b>		<b>area</b> 43:14 44:14 48:3,9 69:4 119:23	

THE SULLIVAN GROUP OF COURT REPORTERS

Index: accurately–authenticity

<b>author</b> 21:6,7,19	103:8 107:22 112:16 117:18	<b>breaking</b> 101:8	80:19 84:17 88:17 119:2,3,7
<b>average</b> 64:4,6,13 65:23 67:7,9 68:12,23 70:12 73:1,8, 13,21,22,24 74:17,18, 19 78:17,20,21,22 79:8, 9,22 80:9	<b>begins</b> 59:5,7 104:9 112:18	<b>breaks</b> 41:21	<b>calculation</b> 74:21 92:17,21 93:4
<b>aware</b> 11:19 15:21 26:20,22 27:5 28:15 33:13,15 37:2 119:19	<b>behalf</b> 5:5	<b>briefly</b> 51:15 54:1 58:9 85:16 121:14	<b>call</b> 14:16 38:17 114:3 116:24
<b>azimuth</b> 84:22	<b>believed</b> 60:7 61:20 63:10	<b>bring</b> 28:18 100:19	<b>called</b> 24:4 25:1 42:19 50:4,12 111:6 112:2 116:13
<b>B</b>	<b>bends</b> 66:8	<b>bringing</b> 28:20	<b>candidate</b> 117:25
<b>bachelor's</b> 114:5	<b>BHA</b> 49:15 50:23 51:3 57:2 102:19	<b>broad</b> 111:16	<b>captures</b> 69:18
<b>back</b> 9:19,21 20:6 30:10 41:25 51:15 61:10 71:21 72:4,9 83:3,12 87:23 88:25 103:22 109:20,24 110:2 116:1 122:10,12	<b>bit</b> 12:23 15:4 17:15,19 52:9 76:18 107:14	<b>broken</b> 81:1	<b>car</b> 93:1
<b>background</b> 12:24 22:13	<b>block</b> 48:18	<b>Brun</b> 6:1,14 78:10 104:22	<b>career</b> 14:22
<b>Baker</b> 5:5 8:11,14	<b>bonds</b> 39:13	<b>buckets</b> 120:15	<b>case</b> 6:9 9:17 11:7 46:9 59:21 60:1 93:18 110:25
<b>base</b> 56:4	<b>books</b> 93:10	<b>Budiman</b> 24:4,8,11,15,21 110:17 111:23 112:1,6,12 116:10 117:12 118:14 119:6,25 121:16	<b>cases</b> 11:11,18 15:5 17:14 21:11 24:17 25:14 26:4, 17
<b>based</b> 37:3,16 43:13 45:22 54:10 55:1,4,21 67:11 75:6 81:21 88:21 98:13 104:7 105:22 112:1 117:3 119:4	<b>bore</b> 38:19 45:15 48:14,21 50:14,22 51:2 106:16	<b>Budiman's</b> 111:21	<b>casing</b> 13:24 86:12
<b>basis</b> 15:1	<b>bottom</b> 38:19,23 39:3 46:22 49:14 57:3,8 69:7	<b>bulk</b> 12:22	<b>category</b> 111:16
<b>bear</b> 78:10	<b>Botts</b> 5:5 8:11,14	<b>C</b>	<b>caught</b> 54:19
<b>Bearing</b> 95:22	<b>bounds</b> 73:20	<b>calculate</b> 65:15,24 66:2,24 67:9, 20 68:3,11 74:7,12,22 78:20 79:1,8 80:2,4,8	<b>caution</b> 32:14 34:15 61:17
<b>begin</b> 48:15	<b>Bowser</b> 5:9,10 122:19,22	83:20 84:16,23 90:2 92:13 93:16,24 97:14 98:18 99:3 100:10 101:25 114:1	<b>cell</b> 8:25
<b>beginning</b> 71:1 83:21,25 84:6 89:5	<b>box</b> 10:20 47:17,21 100:22 101:8	<b>calculated</b> 67:1 68:23 73:25 89:22 92:22 99:13,23 100:11	<b>Central</b> 5:2 7:24
	<b>boxes</b> 55:5	104:9 118:1,6,8,13 121:16,18	<b>CERTIFIED</b> 6:2
	<b>break</b> 7:23,25 41:22 42:6 71:16,18 72:6 87:25 88:4 109:19,23 110:4	<b>calculates</b> 67:17	<b>cetera</b> 66:8 97:8 108:14 118:3, 21 121:21
		<b>calculating</b> 52:17 53:4 56:25 68:5	<b>Chad</b> 5:8

THE SULLIVAN GROUP OF COURT REPORTERS

Index: author–Chad

<b>challenged</b> 31:13 35:12 36:23	36:23 37:3 56:8 61:22 62:14 63:9 97:5	<b>communications</b> 32:15,17 34:16 60:24 61:19	<b>confirm</b> 28:16,22 37:9 72:18
<b>change</b> 66:18 67:2 70:23 81:4 82:1,2 84:14,15,18,23	<b>Clarke</b> 5:4 122:4	<b>companies</b> 13:13	<b>confirmed</b> 10:1
<b>changed</b> 117:24	<b>clean</b> 9:18 10:2,5	<b>company</b> 12:1 13:15,23 117:7	<b>confusing</b> 12:2
<b>character</b> 43:12	<b>clear</b> 7:12,17 15:10 19:3,4 36:5 45:10 55:1 64:14 65:7 81:5	<b>comparison</b> 51:4	<b>connected</b> 81:23
<b>characteristic</b> 103:13	<b>clearer</b> 20:18	<b>complete</b> 8:19 29:2	<b>connecting</b> 57:2 73:16 95:9 102:19 103:5,9,19
<b>characteristics</b> 108:12 109:10	<b>clients</b> 13:7	<b>completely</b> 9:24	<b>connection</b> 11:1
<b>characterize</b> 14:3 40:1 47:15 100:8 112:3	<b>clock</b> 71:15	<b>completions</b> 13:16 14:1	<b>considerations</b> 36:17,21 37:1,4,10
<b>characterized</b> 66:8	<b>close</b> 52:5 90:11	<b>complex</b> 110:17 111:23	<b>considered</b> 27:22,25 28:4 29:10,14, 24 30:4 36:18 37:9 64:11 112:23
<b>characterizing</b> 93:1 99:16 100:12	<b>colleagues</b> 5:7	<b>component</b> 96:7	<b>considers</b> 86:20
<b>chart</b> 55:4 116:24,25	<b>color</b> 75:23,25 76:12	<b>comprises</b> 13:5	<b>consistent</b> 46:18 58:6
<b>chat</b> 9:13 10:13,16,20 16:4 22:20 24:4 25:1,18 26:7 74:24 90:14	<b>column</b> 52:12,13 69:21,22 85:16,18 86:7 88:12,13, 25 102:9 112:15 117:15 119:14,25 120:2,6 121:6,14,15	<b>compute</b> 74:18 80:2	<b>consolidate</b> 30:8
<b>check</b> 9:4 57:12	<b>Columns</b> 80:11	<b>computer</b> 57:1,6 88:18	<b>constant</b> 70:17 73:14 81:1,7,11, 20,23 82:3
<b>circle</b> 81:22,23 82:3	<b>combination</b> 110:13	<b>con-</b> 99:17	<b>constitute</b> 45:2
<b>circled</b> 76:21 77:24 91:22 92:6	<b>combine</b> 112:7	<b>concept</b> 68:17 121:5,7	<b>constrain</b> 120:22 121:3
<b>circumstance</b> 41:10 71:5 97:15 98:17	<b>comfortable</b> 104:15,17	<b>conception</b> 88:7	<b>constrained</b> 118:19
<b>circumstances</b> 56:5 70:3	<b>comma</b> 108:13,14	<b>concepts</b> 120:10	<b>constraint</b> 120:11,21 121:7
<b>claim</b> 26:7,12 56:9 58:11 59:17	<b>comments</b> 18:4,9 19:2 20:18	<b>conclude</b> 110:12	<b>constraints</b> 111:6,11,12 118:23,24 119:5,11,12
<b>claimed</b> 36:18 64:23 65:4	<b>commonly</b> 14:11 24:14 65:12 66:14,22 68:8 111:13	<b>conclusion</b> 104:7 105:21,24	<b>constructing</b> 118:15
<b>claims</b> 26:25 30:24 31:13,24 32:3,4,9,10,13,19,23 33:15,18,23 34:2,12,20, 21,23 35:5,9,12,18,21	<b>communicate</b> 8:17	<b>conclusions</b> 33:22	<b>construction</b> 13:25 26:7,13 58:11 59:17 61:10 63:3 72:14, 23 87:17

THE SULLIVAN GROUP OF COURT REPORTERS  
Index: challenged–construction

<b>construe</b> 59:21 60:3,8,11,18 61:5,16 62:18 63:11 72:23 92:18	15,16,20	86:8,9,12,14 97:6 111:14 118:20	73:6,7 77:10,15,22 78:8 79:23 80:22 81:7,11,12
<b>construed</b> 56:20,24 57:9,10,21,24 58:4,8 62:7 63:7,21 67:14 87:9			<b>curved</b> 77:2 78:6,11
<b>construing</b> 59:25 60:4 63:4 100:2			<b>curves</b> 65:16 73:5,17 76:23 77:2,4,5 78:2,24 79:5 82:9 86:9 114:3
<b>consulting</b> 12:10 13:21 15:1			<b>customary</b> 62:15
<b>contact</b> 45:14			<b>cut</b> 45:5
<b>contained</b> 25:25			
<b>content</b> 30:24 36:4 60:20 63:8			<b>D</b>
<b>contents</b> 31:19 32:5			<b>daily</b> 14:25
<b>context</b> 20:19 40:14,18 43:25 51:24 65:1,3 67:15,19 68:10 69:25 76:17 98:1			<b>Dallas</b> 8:11
<b>continuation</b> 26:21			<b>dashed</b> 48:20
<b>continue</b> 37:13			<b>dashes</b> 77:1
<b>continues</b> 48:19			<b>data</b> 38:12 43:14 45:22 84:21 108:12 109:10 112:2
<b>continuing</b> 14:5			<b>dates</b> 31:4
<b>continuous</b> 43:12 45:5			<b>day</b> 12:18 82:21
<b>contract</b> 13:7			<b>days</b> 12:16
<b>control</b> 9:1			<b>decide</b> 32:12
<b>converge</b> 50:4			<b>decided</b> 34:13,24 60:17 61:4,15
<b>convergence</b> 49:13 50:4,12 51:5 54:9 57:2,7,25 58:5 63:22 64:24 65:5 72:16 73:24 87:10 90:6 92:20 93:2, 20 94:3 99:9,17 103:9,			<b>decides</b> 121:1
	15,16,20	86:8,9,12,14 97:6 111:14 118:20	<b>deciding</b> 33:6
	37:17 72:8	86:8,9,12,14 97:6 111:14 118:20	<b>decision</b> 60:13 112:25 120:10, 11,17 121:7
	99:10,20	86:8,9,12,14 97:6 111:14 118:20	<b>declaration</b> 8:7 9:21 15:22 16:1,3,
	43:21 44:2	86:8,9,12,14 97:6 111:14 118:20	
	44:6 95:15	86:8,9,12,14 97:6 111:14 118:20	
	9:7 10:2,5 15:17	86:8,9,12,14 97:6 111:14 118:20	
	9:18,22 10:8 47:11 49:2 75:11 90:25	86:8,9,12,14 97:6 111:14 118:20	
	12:25 13:1 15:8,9,11, 12,14,15,19,20 20:23, 24 22:3,6 24:22 27:10 28:1,2 29:12 31:15 34:5 35:7,8 37:25 38:1 39:18 40:25 42:15,16,18 45:11 46:3 47:2,9,18,19 54:5 56:17,22 57:22,23 59:11,15 60:1 62:16,24 63:17,18,24 64:17 66:14 70:21 72:16,17 75:20,21 83:17,18,22 87:6,7,12 88:10,24 91:24,25 98:4 100:4,5	86:8,9,12,14 97:6 111:14 118:20	
	102:17 104:11,13 108:4,5,7,10,15 110:14, 15,19 113:6 118:9	86:8,9,12,14 97:6 111:14 118:20	
	31:16 49:16,17 51:7 53:1,10,11 54:12,13 62:17 63:24 72:18 104:6 112:21 113:2,3 115:9,13 121:22	86:8,9,12,14 97:6 111:14 118:20	
	51:4,5,10,13 52:10,17, 19,20 53:8,13,14,18,22 54:10,16 55:1,7,18,21, 22,23,25 56:2,3 85:5,8, 10,15,22 86:1,8,20 97:7 111:18 116:17,20,23 117:1,4,9,11 118:1,25 119:4,7,11 121:20	86:8,9,12,14 97:6 111:14 118:20	
	53:19 55:4,22 56:6,9	86:8,9,12,14 97:6 111:14 118:20	
	64:9,12 69:14	86:8,9,12,14 97:6 111:14 118:20	
	64:15 70:7 71:11,13	86:8,9,12,14 97:6 111:14 118:20	

THE SULLIVAN GROUP OF COURT REPORTERS

Index: construe–declaration

11,14,18,23 17:2,5 18:6 27:17,21 28:1,4 29:4,5, 8,11,14,22,23 30:10 31:10,19,25 32:13 33:12,14,16,21 36:11 37:14,16,22 44:24 45:23 46:24 48:25 49:2 54:2 55:10,16 56:13,14, 17,24 57:11,18 59:10, 16,19,20 61:24 62:11 63:8,14 65:18 66:1 67:5 68:16 69:2,5,6 72:10 80:3 87:1 92:24 94:2 99:25 103:23 105:14 107:2,20 110:9 116:1,7	<b>department</b> 13:17 <b>depend</b> 44:8 81:17,19 <b>dependent</b> 32:9,10 34:11 120:24 <b>depending</b> 81:25 82:2 93:20 <b>depends</b> 40:1 44:7 70:2 80:25 93:17 <b>depicts</b> 49:9,12 <b>deposed</b> 10:22 11:1,4 <b>deposition</b> 5:1 6:21 7:6,11 8:4,8, 19,22 9:11 10:10 11:13 12:12,15 23:12 33:14 34:6 75:10 76:16 90:19, 20 91:2 99:21 <b>depth</b> 44:4 107:7,10,13,16,17, 24 108:7,14,15,16 109:8,9,12,16 <b>derivatives</b> 111:4,10	9:15 16:7 <b>desktop</b> 11:19 <b>detail</b> 11:19 <b>detailed</b> 31:21 101:7 <b>details</b> 61:6,11 <b>determine</b> 43:15 51:4 54:15 78:20 89:19 100:6,9 112:6 <b>determined</b> 44:2 <b>determining</b> 57:5 68:16 92:17 <b>develop</b> 35:10,19 36:2 50:14 <b>developed</b> 35:23 38:15 39:11 80:2 110:23 <b>developing</b> 74:12 <b>development</b> 13:6,25 <b>developments</b> 13:20 <b>deviation</b> 104:4,5 105:22 <b>difference</b> 27:12 <b>differently</b> 68:3 76:18 93:11 <b>difficult</b> 14:15 22:12 112:9 <b>difficulty</b> 87:20 <b>digitally</b> 9:13 <b>dimension</b> 98:7 <b>dimensional</b> 96:7 <b>dimensions</b> 95:23 98:10	<b>direct</b> 119:23,25 <b>directed</b> 39:9 <b>direction</b> 84:14,15 <b>directly</b> 112:23 <b>disagree</b> 20:12 27:13 <b>disagreed</b> 33:21 <b>disagreements</b> 20:9,19 33:17 34:1 <b>discloses</b> 104:16 <b>disclosure</b> 8:25 27:9,10 <b>discontinuous</b> 45:6 <b>discuss</b> 54:4 <b>discussed</b> 34:22 38:3 42:11 64:16 97:6 99:2,6 114:20 118:15 <b>discusses</b> 58:24 101:8 104:20,21 <b>discussing</b> 37:13 55:12 63:16 83:16 88:15 97:22 102:16 <b>discussion</b> 42:10 <b>discussions</b> 12:22 28:21 34:23 60:20 <b>disputed</b> 62:8 <b>dissertation</b> 43:10 <b>distance</b> 40:6 52:19 57:1,22,24, 25 58:4 59:21 74:18 87:6,9,10,14,18 88:5,8, 9,18,21,24 89:6,10,24
---	--	--	---

THE SULLIVAN GROUP OF COURT REPORTERS

Index: declarations–distance

90:2,6,8 92:14,17,19, 22,25 93:4,16,19,25 94:7,10 95:5,6,17,18 96:17 97:2,3,10,14 98:2,3,18 99:1,4,16,20 100:3,7,11,25 101:4,10, 13,14,17,21,25 102:2,3, 7,15,24 103:3,5,12,13, 17,19 115:23	<b>downloaded</b> 23:3,4 27:18	95:10,17 96:2 98:3	63:19 64:19 71:2 72:10 83:22,25 84:6 86:6,10 89:22,23 90:9 99:12
<b>distances</b> 89:17 99:3 113:12,19 114:2	<b>draft</b> 17:22 18:24 32:25	<b>E-2</b> 95:11,17 96:3 98:4	<b>ended</b> 33:23 35:1
<b>distinct</b> 94:22,23,24 95:11	<b>drafted</b> 18:2	<b>e.g.</b> 53:5,6	<b>ends</b> 66:25 104:10
<b>distorted</b> 48:6	<b>drawn</b> 79:5	<b>earlier</b> 31:18 42:13 58:10 78:19 80:10 83:19 92:1 97:22 98:1 114:9	<b>engineer</b> 13:4 14:4 18:12 21:18 38:15,16 39:2,12 45:20 68:6 74:14,15 79:14 93:13 115:9
<b>district</b> 12:8 58:11 59:17,20 60:4,11,18 61:5 62:7,19	<b>drill</b> 41:4 50:15 57:6 59:22 63:17,20 64:5,23 65:5 66:7,11 68:18 70:4 72:14 107:12,14,16 110:25 118:2,6,12 119:4 120:15,23 121:21,23 122:2	<b>earth</b> 40:16,23 41:1 42:18 44:2 48:23	<b>engineering</b> 18:14 41:4 43:25 113:25 114:6
<b>divide</b> 66:21 84:24	<b>drilled</b> 50:23 51:3 66:12 67:17 106:24	<b>easier</b> 9:22 37:21 108:24	<b>engineers</b> 14:13 43:6 45:8,21 68:2
<b>divided</b> 66:19 67:2	<b>drilling</b> 5:6,11 11:9,15 13:16,22 14:1,13 38:15 39:2,12 41:10 44:1 45:14,21 57:1,3,7 58:1,6 67:25 68:1 87:11 96:6 102:19 103:6,14 106:17 107:18	<b>easily</b> 22:21	<b>Engineers'</b> 28:7
<b>dividing</b> 84:19	108:11,13 109:9,11,12, 13 111:1 116:13,17,20, 23 117:1,4,9,10 118:16 120:18,19,24 124:2	<b>Eastern</b> 109:24 122:10,20,21	<b>enlarge</b> 69:15,19
<b>document</b> 19:3,15 21:15 22:17 26:14 75:17,24 114:17 115:14,24	<b>education</b> 30:22 31:7	<b>easy</b> 76:8	<b>ensure</b> 7:11,17 21:2 22:17 30:3
<b>documents</b> 9:7,12,15,18,20 10:11, 13 18:14,23 19:16,17 20:3 22:20 27:25 28:3, 9,10,13,17 29:10,13,18, 20,23 30:4,8,9	<b>effectively</b> 115:13	<b>editorial</b> 18:20 19:1 20:18 21:8, 13 22:16 36:4	<b>enters</b> 48:18
<b>dogleg</b> 64:10 67:25 68:16 69:11,19 71:10,13 80:16	<b>drives</b> 116:23	<b>effort</b> 19:11	<b>entire</b> 43:17 47:17,21 71:1 72:24 73:2 78:23
<b>doglegs</b> 66:7	<b>driving</b> 84:10	<b>elements</b> 32:4	<b>entirety</b> 104:12
<b>dollars</b> 53:5	<b>drop</b> 20:6	<b>emails</b> 9:4	<b>envision</b> 71:4
<b>dot</b> 69:9	<b>due</b> 106:17	<b>embodiment</b> 55:24 56:2,6	<b>equations</b> 120:11,21 121:7
<b>download</b> 9:15 10:14	<b>DULY</b> 6:2	<b>embodiments</b> 80:17 111:25	<b>equipment</b> 8:21
	<b>duty</b> 29:1	<b>emphasized</b> 107:6	<b>error</b> 51:25 52:2
	<b>dynamic</b> 113:1 119:9	<b>employed</b> 12:25	<b>essentially</b> 30:22 49:25 57:15,16 111:2
		<b>encompassed</b> 44:21	<b>et al</b> 24:9 25:6
	<b>E</b>	<b>end</b> 18:18 21:17 52:1 55:3	<b>evaluate</b> 14:11
	<b>E-1</b>		

THE SULLIVAN GROUP OF COURT REPORTERS

Index: distances—evaluate

<b>evaluating</b> 14:11 36:18	<b>explain</b> 20:25 63:25 69:21 80:8 90:1 92:13,21 100:6,13 101:3 110:20	34:25	<b>flow</b> 55:4 109:14
<b>evaluation</b> 108:13	<b>explains</b> 101:24	<b>figure</b> 38:4 46:15 47:3,8,17 48:1,11,16,24 49:9,11, 18,25 50:3 51:10 52:10 54:4,15,25 55:6,13,15, 17,20 56:1,7,11 69:13 75:11,24 76:1,3,5 77:4 79:20 80:21 81:24 82:7 83:3,13,14,15 85:2,4 90:25 91:14,15 92:12 94:6,16 97:23 100:17, 20,21 101:16,20,21 105:14,18 116:10,14,17	<b>fluid</b> 109:12,13
<b>evidence</b> 36:16,22 37:4 73:20 74:3	<b>explanation</b> 101:5	<b>focus</b> 17:20 34:6 53:18 67:13 69:15	<b>focused</b> 33:22
<b>evolve</b> 112:23	<b>Exponent</b> 12:25 13:1,8,9,12,14 14:5 18:4,16 20:23 29:24	<b>focusing</b> 68:20 70:5 71:13	<b>folders</b> 30:5,6
<b>EXAMINATION</b> 6:4	<b>express</b> 90:5	<b>follow</b> 15:22	<b>foot</b> 53:7 55:3
<b>EXAMINED</b> 6:3	<b>expressed</b> 19:16	<b>Footnote</b> 62:4,6	<b>form</b> 19:24 20:3 34:4,12 35:13,22 38:24 40:19 41:13 42:24 43:23 46:12 50:6 51:11,23 54:19 67:22 73:9 77:12, 20 78:3 81:14 93:6 96:21 97:16 98:5,12,20 101:18 105:5 113:14,21 120:16,25 121:1,9
<b>examples</b> 68:15,22 80:17 106:20	<b>extent</b> 21:3 32:16 34:17,19 36:4 60:22 61:18	<b>finalized</b> 20:4	<b>formalized</b> 18:21,22
<b>excerpts</b> 25:24	<b>Exxon</b> 13:15,19,21,23 14:3,6, 16 15:2	<b>find</b> 65:25 93:19 109:5 111:9	<b>format</b> 21:9,10,12
<b>excluded</b> 11:6	<b>F</b>	<b>fine</b> 9:24 37:20 41:17,23 42:1 71:23 76:19 85:13 116:3	<b>formation</b> 38:13 39:10,11,14,15, 22,24,25 40:3,5,8,10, 12,13,15,19,22,24 42:15,20,23 43:3,7,9, 12,13,15,18,21 44:11, 14,16,21 45:3,15,25 46:7,9 47:8,16 48:7,18 108:11,12 109:10,11
<b>excuse</b> 29:4 77:5 102:3 120:10	<b>fact</b> 28:18	<b>finish</b> 7:18	<b>formations</b> 41:2,5,6,11,15,16,18 43:11
<b>exemplary</b> 70:3 101:5 106:23	<b>factors</b> 86:20	<b>finished</b> 120:7 122:13	<b>fracturing</b> 14:2
<b>exhibit</b> 22:23 23:15 24:3,17,21, 25 25:14,17,25 26:3,7, 17 46:21 47:1 58:10,15 74:25 75:6,9,10,11,14 76:20 80:20 82:6 83:16 90:13,20,21 91:1 94:6 106:3 112:13 114:9,15 115:6 117:13	<b>failing</b> 106:17	<b>firm</b> 21:18,20	
<b>exist</b> 56:6	<b>fails</b> 106:24	<b>fit</b> 18:1 121:6	
<b>expect</b> 76:7 113:23 114:4	<b>fair</b> 7:3,4	<b>fits</b> 120:15	
<b>expectation</b> 110:13 112:9	<b>fairly</b> 59:23,24	<b>flat</b> 95:21	
<b>experience</b> 30:23 31:7 117:3	<b>familiar</b> 11:23 114:15,17,19	<b>flip</b> 9:19 31:18 64:18	
<b>expert</b> 11:25 12:7 13:7 14:18 21:21 59:10	<b>farther</b> 89:12,16	<b>felt</b>	
<b>expertise</b> 31:6	<b>faults</b> 45:5		
	<b>feet</b> 48:4 69:11		
	<b>felt</b>		

THE SULLIVAN GROUP OF COURT REPORTERS

Index: evaluating–fracturing

<b>frequently</b> 117:7	<b>geological</b> 39:21 40:3,15,19,24	<b>H</b>	<b>highly</b> 22:11 48:6
<b>friction</b> 86:13,15	<b>geologists</b> 43:6	<b>H&amp;p</b> 59:5,9	<b>Hilbert</b> 6:1,6,14 15:6 34:15 42:6 59:10,13 61:17 72:4 74:24 75:16 76:15 87:23 90:12 91:7 110:2 122:18
<b>FRIDAY</b> 5:1	<b>geology</b> 43:10	<b>H-A-L-L-A-I</b> 18:11	<b>hired</b> 18:12
<b>front</b> 9:8 10:7 17:25 47:13	<b>geometric</b> 57:2,7,25 58:5 63:22 72:15 87:10 103:9	<b>Hallai</b> 18:10,18,24 19:6,12 20:10 21:14 28:11,13, 16 30:1 33:5 36:2,7	<b>hit</b> 45:18
<b>full</b> 6:12 8:25	<b>give</b> 16:4,23 22:25 26:8 41:21 70:6 74:25 90:13 122:16	<b>Hallai's</b> 20:15	<b>hold</b> 40:16 46:23 49:1 109:5
<b>fully</b> 6:17 12:19 22:13,14	<b>giving</b> 98:7	<b>hard</b> 9:7,18,22 10:8 15:17 47:11 49:2	<b>holding</b> 41:5
<b>function</b> 110:18,20,23 111:3,4,5, 7,9,22,24 112:5 118:16, 17,18 119:1,9,10 120:12,23 121:8	<b>good</b> 6:6,7 41:22 71:17 72:1 122:19	<b>head</b> 7:13 94:18	<b>holds</b> 39:15 40:19
<b>functions</b> 111:13	<b>governing</b> 119:1	<b>header</b> 58:23	<b>hole</b> 38:19,23 39:3 48:14 49:14 50:22 51:3 57:3,8 103:6,13
<b>future</b> 49:14	<b>grab</b> 109:2	<b>heading</b> 32:8	<b>honest</b> 61:7
<b>G</b>		<b>heard</b> 11:17 12:4 44:16 84:8	<b>honestly</b> 6:18 59:23
<b>G1</b> 92:9	<b>grant</b> 11:3	<b>hearing</b> 9:1	<b>horizon</b> 43:5,7 44:13,16 46:7
<b>G2</b> 92:3	<b>great</b> 10:6 12:23 15:3,24 16:21 17:2,12 20:22 23:5 24:2,16 25:5 26:6 27:15 29:7,21 76:10	<b>hearsay</b> 75:7 91:5	<b>horizontal</b> 40:4 44:3,4 68:1
<b>gas</b> 13:13 39:13,15,22 40:6, 17,20 41:5,6,9 42:13,19 44:15 46:1,8 47:20 48:3,8 65:12	<b>greater</b> 89:11	<b>heart</b> 63:9	<b>horizontally</b> 48:19,20
<b>general</b> 40:16 56:1 70:19 110:25 113:23	<b>ground</b> 45:11	<b>Helmerich</b> 12:1,3	<b>hour</b> 7:24 41:21,22 71:17 109:19
<b>generally</b> 14:13 20:20 21:23 27:5, 9,10,14 29:17 32:22 34:22 37:17 42:21 43:24 45:12 77:7 84:6, 19 96:7 97:3 107:13 114:16,21 119:24	<b>grounds</b> 32:2	<b>helped</b> 14:23	<b>hourly</b> 117:8
<b>generated</b> 117:25	<b>group</b> 13:4	<b>helpful</b> 87:2	<b>hours</b> 12:18,19 19:6,8,19,20, 21 20:5
<b>geologic</b> 39:11 104:4	<b>guess</b> 8:24 12:3 103:11	<b>helps</b> 27:21	<b>Houston</b> 13:15,23
	<b>guessing</b> 108:21	<b>hesitate</b> 58:2	<b>hull</b> 107:15
	<b>guide</b> 25:23,25 26:2 114:20 115:2,6,11	<b>heterogenous</b> 43:11 47:24	<b>hydraulic</b> 14:2
	<b>guided</b> 65:18,19	<b>high</b> 39:13	
		<b>higher</b> 43:16 117:9	

THE SULLIVAN GROUP OF COURT REPORTERS

Index: frequently–hydraulic

<b>hydrocarbon</b> 45:10,18 46:3	<b>include</b> 14:6 28:10 32:13 56:9 86:12 108:12 109:10 112:24	<b>inter</b> 11:2	60:2 63:12 65:20
<b>hydrocarbons</b> 46:10,11	<b>included</b> 36:8 116:11	<b>interactions</b> 18:3	<b>IPR2022-00288</b> 6:11 15:10,19
<b>hypothesis</b> 95:1	<b>includes</b> 18:19 21:5	<b>intermediary</b> 105:1	<b>IPR2022-00289</b> 6:11 15:13
<b>hypothetical</b> 38:25 39:20 48:5 70:25 73:4 81:10,22 95:6,12 96:11 99:9 101:6	<b>including</b> 8:7	<b>intermediate</b> 104:22 105:2,8	<b>IPRS</b> 15:7 24:22 60:5,13 61:12,16 63:3
<b>hypothetically</b> 45:3,12 70:18 71:4,7 79:6 83:10 90:4 94:9 95:1,13 96:23 98:6,21 99:7 106:23	<b>incorporated</b> 13:1	<b>interpret</b> 52:5 69:12 74:17 92:18 97:4 115:8	<b>issues</b> 14:14 86:16
<b>I</b>			
<b>idea</b> 68:4 87:16	<b>industry</b> 11:20 65:12,14 66:14, 23,24 67:21 93:5,15 117:3	<b>interpretation</b> 93:13 96:5	<b>Item</b> 120:18
<b>identical</b> 29:19 71:5	<b>indicia</b> 37:1	<b>interpreted</b> 62:14	<b>J</b>
<b>identification</b> 75:14 90:21 101:3	<b>individual</b> 64:6	<b>interrupt</b> 14:9	<b>James</b> 5:8
<b>identified</b> 45:7 53:8,19,23 54:10 55:18 56:10 69:9	<b>industry</b> 117:4,10	<b>interruption/technical</b> 87:19	<b>JANUARY</b> 5:1
<b>identify</b> 45:21 54:8 56:8,23 69:11 85:5 100:25 101:10	<b>influence</b> 116:20 117:1	<b>intersect</b> 39:21 40:2 46:2,11 105:4,23	<b>Jonathan</b> 5:10
<b>identifying</b> 52:18 101:9	<b>influences</b> 116:20 117:1	<b>intersects</b> 39:17 40:7 104:19 105:19	<b>JR</b> 6:1
<b>illustrated</b> 49:18 106:8,14	<b>information</b> 18:15 30:7 38:12	<b>intimately</b> 11:23	<b>Julian</b> 18:10
<b>immediately</b> 108:2	<b>installation</b> 106:18	<b>intrinsic</b> 73:20 74:3	<b>jump</b> 37:21 116:2
<b>impact</b> 86:13,15	<b>instance</b> 9:20	<b>introduce</b> 26:6	<b>June</b> 31:5
<b>implemented</b> 74:21	<b>instances</b> 41:3	<b>invention</b> 36:19	<b>Junior</b> 6:14
<b>important</b> 30:6 60:8,15 61:13,21	<b>Institute</b> 93:10	<b>involve</b> 52:18	<b>K</b>
<b>impossible</b> 95:24 96:6	<b>instruct</b> 60:25	<b>involved</b> 14:23 39:2	<b>keyboard</b> 8:24
<b>inclination</b> 84:22	<b>instructs</b> 7:6	<b>involvement</b> 33:5	<b>kind</b> 12:2 18:1 64:19
	<b>intended</b> 38:18,22 39:8,20	<b>involves</b> 15:10,13	<b>knowing</b> 67:16
	<b>intent</b> 71:6	<b>involving</b> 12:9 15:7 21:4 110:18	<b>knowledge</b> 11:5,8 21:20 86:21 93:17
	<b>intention</b> 39:1,21	<b>IPR</b> 11:2 15:18 22:24 23:16	

THE SULLIVAN GROUP OF COURT REPORTERS  
Index: hydrocarbon–knowledge

<b>L</b> <b>label</b> 46:21 <b>lack</b> 112:9 <b>landmark</b> 25:23,25 26:2 114:18 115:5 <b>landscape</b> 76:9 <b>language</b> 17:25 21:22 102:18,22 103:8 <b>laptop</b> 8:23 10:8,12,17,18,19 <b>large</b> 82:12 <b>launch</b> 86:16 <b>Lawrence</b> 6:14 <b>layer</b> 40:22,25 <b>layers</b> 41:1,7 <b>leased</b> 117:8 <b>led</b> 60:12 <b>left</b> 48:18,19 74:22 77:8 93:12 109:18 <b>left-hand</b> 49:23,25 <b>legal</b> 17:24 <b>length</b> 40:3 66:19,21 67:1,2 69:15 70:13,23 81:19 84:19,24 89:11,12,15 95:8,9 96:2 97:2,3,4,5, 7,9,10,11 101:9 107:12, 13,16 <b>lengths</b> 68:18 97:13 98:22,23,	<b>25</b> <b>letting</b> 58:13 <b>library</b> 28:7 <b>light</b> 58:7 63:7 <b>limit</b> 84:4 97:5 <b>limitation</b> 88:15,22 102:14,18,23 106:18 <b>limitations</b> 21:22 32:5,6,12 33:6, 11,18 34:2,11 35:5,9, 18,21 56:9 63:20 65:1,3 <b>lines</b> 69:21 81:23 95:21 102:12 119:14 120:5,6 <b>list</b> 27:25 28:21 29:2 30:3 56:2 <b>listed</b> 28:14,23 <b>lists</b> 29:19 <b>litigation</b> 12:8 58:12 60:4,18 61:5 62:19 <b>LLP</b> 5:5 <b>located</b> 8:10 42:14,19,23 43:4 64:20 77:4,5,10,18 78:8 <b>location</b> 42:18 43:3,22 49:15 50:1 57:3 77:11 94:12 102:19 103:6,14 <b>locations</b> 43:16 84:23 <b>long</b> 11:20 12:14 13:9 77:1 82:22,23 120:4 <b>longer</b> 40:6 95:25 96:18 98:3 117:8	<b>looked</b> 82:24 106:1 <b>lot</b> 17:19 109:17 <b>louder</b> 54:22 <b>lower</b> 43:17 <b>lunch</b> 7:25 87:21,25 <b>Lynette</b> 54:18 <b>M</b> <b>made</b> 18:1 19:1 21:13 99:22 <b>maintained</b> 30:5 <b>make</b> 20:18 21:4 36:5 42:17 45:14 47:14 48:5 65:23 79:14 96:5,8,9 112:20 113:9 116:2 118:9 122:6 <b>makes</b> 21:9 79:16 111:21 <b>making</b> 110:13 <b>management</b> 18:17 <b>managing</b> 18:11 <b>margin</b> 51:25 52:2 <b>marked</b> 75:10,14 77:18 78:9 90:21 91:1 94:7 <b>Markov</b> 112:24 <b>material</b> 111:19 <b>Materials</b> 27:22 <b>math</b> 73:12 114:5	<b>mathematical</b> 110:22 111:10,15,17 <b>mathematically</b> 66:2 84:12,14 <b>matter</b> 11:24 20:12,13 30:21, 25 31:2 59:19 61:22 <b>matters</b> 11:4 12:6 13:6 20:1 21:4 22:12 28:6 29:1 63:9 <b>maximum</b> 64:9 <b>meaning</b> 30:17 58:6 62:8,15,20 63:5 72:15 <b>means</b> 22:7 44:7 52:3 64:1 67:14 72:20 73:21 88:8 116:20 119:21 <b>meant</b> 50:2 65:8 74:10 <b>measure</b> 53:6 78:13 83:24 <b>measured</b> 66:17,18 84:22 97:2 107:7,10,13 109:16 <b>measurement</b> 66:16,21 97:11 108:16 <b>measurements</b> 108:13 109:12 <b>measures</b> 115:23 <b>mechanical</b> 14:4 113:25 114:6 <b>meet</b> 12:11,14 31:5 46:5,6 49:25 118:19 119:11 <b>meeting</b> 10:20 <b>meets</b> 21:16,23 22:17 54:16 <b>memorandum</b> 26:8 <b>memory</b> 58:2
--	---	--	---

THE SULLIVAN GROUP OF COURT REPORTERS

Index: label–memory

<b>mention</b> 27:13	<b>modifying</b> 103:16	<b>naval</b> 18:13	<b>objective</b> 36:16 39:21 46:4,5,13 50:9 54:14 93:18,19 110:18,20 111:7,9,13, 21,24 112:5 117:25 118:1,15,17,18,24 119:9,10,15,17,21 120:12,23 121:5,8,11, 16,18,20,24 122:1
<b>mentioned</b> 6:9,24 10:12 20:22 42:13 83:19	<b>moment</b> 34:20 82:17 118:15 120:5	<b>necessarily</b> 50:13 52:6 70:24	
<b>met</b> 12:17,20	<b>monetary</b> 53:4	<b>needed</b> 63:7,10	
<b>method</b> 54:8 69:13 74:12,14 84:4,25 92:17,22 93:23 107:24 110:23 112:3 119:8,9	<b>monitor</b> 10:18	<b>nice</b> 82:20	
<b>methodology</b> 101:7	<b>monitors</b> 8:16,24	<b>nonlitigation</b> 13:6	<b>obtain</b> 46:1
<b>methods</b> 84:25	<b>month</b> 17:16 19:20,21	<b>nonobvious</b> 37:3	<b>obtained</b> 42:14 53:13
<b>middle</b> 38:10 49:7 50:21 106:7 107:20	<b>months</b> 17:17,21 19:9,18 20:1, 3,6	<b>nonobviousness</b> 35:11,20 36:16,17	<b>obvious</b> 36:19 108:23
<b>mind</b> 47:10 50:8 58:13 83:13 86:5 95:22 105:25 106:11 115:10 117:21	<b>morning</b> 6:6,7 9:19	<b>noon</b> 7:24	<b>obviousness</b> 31:21 36:22
<b>mindful</b> 71:16	<b>motivated</b> 104:3	<b>notes</b> 10:2,7 122:6,17	<b>occasionally</b> 12:19,20
<b>minimize</b> 104:4,5 105:22	<b>motivation</b> 112:7	<b>number</b> 15:23 47:7,14 48:10 52:18 56:25 69:10 75:16,17,20 77:11 79:3 91:8,10,21 93:22 99:13, 16,20 109:14 110:23 119:11	<b>October</b> 16:19 17:10
<b>minimizing</b> 111:14	<b>Motive</b> 5:6 11:9,14,15,17 12:4		<b>offered</b> 44:24
<b>minute</b> 51:18 75:1 90:14 106:1 113:4 114:8	<b>Motive's</b> 12:1	<b>numbers</b> 15:23 21:12 92:11	<b>offering</b> 75:9
<b>minutes</b> 20:22 122:6,17	<b>move</b> 83:12	<b>numerically</b> 71:6 85:15	<b>office</b> 84:11
<b>Mischaracterizes</b> 74:8	<b>movements</b> 7:14		<b>offices</b> 8:11
<b>missed</b> 122:7	<b>multiple</b> 9:17 39:23 40:2,9 41:1, 2,4,11,15,16,17,18 46:9 54:9 65:16 99:3	<b>O</b>	<b>offset</b> 55:22 56:2 57:1,22,24, 25 58:4 59:21 87:6,9, 10,14,18 88:5,8,9,18, 21,24 89:17,24 90:2,6,8 92:13,17,19,25 93:4,16, 25 94:6 97:2,7,9,14 98:18 99:1,3,4,12,13, 16,20 100:2,3,7,11 101:13,16,21,25 102:2, 3,7,15,24 103:3,4,5,12, 17
<b>mixture</b> 86:15		<b>oath</b> 6:21	
<b>model</b> 110:17 112:24,25 113:1	<b>Nabors</b> 5:11	<b>object</b> 7:5 34:4 41:13 51:11 67:22 75:6 91:4 101:18 105:5	
<b>modify</b> 102:22 103:3,9 104:4 112:8	<b>names</b> 43:5	<b>objection</b> 19:24 37:5 38:24 42:24 43:23 46:12 50:6 54:18 62:21 72:21 73:9 74:8 76:24 77:6,12 78:3,14 79:11 80:23 81:14 82:10 84:1 92:15 93:6 95:19 96:21 97:16 98:5, 12,20 113:14,21 120:16	
	<b>narrow</b> 54:9		<b>offshore</b> 18:13
	<b>nature</b> 12:3 60:6		<b>oil</b> 13:12,13 39:13,15,22 40:6,16,19 41:5,9 42:13,19 44:15 46:1,8 47:20,25 48:3,8 65:12

THE SULLIVAN GROUP OF COURT REPORTERS

Index: mention–oil

<b>Oliver</b>	14:10	72:9,10,13 86:10,25 87:5,9 101:7 103:23 104:2 105:13 106:5,8 107:1,8,19,20 108:3,7, 25 109:3,4,7 110:8,11 111:22 116:6,11 120:4, 9	100:15,18 101:23,24 102:9 105:7 112:10 117:12 119:17
<b>online</b>		<b>parallel</b> 12:8	<b>patents</b> 12:9 27:4 29:16 30:24 31:3 32:20,21,22 58:25 60:7,14 64:8 65:21 66:10 67:6,14,20 68:10, 14,21 69:25 84:3
<b>Oops</b>		<b>parameters</b> 54:16 110:24 111:23,25 116:25 117:24 118:19, 22	<b>path</b> 14:12,14 38:4,8,10,13, 14,16,18,22,25 39:1,3, 4,6,8,10,17,19,20,23 40:2,5,8 42:11 44:5 45:1,13,18 46:1,2,5,10 48:11,14 49:9,15 50:4, 5,11,12,15,23,25 51:1, 4,5,17,20,21,22 52:2,3, 4,5,10,18 53:6,8,9,13, 15,22,23 54:10,11,16 55:1,2,3,6,21 57:4,6,25 58:1,5,6 59:22 63:17, 20,22 64:5,7,23,24 65:5,6,16 66:7,11,12,19 67:1,3 68:3,18 69:9,16, 17 70:4 71:1 72:14,16, 24 73:1,2,5,8,23,24 76:21,23 77:5,10,18,24 78:2,13,18,23 79:3,5,9, 19,22 80:22 81:10,13 82:7,9 83:4,5,21,22,25 84:15,19,24 86:9 87:10, 11,13 88:9,20 89:11,12, 13,15,17 90:3,7,9,11 91:24 92:2,5,8,11,14,20 93:2,20 94:4,17,20,22, 24 95:6,7,10,12,14 96:13,16,17,19,20 99:9, 17 100:3,12 101:1,9,11, 14,15,25 102:20 103:7, 10,14,15,17,20 106:16 107:18 113:23 114:23, 24 119:4,7,10 120:19
<b>open</b>		<b>part</b> 8:4 12:4 28:5 29:1 37:15 103:19 118:25 119:18	<b>partes</b> 11:2
<b>opened</b>		<b>partial</b> 111:4,10	<b>parties</b> 30:21 62:8
<b>opening</b>		<b>parties'</b> 58:21	<b>passage</b> 53:12
<b>operating</b>		<b>patent</b> 5:5 9:22 12:8 15:7,8,11, 13,23 22:24 23:8,9,11, 13,16,20,21,23,24 24:8, 9,12 25:5,10 26:20,21, 24,25 27:8,9 31:1,24 32:3 37:2 38:5,8 42:12 45:24 46:16,24,25 47:1, 16,23 48:8,12,13 49:19 50:8 51:24 52:11 53:20 54:5,15,25 55:13,17 56:21 58:8 64:2,3 65:3 67:12 69:3,14 70:12 73:19 74:6,20 75:12,17, 20 76:1 78:16 80:8,12 81:6 82:14,16,24 83:12, 13,14 84:13 85:2,17 88:11 89:1,19 91:1,8, 10,11,15 93:24 99:15	<b>paths</b> 14:7,19,21 49:12,13,24 50:3,9,10,15 51:9,12 52:1 54:9,10 55:18 56:4 57:2,7 92:20 93:2,20 95:15,16 96:6 97:12,14, 23 98:19 99:17 104:18, 24 105:3,9,23 113:13, 20 114:3 115:23
<b>operator</b>		<b>Payne</b>	
<b>operators</b>			
<b>opine</b>			
<b>opinion</b>			
<b>opinions</b>			
<b>opportunities</b>			

THE SULLIVAN GROUP OF COURT REPORTERS

Index: Oliver–Payne

12:1,3	<b>petitions</b> 60:16 61:21 63:6,8 65:20	<b>point</b> 45:11,13 46:17 49:13, 18,21 50:1 61:14 64:14 72:25 81:4,5 83:21,22 84:6 85:13 90:9,10 93:1 94:16,20,22,23,24 95:11 96:16,17,18,19 104:22,25 105:1,2,8,9, 10,11	<b>practice</b> 9:14 84:21
<b>PDF</b> 114:12	<b>petroleum</b> 11:20 14:4 28:7 38:16 41:3 43:6,25 45:8 93:9 113:25 114:6	<b>pointed</b> 32:1	<b>precise</b> 43:21 94:12
<b>peak</b> 64:9 68:16 69:8,23 70:1,9,14,17,19 71:1,2, 9,11 80:15,21 81:4,12, 20 82:1	<b>PGR</b> 11:3	<b>pointing</b> 94:22 116:16	<b>precisely</b> 65:24 89:19 92:22 101:11
<b>penalty</b> 86:16	<b>Ph.d.</b> 6:1 18:13	<b>points</b> 59:10 66:19,20 84:16, 18,19 89:22 93:1 94:11 95:3,9,13 96:13,18 99:8 104:20,23 107:12 113:13,20 114:2	<b>predetermined</b> 105:10
<b>pencil</b> 73:11	<b>phone</b> 8:25	<b>police</b> 84:10	<b>predrilled</b> 39:1
<b>penetration</b> 109:14 118:20	<b>phrase</b> 58:7 88:19 107:6	<b>popped</b> 12:20	<b>preliminary</b> 34:12
<b>people</b> 12:20 13:5 18:20 68:8 94:18 119:19	<b>physically</b> 67:17	<b>porosity</b> 43:11	<b>prepare</b> 7:10 12:11,15 15:25 17:22
<b>perfectly</b> 61:7	<b>pipe</b> 107:12,14,16 110:25	<b>portion</b> 17:25 20:4 45:18,19 51:6,16 52:21 56:12 77:14 78:6 108:3,6	<b>prepared</b> 74:1 92:21 99:14
<b>perform</b> 65:17 66:1 111:2	<b>Pirovolou</b> 25:1,6,9,13 104:4,9,12, 16,20,21 105:25 108:17,20,25 112:8	<b>portions</b> 18:24 89:17	<b>preparing</b> 17:13 28:1,4 29:11,14 34:6
<b>performed</b> 11:22 27:3 66:3 67:4,8 73:10,18 74:2 78:15,19 79:2,13,16 80:1 81:16 84:2 99:22 100:9 101:4	<b>Pirovolou's</b> 104:18 105:3,7 107:24 108:3,6,19	<b>POSITA</b> 31:5 40:14,20 47:23 48:3 50:2 64:23 65:2 66:23 67:16 86:21 93:8, 13 104:3 107:21 110:12 112:4 113:24	<b>preplanned</b> 39:20 46:2,10
<b>period</b> 20:5 31:7	<b>place</b> 30:2,8 47:25 68:6	<b>position</b> 69:23 104:10,18 105:3	<b>prescribe</b> 101:6
<b>permitted</b> 8:5	<b>places</b> 104:21	<b>positions</b> 20:10 58:21	<b>prescribed</b> 111:5
<b>person</b> 22:1 30:18,22 36:5 40:11,13 43:20 74:5,11 76:16 78:12 90:1 107:10 113:11,18 115:12	<b>plain</b> 62:19 63:5	<b>possibly</b> 45:16	<b>present</b> 76:16 112:7
<b>personal</b> 86:21	<b>plan</b> 7:23 38:14,17 45:14 46:5	<b>post</b> 11:2	<b>pressure</b> 109:13
<b>perspective</b> 89:10	<b>plane</b> 95:21 96:4	<b>potentially</b> 74:12	<b>previous</b> 74:16 98:13
<b>petition</b> 31:13 34:21 100:1	<b>planned</b> 38:14 50:10 106:16		<b>previously</b> 99:2
<b>petitioner</b> 5:9 6:9	<b>planning</b> 46:1 114:23,24		<b>primarily</b> 18:10 20:17
<b>petitioner's</b> 75:13 76:12 91:3,18	<b>plans</b> 45:24		<b>primary</b> 36:5
	<b>plural</b> 32:21		<b>principal</b> 13:4 21:17,18,20 22:2, 4,10,12
			<b>printed</b> 20:3

THE SULLIVAN GROUP OF COURT REPORTERS

Index: PDF-printed

<b>prior</b> 11:17,23 13:12,14 30:25	<b>properties</b> 108:13 109:11	118:8,9	41:20
<b>priority</b> 31:4	<b>proposed</b> 81:18 92:16	<b>questions</b> 6:10,17,24 7:1,5,8,18 8:5 9:5 109:17 122:5, 13,18	<b>reaming</b> 86:12
<b>probability</b> 112:1 121:20	<b>provide</b> 9:12 11:10 18:4 63:3 72:13 80:13,16 85:12	<b>quickly</b> 29:5	<b>reason</b> 6:16 11:7
<b>problem</b> 14:17	<b>provided</b> 8:23 9:19 10:12 15:6 17:24 18:8 21:10,11 33:10 34:2	<b>quote</b> 38:11 69:8	<b>reasonable</b> 110:12 112:9
<b>problems</b> 111:14	<b>providing</b> 6:21	<b>quote/unquote</b> 93:23	<b>reasoning</b> 104:7 105:22
<b>procedure</b> 30:3 74:21 80:12 99:5,6	<b>provision</b> 22:15	<b>quoted</b> 108:3,6	<b>recall</b> 17:12,17 28:20 34:8 37:6 47:7 48:10 59:23 60:12 61:6,8,11,12 82:24 88:6 104:14 105:7 119:23 121:10
<b>proceedings</b> 9:8 11:2,3 59:17 60:11	<b>proximity</b> 115:20,22		<b>recalling</b> 19:8
<b>process</b> 20:23 21:1,5 22:2 28:5 30:2 34:23 39:2 52:17 55:7 60:14 61:6,11 69:13 89:21 111:1,10	<b>publication</b> 25:6,7,10 31:1	<b>radii</b> 81:2	<b>Received</b> 16:7
<b>process-based</b> 112:25	<b>pull</b> 73:11	<b>radius</b> 81:1,11	<b>recent</b> 61:13
<b>processes</b> 61:9	<b>pulled</b> 58:16 115:15	<b>range</b> 45:4	<b>recently</b> 28:25
<b>produce</b> 41:5 45:15 46:8	<b>pulling</b> 58:13 105:25	<b>rank</b> 119:20	<b>recess</b> 42:4 72:2 87:21 109:25 122:11,24
<b>produced</b> 55:4	<b>pumps</b> 118:21	<b>rate</b> 109:14 117:8 118:20	<b>recognize</b> 23:9,21 24:9 25:7 67:15,18 75:16,19,23, 25 91:14
<b>producer</b> 41:4	<b>purple</b> 76:21 77:11,18	<b>reaching</b> 36:22	<b>recollection</b> 33:8
<b>product</b> 34:24	<b>purpose</b> 41:8 45:13	<b>read</b> 28:8 31:16 33:13,14 49:16,17 51:6 52:21 53:1,10,11,21 54:12,13, 17 62:17 63:24 74:2 76:6 86:1 87:17 89:8 101:19 103:7 104:6,12 112:20,21 113:2,3 118:11 119:13 120:5,8, 13 121:22	<b>recollections</b> 94:1
<b>Production</b> 13:15,23 14:16	<b>purposes</b> 67:5 91:2	<b>reading</b> 52:24 63:9 65:21 74:5 82:22 86:5 94:1 106:11 112:1,6,10 117:21	<b>recommendations</b> 20:16
<b>productivity</b> 43:16,17	<b>put</b> 19:11 65:20 90:14 94:19	<b>reads</b> 69:7 110:15 121:17,18	<b>record</b> 6:13 7:12,17 41:24,25 71:21 75:5 86:7 89:9 106:12 117:22 122:9,12
<b>products</b> 114:18		<b>ready</b> 122:25	<b>recording</b> 7:20
<b>programming</b> 113:1	<b>Q</b>	<b>realize</b>	<b>recover</b> 40:6 41:9
<b>project</b> 30:5,6	<b>quality</b> 18:16,22 20:23 21:23 22:2 30:3		<b>red</b> 77:25 78:9 91:14,17,22
<b>promised</b> 41:21	<b>question</b> 7:2,3,7,12 12:2,19 32:16 34:17 35:14 38:20 51:19 54:19 61:1 113:15 115:4,8,10		

THE SULLIVAN GROUP OF COURT REPORTERS

Index: prior–red

92:6,11	5:1 76:17	<b>reservoir</b> 45:8,20	4,10 30:4
<b>refer</b> 11:13 15:18 23:11,23 24:11,14 25:9,23 26:12 27:7 37:16 41:16 43:7 44:10 45:24 67:7 101:16 108:19	<b>rendering</b> 76:25 81:3 95:25 96:10	<b>respect</b> 22:5 33:11 35:6 38:4 103:16	<b>reviewers</b> 29:24
<b>reference</b> 37:15 47:7,14,17 48:10 91:21	<b>rent</b> 117:9	<b>respective</b> 53:14	<b>reviewing</b> 60:14 115:24
<b>referred</b> 19:25 36:16 44:14 47:8 48:11,12 59:14 65:2	<b>rented</b> 117:8	<b>responding</b> 60:15 65:19 99:25	<b>reviews</b> 18:19 21:13,21
<b>referring</b> 11:14 15:19 23:13,24 24:12 25:10,24 26:14 46:23 65:4 75:17 85:19 86:17,19 97:25 108:17 113:4,8	<b>repeat</b> 35:14 113:15 118:8	<b>responds</b> 59:5	<b>revise</b> 19:5
<b>refers</b> 47:16 80:12 108:7	<b>rephrase</b> 42:25 44:19	<b>response</b> 51:19 65:19	<b>revised</b> 19:2
<b>refined</b> 33:1	<b>report</b> 13:5 18:17 21:6,7 22:15 29:3 32:25 33:3,24 35:24 57:14 115:20,22	<b>responsibilities</b> 13:2,18 14:6	<b>revisions</b> 18:1
<b>reflected</b> 87:16	<b>reporter</b> 6:3 7:10,19	<b>responsible</b> 19:14,15 33:8	<b>rig</b> 117:6,7,9
<b>reflecting</b> 19:22	<b>reports</b> 18:11,15	<b>rest</b> 18:2 49:11 51:2 75:23 91:14	<b>rock</b> 43:10,12 44:15,17,20 45:3 47:24 48:9
<b>region</b> 52:3	<b>represent</b> 5:10 40:22 79:4 91:19 95:6	<b>result</b> 14:5 111:20 119:10	<b>role</b> 13:3,8,19 45:20
<b>related</b> 27:1 44:23,25 108:12 109:10	<b>representing</b> 49:14 92:10 95:4	<b>resulted</b> 106:16	<b>room</b> 8:13
<b>relative</b> 58:1,5 87:11 95:25	<b>represents</b> <small>THE SULLIVAN GROUP OF COURT REPORTERS</small> 91:24 93:22	<b>retained</b> 11:9,24 17:18	<b>rotate</b> 76:2,6
<b>relevance</b> 62:21 75:6 91:5	<b>reproduced</b> 55:16	<b>retentions</b> 13:8	<b>rotated</b> 76:9
<b>relevant</b> 28:19,21 29:3 30:7	<b>required</b> 7:7	<b>return</b> 42:10 54:1 117:12 121:14	<b>roughly</b> 29:17
<b>relied</b> 28:9,11 29:20 115:1,6	<b>requirements</b> 31:6 86:13	<b>reveal</b> 32:15 34:16 60:20 61:18	<hr/> <b>S</b>
<b>remember</b> 7:15 24:14,19 29:18 59:18 102:7	<b>requires</b> 96:9	<b>revealing</b> 32:17 60:23	<b>saving</b> 16:7
<b>remind</b> 119:17	<b>research</b> 13:6,15,20,23,24 14:16, 17	<b>review</b> 11:2,3 20:23 21:5 22:2, 16 28:13 30:3 88:23	<b>scale</b> 48:1,6
<b>remote</b>	<b>researchers</b> 14:16	<b>reviewed</b> 17:25 18:14,15 19:3 22:7,9 27:4 28:12,17 29:3 32:19,20,24 34:19 36:3 114:16	<b>scientists</b> 68:2
	<b>reserves</b> 39:15,22 40:7,17,20 41:5,9 42:14,19,23 43:3 44:15 46:2 47:20	<b>reviewer</b> 18:18 21:8,14,17 22:2,	<b>scope</b> 37:5 44:22 76:24 77:6, 13,20 78:4,14 79:11,24 80:23 81:15 82:10 83:7 84:1 92:15,23 94:8 95:19 96:22
			<b>score</b> 118:1 119:15,18,21 121:6,11,16,18,20,24

THE SULLIVAN GROUP OF COURT REPORTERS

Index: refer–score

<b>scores</b> 118:24 119:19 122:1	106:7,11,19 107:19,22, 23 108:2,18,20 109:15 110:11,17 112:16,20 117:18,21,22 121:19 122:1	<b>76:6</b>	9,11,12
<b>scratch</b> 20:14 39:6 52:21 55:16 86:18 87:4		<b>sign</b> 16:18 17:9 19:12	<b>solution</b> 111:5,9 117:25
<b>screen</b> 9:23 112:14	<b>sentences</b> 104:8 118:5,11 119:13	<b>sign-off</b> 21:18 22:18	<b>solutions</b> 105:8
<b>SDP</b> 113:1	<b>separate</b> 41:7	<b>signature</b> 16:16 17:7	<b>solve</b> 14:17 111:14 120:20 121:2
<b>search</b> 68:25 69:2 119:16	<b>separated</b> 52:6	<b>signing</b> 21:6	<b>solving</b> 111:11
<b>searchable</b> 82:21	<b>served</b> 11:25	<b>similar</b> 20:7 44:13 86:14 102:5	<b>somebody's</b> 84:7
<b>secondary</b> 36:17,21,25 37:1,3,10	<b>serving</b> 12:7	<b>similarities</b> 29:18 32:23	<b>sort</b> 13:20 21:12 48:5
<b>section</b> 27:1 31:21 56:16 63:16 71:13 77:17,22 78:11	<b>set</b> 46:9 55:18 96:13 98:7 118:24 122:13	<b>Similarly</b> 25:9	<b>sorts</b> 20:18
<b>sections</b> 77:2 97:13,18 98:14	<b>severity</b> 64:10 69:11,19 80:16	<b>simply</b> 99:23	<b>sounds</b> 15:24 27:15 72:1 122:19
<b>segment</b> 53:6,14,21 77:22 101:1, 10	<b>share</b> 10:13 16:3,22 22:19,23 23:15 24:3,25 25:17 35:24 74:24 90:12	<b>single</b> 45:11,13 54:10	<b>space</b> 94:21 95:21 97:24
<b>segments</b> 53:7,22 86:14 101:9,12, 14	<b>shared</b> 58:10 114:9	<b>siren</b> 84:8	<b>spanning</b> 69:10
<b>seismic</b> 38:11 43:13 45:22	<b>shorter</b> 40:8	<b>sit</b> 61:7 100:13 102:7 121:10	<b>speak</b> 8:6 18:8 32:21 42:6 72:6 76:4 81:3 87:25 110:4
<b>select</b> 54:11	<b>SHORTHAND</b> 6:2	<b>situation</b> 70:25 81:22 96:11 97:25	<b>speaking</b> 7:20 34:22 43:24 45:12 77:7 84:13,14,17,20 108:8 109:8,16
<b>selected</b> 55:3 66:11 106:15	<b>show</b> 102:4	<b>situations</b> 22:11	<b>specific</b> 7:7 40:24 50:14 63:3 67:13 69:4 70:3 108:20
<b>selecting</b> 55:6	<b>showing</b> 94:12 99:23 103:18	<b>size</b> 81:25	<b>specifically</b> 28:22 37:6 43:2 55:22 57:21 60:12 65:17,22 67:9,11 68:20 73:24 94:1
<b>selection</b> 55:7 56:4	<b>shown</b> 48:16 56:7 92:18	<b>skill</b> 30:18 40:12,13 43:20 62:16 74:5,11 78:12 90:1 107:11 113:12,19	<b>specification</b> 26:23,24 27:7 32:20 47:22 53:20 64:13 74:3, 6 78:16 80:14 81:6,18 82:14 83:1 84:13 86:22 88:23 94:2 101:6
<b>selects</b> 55:1	<b>Shubert</b> 33:11 34:2	<b>skilled</b> 113:24	
<b>sense</b> 79:14,17 103:19	<b>Shubert's</b> 33:18 63:8	<b>sliding</b> 52:20	
<b>sentence</b> 31:12 50:21 51:2,6,16 52:16 53:16,20 54:7,24 58:4 59:2,4,6,9,14 62:6 64:15 85:21 86:6 87:8 89:5,8 104:2 105:14	<b>sic</b> 31:4	<b>smaller</b> 42:22 69:16,18	
	<b>side</b> 8:15 10:19 15:16 49:25	<b>Society</b> 28:6	
	<b>sideways</b>	<b>software</b> 114:19,22 115:1,3,5,7,	

THE SULLIVAN GROUP OF COURT REPORTERS

Index: scores–specifications

55:24 58:7 60:6 64:2 67:15 68:14 80:10,17 84:4 85:11 89:18 99:5 101:24	63:19 87:8 110:24 111:8	<b>stricken</b> 11:6	<b>synthesized</b> 18:14
<b>specificity</b> 48:7	<b>stated</b> 51:20 88:7 98:1,6	<b>strike</b> 106:17,20,24	<b>system</b> 18:17,21,22 21:24 57:1, 6 69:13 88:18 110:25 111:8 119:8
<b>speculating</b> 121:12	<b>statement</b> 36:15 49:8,11	<b>strong</b> 35:1	
<b>spend</b> 82:21	<b>states</b> 47:23 53:5,17	<b>structure</b> 57:14 119:1	<b>T</b>
<b>spent</b> 17:13 19:7,18,23	<b>statistics</b> 112:2	<b>stuff</b> 10:19 34:7	<b>table</b> 31:19 32:4
<b>spider</b> 116:24,25	<b>Stavinoha</b> 5:4 8:15,18 12:13,15,22 18:3 19:24 32:14 33:1 34:4,15 35:13,22 37:5 38:24 41:13 42:24	<b>subject</b> 31:1 32:8 118:23	<b>takes</b> 107:24
<b>spots</b> 43:16	43:23 44:22 46:12 50:6 51:11,23 54:18,22 60:19 61:17 62:21	<b>subjects</b> 111:17	<b>taking</b> 111:3,10
<b>spread</b> 17:16,19	67:22 71:24 72:1,21 73:9 74:8 75:5 76:24	<b>submit</b> 59:16	<b>talk</b> 12:23 15:4 18:5 41:19 52:9 56:12 58:9
<b>squiggles</b> 69:18 70:5,9,10	77:6,12,20 78:3,14 79:11,24 80:23 81:14	<b>submits</b> 21:8	<b>talked</b> 29:16 45:23 92:18
<b>squiggly</b> 69:17 70:4	82:10 83:7 84:1 91:4 92:15 93:6 94:8 95:19	<b>submitted</b> 15:5 22:8 26:3,16 59:19	<b>talking</b> 7:21 44:17 88:4
<b>stability</b> 118:2	96:21 97:16 98:5,12,20 101:18 105:5 113:14,21 120:16 121:9 122:8,16, 21,25	<b>subset</b> 42:22	<b>tangent</b> 66:25
<b>staff</b> 18:20	<b>stay</b> 9:10	<b>substance</b> 8:6,18 18:5 42:7 60:23 72:7 88:1 110:5	<b>target</b> 38:4,7,10,14,16,18,22, 25 39:4,6,8,10,16,17, 19,23 40:3,18,19 41:15, 16,18 42:11 43:21
<b>standard</b> 5:2 67:20,24 68:7 93:4, 9,12,23	<b>steerage</b> 86:15	<b>substantively</b> 37:17	44:11,21 45:1,10,13,17, 18,24 46:2,3,5,6,7,8,10, 11 48:11,14 49:9,15
<b>standards</b> 21:23 22:17	<b>stenographer</b> 5:14 54:21,23 87:19	<b>success</b> 110:13 112:10 118:2 121:21	50:5,23,25 51:1,3,17, 19,20,21,22 52:2,4 57:3
<b>standing</b> 94:21	<b>Step</b> 69:8 85:4 100:21	<b>suggest</b> 36:7 89:16	58:1,5 87:11 89:12,13
<b>start</b> 7:18 75:9 96:14	<b>stochastic</b> 112:2 113:1,5,8 119:9	<b>suggested</b> 72:23	90:7,10,11 91:24 92:2, 20 93:2,20 94:4 99:9,18
<b>started</b> 32:25	<b>straight</b> 73:15 82:13,16 83:1,2, 4,5,8,9 107:17	<b>suitable</b> 38:12	100:12 101:1,10,14 102:19 103:6,15
<b>starting</b> 52:16 58:17 86:6 106:8 117:15 120:1	<b>straightforward</b> 70:1	<b>support</b> 59:7,9	104:10,19 105:4,19,23 106:17,21,25
<b>starts</b> 27:21 49:8 50:22 59:3 85:21 107:21	<b>stratigraphic</b> 40:15	<b>surface</b> 48:21,23 107:14,17	<b>targets</b> 39:23 40:2,9 41:12,17 45:21 104:5
<b>state</b> 6:12 31:12 54:8 62:13	<b>strength</b> 111:18	<b>switch</b> 116:1	<b>taught</b> 13:25
		<b>sworn</b> 5:12 6:2,21	<b>teaches</b> 114:1

THE SULLIVAN GROUP OF COURT REPORTERS

Index: specificity–teaches

<b>technical</b> 18:18 21:4,14 22:11,16 31:6 36:4	<b>text</b> 9:4	24:11 25:23 26:12,17 27:7 37:16 83:19 84:17 92:1 100:13 106:1 114:9	63:13 86:25 88:11,25 102:9 103:22 107:1 108:25 110:8
<b>technically</b> 21:3,16	<b>theoretically</b> 96:23 99:7		<b>turns</b> 64:5,7
<b>technique</b> 111:16	<b>theory</b> 110:22 111:17 112:6 120:19	<b>today's</b> 6:20 7:11 11:13 23:12	<b>twists</b> 64:5,6
<b>Technologies</b> 5:11 11:10,15	<b>thing</b> 20:7 21:13 65:8 69:24 85:7 116:22	<b>top</b> 58:20 62:10 64:22 75:17 91:7 103:25	<b>two-dimensional</b> 95:21
<b>technology</b> 14:2 28:8	<b>things</b> 19:2 21:21 29:2 36:5 67:17 76:6 82:20 90:18 109:21 111:19	<b>topic</b> 41:20	<b>type</b> 108:16
<b>telling</b> 102:24 103:4	<b>thinking</b> 86:17 97:10	<b>total</b> 34:6 53:13 55:18,21 107:7,13 109:16 118:2, 5,12 120:14,18 121:21, 23 122:2	<b>types</b> 21:20 28:6 52:19 53:19
<b>temperature</b> 109:12	<b>thoroughness</b> 57:13	<b>Totally</b> 24:20	<b>typical</b> 93:15
<b>template</b> 18:2	<b>thought</b> 28:19 84:7 89:21	<b>traditionally</b> 106:15	<b>typically</b> 44:20 76:15
<b>ten-minute</b> 41:22 71:18 109:23	<b>three-dimensional</b> 96:12,15 97:24 98:1	<b>trail</b> 39:3	<b>U</b>
<b>term</b> 30:18 38:7 40:12 52:5 57:21 63:17,20 65:11, 14 66:4,5,6,13 67:10,11 70:5 72:14 87:6 88:5,7 93:7 100:2 102:15	<b>thumb</b> 64:18	<b>training</b> 14:3	<b>U.S.</b> 15:11,13 23:8,13,20,24 24:8,12 25:5,10 91:8
<b>termed</b> 38:16 70:12	<b>time</b> 5:2 8:1 11:20 17:12,16, 20 19:22 20:2 22:14 28:8,9 30:25 34:7-35:15 37:11 41:22 52:20 53:3, 10 54:22 55:23 56:3 61:9,14 62:23 63:11 69:1 71:17 76:5 82:25 107:15 112:23 116:14, 17,20,23 117:1,4,10,19, 24 118:2,5,9,12,16,20, 21 119:3 120:14,18,19, 21,22,24,25 121:2,21, 23 122:2,14,19	<b>trajectories</b> 107:7	<b>uh-huh</b> 7:13
<b>terminology</b> 42:18 43:8	<b>times</b> 10:24 11:21 18:16 19:21	<b>trajectory</b> 104:9 105:18 106:15, 20,22,24 112:22	<b>ultimately</b> 36:8 39:10 55:7
<b>terms</b> 19:19 51:5 56:20,23 57:9,10 59:21,25 60:3, 9,11,15,17 61:4,13,15, 21 62:7,18 63:4,7 65:22	<b>title</b> 115:19	<b>transcript</b> 7:10	<b>uncertainties</b> 112:3,17,19,22
<b>testified</b> 6:3 78:19 80:10 91:25	<b>titled</b> 27:1	<b>tribunal</b> 11:6	<b>underground</b> 48:4
<b>testify</b> 11:18 76:4	<b>today</b> 5:7 6:10,17 8:8,10,22 9:8 10:8,10 12:12 23:23	<b>trocar</b> 39:13	<b>underneath</b> 58:23
<b>testifying</b> 104:15		<b>trouble</b> 7:20	<b>understand</b> 6:20,23,25 7:1,9,16 8:8, 20 11:14 15:18 22:13, 14 23:12,24 24:12,16, 18,20,21,23 25:10,12, 13,24 26:1,2,5,13,16, 18,23 27:8 30:23 37:20 40:11,14,21 50:2 64:8 65:2 72:18 74:6 76:13, 14,18,19 80:13 91:10, 17,19 92:10 93:8 99:19 103:21 106:19 111:25 112:4 113:19 115:2,6 119:24 120:14
<b>testimony</b> 6:22 8:7,19 11:6,10 15:6 35:6 42:7 50:19 72:7 74:9,17 88:1 110:5		<b>Tuesday</b> 12:17	
<b>Texas</b> 8:12 13:15		<b>turn</b> 16:13 17:4 30:10 31:9 37:22 52:11 55:9 56:13	

THE SULLIVAN GROUP OF COURT REPORTERS

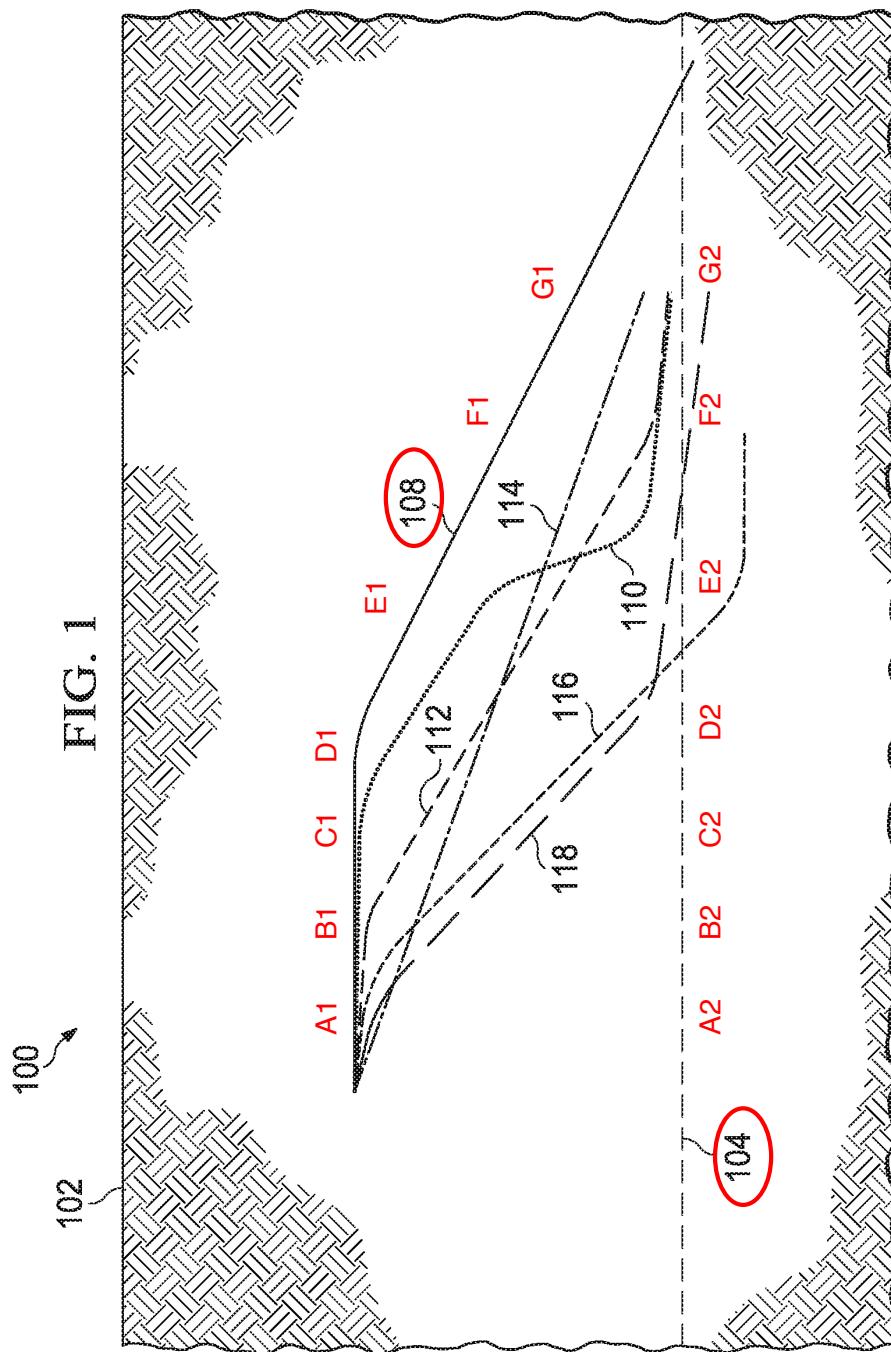
Index: technical-understand

<b>understanding</b> 30:17 38:7,9 45:1 49:21,23 51:9 53:12,17 54:14 55:20 67:10 72:19 87:6 115:25 116:19 118:14 121:25	<b>vary</b> 68:5,17 74:13,14	<b>wide</b> 45:4	22:9,15 87:12
<b>understands</b> 40:12	<b>verbal</b> 7:13	<b>Williams</b> 5:8 12:21	<b>X</b>
<b>understood</b> 7:3,8,21 62:15 64:23 65:4 94:15 113:9	<b>version</b> 33:3 34:13 80:21 82:7 92:12 94:5 97:23 114:12	<b>window</b> 9:13 10:13 16:4 22:20 24:4 25:1,18 26:7 68:18 69:10,15,18 70:13,17, 25 71:8,11 74:19,25 80:13,15,19 81:19,25 82:2 90:14	<b>XY</b> 44:6
<b>undetermined</b> 93:1	<b>versus</b> 35:5 45:19	<b>windows</b> 10:16	<b>XYZ</b> 43:21 44:2
<b>unit</b> 40:15 53:6 66:16	<b>vertical</b> 40:7 44:1 68:1 107:16 109:16	<b>word</b> 27:3,14 53:18 88:21 103:9 113:10 119:14	<b>Y</b>
<b>United</b> 53:5	<b>viewed</b> 62:25 86:15 89:24 107:21	<b>words</b> 87:18 101:20 102:2,3	<b>years</b> 13:10,11 18:12
<b>units</b> 66:20 70:22 97:11	<b>Viewing</b> 115:20	<b>work</b> 11:22 12:5 13:5,7,13,14 14:5 15:1 17:19 20:7 21:3 71:22,24 92:23	<b>Z</b>
<b>unpatentable</b> 31:15	<b>visible</b> 49:20	<b>worked</b> 11:20 13:14 19:10 32:24	<b>zone</b> 44:11,14,15,16 45:2 46:6,7
<b>unquote</b> 38:13	<b>volume</b> 44:14,17,20 45:2,6 48:9	<b>working</b> 13:12 19:7,18 20:2 48:3	<b>Zoom</b> 9:14 10:20
<b>unspecified</b> 104:23	<b>volumes</b> 9:3 45:4	<b>wait</b> 62:1	
<b>USA</b> 5:11		<b>Walters</b> 5:8	
<b>user</b> 25:23,25 26:2 114:20 115:2,6,11 121:1		<b>wanted</b> 30:7 113:9	
<b>V</b>			
<b>valuation</b> 109:11	<b>water</b> 39:13	<b>water</b> 18:17	
<b>values</b> 68:19 70:24 73:13 119:20	<b>ways</b> 67:3 74:17,18 78:25 79:15 80:1	<b>writers</b> 50:8 65:3 69:14 73:19 74:20	
<b>variable</b> 81:8 116:13	<b>Wednesday</b> 12:17	<b>writing</b> 17:15,20 19:14,15 29:3 63:12	
<b>variables</b> 110:24 118:17,18 119:20 120:11,17 121:2,7	<b>well-bore</b> 14:12	<b>written</b> 67:25	
<b>varies</b> 43:18	<b>well-planned</b> 38:11	<b>wrong</b> 52:21	
	<b>wells</b> 14:24 43:14 48:3 68:1	<b>wrote</b>	

THE SULLIVAN GROUP OF COURT REPORTERS

Index: understanding–Zoom

FIG. 1



1/6/2023 HILBERT

EXHIBIT

A

Exhibit A

Deposition of Dr. Hilbert

IPR2022-00288 / IPR2022-00289

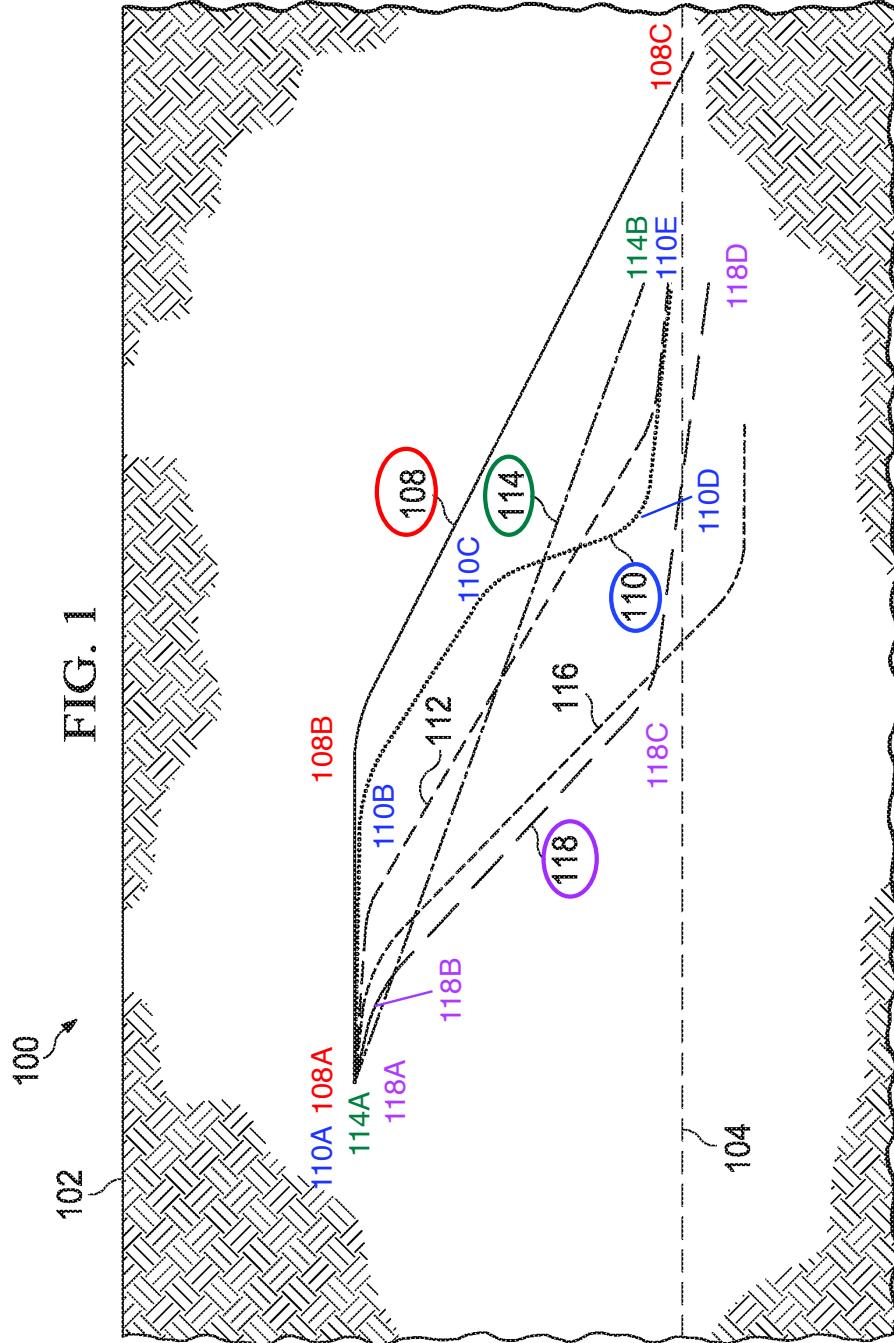
EX1001

Nabors Drilling Technologies USA, Inc. / Page 3 of 21

EX1029 / IPR2022-00289 / Page 151 of 152

NABORS v. MOTIVE DRILLING

FIG. 1



1/6/2023 HILBERT

EXHIBIT

**B**

Exhibit B

Deposition of Dr. Hilbert

IPR2022-00288 / IPR2022-00289

EX1001

Nabors Drilling Technologies USA, Inc. / Page 3 of 21

EX1029 / IPR2022-00289 / Page 152 of 152

NABORS v. MOTIVE DRILLING