PUBLIC VERSION

IN THE MATTER OF AN ARBITRATION UNDER CHAPTER ELEVEN OF THE NORTH AMERICAN FREE TRADE AGREEMENT AND THE 1976 UNCITRAL ARBITRATION RULES

between

THEODORE DAVID EINARSSON, HAROLED PAUL EINARSSON, RUSSELL JOHN EINARSSON, GEOPHYSICAL SERVICE INCORPORATED (GSI)

(the "Claimants")

-and-

GOVERNMENT OF CANADA

(the "Respondent", and together with the Claimants, the "Disputing Parties")

(ICSID Case No. UNCT/20/6)

REJOINDER EXPERT OPINION REPORT

by Doug Uffen, P. Geoph (APEGA)
President / Director of Reflection Peak Enterprises Limited

October 29th, 2024

REFLECTION PEAK

TABLE OF CONTENTS

I. OVERVIEW

1. I have been engaged by the Government of Canada as an independent expert in this arbitration to provide insight about the appropriate methodology that an objective third party would adopt in order to establish a fair market value of GSI's seismic data library. In my first Expert Opinion Report, dated January 13, 2023,[1] I described my background and qualifications, the nature of seismic data, as well as oil and gas industry practices in relation to seismic data. I opined that the only proper means of determining the value of GSI's seismic data library is to conduct a data quality inspection of GSI's seismic data, storage tapes, files and records, and described the methodology for such an appraisal in my report, which includes the consideration of other factors that could affect market value.

2. In their Reply, the Claimants did not directly respond to my first report. Instead, they put forward a new expert, Victor Ancira of Troika USA ("Troika"), to perform an asset-based valuation of GSI's library, using a "replacement cost" methodology because information about other multi-client ("MC") data lease rates in proximity of GSI's data were unavailable at the time of generation of their report. In Section 2 of this Report, I explain why, in my opinion, Mr. Ancira does not appear to have relevant qualifications to value GSI's multi-client seismic database, as well as why Troika's use of a "replacement cost" methodology to assess the fair market value of GSI's seismic data library is inappropriate.

3. [redacted] [2] Paul Einarsson states in paragraph 146 of his May 31, 2024 witness statement that GSI hired [redacted] to provide a valuation of its then current set of seismic data. According to Mr. Einarsson, these valuations were "done from a geophysical perspective and for a specific purpose to support GSI financings." This suggests that

[1] **RER-03**, Expert Report of Doug Uffen, 13 January 2023.

[2] **C-560**, Bundle of Seismic Data Valuations Reports for GSI by [redacted]

GSI itself considered [redacted] seismic database valuations reliable enough to truthfully represent its value to any banking institution. [redacted] incorporated, as guidance, sales revenue information in its valuation analysis. I have been instructed by counsel for the Government of Canada to provide a review of [redacted] valuation methodology of GSI's seismic data library in Section 3 of this Report. Despite identifying several limitations and unreasonable assumptions in [redacted] valuation methodology, for the purposes of assisting the Tribunal, I have also been instructed to extend the application of [redacted] valuation methodology from its [redacted] to provide a valuation of GSI's Canadian seismic data library as of November 30, 2017. In doing so, I have treated the assumptions in [redacted] as still relevant, except where expressly stated otherwise in the [redacted] Additionally, for the purposes of this valuation, I have been instructed to exclude any valuation of GSI's non-Canadian seismic data as none of that material has ever been available from the Boards. In the absence of any physical review or analysis of GSI's actual seismic data library, I am of the opinion that, at most, [redacted] valuation methodology should only be considered as establishing a maximum "ceiling" for potentially valuing GSI's seismic data library.

4. Despite the valuation established by the [redacted] methodology, I also remain of the view that the only reasonable way to determine the fair market value of GSI's seismic data library is by applying the data quality inspection methodology outlined in my first report. The [redacted] methodology is, in my view, limited as it assumes that all of the stored data (both the basic data and stacked / migrated data) is actually in great condition and fully retrievable, without any data loss. Even with the most careful storage procedures to ensure data integrity, data that is 40 years old may have limited value if more modern data exists in the same region. [redacted] methodology also assumes that all data of a similar vintage or age are of the same data quality. [redacted] also did not take into account actual industry activity (or lack thereof), exploration moratoriums, government bid round activity and a limited customer base due to expensive exploration costs, all of which will influence the revenue value of the data. In the absence of [redacted] having accounted for these factors, [redacted] valuation can only be

considered an absolute ceiling for valuation of GSI's seismic data library, the Fair Market Value ("FMV") of which is likely to be less for the reasons to be described more fully in Section 4 of this Report.

5. Lastly, Section 5 summarizes my conclusions in this Report. In short, I do not consider Troika's "replacement cost" methodology to provide a reasonable alternative approach to valuing GSI's seismic data library as it existed, in 2017. Similarly, in the absence of a detailed review and analysis of GSI's actual seismic data library, the [redacted] methodology should, at most, only be considered as establishing a maximum "ceiling" for the valuation of GSI's seismic data library. The actual FMV of GSI's seismic data library is likely lower than what [redacted] methodology suggests.

6. Attached at Appendix A of this Report is my curriculum vitae, which is current as of the date of the filing of this Report.

II. THE TROIKA REPORT DOES NOT PRESENT A REASONABLE ALTERNATIVE METHODOLOGY FOR VALUING GSI'S SEISMIC DATA LIBRARY

7. In their Reply, the Claimants did not directly respond to my first report. Instead, they put forward a new expert, Victor Ancira of Troika, to perform an asset-based valuation of GSI's seismic data library using a replacement cost methodology. In this Section of my report, I provide comments on: (1) Victor Ancira of Troika's lack of relevant qualifications to value GSI's multi-client seismic database; and (2) why Troika's use of a "replacement cost" methodology to assess the fair market value of GSI's seismic data library is inappropriate.

A. Troika Does Not Possess the Qualifications and Expertise to Provide a Fair Market Valuation of GSI's Seismic Data Library

8. Firstly, I do not consider Mr. Ancira to possess the relevant qualifications to provide an asset-based valuation of GSI's seismic data library, albeit no resume for Mr. Ancira was provided. Based on my review of the Troika Report, Victor Ancira's background is in seismic data management. He has experience in recommending best practices, processes and procedures used in seismic data management. It appears that

he has experience in day-to-day seismic data management operations including data storage quality management at Kestrel Integrated Data Management. He also has experience with data management software at Troika and has provided Cloud hosting storage services to the industry. It appears that his experience with the Technical Standards Committee of the Society of Exploration Geophysicists (SEG) was primarily based upon various upgrade iterations of the SEGY file format for data acquisition, processing and storage.[3]

9. Seismic data management entails the indexing, storage, retrieval, tracking, archival, and maintenance of seismic data, essentially being able to maintain its condition, find it, retrieve it and then make use of it. Several software packages are available to industry that enable personnel to perform the various tasks associated with the indexing, retrieval, storage, tracking and archival of seismic data. Given that seismic data can be stored in various formats and on a wide range of mediums, those involved in this role are primarily concerned about the technical aspects of managing a seismic data library, as opposed to commercial, market-based considerations.

10. Notably, Victor Ancira's expertise does not appear to be associated with interpreting seismic data to delineate drilling investment opportunities to explore for or develop hydrocarbons. He does not claim to be a professional geophysicist. He is experienced with respect to the storage and archival of seismic data, not working with it, with its frailties, and making judgements regarding its quality and then recommend reprocessing it to enhance data quality, when required. He makes no mention of valuation of seismic databases for his various clients nor is a resume provided. It appears that Mr. Ancira is outside his area of expertise to value a seismic database.

11. Hence, in my view, I do not consider Mr. Ancira's qualifications and expertise as being relevant or appropriate for the exercise that he was tasked to do which was "to provide a valuation of the GSI Multi-Client (MC) library".

[3] **CER-07**, Expert Report of Victor Ancira, Troika USA, 3 May 2024 ("Troika Report"), paras. 1-7.

B. Troika's "Replacement Cost" Methodology is Flawed

12. Secondly, I do not consider the use of a "replacement cost" methodology to be appropriate for assessing the fair market value of GSI's seismic data library given Troika's limited evaluation and assessment of the actual assets comprising GSI's seismic data library and its failure to account for market considerations affecting the value of GSI's seismic data library. Furthermore, a valuation of GSI's seismic data library, which primarily consists of seismic data that is 30-40 years old, using more recent replacement costs will result in a significantly improved data quality in the dataset.

13. From the outset, I note that the Troika Report relies generally upon information provided by GSI.[4] The description of GSI's multi-client library in Section II of the Troika Report provides very limited information. There is no mention whether the original data acquisition or processing costs supplied by GSI were reviewed or audited by Troika. The number of 3D square kilometers matched Schedule 1, entitled "Canadian Schedule of Lines and Kilometers" (Exhibit C-047), and I observed that the number of 2D line kilometers did match closely to that document. For the most part, slight variations are noted due to round up errors, however Troika's 2D data total for the Beaufort / Amauligak 2D data is 36,222 kilometers as opposed to 32,242.66 as noted in Schedule 1. In Troika's listing of the Orphan Basin 2003 data, it is described as 3D data but Schedule 1 (C-047) indicates that it is 2D seismic data. The difference is 13,200 line kilometers of 2D data versus 3352.463 kilometers as noted in Schedule 1. These are the two main discrepancies in the two listings of seismic data and it suggests inconsistencies with what is being reported. This may have an effect upon valuations of the entire dataset in the vicinity of 5% of its value. The Troika Report also notes that GSI possesses 51,506 kilometers of gravity data and 31,345 kilometers of magnetic data in GSI's seismic data library, yet this data was not evaluated. According to Mr. Ancira, "[a] sample of GSI MC (seismic) data was reviewed using Troika's Quickview application". The data was found readable with all of the

[4] See e.g., **CER-07**, Troika Report, at para. 10, FN 1, citing "Information provided by GSI".

information required to load it into a geoscience workstation.[5] It is fair to presume from this statement that the processed data was sampled. That presumption is re-inforced by a following statement that states that the textual headers were populated with information to allow for further processing. From these two statements, it is presumed that only the processed data was sampled and not any of the field data. The value of a GSI license is that the field data provided permits the data to be fully reprocessed from scratch. It does not appear that the field data was tested for retrieval and integrity.

14. Beyond Paul Einarsson's statement that "GSI has reprocessed most of the Seismic Works over time",[6] there is no confirmation of which seismic data programs or the number of kilometers of data that were reprocessed or the resulting quality of the reprocessed seismic data. The Troika Report merely cites Figure 8 of Michael Enachescu's article in the May 2007 edition of the CSEG Recorder magazine which shows a 1984-85 2D seismic line collected by the Geological Survey of Canada over the Laurentian Basin.[7] The captioned Figure 8 states, "(d)ata was reprocessed in 2006 by Arcis, with great improvement in overall quality, proving how valuable older digital field data is for exploration and research."[8] However, data processing technology evolves over time. In my view, the best data reprocessing effort would only be able to upgrade the quality of the data by one quartile (ie: from "poor" quality data to "fair" quality data, or "fair" quality data to "good" data quality). Furthermore, despite the use of newer technology, older seismic data can never be reprocessed to match the excellent data quality that data acquisition and processing technology can provide today as the acquisition parameters of older seismic data are "baked-in" and are not subject to change. In addition, some modern-day processing pre-stack time migration algorithms require a certain signal-to-noise threshold to properly perform their operation on the data. For example, Radon multiple suppression algorithms can greatly improve the "ringing" associated with water-bottom multiples. More advanced

[5] **CER-07**, Troika Report, para. 16.

[6] **CWS-12**, Witness Statement of Harold Paul Einarsson, dated 31 May 2024, at para. 154.

[7] **CER-07**, Troika Report, para. 13.

[8] **CER-07**, Troika Report, para. 13; **C-366**, CSEG Recorder - Digital Seismic Dilemma, Ownership and Copyright of Offshore Data - Michael Enachescu, 2007-04, p. 49, Figure 8

filtering algorithms such as FX or FXY deconvolution processes can attack noise better than Tau-P algorithms. Therefore, in order to accurately evaluate the value of GSI's seismic data library, additional information on the number of kilometers reprocessed, the reprocessing techniques used, and then the resulting data quality, is required.

15. The Troika Report states that tape header information is present within the SEGY file EBCDIC headers of the stacked data to facilitate data loading into an interpretive workstation.[9] However, there is no mention whether any of the field data was audited and tested for stiction concerns. There is also no mention of the size of this "sample" of stacked data that was loaded into a workstation to test whether some of the data could be read. While the reprocessed data gathers, velocity files and pre-stack migrated ("PSTM") data now may reside on Digital Linear Tape ("DLT") tape,[10] there is no mention whether the original field data is now stored on this medium or whether it still resides on an older medium which might be more prone to stiction issues. Hence, it is difficult to assess the value of the data without accurate information that addresses data integrity.

16. As acknowledged by Mr. Ancira, Troika's "replacement cost" methodology is also flawed because it does not account for competitive considerations.[11] According to the Troika Report, "[t]here were several attempts to collect market information regarding current market lease rates of multi-client (MC) data in the same regions where GSI has data but there was not enough information available at the time of the generation of the Troika Report to be able to value the library from a lease revenue point of view."[12]

17. In my view, upon completion of a data quality assessment, benchmarking seismic data quality against other competitors both on a cost basis and a data quality basis is possible. Using unaudited original costs to acquire and process the seismic

[9] **CER-07**, Troika Report, para. 16.

[10] **CER-07**, Troika Report, para. 10.

[11] **CER-07**, Troika Report, para. 19.

[12] **CER-07**, Troika Report, para. 15.

data and to value the data does not account for value depreciation over the years as technology evolves and competitive data is acquired. The "replacement cost" methodology applied by Troika is not an appropriate valuation in this instance as more modern data acquisition and processing technology would most likely create an excellent data quality dataset which would likely not be comparable to the actual data contained in GSI's seismic data library, which consists of seismic data collected 15-50 years ago. This would result in a significant uplift in data quality and valuation. Current replacement costs also do not reflect the original investment made by GSI in the first place.

III. AGE DATING OF [redacted] REPORT FOR THE POTENTIAL VALUE OF GSI'S LIBRARY

18. According to the Claimants, GSI hired [redacted] to provide a valuation of its then current set of GSI's seismic data.[13] According to Mr. Einarsson, these valuations were done "from a geophysical perspective and for a specific purpose to support GSI financings."[14] These valuations had access to historic cash flow information but were not very detailed in their review and analysis of the data itself.[15] It is my understanding that these reports were produced to Canada during GSI's document production in this arbitration.

19. I have been instructed by counsel for the Government of Canada to provide a review of [redacted] valuation methodology of GSI's seismic data library, for which I have identified several limitations and assumptions. Nevertheless, assuming [redacted] valuation methodology were to be considered as a possible approach for valuing GSI's seismic data library, I have also been instructed to extend the application of [redacted] valuation methodology from its [redacted] another [redacted] to provide a valuation of GSI's Canadian seismic data library as of November 30, 2017. In doing so, I have treated the assumptions in the [redacted] as

[13] **CWS-12**, Witness Statement of Harold Paul Einarsson, dated 31 May 2024, at para. 146; **C-560**, [redacted]

[14] **CWS-12**, Witness Statement of Harold Paul Einarsson, dated 31 May 2024, at para. 146.

[15] **CWS-12**, Witness Statement of Harold Paul Einarsson, dated 31 May 2024, at para. 146.

relevant, except where expressly stated otherwise in the [redacted] Additionally, for the purposes of this arbitration, I have been instructed to exclude any valuation of GSI's international data.

A. Summary of [redacted] Seismic Database Evaluation Reports and Assumptions

20. For the purposes of this Section of my Report, the materials I primarily relied upon to "age date" the valuation of GSI's seismic data library in the [redacted] taking into account a valuation date of November 30, 2017 were: [redacted];[18] (4) Schedule 1 of Exhibit C-047 titled "Canadian Schedule of Lines and Kilometers;[19] and (5) Exhibit C-048, titled "Geophysical Service Incorporation Speculative Data Bought from Halliburton".[20]

21. In the [redacted] used a Discounted Replacement Cost Valuation of Seismic Data ("DRCV") methodology.[21] A DRCV approach assumes the use of modern technologies and practices which are not relevant for an aged seismic database. [redacted]

[16] **C-560**, [redacted]

[17] **C-560**, [redacted]

[18] **C-560**, [redacted]

[19] **C-047**, Seismic Survey Assets, Schedule 1.

[20] **C-048**, Speculative Data Brought from Halliburton.

[21] **C-560**, [redacted]

[22] **C-560**, [redacted]

[23] **C-560**, [redacted]

[redacted][24] [redacted]

[redacted][25]

22. As noted in the [redacted] information pertaining to line lengths, fold and the age of the data was provided by GSI and accepted at face value on an unaudited basis. Current data acquisition costs for the valuation date were determined for the various regions.[26] These were then discounted to reflect the age of the data with a [redacted] per annum cost escalation factor for data acquisition costs being used to create an Acquisition Cost as of Valuation Date. A fold adjustment was also applied to account for data of lower and higher than average fold.[27] Fold is the number of times a given point in the subsurface is sampled. As a rule of thumb, the higher the fold, typically the less noise in the data. Fold was used in the [redacted] as a proxy for data quality.

23. In my opinion, one of the main limitations of [redacted] valuation methodology is that the seismic data at issue was not inspected directly for data quality nor was any benchmarking undertaken, nor were several other market factors taken into account. The use of seismic data fold as a proxy for data quality, even with scaling factors deployed, is problematic and does not yield an accurate assessment of data quality or valuation of the seismic data assets. As explained in my first report and further below at paragraph 43, numerous factors other than fold can affect data quality.[28] Variations in data acquisition parameters can affect data quality. This includes considerations as to how the data was processed, when was it processed and what algorithms were applied to the data. [redacted] but that is in reality an unrealistic assumption given the age and acquisition parameters of the data GSI purchased from Halliburton in 1993 relative to today.

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[24] **C-560**, [redacted]

[25] **C-560**, [redacted]

[26] **C-560**, [redacted]

[27] **C-560**, [redacted]

[28] **RER-03**, Expert Report of Doug Uffen, 13 January 2023 ("First Report"), Section VII(A) "Overview of Aspects of Data Quality Assessment".

24. [redacted].[29] However, as explained further below at paragraphs 47-50 and in Section VII(B) of my first report, future use of the data and any potential future licensing sales revenue can be affected by industry activity within a given region.

25. For example, as discussed in more detail below at paragraph 50, the Labrador Shelf has not had an abundance of exploration and drilling activity over the last 15 years.

26. In my first report, I explained that the date of data acquisition is often used as a proxy for data quality, as commercial applications for older data are more limited as there comes a point where the data no longer attracts any data sales.[30] Accordingly, the value of seismic data is typically depreciated according to its age or vintage. [redacted] In my view, this is a typical and reasonable standard curve for seismic data depreciation.

27. The [redacted] used [redacted] a detailed summary of data sales and a "[redacted][33] Assigned acquisition cost values on a per kilometer basis were given to 1983-1989 datasets in

[29] **C-560**, [redacted]

[30] **RER-03**, First Report, at para. 64.

[31] **C-560**, [redacted]

[32] **C-560**, [redacted]

[33] **C-560**, [redacted]

the Beaufort Sea, the 1971-1981 Beaufort Sea datasets and the High Arctic datasets.[34] GSI did not provide actual acquisition costs. Additional value [redacted] was given to datasets that had been reprocessed.[35] To date, no tally of how many kilometers of data has been reprocessed, has been reviewed or supplied within the written text of the [redacted] or by GSI in any other materials in this arbitration. A revised depreciation with age curve was provided in the [redacted] reflecting data sale revenue provided by GSI is shown in orange in Figure 1 below. A copy of the tabulated data from the [redacted] is shown in Figure 2. As a result of utilizing this revised depreciation with age curve, [redacted] notes that the value of the East Coast of Canada data from [redacted] was reduced by approximately [redacted] from its [redacted] value.

[redacted]

Figure 1: [redacted]

[34] **C-560**, [redacted]

[35] **C-560**, [redacted]

[redacted]

Figure 2: [redacted]

28. [redacted]

B. Application of [redacted] DRCV Methodology to a 2017 Valuation Date

29. I have been instructed to extend the application of [redacted] to 2017 to provide a valuation of GSI's Canadian seismic data library as of November 30, 2017. In doing so, I have treated the assumptions in the [redacted] as still relevant, except where expressly stated otherwise in [redacted] Additionally, for the purposes of this valuation, I have been instructed to exclude any valuation of GSI's non-Canadian seismic data. In the absence of any detailed review or analysis of GSI's actual seismic data library, I am of the opinion that, at most, [redacted] should only be considered as establishing a maximum "ceiling" for valuing GSI's seismic data library.

30. For the purposes of this analysis, the resultant values assigned in the [redacted] were relied upon as a starting point for valuing GSI's Canadian seismic data library as of 2017. No additional seismic data was acquired in Canada after 2009.[36]

[36] **CER-07**, Troika Report, para. 10.

Using this information, [redacted] to reflect a valuation for the Canadian datasets as of the year 2017 as the steeper depreciation curve used in [redacted].

31. For the purpose of conducting this analysis I reviewed Exhibit C-357.24, titled "[redacted]", which contains a list of GSI's Canadian seismic assets and line lengths by dataset.[37] The line lengths however vary from the Claimants listing of data acquired from Halliburton in Exhibit C-048.[38] I observed that the line lengths in Exhibit C-357.24 are often slightly longer than in Exhibit C-048. It is presumed that GSI included the line lengths associated with tail-spreads. Tail-spreads have either, increasing fold coming onto the line or decreasing fold at the end of the seismic line. These regions can be subject to poorer data quality than the full fold seismic line and should not be considered in determining line lengths.

32. Based predominantly on the information in Exhibit C-357.24, I created Appendix B of this report, which is a spreadsheet listing GSI's 2D data and 3D data. The data is ordered first by Region (Column A), then by dataset / survey name (Column B), year of data acquisition (Column C) and the number of kilometers (Column D). Sub-totals of the number of kilometers of surveys in each region were tabulated in Column E. As each dataset / survey name possessed different and sometimes disproportionate cumulative line lengths (Column D), the cumulative number of kilometers had to be related to its proportionate share of the GSI database (Column F). The age of each dataset relative to the year 2009 is shown in Column G.

33. The age depreciation S-Curve used in the [redacted] (shown in Figure 3) was replicated and applied to the information in Column G to derive the value in decimal form in Column H, which is the age depreciation curve value in [redacted]

[37] **C-357.24**, [redacted]

[38] **C-048**, Speculative Data Brought from Halliburton.

[9] Notably, if the age depreciation curve in the were to be applied, it would also result in a much lower valuation of GSI's seismic data library.

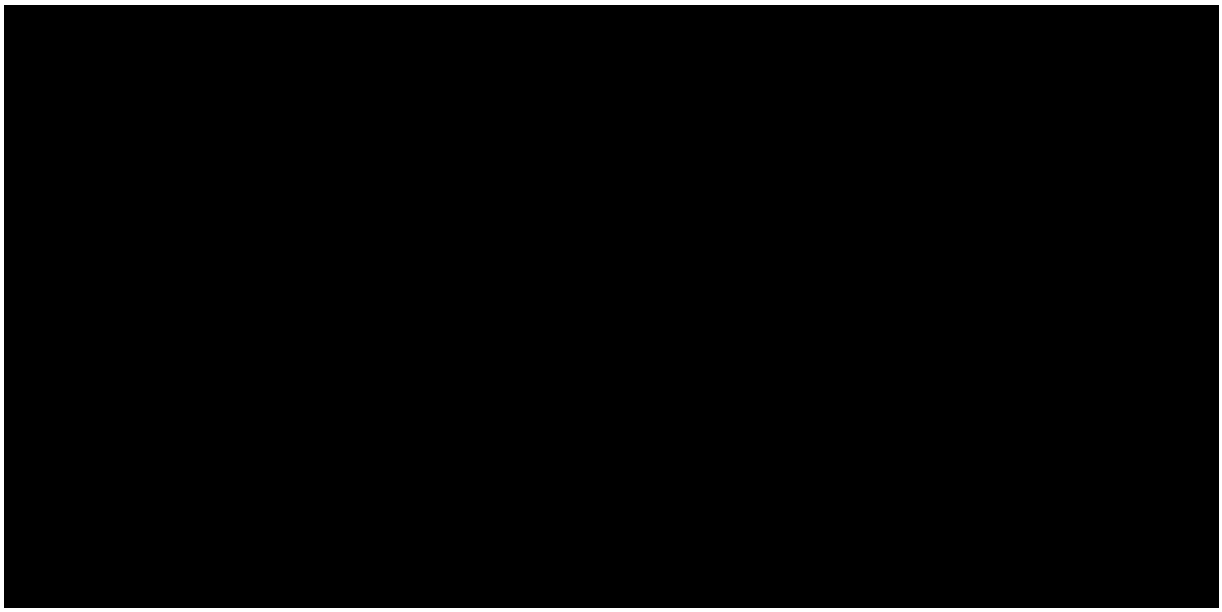


Figure 3:

34. Column H denotes in decimal form the depreciation value factor for each dataset based upon the year of data acquisition using the For example, For the purposes of this Report, data that was even though it may possess some small residual value under certain constraints and conditions.

35. Column I shows the percentage weighting (in decimal terms) of each dataset relative to the whole dataset, relative to the number of kilometers for each respective survey. In order to further "age date" GSI's seismic data to 2017, Column J represents the age of each dataset as of the year 2017. The depreciated value percentage (in decimal terms) for the year 2017 is shown in Column K after the age depreciation

[39] **C-560**,

curve used in the [redacted] is applied. The respective percentage weighting (in decimal terms) of each dataset within the whole dataset, relative to the number of kilometers for each respective survey as of the year 2017 is noted in Column L. The difference in the depreciation factors between the years [redacted] and 2017 (Column H – Column K) are noted in Column M and the respective difference in percentage weighting (in decimal terms) of each dataset within the whole dataset, relative to the number of kilometers for each respective dataset as of the year 2017 is noted in Column N.

36. Due to a current exploration moratorium in the Arctic that was imposed in 2015, any seismic data located offshore in Arctic waters (identified by the yellow-colored cells in Appendix B) was assigned a value of zero as its potential future use is uncertain. Some of these data were already assigned a zero value as their age was greater than 40 years old. For the purposes of valuing GSI's Canadian seismic data library, I was also instructed by the Government of Canada's Counsel to exclude [redacted] listed in Exhibit C-357.24 (identified by the orange-colored cells in Appendix B), [redacted]

37. Overall, the number of kilometers for each eligible dataset in this valuation exercise are shown in Column O. A total of [redacted] line kilometers (cell O128) of the [redacted] line kilometers of the GSI dataset (cell D128), possesses value for this valuation exercise. The sum of the percentage weighting of each 2D dataset for the years [redacted] and 2017 respectively are given by cells I128 and L128, the difference being shown in cell N128. Cell Q128 represents the sum of the line length percentage weightings remaining for the year 2017. On a percentage basis relative to the sum shown for the year [redacted] (cell I128), the relative value summation for the Canadian 2D data in the year 2017 that is not in the Arctic and is less than 40 years of age is shown in cell Q129. On a depreciated basis, the 2D data has a value that is [redacted] The same exercise was conducted for the 3D data, hence the 3D data has a value that is [redacted] of the [redacted]

38. Based on the foregoing, applying the [redacted] the 2017 value of GSI's Canadian 2D seismic data library is [redacted] (cell Q129) times the value calculated by [redacted]. As a result, GSI's 2D Canadian seismic data would be valued at [redacted] in 2017. Similarly, GSI's 3D Canadian seismic data would be valued at [redacted] in 2017**.** Hence, applying [redacted], the total value of GSI's Canadian seismic database is calculated at [redacted] in 2017 (see also, Appendix B which also identifies the proportionate mileage percentage share that each seismic survey represented in relation to the entire GSI seismic database).

39. As stated above, the value of [redacted] does not, in my opinion, represent the actual FMV of GSI's seismic database. It is an absolute ceiling set by [redacted] that does not take into account factors such as quality of data, available competitor data and lack of demand in a low-activity regions, all of which would reduce the FMV that a third-party buyer would be willing to pay for the entire database (for example, an oil company entering the East Coast exploration arena for the first time, which is unlikely given the number of companies already involved to date). As stated before, [redacted] is not my preferred method for valuing GSI's seismic database.

40. Further, in accordance with the [redacted] the resultant future sales value, which is calculated as [redacted] of the total value, is calculated at [redacted] in 2017. As explained above, this value reflects the potential future sales revenue that a third-party owner of the data could achieve by licensing it to third parties. In my opinion, this amount is likely closer to the FMV value as it might account for the potential concerns with the database (quality, competitor data, lack of demand in low-activity areas, etc.) that a real-world buyer would consider. However, on a risked commercial basis, a purchaser wanting to further license the data would likely demand to pay less than this valuation to secure a greater profit and / or an adequate rate of return.

41. Overall, despite the fact that [redacted] and I appear to concur that value of data depreciates over time, I am of the opinion that the total value derived from the

application of the [redacted], at best, only establishes a ceiling for the valuation of GSI's seismic data library. As noted above, this methodology suffers from various shortcomings in its assumptions and approach, namely the fact that data quality was not directly considered, nor were market considerations (e.g., industry activity, bid round activity, moratoriums and the presence of competitor data) relating to potential future licensing revenues and licensing contract terms and conditions. For all the above reasons, it is my belief that the actual fair market value of the Canadian assets of the GSI database is less than the value assessed using the [redacted]

IV. REQUIREMENT TO ACCOUNT FOR DATA QUALITY AND MARKET FACTORS TO ACCURATELY VALUE GSI'S SEISMIC DATA LIBRARY

42. As explained above in Section III, there are various limitations concerning [redacted] assumptions and approach to their valuation methodology. There are various factors which would have to be taken into account and which would likely reduce the value of GSI's Canadian seismic data library further than what an application of [redacted] would assess.

43. In contrast to the seismic data valuation methodology set out in my first report, data quality was not considered directly in t[redacted] or the Troika Report. As noted at paragraph 23 above and in Section VII(A) of my first report, numerous factors other than fold can affect data quality. The condition of the data itself, how it is stored, and what medium it is stored upon, can also affect value as older datasets may not be fully recoverable. If stored on magnetic tape, the data may be subject to stiction issues which might hinder the archival and hence the retrieval of the data. How the tapes were maintained and whether they were spun periodically, can affect data retention and retrieval capabilities. Variations in data acquisition parameters can affect data quality. Even weather conditions can affect data quality. For onshore data, windy weather conditions can affect signal to noise ratios. Wet weather conditions may affect geophone coupling and electronic line leakage. For marine data, rough seas can cause data quality concerns as much as cable feathering associated with strong currents. Shallow water bottom situations have been known to cause water bottom multiple

reflections which can degrade data quality, if not removed properly in data processing. None of these factors were considered by [redacted] opting instead to simply use fold and a fold adjustment factor to act as a proxy for data quality. The Troika Report also does not consider data quality.

44. While the Claimants have not provided any additional analysis of the data quality factors identified, based on the limited information available on GSI's seismic data from the Boards, I conducted a sample data quality inspection of a small sample of GSI's publicly available seismic data (15 lines) as supplied by the various Boards as access to GSI's seismic data library has not been possible.

45. Based on my review, the overall quality of GSI's seismic data appears to vary. For example, Line [redacted] was acquired in the Labrador Sea in October / November of 1982.[40] A 2400 meter recording cable was used with 25 meter receiver intervals with a 96 channel recording system to create 40 fold data. Line [redacted] was acquired in the Grand Banks in June of 1999.[41] A 6000 meter cable was used with 12.5 meter receiver intervals with a 480 channel recording system to create 80 fold data. Comparing the two lines, albeit the geographic regions are totally different, Line [redacted] is of Fair to Good quality data while Line [redacted] is of Poor data quality on a quartile basis. Line [redacted] was acquired 17 years later with better technology. It had a longer recording streamer, more recording channels, a shorter receiver interval and higher fold. This resulted in higher frequency data as evidenced by the shallowest time variant filter which was 12/18/45/55 Hertz for Line [redacted] versus a 6/11/65/75 Hertz filter for Line [redacted] The higher the frequency content, often the better the resolution. Hence, more modern data, acquired with more current technology, often produces better quality data.

46. That said, modern data does not always result in better data quality. For example, Line [redacted] was acquired in the Annie / Bonnie region in 2001.[42] A 6000

[40] **R-560**, [redacted]

[41] **R-561**, [redacted]

[42] **R-562**, [redacted]

meter recording cable was used with 12.5 meter receiver intervals with a 480 channel recording system to create 120 fold data. Comparing this line to [redacted], the recording parameters are fairly similar with Line [redacted] having higher fold as a result of using a shorter receiver interval. One might expect Line [redacted] to be of slightly better data quality, but based on my review, I would assign it a Poor data quality rating instead. Admittedly the geographic regions are quite diverse in this comparison, but Line [redacted] has a single final filter of 10-55 Hertz. While different geographic regions and weather conditions during recording might explain this disparity, different processing houses and algorithms applied to the data can also affect overall data quality. So as much as vintage and fold are often used as proxies for data quality as in [redacted] this is not always the case. This is an additional factor that is overlooked in [redacted] and would likely downgrade the actual value of GSI's seismic data library.

47. Data quality aside, as noted above at paragraph 24 and in Section VII(B) of my first report, future use of the data and any potential future licensing sales revenue can be affected by industry activity within a given region. Land sale or bid round activity often initiates corporate interest and the desire to evaluate the hydrocarbon potential of a given area. Regions with more recent data, perhaps acquired with more modern data acquisition parameters and technology, might be preferentially selected, and subsequently sell better than older datasets that may possess poorer data quality. Hence the presence of alternative datasets provides a potential licensee or purchaser with competitive choice. More modern datasets with excellent data quality may render the value of existing older seismic data in the same locale to effectively nothing, before a 40-year timeline has elapsed. These factors were not considered fully in the [redacted] nor considered in the Troika Report.

48. Regional factors were also not considered by [redacted] In addition to the 2015 moratorium in the Arctic, the demise of the Mackenzie Valley pipeline project in 2015, which drove the demand for GSI seismic data in the Beaufort Sea in the 2000s, means

that GSI's Beaufort Sea and Arctic data would have had little value by 2017 and has no additional foreseeable sales value today.[43]

49. Furthermore, while there was exploration activity in Nova Scotia in the 2000s, because discoveries have been mostly in natural gas rather than oil, it is no longer a high activity investment region because natural gas requires a higher level of infrastructure procurement to produce. There has been no successful call for bids in Nova Scotia offshore since 2015 and offshore gas projects were decommissioned in 2018.[44]

50. As for Newfoundland and Labrador, I note that the Labrador Shelf has not had an abundance of exploration and drilling activity over the last 15 years, so there is unlikely to be demand for GSI data in that region. Eastern Newfoundland continues to be a fairly active area of exploration, but that also means there is a significant abundance of seismic data available from GSI competitors, which may impact the value of even GSI's data collected in the late 1990s and 2000s.[45]

51. For all the above reasons, it is my belief that the actual fair market value of the Canadian assets of the GSI database is less than the value assessed using the [redacted] For my preferred valuation methodology and approach, I refer to my first report.

V. CONCLUSION

52. Benchmarking seismic data to other competitors both on a cost basis and a data quality basis is possible and a beneficial step for accurately valuing a seismic data library. The Troika Report ignores these factors, opting instead for a "replacement

[43] **R-563**, U.S.-Canada Joint Arctic Leaders' Statement re Arctic Drilling Moratorium, 20 December 2016; **R-564**, CBC News, "Mackenzie Valley Pipeline Project Officially One for the History Books," 28 December 2017; **R-565**, CBC News "Feds Return $430M to oil and gas companies ahead of Arctic offshore exploration ban," 18 December 2019.

[44] **R-566**, CBC News, "Call for Nova Scotia offshore exploration licenses gets no bids," 12 November 2021. According to the CNSOBP website (https://www.cnsopb.ns.ca/what-we-do/lands-management/call-for-bids), the last successful call for bids was in 2015.

[45] See **RWS-02**, Witness Statement of Trevor Bennett, 16 January 2023, Annex II.

cost" methodology to value GSI's seismic data library. In my view, the "replacement cost" methodology is not an appropriate valuation method in this instance as more modern data acquisition and processing technology would most likely create an excellent data quality dataset which may not be comparable to the data quality contained in GSI's seismic data library. Using unaudited GSI original costs to acquire and process the seismic data to then value the data, does not account for value depreciation over the years as technology evolves and competitive data is acquired.

53. [redacted] to valuing GSI's seismic data library. However, in my view this methodology is also flawed given that the seismic data at issue was not inspected for data quality, nor were other market factors considered. Nevertheless, [redacted] recognizes that the value of seismic data decreases over time and applies a reasonable age depreciation curve to account for this factor.

54. For the purposes of this report, I have been instructed to calculate a [redacted] GSI's Canadian seismic data library as of 2017. In doing so, I applied the age depreciation S-Curve in the [redacted] to GSI's seismic data library. Prior assumptions and methodology used [redacted] were also taken at face value. Using this methodology, the total FMV of GSI's Canadian seismic database assets is calculated as being [redacted] In accordance with the [redacted] the resultant future licensing sales value was calculated to be [redacted]

55. Overall, however, given the limitations of [redacted] I am of the view that, at best, this value only establishes an absolute ceiling for the valuation of GSI's seismic data library because, as described above, it did not include a data quality inspection per the methodology I outlined in my first report. Furthermore, [redacted] did not consider market factors like government moratoriums, exploration permit bid round activity and available competitor data. Hence, it is my belief that the actual fair market value of the Canadian assets of the GSI database is much lower than [redacted] and likely closer to its future data sale licensing value, which is pegged at

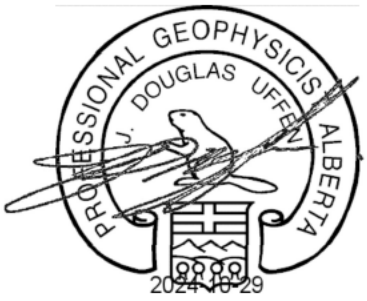
[redacted]. However, any third-party buyer wanting to purchase the data library for future potential licensing sales would have to risk the investment.

October 29th, 2024

[Signed]

_____

J. Douglas Uffen, P. Geoph. (APEGA)
Reflection Peak Enterprises Limited
323 Scenic Glen Bay NW
Calgary, Alberta, Canada
T3L 1H7



PERMIT TO PRACTICE
REFLECTION PEAK ENTERPRISES LIMITED
RM SIGNATURE: [Signed]
RM APEGA ID #: 40067
DATE: 2024-10-29
PERMIT NUMBER: P008041
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

VI. APPENDIX A: UPDATED CURRICULUM VITAE

J. Douglas Uffen, P. Geoph. (APEGA)

323 Scenic Glen Bay N.W.
Calgary, Alberta, Canada T3L 1H7
Res: (403) 239-9548

An honest, passionate and highly creative geophysicist / executive that integrates his technical knowledge, business acumen, strong communication skills and strategic vision to successfully add value, utilizing communication across multi-disciplinary teams to mitigate drilling risk for new exploration opportunities and optimizing production development.

Work Experience

Reflection Peak Enterprises Limited (RPEL) Calgary, Alberta
2002 - 2007
Title: President
2010 – present
Responsible for all financial reporting, licence to practice, and all technical aspects

Accomplishments

- Providing executive and technical level interpretational expertise to several international junior start-ups
- Proved the value of geophysics to define geologic lithologic edges in a conventional play and geo-steered over 100 wells with many top 10 IP30 oil producers in Alberta.
- Proved the value of geophysics to define compressional structuring in Upper and Lower Montney, selected drill locations and pad locations, and combined it with coherence, curvature and a Poisson Ratio interpretation depicting stratigraphic variance, while also acquiring micro-seismic data to gain insight for selecting frac ports and affecting well completion design.
- Performed a Reservoir Characterization study including a petrophysical classification of rock lithology to define and high-grade 10 new drilling locations for a client in India.
- Conducted a waveform classification study and neural net study for lithologic discrimination.
- Conducted a 2D interpretation in Algeria resulting in the recommendation to drill a wildcat exploration well which was economically successful
- Post a corporate merger for a major oil company, conducted an asset property review interpretation consisting of 4 3D surveys and approximately 3,000 kilometers of 2D data in a five month period, resulting in a catalogue listing of opportunities and several proposed drilling locations
- While a co-owner of a subsidiary firm, Petrel Robertson Consulting Ltd., performed due diligence assignments for NI51-101 reserve audits, Reserve Assessments,

Initial Placement Offerings (IPOs) and share financings, performed interpretive projects for a variety of junior oil companies within the Western Canadian Sedimentary Basin as part of an exploration team for hire.

- Performed technical interpretation for a domestic client that resulted in 29 of 30 exploratory / appraisal wells being cased for future completion.
- Created Geo-Reservoir as a wholly owned subsidiary of RPEL and practiced through this entity for 3 years, then shut down due to oil price collapse in Q1 2015.
- Expert party third witness for 3 legal cases, including two other National Energy Board (NEB) hearings and a currently a NAFTA Tribunal.

Canoro Resources Limited Calgary, Alberta
2007 - 2010
Title: VP Geoscience, Officer of the Company

Responsible for all aspects of geology and geophysics, play generation, strategic planning, third party opportunities evaluations, exploration drilling program design, regulatory consultations and compliance, partner and investor presentations, Board presentations, press releases and supervised up to 8 staff members domestically and internationally

Accomplishments

- Drilled 2 successful Barail wells, re-established production from a shallower zone and added a newer deeper producing zone, resulting in production additions from 500 bbls/d to 1100bbl/d
- Recommended investing in compression to raise reservoir pressure of a retrograde gas condensate field above dew-point and to strive for positive corporate cash-flow
- Conducted a post-mortem of drilling results and performed two Pre-Stack Depth Migrations and additional reservoir characterization to revise the geologic model accurately depict reserves to mitigate future drilling risk
- Co-authored a Plan of Development document and identified key targets for another round of drilling activity

Conoco Canada Limited / Conoco Canada Resources Limited / ConocoPhillips Canada Limited Calgary, Alberta
2001 - 2002
Titles : Chief Geophysicist , April 2001 - August 2001
Exploration Manager, Western Canada New Ventures, August 2001 - March 2002
Chief Geophysicist, March 2001 - October 2002

As Chief Geophysicist, lead a community of 40+ professional staff, reviewed plays and economic evaluations to provide consistent risking, made technical and economic recommendations and influenced exploration strategic planning.
As Exploration Manager, started a New Ventures Exploration group that reviewed the Western Canadian Sedimentary Basin for potential, high graded opportunities, and initiated a “Big E” exploration program.

Accomplishments

- Initiated the G&G mapping of four play trends within the WCSB and initiated prospect generation along those play trends that met corporate criteria for reserve additions and economic criteria
- Served on a rotational basis as Deputy Incident Commander for the Emergency Response Team
- Possessed a $ 5M signing authority by Conoco Canada, $ 1M by ConocoPhillips.
- Undertook a forensic accounting exercise to correct the corporation's exploration accounting records after the merger, to facilitate more accurate reporting, budgetary management and forecasting.
- Chaired a Software / Database Rationalization Committee which recommended a methodology and approach for streamlining geological and geophysical workflows and reducing overhead costs by $1 million dollars
- Initiated and negotiated the contract terms for the purchase and acquisition of $20M worth of Foothills 3D seismic data.
- Instituted monthly geophysical meetings to share knowledge amongst the community.

Canadian Forest Oil Ltd. Calgary, Alberta
1997-2001
Title: Chief Geophysicist
Conducted seismic interpretations and geophysical operations, responsible for seismic budgets, AFE accruals, departmental computer planning, data management, pathfinding new plays and participating in corporate evaluations. In addition, supervised a group of professional full-time employees and part-time consultants with support staff.

Accomplishments

- Recommended whipping the P-66A well in Fort Liard which was press released as flowing after stimulation at 24 mmcf / day.
- Recommended the drilling of N-01 in Fort Liard which was press released as flowing from three Mattson zones at 49.7 mmcf / day.
- Assisted with numerous third party play evaluations, one being Cutpick (Grande Cache), which became a core property for the company, netting 30 mmcf / day production by the end of 2001.
- Recommended and assisted with numerous corporate evaluations and acquisitions, resulting in the purchase of Saxon Petroleum, Anschutz Canada and the N.W.T. assets of Unocal.
- Orchestrated and initiated a seismic database clean-up which streamlined operations, resulting in a one year cost recovery through a 250% increase in data sales.
- Upgraded computer software and hardware, coupled with a Y2K plan, to further maximize data workflows and data management.

Boyd PetroSearch Calgary, Alberta
1995 - 1997
Title: Senior Geophysicist

Performed seismic interpretation and play evaluations for domestic and international clients and provided technical training for international clients

Accomplishments

- Performed a commercial interpretation of the Blackfoot multi-component 3C-3D survey on behalf of 22 sponsoring companies and the CREWES consortium at the University of Calgary and received Honorable Mention for Best Paper at the SEG in 1997.
- Working alongside Chinese Nationals, conducted a 2D data interpretation and regional basin analysis of two regions within the State Province of Jiangsu

Home Oil Company Limited - Calgary, Alberta
1986 - 1995
Titles: Geophysicist, Senior Geophysicist, Staff Geophysicist
As an Exploratory Geophysicist, conducted play and prospect generation along with making recommendations for data acquisition, data processing, data purchases and land sale purchases.
As a Production Geophysicist, conducted development and exploitation geophysics for 28 core production properties.

As an Exploration Advisor, acted as an internal resource person / consultant / instructor, kept abreast of geophysical technology, evaluated new methods and performed advanced interpretations in AVO, VSPs and electro-magnetics.

Accomplishments

- As a Production Geophysicist, fourteen operated locations drilled (12 successful) from 51 mapped and recommended drilling locations, fifteen non-operated locations endorsed, 8 of 9 were drilled successfully.
- As a Development Geophysicist, recommended drilling three wells (one vertical and two horizontal wells) at Swan Hills Unit #1 with an initial cumulative gross production of 2600 bbls / day, resulting in an initial 10% unit production increase and received two Best Paper awards at industry forums.
- Recommended drilling four exploration wells at Umbach with initial cumulative gross production of 150 bbls / day oil and 9.5 mmcf / day gas, making it a new core property for the company.
- Was instrumental in the corporation maximizing value at Caroline which was sold for a 40% return.
- Recommended drilling a well that tested 36 mmcf / day from the Swan Hills formation at Caroline.
- Drilled the discovery well in Caribou Hills which tested 1.5 mmcf / day from the Grosmont.
- Developed a new Performance and Development process and form that was more responsive to performance management and aligned with corporate values.
- As a member of a "Skunk Works" group, recommended a strategy to exploit reserves about core properties which later became my mandate, culminating in a transfer to the production department.

- Chaired a committee that guided the development and data clean-up of a digital shotpoint database.
- Drilled a Jean-Marie discovery gas well in Shekelie and scoped the potential at Peggo / Pesh that initiated the corporation's aggressive development program.

General American Oils Limited (Phillips Petroleum)
1984 - 1986
Titles: Geophysicist, Staff Geophysicist
Performed structural and stratigraphic seismic data interpretation, prospect generation and made recommendations for land purchases and drilling locations

Accomplishments
- Drilled a successful Gilwood oil well on the Peace River Arch that spurred further exploration activity.
- Drilled a successful Sulphur Point oil well near the Shekelie basin.

Texaco Canada Resources Limited Calgary, Alberta
1982 - 1984
Titles: Geophysicist I-II
Interpreted seismic data, performed seismic modeling, initiated seismic acquisition programs, and made recommendations to management.

Accomplishments
- Interpreted, mapped and recommended 14 drilling locations for Glauconite oil and gas in Southern Alberta.
- Recommended half a dozen locations at Blueberry for gas potential just prior to deep rights reversion.
- Interpreted, mapped and drilled my most expensive dry-hole of my career in the Gulf of St. Lawrence and learned how to deal with failure.

Education

1978 - 1982 B. Sc. (Hon) Geophysics with a Geology minor
The University of Western Ontario
London, Ontario, Canada

Work Experience

International Exposure
China, India, Algeria, Egypt, Kuwait, Tunisia, Tanzania, Senegal, Italy, France, Australia, New Zealand, Argentina, & Gulf of Mexico (USA).

Canada's Frontier Structural Regions
Fort Liard, NWT - Chinkeh, Mattson, Flett, Nahanni,
Central MacKenzie, NWT - Indian River, Kee Scarp and Cambrian.
Beaufort Sea, NWT - Tertiary Section
Southeast Yukon - Mattson, Flett,and Nahanni
East Coast - Jurassic and Paleozoic Sections

Canadian Foothills
Cardium, Cadomin, Gething, Cadotte, Baldonnel, Triassic, Mississippian, Wabamun, Slave Point,

Northeast British Columbia
Bluesky, Gething, Baldonnel, Charlie Lake, Halfway, Doig, Nikanassin, Artex, Kiskatinaw, Montney, Belloy, Debolt, Wabamun, Slave Point, Keg River, and Pine Point.

Northwestern Alberta
Grosmont, Rycroft, Kiskatinaw, Jean-Marie, Slave Point, Sulphur Point, Muskeg and Keg River.

Northeastern Alberta
Grand Rapids, Viking, Clearwater, Wabiskaw, McMurray and Keg River.

Central Alberta
Gething, Viking, Cardium, Mannville, Montney, Mississippian, Nisku, Wabamun, Leduc, Swan Hills, Gilwood,

Peace River Arch
Slave Point, Keg River, Gilwood, Granite Wash.

Deep Basin
Cardium, Gething, Cadomin, Fahler, Notikewan, Wabamun, Leduc, Swan Hills.

Southern Alberta
Viking, Mannville, Glauconite, Sawtooth, Sunburst, Basal Quartz, Elkton, Pekisko, Shunda, Turner Valley, the Paleozoic unconformity, Nisku, Leduc, Swan Hills and Granite Wash.

Saskatchewan
Birdbear, Winnipegosis, Red River.

Written Papers

Data, Information and Knowledge Management: A Practical Perspective
Published in the April 2017 edition of the CGDMS Newsletter

Reliable Geophysics
Published in the April 2015 Edition of the CSEG Recorder, Marian Hanna co-author

Value of Integrated Geophysics
Published in the February 2014 edition of the CSEG Recorder, Marian Hanna co-author

Geophysics and a Reserve Audit Perspective
Published in the March 2011 edition of the CSEG Recorder

Are You Managing Your IT Solutions or is IT Managing You?
Published in the September 2004 edition of the CSEG Recorder

The Industry Today and the Road Ahead
- CSPG/CSEG Joint Convention, June 2003
- Co-author, Doug Pruden, GEDCO

Executive Report
Published in the March 2003 edition of the CSEG Recorder

Your Society Today
A President's message which was published in the April 2002 edition of the CSEG Recorder

A Personal Biography
Published in the May 2001 edition of the CSEG Recorder

A Message from the CSEG Vice-President
Published in the May 2001 edition of the CSEG Recorder

The Great Seismic Round-Up: A Database Clean-Up and Management Case Study
Published in the September 2000 edition of the CSEG Recorder

GeoTriad '98; A More Relaxed Perspective
Published in the November 1998 edition of the CSEG Recorder

Swan Hills Unit #1 : Adding Value with Seismic through Reservoir Delineation and Characterization
- Applications of 3-D Seismic Data to Exploration and Production as Chapter 19, the AAPG and the SEG, P. Weimer and T.L. Davis, editors, chapter 19.
- Published an abbreviated version of the paper in the January 1996 edition of the SPE Newsletter.

Oral Papers

Reservoir Characterization Using 3D Seismic Attribute Volumes: Adding Value By Providing The Opportunity for Better Drill Outcomes
Presented as a guest speaker at the 2014 CSEG symposium, March 2014

How to Set Up a Dataroom
Presented at the CSEG / CSPG Joint Convention, May 2012
Presented at the CSEG Lunchbox Theatre session, October 2012

Ethical Use of Geophysical Data
Presented at GeoCanada 2010 convention, May 2010

Byte Me! How Geoscience Data Architecture Can Help You
Presented at the joint CSPG / CSEG convention, June 2005

Applied Data Architecture: A Geo-Science Perspective
Presented at the PPDM Conference in Calgary, November 2004

The Industry Today and the Road Ahead

- Presented at the 2003 CSEG Convention, March 2005
- Presented at the University of Alberta, March 2005
- Invited Keynote Speaker at the 2003 PPDM Conference in Calgary, contributing presenter at the 2004 PPDM conference

How to Maximize Seismic Data Asset Value
Presented at the Centrum conference, May 2001.

Using 3C-3D Seismic Data to Delineate a Sandstone Reservoir, Alberta, Canada
Presented by Don Lawton at the 1997 SEG convention.

The Application of Geophysical Reservoir Technology within a Business Perspective
Presented at the 1996 CSEG convention as an invited reservoir geophysics workshop guest panelist.

Swan Hills Unit #1: Adding Value with Seismic Through Reservoir Delineation and Characterization
- Presented at the joint 1994 CSPG/CSEG convention.
- Co-authored and co-presented an expanded version of the paper with Rick Wallace of Ulterra Geoscience Ltd. at the January 1995 CSEG luncheon.
- Presented at the 1995 SEG convention in Houston and received outstanding contribution recognition by the SEG.
- Presented at the University of Calgary in March 1996.
- Presented to the Canadian Institute of Mining, Metallurgy & Petroleum Technology technical luncheon in Calgary at the Westin Hotel.

- Presented to the Society of Exploration Geophysicists, Beijing Section, September 1996, Beijing, China.
- Presented to the Society of Petroleum Engineers at the Integrated Reservoir Characterization workshop in October 1996, Calgary.

Do We Really Know How to Think?
The Process of Diagnosis in Exploration and Development
Presented at the 1994 CSPG/CSEG joint convention.

AVO and the Practical Geophysicist
Presented at the 1991 CSEG convention as an invited AVO workshop guest panelist.

Industry Courses Taught

The Rules, Rights, Responsibilities and Obligations of Seismic Data Ownership
2005 – present

This one-day course identifies and clarifies the unwritten rules practiced in industry as it pertains to seismic data ownership. The course will also identify and address subtle nuances where current standard industry practice is not uniform. The attendee will develop the insight to make their own informed decisions on these matters. The course will focus upon the rules, rights, privileges, responsibilities and obligations of seismic data ownership and their ramifications, permissions and limitations as related to specific business situations.

Geoscience Data Architecture **2003-2007**

This two-day course will offer the attendee insights regarding computer system architecture as it pertains to the geological and geophysical disciplines, business unit structures, hardware platforms, and data integrity. The attendee will develop a heightened awareness for the complexities and opportunities for prompt data retrieval and manipulation. The course will also permit the attendee to assess their own data situation and help them to develop optimal processes and procedures to efficiently manage both hardcopy and electronic data to meet their business unit requirements.

Affiliations

CSEG, APEGA, Calgary Petroleum Club, Jaguar Club of North America, President of the Canadian Prairies Jaguar Club

Professional Volunteerism

Initiated and acted as Chairman of the Advocacy Committee of the Chief Geophysicists Forum (CGF) (2020)

CSEG Foundation Chairman Outreach Committee (2016 – 2018)

Board Member for the Canadian Society of Exploration Geophysicists Foundation (2016 – 2018)

Board Member for the Calgary Geoscience Data Manager's Society (2014- 2018, 2020-present)

Member of the Chief Geophysicist's Forum (since inception in 1998 – present)

Resource member to the CSEG VIG committee (2013-2015)

CSEG President's Advisory Committee member (2003-2012)

Vice President for the Canadian Federation of Earth Scientists, 2012

Chairman of the 2012 CSEG DoodleTrain Committee

Chairman of the 2011 CSEG DoodleTrain Curriculum Committee, Vice Chairman DoodleTrain Committee

Member of the Guidelines for Ethical Use of Geophysical Data, APEGA sub-committee (2007-2010)

Member of the CSEG Outreach Committee (2005-2006)

- Drafted a plan for committee initiatives
- Initiated an Ambassadors program to represent the CSEG domestically and internationally.

Past President of the Canadian Society of Exploration Geophysicists, March 2003 – March 2004

- Initiated and authored a Long Range Plan as a member of the President's Advisory Council
- Chaired Awards and CSEG office personnel committee

President of the Canadian Society of Exploration Geophysicists (CSEG), March 2002 - March 2003

- Implemented a series of internal policies, procedures and structure to the society
- Supported the creation of the CSEG DoodleTrain Continuing Education week.
- Requested better financial reporting and cash-flow statements
- Initiated the need for a CSEG Foundation

Vice President of the CSEG, March 2001 - March 2002

- Improved internal communication between elected Directors, Committee Chairs and the CSEG office staff.

Executive Advisor for the Geo-Canada 2000 convention, October 1998 - May 2000

- Provided general guidance and recommended identifying discretionary expenditures and determining the timing of these expenditures relative to profitability forecasting.

Co-Chairman of the Chief Geophysicists Forum, 1999

- Initiated and conducted a couple of surveys for the members.

Consulted as an advisor to an APEGGA Investigative Committee for Disciplinary Action regarding what comprised industry standard practice.

- Provided expert guidance and council

CSEG Co-Chairman of Geo-Triad '98

- Acted as a visionary leader for the Geo-Triad '98 joint convention as CSEG General Co-Chairman, by re-engineering it at a new venue with the assistance of over 130 volunteers, coordinating the interests of three societies, resulting in over $ 710,000 in net revenues

Served on the CSEG Convention Technical Committee on two separate occasions in the 1980s.

- Organized speaker mementos, secured session chairs

Awards

Received the Best Geophysical Paper Award at the 1994 CSPG / CSEG joint convention for the oral paper, "Swan Hills Unit #1 : Adding Value with Seismic Through Reservoir Delineation and Characterization".

Received the CSEG Best Paper Award in 1995 for a co-authored, co-presented version of this paper

Received from the SEG, Honorable Mention for Best Paper in 1997 as a co-author of an oral paper presented by Don Lawton, "Using 3C-3D Seismic Data to Delineate a Sandstone Reservoir, Alberta, Canada".

Received a Meritorious Service Award from the CSEG in 1999 for his dedication to the science of geophysics

Volunteer of the Year Award from the Calgary Geoscience Data Managers Society in 2019

VII. APPENDIX B: ANALYSIS OF GSI 2D AND 3D DATA