Summary of Analysis of Damages to Ecuador's Amazon Basin
Aguinda v. ChevronTexaco
September 17, 2010
Prepared by lawyers for the Amazon communities based on court submissions

On August 2, 2010, the Ecuador Court hearing the lawsuit brought by 30,000 rainforest residents against Chevron issued an Order directing both Chevron and the affected communities to submit a document setting forth and justifying their positions on the economic value of the damages. In accordance with the Court's Order, the Ecuadorian communities submitted a legal brief along with six Annexes prepared by environmental, economic, and medical consultants retained by the communities. These expert valuation assessments were submitted to add additional scientific analysis and insight for the Court on the issue of damages utilizing evidence in the record and from relevant public studies. The supplemental analyses can be summarized as follows:

***Soil and Groundwater Remediation*:** provides an evaluation and estimate of the potential costs for the remediation of environmental damages in the Concession area in the Oriente region, prepared by Douglas C. Allen, P.A. ("DCA"), a consulting firm that specializes in helping organizations to define, quantify and manage their high risk environmental exposures and liabilities. Among other engagements, the firm has served as a neutral expert charged with allocating investigation costs at a U.S. Environmental Protection Agency "Superfund" site among various parties potentially responsible for contamination, and has performed due diligence and environmental liability assessment in advance of mergers and acquisitions on behalf of private industry. The firm's principal, Douglas Allen, holds a Master of Engineering degree from Dartmouth College and has over 25 years of environmental consulting experience for complex, high stakes commercial transactions, matters, and disputes.

To arrive at a conservative valuation for environmental remediation, DCA employed a framework that integrates three components: (1) Ecuador's current quality standards for contaminated environmental media; (2) U.S. environmental legislation and guidance for investigating and remediating contaminated sites under the Comprehensive Environmental Reclamation, Compensation and Liability Act; and (3) standard guidance for estimating environmental costs and liabilities developed by the American Society for Testing and Materials (ASTM). DCA estimates that potential costs to remediate contaminated soils at 356 well sites and 22 production stations may range from $487 million (for cleanup to 1,000 ppm of TPH) to $949 million (for cleanup to 1,000 ppm of TPH). DCA estimates potential costs to remediate contaminated groundwater at 210 well sites and 22 production stations could range from $396 to $911 million to remediate groundwater to the Ecuadorian standard of 0.325 mg/l for TPH. Thus, in total, DCA's admittedly conservative estimate places the costs to remediate soil and groundwater at **$883 million to $1.86 billion**. DCA's analysis offers reasons why the high end of this range, which accounts for soil remediation to 100 ppm of TPH, may be appropriate. Moreover, DCA notes that this range does not include the costs to remediate sediment in surface water bodies and wetland areas – although data reviewed by DCA indicates

that sediment contamination exists, practical constraints foreclosed DCA from including sediment remediation in its calculus.

***Unjust Enrichment*:** is an analysis of Chevron's unjust enrichment by virtue of non-compliance with environmental requirements, prepared by Jonathan Shefftz, a financial economist holding a Master of Public Policy degree from the John F. Kennedy School of Government at Harvard University. Mr. Shefftz has performed economic modeling and analyses on behalf of the U.S. Environmental Protection Agency, the Department of Energy, and numerous other federal and state government agencies, and has also performed work on behalf of numerous private corporations, industry groups, and non-profit organizations. In the context of environmental enforcement actions brought under numerous U.S. environmental laws and regulations, Mr. Shefftz has modeled companies' cash flows to calculate the economic benefit conferred on those companies by virtue of regulatory non-compliance (i.e., unjust enrichment). Mr. Shefftz has been qualified as an expert witness by numerous courts, including U.S. federal court, state court, and a U.S. federal agency's administrative court.

Mr. Shefftz discusses how Chevron realized significant undue financial gain by avoiding compliance with environmental requirements for many years, thus freeing up monies for investment elsewhere. Mr. Shefftz also notes that this particular component of a damages award, to be effective, must be substantial enough that it negates any financial incentive toward non-compliance. Relying on standard financial cash flow and net present value analysis techniques, based on modern and generally accepted financial principles, Mr. Shefftz calculates the range of Chevron's unjust enrichment from avoiding necessary environmental compliance costs during its operations in Ecuador. Mr. Shefftz concludes that an appropriate unjust enrichment component to a finding of damages ranges from $4.57 billion to $9.46 billion assuming a 100% probability of detection and ultimate payment, from $9.13 billion to 18.93 billion assuming a 50% probability of detection and ultimate payment, and from $18.26 billion to $37.86 billion assuming a 25% probability of detection and ultimate payment. Plaintiffs respectfully submit that, given the evidence in this case, Chevron had at most a 25% probability of detection and ultimate payment, and therefore the unjust enrichment award should at minimum range from **$18.26 billion to $37.86 billion.** This is a conservative figure, as in reality it is highly unlikely that Chevron believed it had more than a 10% probability of detection and ultimate payment.

***Healthcare Costs to Address Affected Population*:** is an analysis of the estimated costs to deliver healthcare to the residents of the Concession area, prepared by Dr. Carlos Picone, a medical doctor based in the Washington, D.C. area. Dr. Picone is certified in internal medicine, pulmonary medicine, critical care medicine, and hospice and palliative care medicine. Dr. Picone received his Doctor of Medicine from the University of Cordoba, Spain, and was also trained at the Medical College of Virginia in the U.S.; he has held numerous teaching appointments at both institutions. Dr. Picone has served as the president of the Pan American Medical Society, a non-profit organization dedicated to organizing good-faith medical and surgical missions in Central and South America. Dr. Picone possesses first-hand knowledge of the challenges in

providing medical care to Ecuador's rural population by virtue of his participation in medical missions to Ecuador.

Dr. Picone derives an estimate for addressing the health-care needs of those living in the area affected by Chevron's historical oil extraction operations based on the per capita health care spending for the nation of Ecuador in 2008, which Dr. Picone projects over the course of 30 years into the future. Citing recent World Health Organization data, Dr. Picone notes that the total expenditure for health care by the Ecuadorean government in 2008 was $231 per person. Multiplying this figure by the annual population projections for the affected regions over the next ten years – and assuming *static* population for the subsequent 20 years, – Dr. Picone estimates that the provision of healthcare to affected persons will cost **$1.4 billion** over the next 30 years. Dr. Picone notes that this estimate, insofar as it is based on a historical average, is likely quite conservative. Finally, Dr. Picone tests this $1.4 billion estimate by comparing it to the projected costs for the health care delivery program currently underway in the United States to address responders to the World Trade Center disaster, which shares certain important characteristics with the contemplated program that may be established to treat residents of the Concession area. Dr. Picone's comparison generally confirms the reasonableness of the $1.4 billion estimate, and suggests that the estimate may in fact represent the low-end of the spectrum. The 30-year projected cost of the World Trade Center program, based on costs to date, is $1.6 billion. And for a variety of reasons identified by Dr. Picone – including the long-term nature of the toxic exposure in the Concession area – there is reason to believe that the costs of the World Trade Center program would not be as high as the costs necessary to address the health concerns of the residents of the Concession area exposed to petroleum-related toxins.

Excess Cancer Deaths: is an estimate of the number and costs of excess cancer deaths associated with residence in the oil-producing areas of the Sucumbios and Orellana Provinces, prepared by Dr. Daniel L. Rourke. Dr. Rourke received his Ph.D from the University of California, Los Angeles, and over the course of his career, has been affiliated with some of the premier financial, accounting, and public policy organizations in the United States. Dr. Rourke has extensive experience applying advanced statistical and mathematical techniques to the solution of complex litigation and compliance problems. Significantly, he has developed actuarial/epidemiological models forecasting the volume and timing of future claims for cancers and other health problems arising from toxic exposure for over a dozen clients.

In his initial analysis and the addendum thereto, Dr. Rourke employs standard actuarial life-table methodology to perform the computations required for this analysis, including a population estimate for the relevant time period and geographic location, the age distribution of the population, age-specific total mortality rates and the age-specific rates for all malignant neoplasms, and an estimate of the age-specific excess risk of cancer. Dr. Rourke calculates an aggregate damages estimate for these excess cancer deaths using a $7 million "value" for each individual lost life, a figure that is derived by averaging data from the U.S. tort system and the economic concept of the "value of a statistical life," as employed by the U.S. Environmental Protection Agency. Dr. Rourke

estimates that the aggregate cost of excess cancer deaths in the four Cantons of Lago Agrio, Shushufindi, Orellana, and La Joya de los Sachas for persons entering those areas through 2019 (and assuming that remediation is completed between 2010 and 2020) will be approximately **$69.7 billion**. Dr. Rourke also makes projections based on alternate cut-off date and geographic scope variables. Even if the calculus is cut off at persons entering *only* the Concession area itself (as opposed to the entirety of the four Cantons) *before 1990* – after which Chevron incorrectly contends that the company can bear no responsibility – the aggregate cost of excess cancer deaths is still estimated at a low-end figure of $12.1 billion.

***Natural Resources Service Losses*:** is a discussion of the extent to which natural resources services in the Concession area may be reduced due to oil field development and operation, i.e., environmental impacts that do not lend themselves to cleanup. This analysis has been prepared by Dr. Lawrence W. Barnthouse, a leading researcher and practitioner in ecological risk assessment. Dr. Barnthouse has developed ecological risk assessment methods for the U.S. Environmental Protection Agency, and also specializes in environmental restoration planning. Dr. Barnthouse, who received his Ph.D in Biology from the University of Chicago, has authored or co-authored more than 90 publications relating to ecological risk assessment. He is a Fellow of the American Association for the Advancement of Science, Hazard/Risk Assessment Editor of the journal *Environmental Toxicology and Chemistry*, and Founding Editorial Board Member of the new journal *Integrated Environmental Assessment and Management.* He frequently serves on committees of the National Academy of Sciences and on peer review panels for major U.S. federal agency projects.

Dr. Barnthouse begins his analysis by describing how the unique characteristics of the rainforest, including its role in the regulation of the global climate and as a reservoir of biodiversity, can magnify the adverse impact of land-clearing and oil-field development on the natural resources services of the rainforest. Dr. Barnthouse discusses the fact that the available data, much of it collected during environmental audits performed in the 1990s, does indeed show that concentrations of TPH and metals in soil, groundwater, and surface water have exceeded levels considered to be toxic to terrestrial and aquatic biota. Dr. Barnthouse notes that the most commonly-used method for estimating cumulative service losses spanning multiple years is termed habitat equivalency analysis ("HEA"), which accounts for the timing and duration of resource losses that occurred in the past, and also for the timing, duration, and effectiveness of future restoration actions or natural recovery. Dr. Barnthouse notes that Mr. Cabrera's application of the HEA method to calculate the extent of restoration needed to compensate for losses of rainforest service in the past and during a 60-year restoration period is similar to HEA applications performed to support Natural Resource Damage Assessments according to U.S. environmental regulations. Dr. Barnthouse notes that while determining the values of service losses in the rainforest with precision is not possible, it is not clear that further studies would produce a range of plausible values different from the range posited by Mr. Cabrera – approximately **$874 million to 1.7 billion**, depending on the methodology employed.

***Potable Water*:** is an analysis of the cost of implementing a potable water system for residents within the Concession area where Chevron carried out oil exploration and production activities, prepared by Dr. Robert Paolo Scardina. Dr. Scardinia is a civil and environmental engineer affiliated with the Virginia Polytechnic Institute, one of the leading institutions of scientific and technical research and education in the United States. Dr. Scardina holds a Ph.D in Civil Engineering, and a Master's Degree in Environmental Engineering. Dr. Scardina has authored or co-authored several peer-reviewed publications on the delivery of potable water and related subject matter.

Dr. Scardina notes that degradation of the environment with petroleum hydrocarbons, metals, and other substances associated with Chevron's activities has been documented at numerous locations throughout the Concession area, with mechanisms of release ranging from oil spills associated with production and transport, to discharge of produced water to surface water to the use of unlined pits for produced water, oil, and other wastes, to the use of oil on roadways as a dust suppressant. Dr. Scardina opines that the availability of safe, potable water in the Concession area is uncertain, and should be a priority. Dr. Scardina takes note of the regional water supplies outlined in the Cabrera Report, but suggests alternatives, including smaller, community based systems or individual household systems. Dr. Scardina notes that the Cabrera Report describes per capita costs for water systems ranging from $188 to $1000 per person, but suggests that the estimated per capita costs could actually be higher than those provided when one considers all of the project components that might be necessary to provide a functional and sustainable water supply system. Dr. Scardina concludes, based on preliminary data, that a comprehensive series of regional water systems might range from approximately **$326 million to $541 million.**

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Of note, the valuation assessments of these prominent experts do not purport to address *every* category of damages at issue in this case. The impacted communities continue to maintain the validity and soundness of the additional categories of damages identified in the expert reports of Richard Cabrera and other experts including, but not limited to, the recovery of indigenous territory and culture and the improvement of oil infrastructure.

Moreover, the valuation assessments made by the Consultants and the resulting estimated potential costs developed for their valuations may be updated upon further review and analysis of the information and data in the record before the Court. The communities will submit any such updates to the Ecuadorian court.

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