

Evaluation of Richard Cabrera's Plan de Trabajo para el Examen Pericial

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Introduction

This report has been developed specifically to provide a technical and scientific evaluation of the "Plan de Trabajo para el Examen Pericial" dated June 25, 2007, and authored by Richard Cabrera Vega (for simplicity, this will be referred to herein as Cabrera's Plan). It is our understanding that Cabrera's Plan was developed to address selected tasks ("a" through "e") outlined under Phase II of the evidentiary proceedings requested in the petition of Alberto Wray to the Superior Court of Nueva Loja dated October 29, 2003 (for simplicity, this will be referred to herein as Wray's petition). As detailed later, we find that Cabrera's Plan is not described in sufficient detail to allow anyone to assess how he and his team will attempt to achieve the very broad proposed scope in the very short allotted time; consequently we have doubts that the effort could possibly achieve the court's presumed objective and produce a scientifically defensible assessment of this very complex topic.

Working as a team, we have undertaken an independent review of the issues raised in Wray's petition and Cabrera's Plan for addressing them, and have arrived at the opinions expressed herein. We are familiar with the issues in this case and have reviewed much material related to the case. Specifically we have read and reviewed many of the experts reports generated both by the Plaintiff's and Chevron's experts, and members of our team have visited the oil fields and inspected sites, were present at two Judicial Inspections, and interviewed experts nominated by Chevron and appointed by the Court to conduct Judicial Inspections. In addition, we have reviewed a considerable amount of written material and database queries relevant to the Judicial Inspections and the situation in general. Other than to make the assignment for our team to undertake this review, neither Chevron nor its consultants have provided direction as to the scope of the effort or the information that we should review.

In Wray's petition a two-phase process was requested. Phase I was to be a series of Judicial Inspections at 122 specified sites in the former Texpet-CEPE concession area. Cabrera has selected 120 sites, a substantial number of which were not included in the original petition. In describing these Phase I Judicial Inspections Wray's petition states: "*In each case, the inspections should also include the surrounding areas, including rivers, water bodies and swamps in the vicinity, given that the main purpose of the proceeding is to determine the environmental effects of the activities related to the exploitation of hydrocarbons*". Phase II had the overall goal, as defined by Wray, to "*determine the environmental effects of activities related to the exploitation of hydrocarbons in all the fields exploited by Texaco as the operator of the consortium in which, initially, the companies Gulf, as well as CEPE, and then Petroecuador, had an interest*". Wray's petition called for Phase I and Phase II to be done by the same expert or experts. In Phase II, the expert or experts were specifically ordered to:

- a) *Evaluate the environmental damage, if any, to primary resources: soil, water resources, vegetation cover, fauna and all the other elements of the environment, and detail their characteristics.*
- b) *Specify, if possible, the origin of such damages, including the cause as well as the chronology.*
- c) *Verify the possible current existence of substances that affect the environment and constitute or could constitute a danger to living beings or a threat to their subsistence and lifestyle.*
- d) *Specify the work, activities and measures of a technical nature that should be conducted in order to clean up the environment, in the first place, and to restore it, to the degree technically possible, to the conditions that existed before the damage occurred.*
- e) *Determine the methodological parameters for the restoration, and the standards or environmental goals to be achieved, as a function of the characteristics of each environment.*

Before the Judicial Inspections (JI) process began in August, 2004, Chevron worked with the Plaintiff's technical consultant, Mr. David Russell (personal communication from Sara McMillen, Chevron Energy Technology Company) for several months to develop a mutually satisfactory and technically sound approach to the Phase I Judicial Inspections. Field and laboratory protocols were documented in the "Sampling Plan" and "Analysis Plan" documents issued in August 2004 and accepted for use by both parties per the Terms of Reference signed by both parties and submitted to the court. Judicial Inspections were initiated August 18, 2004. At every Judicial Inspection both the Plaintiff's experts and Chevron's experts collected soil and water samples and each were free to accompany, observe and split samples with each other. This procedure was designed to allow for clear documentation of the process of evaluating environmental conditions, opportunities to check the methods and results of sampling by the opposing experts, and opportunities to review and rebut the written reports and data compilations that were to be prepared by experts working for both the Plaintiff and Chevron.

Following each Judicial Inspection, both the Plaintiff's experts and Chevron's experts produced reports presenting the data collected and addressing many of the Phase II issues. However, proper Judicial Inspections using the agreed protocols were only completed for 45 of the 122 sites. On March 19, 2007, the Superior Court of Nueva Loja appointed a single expert, Richard Cabrera Vega, and ordered him to undertake a portion of Phase II. Specifically Cabrera was ordered to address the Phase II issues "a" through "e". The court did not alter the underlying objectives or issues to be addressed in Phase I or Phase II. Cabrera's Plan of June 25, 2007 was apparently a specific response to the March 19, 2007, court order.

Opinions

In our opinion, Cabrera was given a daunting, if not impossible, challenge to complete most of Phase II – i.e., tasks a through e - in only 120 days. For reasons unknown to us, a well-designed Phase I process, which had proceeded in a reasonably orderly fashion and begun to amass a valuable set of data on environmental conditions and which supported initiation of Phase II was suddenly terminated. Apparently, the originally requested and subsequently ordered process was, without any stated and logical justification, radically altered to one that appears less rational and certainly less likely to yield a complete set of defensible data. Due to the truncation of the original Phase I process, many sites had not yet been inspected or sampled according to the carefully thought out and mutually accepted plans. The Wray petition stated that, to ensure that the Phase I and II evidentiary efforts would be complementary, it would "be necessary that the same expert or experts be involved in both evidentiary proceedings". In contrast to that initial and reasonable intent, the court has chosen to terminate the Phase I proceedings well before their conclusion and assign the rest of the work to a single expert, Cabrera, who has stated that he has other experts supporting him. To our knowledge, Cabrera was not previously involved in a significant way in the Judicial Inspections. Instead, Cabrera has been ordered to complete selected Phase II tasks without the benefit of a completed set of Phase I Judicial Inspections and in far less time than the original Phase I process would have taken.

We believe that it is simply not possible for a single expert, even with the support of other experts, to undertake and complete the court's intent in a technically defensible way given the short timeframe of the order (120 working days). Nonetheless, Cabrera has accepted the court's challenge and has issued a general plan, dated June 25, 2007, which provides a very general description of his intended approach. While this plan does appear to provide an outline of what might, given sufficient time and resources, lead to a reasonable result it is far too general and lacking in detail to allow us or anyone to gain a reasonably complete understanding of what Cabrera's team will actually do to complete this very complex undertaking. For example, the plan does not specify the number or names of the experts that will work with Cabrera, but only the types of expertise he seeks in his team members. Consequently, since we have little information on the composition of the expert team, and almost no information on the specific methods the team will employ, the only way we can provide a useful evaluation of Cabrera's plan is to describe

the critical elements we believe would need to a part of such an effort to make it successful. These elements are:

- A team of highly qualified, experienced, and unbiased technical experts with sufficient time and support to undertake and complete their tasks.
- A clear statement of scope; i.e., types of environmental effects that are hypothesized to have occurred, along with a clear listing of the specific hypotheses that will be tested during this study.
- A transparent process that allows both parties (Plaintiffs and Defendants) to participate in the development of a strategy for collection of any additional samples and analytical data that are relevant to the hypotheses to be tested, including determining the minimum number of data points needed for the desired level of confidence in results. This transparency must extend to any field work and data collection to be done allowing both parties (Plaintiffs and Defendants) to be present for all data collection and to split samples or make their own counts or measurements to insure reproducibility. This same review process by parties (Plaintiffs and Defendants) should extend into the data interpretation allowing a clear understanding of the decision making process.
- To test these hypotheses and properly evaluate environmental effects, detailed work plans must be developed for each aspect of the study clearly describing what field work will be done, what samples or data will be collected and how, what analysis will be used, what Quality Control and Quality Assurance procedures will be followed. To ensure and benefit from the transparency described above, these plans should be reviewed by both parties (Plaintiffs and Defendants) and all comments and concerns be taken into account.
- A thorough and careful evaluation and analysis of all available and defensible data, including those derived from the earlier Phase I Judicial Inspections, that allow clear evaluation of hypotheses regarding occurrence of environmental effects, and defensible determination of their cause(s) and timing, taking into account the many confounding factors.
- Identification of the timing of any impacts relative to important dates, at a minimum:
 - The initiation of oil fields exploration
 - The 1990 termination of Texaco's operation of the fields
 - The 1998 completion of remedial actions by Texaco

- A rational and defensible method for selection of a representative set of sites to be investigated in Phase II. This must include: 1) a clear justification of how extrapolations can be made from results derived from limited numbers of locations during limited intervals of time, and 2) rigorous and appropriate application of statistical analysis. Both aspects are essential to assessing an area as large as the former Texpet-CEPE concession.
- Clear identification of control or baseline conditions against which hypotheses can be tested. Establishing a clear etiology between Texpet operations and environmental impacts will require a systematic approach that discerns confounding background factors, including temporal and spatial variability in natural and demographic conditions. It is not possible prior to seeing all hypotheses to be tested to list all potential confounding factors. However, a few examples would include:
 - Background or naturally-occurring concentrations for potential compounds of concern
 - Environmental conditions in similar locations or populations such as but not limited to:
 - Other areas in the region with similar land use such as agriculture, cattle grazing, large-scale plantations, etc.
 - Other areas in the region with similar populations of colonists from similar origins who have relocated to the region.
 - When comparing concentrations to regulatory or published limits, the time of issue of the limits must clearly be stated. For compliance assessment, it is most appropriate to compare concentrations to limits in place at the key times such as the 1990 cessation of Texaco's operation or the 1995 remedial action plan.
 - Other oil fields in the region developed by operators other than Texpet-CEPE.
- Clear identification and quantification of the sources of impact; again without seeing the hypotheses a complete list cannot be developed, however examples would include:
 - Oil related impacts such as toxicity of specific constituents of the oil or physical impacts of the oil such as oiling of organisms.
 - Impacts of the conversion of natural habitat to agriculture.
 - Impacts of other non oil development land uses such as logging.
 - Pits remediated by Texpet versus those that Petroecuador agreed to remediate.
 - Impacts of other non petroleum oil related industries such as Palm Oil production
 - Impacts of discharge of untreated municipal sewage, improperly located and poorly maintained landfills, and other infrastructure deficiencies that can directly impact human health.

This must necessarily include a rigorous analysis separating out simple association from causation. For example proving causation of an oil impact on human health would require evidence of a completed exposure pathway from a release to a receptor population, documented evidence that the contaminant(s) of concern cause some health impact, as well as statistically defensible epidemiological evidence of the increased occurrence of that impact. Similar logic would be required to prove causation for any alleged impact.

- Great care must be taken in the design, implementation and interpretation of any interviews with local inhabitants. Any interview process must avoid the introduction of bias, and avoid individuals who may have a significant stake in the outcome of the litigation and to insure adequate controls and interview population is identified and that adequate quality controls are implemented. A detailed and defensible work plan must be developed and reviewed prior to implementation of any interviews. Care must also be taken in the interpretation of the results, much of the information collected must be considered anecdotal and not used alone to prove causation of any alleged impacts.
- Clear separation of environmental impacts or effects from damages, and the rationale for judging damage is required. For example, Texpet cleared areas only as large as required for safe operation of a well or production station. Similarly, Texpet built roads as required by the Government of Ecuador in the 1973 Concession Agreement. While clearing of forest could be defined as a localized impact, the social and economic benefits of such activities to local sustainability are likely to outweigh any potential environmental damage. Furthermore, assessing such damages in economic terms is an extremely complex task that requires a team of environmental economists with experience in tropical forest evaluations, net environmental benefit analysis, etc. Cabrera does not identify this type of expertise on his team.
- A final report or reports that will withstand rigorous peer review.

Both parties participated in a transparent and collaborative process in planning the original Phase I Judicial Inspections, which is the surest way to assure all of the necessary scientific elements are included in a study of this type. All plans presented by Cabrera must be adequately reviewed preferably by both parties (Plaintiffs and Defendants) with all comments and concerns being addressed before implementation. We have been asked to provide an objective review, but have found that we can offer only general suggestions and guidelines since Cabrera's Plan lacks necessary detail. Nevertheless, given the very short time allotted by the court for Cabrera's team to complete their scope, it is our opinion that the implementation of Cabrera's plan would result in a very significant risk of failing to meet the court's general objectives and a very significant chance of producing a report that will not contain the scientific rigor required for completion of the more specific elements we list herein.

Qualifications

The authors of this report have extensive experience evaluating, characterizing and remediating sites impacted by petroleum or other chemical substances. We worked collaboratively as a team, each member with his own expertise reviewing available information and conducting independent and collaborative analysis. All of the opinions expressed in this report are opinions jointly held by all three authors.

Dr. Pedro J.J. Alvarez is the George R. Brown Professor and Chair of Civil and Environmental Engineering at Rice University. He received a bachelor of engineering (B. Eng.) degree in Civil Engineering from McGill University and Master of Science (M.S.) and doctor of philosophy (Ph.D.) degrees in Environmental Engineering from the University of Michigan. Dr. Alvarez has over 15 years experience in applied and fundamental research associated with the fate and transport of environmental pollutants and the cleanup of contaminated sites. He co-authored with Dr. Walter A. Illman the textbook, *Bioremediation and Natural Attenuation of Groundwater Contaminants: Process Fundamentals and Mathematical Models*, published by John Wiley & Sons. Dr. Alvarez is a Diplomate of the American Academy of Environmental Engineers and a Fellow of the American Society of Civil Engineers. His honors include the Cleanup Project of the Year Award from SERDP (2002); the Button of the City of Valencia (2000); the Collegiate Excellence in Teaching Award from the University of Iowa (1997); the Alejo Zuloaga Medal from the Universidad de Carabobo, Venezuela (1996); a Career Award from the National Science Foundation (1995); the Outstanding Achievement Award in Environmental Engineering from the University of Michigan (1991); and several best paper awards. He currently serves on the editorial board of the leading environmental journal *Environmental Science and Technology*. He also serves as honorary professor at Nankai University in Tianjin, China, and as adjunct professor at UFSC in Florianopolis, Brazil and UNAM in Mexico City and as Past President of the Association of Environmental Engineering and Science Professors (AEESP).

Dr. Douglas Mackay is Adjunct Professor in the Department of Land, Air & Water Resources at the University of California at Davis and Consulting Professor in the Department of Civil and Environmental Engineering at Stanford University. He has B.S., M.S., and Ph.D. degrees from Stanford University, the latter two in Environmental Engineering. For over 25 years, his research has focused on controlled field experiments on contaminant transport, transformation, and remediation in groundwater, as well as laboratory studies of processes controlling field behavior. Research has addressed chlorinated hydrocarbon transport and bioattenuation, flushing of chlorinated hydrocarbons from geologic media during pump-and-treat remediation, non-linearity and spatial variability of sorption processes, *in situ* aerobic bioremediation of methyl tertiary-butyl ether (MtBE), anaerobic biotransformation of MtBE, evaluation of methods for estimation of contaminant mass discharge, and impacts of ethanol on natural attenuation of other fuel components. The field research has required special focus on application of standard and innovative methods for characterization of contaminated sites. He served on two National Research Council committees culminating in two reports: *Alternatives to Groundwater Cleanup* (NRC, 1994) and *Natural Attenuation for Groundwater*

Remediation (NRC, 2000). He serves as an associate editor for the *Journal of Contaminant Hydrology and Ground Water Monitoring and Remediation* and has served as peer reviewer for a number of other journals.

Dr. Robert Hinchee is an environmental engineer with a Ph.D. in Civil and Environmental Engineering from Utah State University. He has worked in the petroleum contamination and remediation industry for over 30 years and has been involved in characterization and remediation of over 1000 sites worldwide. For example, he served as the Technical Director overseeing characterization and remediation of the Trecate oil well blowout near Milan, Italy. This 15,000-cubic-meter blowout contaminated approximately 7 square kilometers of farm land with oil more than 1 meter deep in places. The remediation was the largest soil cleanup in European history and has resulted in complete restoration of the land to agricultural use. Dr. Hinchee has also worked in Saudi Arabia and Kuwait characterizing and developing remedial approaches for dealing with the hundreds of square kilometers of land and shoreline contaminated with oil as a result of Iraqi actions in the 1991 Gulf War, the largest oil spill in history. In this role, Dr. Hinchee has testified to the United Nations and provided technical support to the United Nations. In addition, he has authored, co-authored, edited, and co-edited numerous publications including more than 25 books, examples of which include *Hydrocarbon Bioremediation* and *Cost-Effective Remediation and Closure of Petroleum-contaminated Sites*. He was the founding editor of the *Journal of Bioremediation*.