

Exhibit C

INTERNATIONAL CENTRE FOR SETTLEMENT OF INVESTMENT DISPUTES

WASHINGTON, D.C.

In the arbitration proceeding between

PERENCO ECUADOR LIMITED

Claimant

and

THE REPUBLIC OF ECUADOR

Respondent

(ICSID Case No. ARB/08/6)

INTERIM DECISION ON THE ENVIRONMENTAL COUNTERCLAIM

Members of the Tribunal

Judge Peter Tomka, President

Mr. Neil Kaplan, C.B.E., Q.C., S.B.S., Arbitrator

Mr. J. Christopher Thomas, Q.C., Arbitrator

Secretary of the Tribunal

Mr. Marco Tulio Montañés-Rumayor

Date: 11 August 2015

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FREQUENTLY USED ABBREVIATIONS AND ACRONYMS

BP	BP Petroleum Development Limited
Burlington	Perenco's consortium partner, Burlington Resources Inc.
CEPE	<i>Corporación Estatal Petrolera Ecuatoriana</i>
Claimant's Counter-Memorial	Claimant's Counter-Memorial on Counterclaims dated 28 September 2012
Claimant's Reply Post-Hearing Brief	Claimant's Reply Post-Hearing Brief dated 22 November 2013
DINAPA	National Environmental Protection Directorate or Dirección Nacional de Protección Ambiental
Ecuador's Counter-Memorial	Ecuador's Counter-Memorial on Liability and Counterclaims dated 5 December 2011
Ecuador's Reply Post-Hearing Brief	Ecuador's Reply Post-Hearing Brief on Counterclaims dated 22 November 2013
Environmental Management Law	<i>Ley de Gestión Ambiental</i> (Environmental Management Law) enacted on 30 July 1999 Codification 19, published in Supplemental Official Registry No. 418 of September 10, 2004
GSI	GSI Environmental, Inc.
GSI ER I	1 st Expert Report of GSI dated 20 September 2012
GSI ER II	2 nd Expert Report of GSI dated 2 July 2013
IEMS	Integrated Environmental Management Services S.A. de C.V.
IEMS ER I	1 st Expert Report of IEMS dated 29 November 2011
IEMS ER II	2 nd Expert Report of IEMS dated 26 April 2012
IEMS ER III	3 rd Expert Report of IEMS dated 21 February 2013

IEMS ER IV	4 th Expert Report of IEMS dated 4 September 2013
Perenco or the Claimant	Perenco Ecuador Limited
PRAS	<i>Programa de Remediación Ambiental y Social</i> , an agency within the Ecuadorian Ministry of Environment
RAOHE	<i>Reglamento Ambiental para las Operaciones Hidrocarburíferas en el Ecuador</i> , published in the Official Register No. 265 on 13 February 2001
Rejoinder	Claimant's Rejoinder on Counterclaims dated 12 July 2013
Reply	Ecuador's Reply Memorial on Counterclaims dated 22 February 2013
ROH	<i>Reglamento de Operaciones Hidrocarburíferas (Regulation of Hydrocarbon Operations)</i> enacted on 26 September 2002
Rouhani ER	Expert Opinion of Shahrokh Rouhani, Ph.D., P.E. Regarding Calculation of Impacted Soil Volumes in Block 7, Block 21 and the Coca-Payamino United Field, Oriente Region, Ecuador dated 26 June 2013
RPS	RPS Group
RPS ER I	1 st Expert Report of RPS dated 25 November 2011
RPS ER II	2 nd Expert Report of RPS dated 25 July 2012
RPS ER III	3 rd Expert Report of RPS dated February 2013
SPA	Office of the Undersecretary for Environmental Protection or Subsecretaría de Protección Ambiental
Supplemented Memorial	Ecuador's Supplemental Memorial on the Counterclaims dated 27 April 2012
the Ministry	Ministry of Energy and Mines, later the Ministry of Non-Renewable Natural Resources

the Treaty or the BIT	Agreement between the Government of the French Republic and the Government of the Republic of Ecuador on the Reciprocal Promotion and Protection of Investments
TULAS	<i>Texto Unificado de Legislación Ambiental Secundaria</i> (Unified Text of Secondary Environmental Legislation) published in the Official Register No. E 2 on 31 March 2003

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I. INTRODUCTION

A. Parties

1. The Claimant is Perenco Ecuador Limited, and is hereinafter referred to as “**Perenco**” or the “**Claimant.**”
2. The Respondent is the Republic of Ecuador and is hereinafter referred to as “**Ecuador**” or the “**Respondent.**”
3. The Claimant and the Respondent are hereinafter collectively referred to as the “**Parties.**” The Parties’ respective representatives and their addresses are listed above on page (i).

B. Dispute

4. The dispute arises out of a series of measures adopted by the Respondent which, according to Perenco, were in breach of Ecuador’s obligations under the *Agreement between the Government of the French Republic and the Government of the Republic of Ecuador on the Reciprocal Promotion and Protection of Investments* (the “**Treaty**” or the “**BIT**”) and two participation contracts for the exploration and exploitation of Blocks 7 and 21 (the “**Blocks**”) situated in the Ecuadorian Amazonian region. The Tribunal ruled on these claims in its [Decision on Remaining Issues of Jurisdiction and on Liability](#), dispatched to the Parties on 12 September 2014.
5. During the course of the written submissions phase of the prior proceedings, on 5 December 2011, Ecuador presented two counterclaims pursuant to Rule 40 of the ICSID Rules of Procedure for Arbitration Proceedings (the “**Arbitration Rules**”).¹ These related to allegations that Perenco is liable for environmental and infrastructural damage in Blocks 7 and 21. This interim decision will only address the environmental counterclaim.

¹ Ecuador’s Counter-Memorial on Liability and Counterclaims dated 5 December 2011 (“Ecuador’s Counter-Memorial”), paragraph 26.

II. PROCEDURAL HISTORY

6. On 13 July 2011, Ecuador informed the Tribunal that “it may submit various counterclaims with its counter-memorial [on liability],” including those brought against Perenco’s partner in Blocks 7 and 21, Burlington Resources (“**Burlington**”).²

7. On 28 July 2011, the Tribunal, in consultation with the Parties, fixed the procedural calendar for the counterclaims.

8. On 17 November 2011, Ecuador requested a 10-day extension in which to file its Counter-Memorial and its Counterclaims, due on 25 November 2011. Ecuador also confirmed that “while further work is ongoing in Ecuador regarding the extent of the environmental damage caused by Perenco, Ecuador will file on 5 December its counterclaim save as to quantum.”³

9. On 21 November 2011, Perenco confirmed that “in principle, it had no objection to reasonable schedule accommodations,”⁴ but it sought assurances from Ecuador that it would file its entire counterclaim on the proposed amended date.

10. On 24 November 2011, the Tribunal granted Ecuador’s request of 17 November and amended the procedural calendar, providing Claimant’s with a similar extension of time. The Tribunal also drew the Parties’ attention to ICSID Arbitration Rule 40(2)⁵ and requested the Respondent to “inform it at the time of the filing of its counter-claim precisely what additional steps it needs to undertake in order complete its counter-claim, so that the Claimant is able to respond thereto having regard to the procedural schedule as amended.”⁶

11. On 5 December 2011, Ecuador filed a Counter-Memorial on Liability and Counterclaims (“**Ecuador’s Counter-Memorial**”). It was accompanied by the witness statements of Dr. Galo Chiriboga Zambrano, Mr. Pablo Luna, Mr. Diego Montenegro, Mr. Derlis Palacios, Mr. Wilson Pastor Morris, Mr. Germánico Pinto, Mr. Marco Puente, Mr. Manuel Solís, the third witness statement of Dr. Christian Dávalos, and the expert reports of Integrated Environmental Management Services S.A. de C.V. (IEMS), Mr. Brian Moree QC, RPS Energy, Fair Links, Mr. Ricardo Crespo Plaza and Professor Juan Pablo Aguilar Andrade (third).

12. On the same date, Ecuador answered the Tribunal’s request of 24 November by noting that its environmental expert IEMS “is currently undertaking the final stage of its three-stage environmental audit of areas within Blocks 7 and 21 of the Ecuadorian Amazon Region. The

² Ecuador also advanced similar counterclaims against Perenco’s consortium partner, Burlington Resources Inc. (“Burlington”) ICSID Case No. ARB/08/5. After consultation with the parties, the *Burlington* tribunal chose to confine the hearing on liability in March 2011 to the claims advanced by Burlington and to have a separate hearing on the counterclaims. The tribunal’s Decision on Liability on Burlington’s claims was dispatched to the parties on 14 December 2012. See *Burlington Resources, Inc. v. Republic of Ecuador*, ICSID Case No. ARB/08/5, Decision on Liability (14 December 2012) [hereinafter *Burlington v. Ecuador*].

³ See Ecuador’s letter to the Tribunal dated 17 November 2011.

⁴ See Perenco’s letter to the Tribunal dated 21 November 2011.

⁵ Rule 40(2) of the ICSID Arbitration Rules provides that “a counter-claim [shall be presented] no later than in the counter-memorial, unless the Tribunal, upon justification by the party presenting the ancillary claim and upon considering any objection of the other party, authorizes the presentation of the claim at a later stage in the proceeding.”

⁶ See Tribunal’s letter to the Parties dated 24 November 2011.

purpose of this final stage is twofold: (i) to quantify the volume of contaminated soil and underground water pollution in some of the locations that IEMS has already determined, through laboratory analysis, are significantly contaminated; and (ii) to confirm the existence of contamination in other areas identified in its report where IEMS' investigation has led to indicia of pollution."⁷

13. On 4 January 2012, the Tribunal informed the Parties that it intended to hold a telephone conference on 13 January 2012 to "consider the further procedural calendar covering not only Perenco's claim (including the remaining jurisdictional issues) and Ecuador's counterclaims, but also the issues of the quantum in relation to the main claim and the counterclaim."⁸

14. On 13 January 2012, the Tribunal held a telephone conference with the Parties and invited them to reach agreements on the procedural calendar.

15. On 19 January 2012, the Parties confirmed to the Tribunal that: "Ecuador has no objection to releasing Perenco from the 12 April 2012 date for the filing of its Counter-Memorial on Counterclaims. This is premised on the understanding that Perenco has no objection to Ecuador submitting a supplemental memorial on its counterclaims (including a supplemental report by IEMS) (i) before Perenco submits its Counter-Memorial on Counterclaims and (ii), in any event, not earlier than 30 April 2012."⁹

16. On 3 February 2012, the Parties informed the Tribunal of their agreement regarding the procedural calendar for the counterclaims.¹⁰

17. On 13 February 2012, the Tribunal fixed a new procedural calendar in light of the agreement reached by the Parties.¹¹

18. On 27 April 2012, the Respondent filed a Supplemental Memorial on Counterclaims (the "**Supplemental Memorial**"). It was accompanied by the second witness statements of Mr. Pablo Luna and Mr. Diego Montenegro, and the second expert report of IEMS.

19. On September 28, 2012, Perenco filed a Counter-memorial on Counterclaims ("**Claimant's Counter-Memorial**"). It was accompanied by the witness statements of Mr. Wilfrido Saltos, Mr. Eric d'Argentré (third), and Mr. Alex Martínez, and the expert reports of GSI Environmental, Intertek APTECH, and Prof. René Bedón.

20. On 9 January 2013, the Tribunal issued Procedural Order No. 4 concerning Ecuador's request for production of documents regarding its counterclaims.¹²

21. On 5 February 2013, the Parties agreed to extend the deadline for Ecuador to submit its Reply on Counterclaims, with a corresponding extension to Claimant's deadline to submit its Rejoinder on Counterclaims.

22. On 12 February 2013, the Tribunal adopted the procedural calendar as modified by the Parties.

⁷ See Ecuador's letter to the Tribunal dated 5 December 2011.

⁸ See Tribunal's letter to the Parties dated 4 January 2012.

⁹ See Ecuador's letter dated 17 January 2012 and Perenco's letter dated 19 January 2012.

¹⁰ See Perenco's letter dated 3 February 2012 and Ecuador's email dated 7 February 2012.

¹¹ See Tribunal's letter to the Parties dated 13 February 2012.

¹² The Tribunal issued Procedural Orders Nos. 1, 2, and 3 in the context of the jurisdiction and liability phase.

23. On 22 February 2013, Ecuador submitted its Reply on Counterclaims (the “**Reply**”). It was accompanied by the witness statements of Mr. Saulo Carrasco, Mr. Pablo Luna (third), Mr. Diego Montenegro (third), Minister Germánico Pinto (third), and Mr. Manuel Solís (second); as well as the expert reports of IEMS (third), RPS (third), and Professor Fabián Andrade Naváez.
24. On 22 May 2013, the Tribunal issued Procedural Order No. 5 concerning the Claimant’s application to compel disclosure of documents by the Respondent.
25. On 4 June 2013, the Tribunal issued Procedural Order No. 6 regarding the Claimant’s requests to compel disclosure of certain documents by the Respondent pursuant to Procedural Order No. 5.
26. On 12 July 2013, the Claimant filed its Rejoinder on Counterclaims (the “**Rejoinder**”). It was accompanied by the the witness statements of Mr. Wilfrido Saltos (second), Mr. Eric d’Argenté (fourth), and Mr. Gilberto Martínez (second), as well as the expert reports of Dr. Shahrokh Rouhani, GSI Environmental (second), Intertek (second), and Prof. René Bedón (second).
27. On 19 August 2013, the Tribunal issued Procedural Order No. 7 regarding the organization of the hearing on Counterclaims.
28. On 2 September 2013, the Tribunal issued Procedural Order No. 8 regarding the Respondent’s request to introduce into the record additional evidence in connection with the hearing on counterclaims.
29. The hearing on Counterclaims was held at The Hague, from 9-17 September 2013. Present at the hearing were:

Tribunal:

Judge Peter Tomka	President
Mr. Neil Kaplan CBE QC	Co- Arbitrator
Mr. J. Christopher Thomas QC	Co- Arbitrator

Assistants to the Tribunal

Ms. Harpreet Kaur Dhillon	Assistant to Mr. J. Christopher Thomas QC
Ms. Olga Boltenko	Assistant to Mr. Neil Kaplan CBE QC
Mr. Romesh Weeramantry	Assistant to Mr. Neil Kaplan CBE QC

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Mr. Thomas H. Norgaard	Debevoise & Plimpton LLP
Ms. Terra L. Gearhart-Serna	Debevoise & Plimpton LLP
Ms. Corina Gugler	Debevoise & Plimpton LLP
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<i>Support Personnel</i>	
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Mr. Richard Brea	Debevoise & Plimpton LLP
Mr. Jeff Isler	InfoGraphics
<i>Parties</i>	
Mr. Rodrigo Márquez Pacanins	Perenco / MQZ Renewables
Mr. Roland Fox	Perenco
<i>Witness(s)</i>	
Mr. Wilfrido Saltos	Perenco
Mr. Eric d'Argentré	Perenco
Mr. Alex Martínez	Burlington
Mr. Gilberto Martínez	Freelance
<i>Expert(s)</i>	
Mr. John Connor	GSI Environmental, Inc.
Dr. Gino Bianchi Mosquera	GSI Environmental, Inc.
Ms. Claudia Sánchez de Lozada	GSI Environmental, Inc.
Ms. Danielle Bailey	GSI Environmental, Inc.
Dr. Shahrokh Rouhani	NewFields
Dr. Geoffrey Egan	Intertek
Prof. René Bedón Garzón	Albán Bedón Macías & Asociados

On behalf of the Respondent:

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Mr. Eduardo Silva Romero	Dechert (Paris) LLP
Mr. Philip Dunham	Dechert (Paris) LLP
Mr. José Manuel García Represa	Dechert (Paris) LLP
Mr. Timothy Lindsay	Dechert LLP
Mr. Alvaro Galindo	Dechert LLP
Ms. Maria Claudia Procopiak	Dechert LLP
Mr. Pacôme Ziegler	Dechert (Paris) LLP
Mr. Antonio Marzal Yetano	Dechert (Paris) LLP
Ms. Katherine Marami	Dechert (Paris) LLP
Mr. Jeremy Eichler	Dechert (Paris) LLP
Ms. Gabriela González Giraldez	Dechert (Paris) LLP
Ms. Alessandra Esposito Chartrand	Dechert (Paris) LLP
Mr. Loïc Cropage	Dechert (Paris) LLP
Ms. Celia Campbell	Dechert (Paris) LLP

<i>Parties</i>	
Sr. Procurador Diego García Carrión	Procuraduría General de la República del Ecuador
Dr. Blanca Gómez de la Torre	Procuraduría General de la República del Ecuador
Dr. Diana Moya	Procuraduría General de la República del Ecuador
<i>Witness(s)</i>	
Mr. Saulo Carrasco Paredes	Agencia de Regulación y Control Hidrocarburífero del Ecuador (ARCH)
Mr. Pablo Luna	Petroamazonas
Mr. Diego Montenegro	Petroamazonas
Mr. Manuel Solís	Petroamazonas
Mr. Germánico Pinto	Empresa Pública Metropolitana de Movilidad y Obras Públicas
Ms. Laura Maricela Díaz de la Garza	Material and Human Resources Administrator of IEMS (Integrated Environmental Management Services, S.A. de C.V.)
<i>Expert(s)</i>	
Dr. Ricardo Crespo Plaza	Universidad San Francisco de Quito
Dr. Fabián Andrade Narváez	Universidad San Francisco de Quito
Mr. José Rubén Villanueva Peón	IEMS (Integrated Environmental Management Services, S.A. de C.V.)
Mr. José Francisco Alfaro Rodríguez	IEMS (Integrated Environmental Management Services, S.A. de C.V.)
Mr. Jonathan Green	IEMS (Integrated Environmental Management Services, S.A. de C.V.)
Mr. Henry Chaves Kiel	IEMS (Integrated Environmental Management Services, S.A. de C.V.)
Mr. Scott Crouch	RPS
Ms. Martha Pertusa	RPS
Ms. Kathleen Kerr	RPS
Mr. Jean-Louis Courteaud	IT forensic examiner

30. On 18 October 2013, the Tribunal issued Procedural Order No. 9 concerning post-hearing submissions.
31. On 6 November 2013, the Parties filed their Post-Hearing Briefs.
32. On 22 November 2013, the Parties filed their Reply Post-Hearing Briefs.
33. The Tribunal has deliberated in person at meetings held in The Hague and Lower Slaughter as well as by other means.

III. ENVIRONMENTAL COUNTERCLAIM

A. Introduction

34. Ecuador presented the environmental counterclaim on the basis that its experts had determined the existence of an “environmental catastrophe” in the two oil blocks situated in the country's Amazonian rainforest that had been worked by the consortium under Perenco's operatorship.¹³ Ecuador viewed this as an extremely serious matter deserving the most careful consideration by the Tribunal.¹⁴ On this point, the Tribunal cannot but agree. Proper environmental stewardship has assumed great importance in today's world. The Tribunal agrees that if a legal relationship between an investor and the State permits the filing of a claim by the State for environmental damage caused by the investor's activities and such a claim is substantiated, the State is entitled to full reparation in accordance with the requirements of the applicable law.

35. The Tribunal further recognises that a State has wide latitude under international law to prescribe and adjust its environmental laws, standards and policies in response to changing views and a deeper understanding of the risks posed by various activities, including those of extractive industries such as oilfields. All of this is beyond any serious dispute and the Tribunal enters into this phase of the proceeding mindful of the fundamental imperatives of the protection of the environment in Ecuador.

(1) Summary of the Parties' Submissions

36. Ecuador has requested the Tribunal to find Perenco liable for the costs of remedying environmental damage in Blocks 7 and 21, quantified at US\$ 2,279,544,559 for soil clean-up costs, US\$ 265,601,700 for groundwater remediation costs and US\$ 3,380,000 for further groundwater studies (subject to payment of compound interest from the date of the Award until the date of full payment).¹⁵ It asserted that Perenco “abandoned Blocks 7 and 21 in a state which makes a mockery of the nowadays universal, well-established legal principles aimed at

¹³ 2nd Expert Report of IEMS dated 26 April 2012 (“IEMS ER II”), p 3; Supplemental Memorial, section 4; cf. Claimant's Counter-Memorial on Counterclaims dated 28 September 2012 (“Claimant's Counter-Memorial”), paragraph 1.

¹⁴ Transcript, Hearing on Counterclaims, Day 1, pp 19-23 (Opening Statement of Dr. Diego García Carrión).

¹⁵ IEMS ER II, p 1; 3rd Expert Report of IEMS dated 21 February 2013 (“IEMS ER III”), pp 1, 3 and 128 (“In conclusion, IEMS confirm its original findings and conclusions. Some minor adjustments are warranted to the volumes of the contaminated soil and estimated costs for soil remediation, which is estimated at \$2,279,544,559 USD (considering exceedances of background levels) or \$831,125,954 USD (if remediation is limited to concentrations exceeding regulatory criteria). Groundwater remediation will cost and between [sic] \$41,277,600 and \$265,601,700 USD”); Ecuador's Counter-Memorial, paragraphs 978, 980, 981; Supplemental Memorial, paragraphs 9, 416, 418-419, 425; Ecuador's Reply Memorial on Counterclaims dated 22 February 2013 (“Reply”), paragraphs 542, 544-545. In its Counter-Memorial, Ecuador's request was for Perenco to be found liable to remedy any and all environmental damage in Blocks 7 and 21 and in lieu of this be made to pay the full costs of remedying said damage. Ecuador submitted that since Perenco has left the Blocks and the Participation Contracts terminated, it is no longer in a position to itself go about remedying the damage and is thus required to bear the burden of the costs of Ecuador being made to do so in its stead. See Ecuador's Counter-Memorial, paragraphs 692-696.

protecting the environment.”¹⁶ Such principles are said to be reflected in both Ecuadorian law and in the Consortium’s obligations under the Participation Contracts.¹⁷ In particular, the 2008 Constitution expressly prescribes a regime of strict liability (“*responsabilidad objetiva*”) for environmental damage and establishes that the Ecuadorian people have the fundamental right to a healthy environment.¹⁸ The strict liability regime reflects the “polluter-payer principle”, defined by Ecuador as the proposition that “[h]e who causes pollution must, under all circumstances, assume the costs of repairing it.”¹⁹ Ecuador submitted that under this regime it “need only establish the existence of environmental damage and that such damage is found in Blocks 7 and 21, where Perenco operated, that is, where it performed petroleum activities, for Perenco to be strictly liable to the State.”²⁰ It asserted this was the case both before and after the 2008 Constitution’s entry into force, since the Ecuadorian courts have since 2002 applied a strict liability regime to claims of environmental damage resulting from hazardous activities.²¹

37. Ecuador maintained that it was “common ground between the Parties” that petroleum exploration and exploitation activities are hazardous activities that “inherently put the environment at risk.”²² Accordingly, oil operators in Ecuador must exercise “a very high standard of care in their operations, especially where, as here, Perenco operated within highly environmentally fragile areas in the Amazon rainforest.”²³ Ecuador alleged that Perenco failed to operate Blocks 7 and 21 in accordance with the requisite degree of care, “knowing perfectly well the significant environmental impact its operations were having”, because it was “more concerned with running its operations at very low cost” and, further, that it had “failed to take proper steps to prevent such damage or [to] repair the damage.”²⁴

38. Indeed, quite apart from its alleged failure to adhere to its duty of care, Perenco was alleged to have exercised a “strategy of deceit and concealment towards the Ecuadorian authorities” in “systematically [seeking] to mislead the Ecuadorian authorities as to the existence and extent of the environmental damage” in the Blocks.²⁵ Ecuador contended that documents

¹⁶ Supplemental Memorial, paragraph 3; Reply, sections 2.1 and 2.2; see also, Ecuador’s Reply Post-Hearing Brief on Counterclaims dated 22 November 2013 (“Ecuador’s Reply Post-Hearing Brief”), section 3; Transcript, Hearing on Counterclaims, Day 1, p 25 (Opening Statement of Mr. Pierre Mayer)

¹⁷ Ecuador’s Counter-Memorial, paragraph 26; Supplemental Memorial, paragraph 3, footnotes 40, 91, 142; Ecuador’s Reply Post-Hearing Brief, paragraphs 3, 23-25; Transcript, Hearing on Counterclaims, Day 1, pp 34-35 (Opening Statement of Mr. Eduardo Silva Romero).

¹⁸ Supplemental Memorial, paragraphs 3 and 12; Reply, paragraph 17; Transcript, Hearing on Counterclaims, Day 1, pp 20-22 (Opening Statement of Dr. Diego García Carrión).

¹⁹ Transcript, Hearing on Counterclaims, Day 1, pp 25-26 (Opening Statement of Mr. Pierre Mayer).

²⁰ Supplemental Memorial, paragraph 4; Transcript, Hearing on Counterclaims, Day 1, pp 20, 26-36 (Opening Statements of Mr. Pierre Mayer and Mr. Eduardo Silva Romero).

²¹ Reply, paragraphs 234, 345-374; Ecuador’s Reply Post-Hearing Brief, paragraphs 11 and 22; Transcript, Hearing on Counterclaims, Day 1, pp 20, 26-36 (Opening Statements of Mr. Pierre Mayer and Mr. Eduardo Silva Romero).

²² Supplemental Memorial, paragraph 5; Transcript, Hearing on Counterclaims, Day 1, pp 35-36 (Opening Statement of Mr. Eduardo Silva Romero).

²³ Supplemental Memorial, paragraph 5; Reply, paragraph 12.

²⁴ Supplemental Memorial, paragraph 5; Reply, paragraph 12.

²⁵ Supplemental Memorial, paragraphs 6, 87-101; Reply, section 2.1.1.2; cf. Claimant’s Rejoinder on Counterclaims dated 12 July 2013 (“Rejoinder”), paragraphs 298-307.

produced by Perenco in this arbitration demonstrated that Perenco chose not to notify Ecuador of at least 41 spills that occurred in the Blocks during its operatorship.²⁶

39. It alleged further that Perenco has sought to evade its liability for environmental damage in the Blocks by relying on a set of environmental audits of Blocks 7 and 21 commissioned by the Consortium in 2008 and submitted to the Ministry of Energy and Mines, later the Ministry of Non-Renewable Natural Resources (“**the Ministry**”), for approval.²⁷ While the 2008 audits found several minor non-compliances with regulatory requirements in Block 7, they ultimately concluded that the Consortium’s operations in the Blocks complied with Ecuadorian environmental regulations.²⁸

40. Ecuador submitted that this was false as a matter of fact and law, and pointed to different, and in its view more credible, results of a technical inspection that it commissioned in August 2009, shortly after the government intervened to take possession of the Blocks when the Consortium suspended operations.²⁹ Ecuador characterised the 2008 audits as flawed, and rejected Perenco’s claim that they had been approved by the Ministry.³⁰ Even if they had been approved, Ecuador contends, such ministerial approvals could not constitute a full defence under its law in a subsequent proceeding for environmental liability such as the present one.³¹

41. In seeking to prove its environmental claim, Ecuador relied on the evidence of its experts, Integrated Environmental Management Services S.A. de C.V. (“**IEMS**”) of Monterrey, Mexico, to submit that there was “significant environmental damage to soil and underground water in Blocks 7 and 21.”³² IEMS found that the soil in 94% of the 74 locations it tested in Blocks 7 and 21 were contaminated as a result of petroleum activities, as were all of the 18 sites it tested for groundwater contamination.³³

42. Ecuador also submitted three reports by the Energy Division of RPS Group (“**RPS**”), an international consultancy that provides advice on the development of natural resources, land and property, and the management of the environment.³⁴ RPS’s reports initially addressed the risk and existence of damage to the wells and reservoirs in Blocks 7 and 21 as a result of the shut-in

²⁶ In addition to the 25 which it did notify Ecuadorian authorities had occurred. See Reply, paragraphs 46-52 (19 according to the list of oil spills produced by GSI and a further 22 according to the evidence of Ecuador’s witness, Mr. Manuel Solís); 1st Expert Report of GSI, Appendix B3 (Oil Spills as of 20 September 2012); 2nd Witness Statement of Manuel Solís, paragraph 76.

²⁷ Ecuador’s Counter-Memorial, paragraphs 656, 687-688; Reply, paragraphs 282-286

²⁸ Exhibits CE-CC-182, Biannual Environmental Audit of Block 7 and Coca-Payamino Unified Field, Two Years Prior to the Expiration of the Block 7 Participation Contract, November 2008, pp 81-83 and CE-CC-183, Biannual Environmental Audit of Block 21, November 2008, sections 7.1-7.3; Claimant’s Counter-Memorial, paragraphs 28, 42, 173, 174 cf. Supplemental Memorial, paragraph 6.

²⁹ Ecuador’s Counter-Memorial, paragraphs 656, 687-688; Reply, paragraphs 268-286.

³⁰ Ecuador’s Counter-Memorial, paragraph 687; Reply, section 3.1.3.

³¹ Supplemental Memorial, paragraphs 6, 40-43; Expert Report of Ricardo Crespo Plaza, paragraphs 96-98; Reply, paragraph 11.

³² Supplemental Memorial, paragraph 7, section 4. IEMS submitted four expert reports, dated 29 November 2011, 26 April 2012, 21 February 2013 and 4 September 2013.

³³ IEMS ER II, pp 138-142, 180-181; Supplemental Memorial, paragraphs 7, 176, 288-289.

³⁴ 1st Expert Report of RPS dated 25 November 2011 (“RPS ER I”), paragraph 8, see also paragraph 11 which identifies as a core part of RPS’s advisory business the estimation of reserves, forecasts of future production and estimation of future economic performance. 2nd Expert Report of RPS dated 25 July 2012 (“RPS ER II”), and 3rd Expert Report of RPS dated February 2013 (“RPS ER III”).

of wells in July 2009,³⁵ and, as the expert evidence was sequentially developed in the counterclaim, on what RPS considered to be the “flaws in [Perenco’s environmental experts, GSI’s] site investigation program.”³⁶ Ecuador relied on the first two RPS reports chiefly for the purposes of the claims brought by Perenco that were the subject of the Decision on Remaining Issues of Jurisdiction and on Liability. RPS’s third report, of February 2013, sought to rebut GSI’s expert report, concluding that GSI’s “opinion...[was] not correct” and that RPS’s review of record evidence contradicted GSI’s conclusion that Perenco’s operations in the Blocks complied with applicable regulations and industry practices.³⁷

43. For its part, Perenco submitted that the Tribunal should dismiss Ecuador’s environmental claim in its entirety and award costs in its favour and such other and further relief as the Tribunal deemed just and proper.³⁸ Perenco emphatically rejected Ecuador’s depiction of the condition of Blocks 7 and 21 as an “environmental catastrophe.”³⁹ It submitted that, to the contrary, Perenco was a “responsible manager that focused on, preserved, and even improved the environmental and infrastructural integrity of the Blocks” and the environmental counterclaim was a transparent attempt by Ecuador to create a counterweight to, and divert attention from, the serious breaches of contract and Treaty that formed the basis of Perenco’s claim.⁴⁰

44. Perenco also contended that Ecuador’s environmental claim was deficient as a matter of law.⁴¹ Under the applicable Ecuadorian law, the claim, which concerned alleged contamination from activities Perenco undertook in the Blocks from 2002 to July 2009, was governed by a fault-based, not strict liability, regime, “since any changes made by the 2008 Constitution (which entered into force in October 2008) [could not] have any retroactive effect.”⁴² Perenco observed it would be inconsistent with the Constitution’s proscription against the retroactive application of law to hold it to a regime that did not apply for most of the time that it operated the Blocks.⁴³

45. Under the regime applicable prior to the 2008 Constitution’s entry into force, an operator could not be found liable for environmental damage if it had complied with its duty of care to act as a responsible operator.⁴⁴ Since Perenco could prove it had satisfied its duty of care, there

³⁵ RPS ER I, paragraphs 5-6, 161 (RPS concluded that mechanical and environmental damage can occur with an associated loss of production and determined that “at least 14 wells in Blocks 7 and 21 showed” evidence of such damage).

³⁶ RPS ER II, p 5; RPS ER III, sections 1.3, 2, 3, 4 and 7.

³⁷ See conclusions of RPS in section 7 of RPS ER III.

³⁸ Claimant’s Counter-Memorial, paragraphs 189-198, 642-644; Rejoinder, part IV (paragraphs 434-437). Perenco in its Rejoinder submitted that Ecuador had acknowledged that “it would be improper for Ecuador to obtain double recovery as a result of having asserted the same counterclaims against both Perenco and Burlington” cf. Reply, paragraphs 551-553. Perenco further submitted that if the Tribunal “were to find that liability exists for environmental conditions created by Ecuador’s State-owned oil companies, it should order Ecuador to provide an indemnity against third-party claims arising from those conditions.” (Rejoinder, paragraph 435).

³⁹ Claimant’s Counter-Memorial, paragraphs 1-3, 8-25; Rejoinder, paragraphs 1-21; Transcript, Hearing on Counterclaims, Day 1, p 170-178 (Opening Statement of Mark Friedman).

⁴⁰ Claimant’s Counter-Memorial, paragraphs 1-25; Rejoinder, paragraphs 2, 289-297.

⁴¹ Claimant’s Counter-Memorial, paragraphs 189-198; Rejoinder, paragraphs 4-21.

⁴² Claimant’s Counter-Memorial, paragraphs 190, 199; Rejoinder, paragraph 15.

⁴³ Rejoinder, paragraph 15, 308, 318-328; Transcript, Hearing on Counterclaims, Day 1, pp 291-293 (Opening Statement of Ina C. Popova); Ecuador’s Reply Post-Hearing Brief, paragraph 9.

⁴⁴ Claimant’s Counter-Memorial, paragraphs 498-504.

could be no finding of liability.⁴⁵ Even if a strict liability regime did apply (which was not conceded), Ecuador still bore the burden of proving that “the Consortium *caused* environmental harm – *i.e.* an environmental effect that exceed[ed] applicable regulatory limits.”⁴⁶

46. Ultimately, Perenco submitted that Ecuador must “cumulatively establish for each site [claimed to be contaminated] that: (1) the Consortium engaged in a wrongful (negligent or malicious) act in breach of its duty of care; (2) Ecuador suffered harm (*i.e.* environmental damage consisting of a regulatory exceedance); and (3) a causal nexus [that] exist[ed] between the wrongful act and Ecuador’s alleged harm.”⁴⁷ If it succeeded in proving the foregoing, Ecuador then bore the burden of proving “the quantum of the loss suffered as a consequence of the harm.”⁴⁸

47. Perenco argued further that quite apart from the foregoing legal requirements for establishing liability, the environmental counterclaim was subject to temporal limits.⁴⁹ At one end of the events in question, *i.e.*, in relation to damage caused after the government’s July 2009 takeover of the two Blocks, Perenco obviously could not be held liable for damage caused by the operator which succeeded it, namely, Petroamazonas.⁵⁰ As for the other end of the events in question, Perenco argued that it could not be liable for any damage that predated January 2007, the maximum permissible period for claiming damage under the four-year statute of limitations prescribed by Ecuadorian law.⁵¹

48. Putting the legal issues aside, on the matter of the evidence submitted by Ecuador in support of its claim, Perenco submitted there were “systematic” and “fundamental” flaws in the methodology employed by IEMS when investigating the Blocks, with the result that its findings were invalid.⁵² As for the RPS report, it was a “hypothetical assessment” of risks and did not lend further credence to IEMS’ findings.⁵³ In Perenco’s view, rather than a US\$2.4 billion cost

⁴⁵ Claimant’s Counter-Memorial, paragraphs 498-504. Perenco does not accept that it bears the burden of proof to demonstrate that it had satisfied its duty of care; its submission is that Ecuador must establish for each site that the Consortium engaged in wrongful (negligent or malicious) conduct in breach of its duty of care: see Claimant’s Counter-Memorial, paragraphs 190, 196, 200; Rejoinder, paragraphs 15, 22, 290.

⁴⁶ Claimant’s Counter-Memorial, paragraphs 190, 199 [*Italics in original*].

⁴⁷ Claimant’s Counter-Memorial, paragraph 190 [*Italics in original*], taken from the 1st report of its legal expert Rene Bedón, paragraph 49.

⁴⁸ Claimant’s Counter-Memorial, paragraph 190, taken from the 1st report of its legal expert Rene Bedón, paragraph 49.

⁴⁹ Claimant’s Counter-Memorial, paragraphs 21-24, 190-198; Rejoinder, paragraphs 15, 241-242.

⁵⁰ Claimant’s Counter-Memorial, paragraphs 21-24, 190-198; Rejoinder, paragraphs 15, 241-242.

⁵¹ Claimant’s Counter-Memorial, paragraphs 21-24, 190-198; Rejoinder, paragraphs 15, 241-242.

⁵² Rejoinder, paragraphs 5-7, 10-14, 25.

⁵³ Rejoinder, paragraphs 26-27, 294; see also, Claimant’s Reply Post-Hearing Brief dated 22 November 2013 (“Claimant’s Reply Post-Hearing Brief”), paragraphs 35, 41, 45 and 50.

of remediation, the more realistic cost was “under US\$10 million.”⁵⁴ This related to “minor regulatory exceedances” posing no “threat to human health or the environment.”⁵⁵

49. Having investigated the blocks, Perenco’s expert, GSI Environmental, Inc. (“GSI”), opined that there were “no widespread environmental impacts, no impacts to groundwater and only limited impacts to soil, no risk to human health and livestock, and no impacts to surface water, air quality or ecological resources.”⁵⁶ GSI analysed sampling results from its own and IEMS’ field investigation, visiting 58 sites, most of which were sites at which IEMS had found exceedances.⁵⁷

50. In both Perenco’s and GSI’s view, the exceedances resulted mainly from Ecuador’s (and its experts’) insistence on employing so-called “background values” (Perenco’s preferred translation of the relevant provision of TULAS) or “base values” (Ecuador’s preferred translation), rather than the regulatory criteria prescribed by Ecuadorian law.⁵⁸ IEMS had in the first instance compared its soil samples to the alleged background values (i.e., the normally occurring incidences of certain elements in the natural environment) and where such values had been exceeded, IEMS had concluded that the samples were contaminated by oilfield activities.⁵⁹ Perenco argued that Ecuadorian law recognised that oilfield activities inevitably result in a measure of contamination, but that law prescribed acceptable levels of contaminants resulting from permitted activities.⁶⁰ The only relevant question, in Perenco’s view, was whether the Consortium had exceeded the limits of the regulations applicable to its operations.⁶¹

51. Perenco, GSI and its expert on geostatistical analysis, Dr. Shahrokh Rouhani, an environmental scientist and founder of NewFields Companies, LLC, also strongly criticised IEMS’ plotting of the alleged contamination in the two Blocks. IEMS employed a computer software programme called ArcView GIS 10.0 to graphically map the extent of contamination

⁵⁴ Claimant’s Counter-Memorial, paragraphs 18-21; Transcript, Hearing on Counterclaims, Day 8, p 2270 (“limited pockets of areas potentially warranting remediation in Ecuador...scattered around at 17 sites...They pose no risk to human health, even on extraordinarily tough standards...all of them could be remediated for less than \$11 million”) (Closing Statement of Mark Friedman).

⁵⁵ Claimant’s Counter-Memorial, paragraphs 18-21. Perenco submitted in this regard that GSI had demonstrated that these “minor exceedances” did not pose any threat to human health or the environment (Claimant’s Counter-Memorial, paragraph 21).

⁵⁶ Claimant’s Counter-Memorial, paragraph 3; see 1st Expert Opinion of John A. Connor, P.E., P.G., B.C.E.E., and Gino Bianchi Mosquera, D.Env., P.G., Regarding Environmental Conditions in the Coca-Payamino Unified Field, Block 7, and Block 21, Oriente Region, Ecuador, 1st Expert Report of GSI Environmental Inc., dated 20 September 2012 (“GSI ER I”), paragraphs 6-11.

⁵⁷ Claimant’s Counter-Memorial, paragraphs 233-235; GSI ER I, paragraphs 2-5, Appendix D (GSI Site Sampling and Testing Program).

⁵⁸ See, for e.g., Claimant’s Counter-Memorial, paragraph 9. Perenco referred to it as the “average background values” or “*valores de fondo*” – i.e., the average level of substances naturally occurring in the environment in the absence of any human intervention” (Claimant’s Counter-Memorial, paragraph 9 [Italics in original]). Ecuador used the term “base values”, defining it as the “levels of concentration of contaminants naturally present in Blocks 7 and 21”: see Reply, paragraph 82. See also, Expert Opinion of Shahrokh Rouhani, Ph.D., P.E. Regarding Calculation of Impacted Soil Volumes in Block 7, Block 21 and the Coca-Payamino United Field, Oriente Region, Ecuador dated 26 June 2013 (“Rouhani ER”), section 4.2. The Tribunal will use both terms.

⁵⁹ Supplemental Memorial, paragraphs 158-161; Reply, paragraphs 20, 82-89; IEMS ER II, Section IV.1.A.

⁶⁰ Claimant’s Counter-Memorial, paragraphs 10-12.

⁶¹ Claimant’s Counter-Memorial, paragraphs 240-311.

which it said pervaded the Blocks.⁶² GSI considered that this was inconsistent with the accepted practice in the industry of employing site delineation, whereby a site that is considered to be contaminated is delineated by taking samples in the immediate vicinity of the contaminated sample and then working outwards from that point until the sampling no longer reveals any contamination.⁶³ For his part, Dr. Rouhani opined that IEMS' use of the ArcView GIS 10.0 software was flawed and had led to a vast exaggeration of the contamination alleged to exist in the two Blocks.⁶⁴

52. Perenco acknowledged that there was some minor evidence of contamination in the Blocks, but submitted that once Ecuador's use of background values rather than the regulatory criteria that were actually applicable under Ecuadorian law was rejected as being legally unsustainable, and once the proper land-use criteria were applied and the errors and inaccuracies in IEMS' methodology and findings were corrected, the volume of contaminated soil for which Ecuador could possibly claim damages dropped from nearly 2 billion cubic metres of soil to only 33,415 cubic meters of soil, with the quantum of damages dropping commensurately. To be specific, in Perenco's submission, the potentially awardable damages dropped from approximately US\$2.4 billion to US\$9.1 million.⁶⁵

53. In Perenco's view, therefore, Ecuador's counterclaims were "opportunistic" and had been brought in "retaliation" for Perenco's having seised the Tribunal with its contract and Treaty claims.⁶⁶ Perenco asserted that from the time that the Government took over the Blocks on 16 July 2009 until 5 December 2011 (the date on which Ecuador first advanced its Counterclaim) Ecuador gave "no prior indication that it had encountered environmental or infrastructural issues or that it would make any such claims."⁶⁷ In fact, since the State's taking over the Blocks, Petroamazonas had not only operated the Blocks at their full capacity, it had expanded operations.⁶⁸

54. For these and other reasons elaborated in its pleadings, Perenco requested the Tribunal to dismiss the counterclaims and, amongst other relief, order Ecuador to reimburse it for all of its costs on an indemnity basis.⁶⁹

55. With these summaries of the Parties' positions set out in general terms, the Tribunal turns to a description of Blocks 7 and 21 and the legal framework applicable in this claim.

⁶² 1st Expert Report of IEMS dated 29 November 2011 ("IEMS ER I"), p 63.

⁶³ GSI ER I, section 3.9.6, in particular, paragraph 139, see Appendix D, D.5.1 (Methodology to Estimate Potentially Impacted Areas). See below at paragraph 209 for detailed explanation of the method that GSI used.

⁶⁴ Rouhani ER, section 4.1.

⁶⁵ Claimant's Counter-Memorial, paragraphs 192-193, 231-239; GSI ER I paragraphs 150, 219, 226-231, Table 3. At paragraph 276 of its Counter-Memorial, the Claimant states that "the difference between applying 'background values' and applying the most stringent standard of the RAOH is the difference between US\$2.2 billion and US\$895 million in alleged remediation costs". Rejoinder, paragraphs 217-240.

⁶⁶ Claimant's Counter-Memorial, paragraphs 2, 4-6; Rejoinder, paragraphs 2, 289-297.

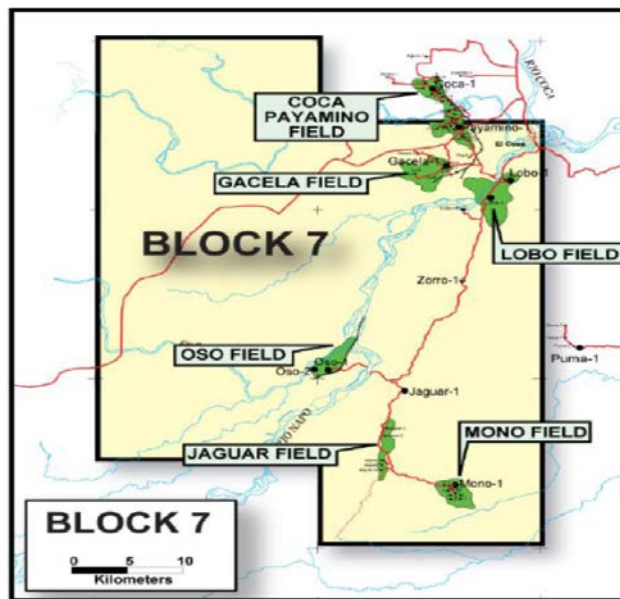
⁶⁷ Claimant's Counter-Memorial, paragraphs 4-6.

⁶⁸ Claimant's Counter-Memorial, paragraphs 375-377; Transcript, Hearing on Counterclaims, Day 1, p 170-178 (Opening Statement of Mark Friedman).

⁶⁹ Claimant's Counter-Memorial, paragraph 35.

(2) Blocks 7 and 21

56. Block 7 and the Coca-Payamino Unified Field comprise a combined area of 200,000 hectares in the Amazonian region of North-east Ecuador.⁷⁰ The area straddles both banks of the 1,000 km long Napo River, a major tributary of the Amazon River.⁷¹ The city of Francisco de Orellana, the capital of the Province of Orellana, with some 73,000 inhabitants, is located in Block 7.⁷² The main economic activity of the local inhabitants is agriculture.⁷³

Block 7⁷⁴

57. Block 7 was developed by BP Petroleum Development Limited (“BP”) beginning in December 1985.⁷⁵ By the time BP sold its rights to Oryx in September 1990, it had drilled five wells.⁷⁶ The only activity in Block 7 prior to BP’s development activities consisted of the drilling of two exploratory wells, Zorro and Cónдор, by Texaco in the early 1970s.⁷⁷

58. A part of the Payamino field, located in the far north-east corner of Block 7, was included as part of BP’s Services Contract with CEPE (*Corporación Estatal Petrolera Ecuatoriana*,

⁷⁰ Claimant’s Counter-Memorial, paragraph 85; Supplemental Memorial, paragraph 54.

⁷¹ Supplemental Memorial, paragraph 54.

⁷² Supplemental Memorial, paragraph 57.

⁷³ Supplemental Memorial, paragraph 56.

⁷⁴ Ecuador’s Counter-Memorial, p 180, in turn adopting an image from Exhibit E-77, 2006 Oso Development Plan, p 9.

⁷⁵ Exhibit CE-CC-4, Services Contract for the Exploration and Exploitation of Hydrocarbons in Block 7 Located in the Ecuadorian Amazon Region, December 18, 1985; 1st Witness Statement of Wilfrido Saltos, paragraph 28.

⁷⁶ Exhibit CE-CC-4, Services Contract for the Exploration and Exploitation of Hydrocarbons in Block 7 Located in the Ecuadorian Amazon Region, December 18, 1985; 1st Witness Statement of Wilfrido Saltos, paragraph 28; Claimant’s Counter-Memorial, paragraph 86; Supplemental Memorial, paragraphs 59-60.

⁷⁷ Claimant’s Counter-Memorial, paragraph 86.

Petroecuador's predecessor).⁷⁸ It did not include the Coca field, which is located further north and outside Block 7's boundaries; that field was then separately operated by *Petroproducción*.⁷⁹ At the time, the Coca and Payamino fields were thought to constitute different oil reservoirs and it was only in 1987, when CEPE drilled the Payamino 2 well, that it was discovered that they produced from a single reservoir.⁸⁰ When Oryx acquired BP's interest in September 1990, it also entered into a joint operating agreement with Petroecuador for the Coca and Payamino fields.⁸¹ The area was thereafter known as the Coca-Payamino Unified Field, with Oryx and *Petroproducción* taking turns acting as the operator.⁸² Perenco emphasised that according to IEMS' data, this area (which had been worked for some time before Perenco appeared on the scene) "accounts for 52% of Ecuador's total soil contamination claims and 44% of its total groundwater claims."⁸³

59. In March 2000, the Block 7 Services Contract was terminated and replaced by the Block 7 Participation Contract.⁸⁴ This contract included the right to operate the Coca-Payamino Unified Field.⁸⁵ In May 2002, Perenco and Burlington began to acquire their respective interests in the Block, and ultimately bought out the other investors in 2005.⁸⁶

60. Perenco submitted that "[a]t the time of Ecuador's July 16, 2009 takeover, Block 7 (not including Coca-Payamino, [...]) consisted of 85 wells and 6 CPFs⁸⁷ in [5] operating fields: Gacela, Mono, Lobo, Jaguar, and Oso."⁸⁸ Ecuador's description of the Block was somewhat different; it noted that at the time of its taking possession in response to the Consortium's

⁷⁸ 1st Witness Statement of Wilfrido Saltos, paragraph 34; Claimant's Counter-Memorial, paragraphs 92-94.

⁷⁹ 1st Witness Statement of Wilfrido Saltos, paragraphs 34-36; Claimant's Counter-Memorial, paragraphs 92-94.

⁸⁰ 1st Witness Statement of Wilfrido Saltos, paragraphs 35-36.

⁸¹ Exhibit CE-CC-8, Operational Agreement for the Unified Exploitation of Common Oil Deposits Basal Tena, Napo "U," Hollín Superior and Hollín Principal of the Coca Payamino Unified Field, April 26, 1992, Clauses 1.2, 5.1.2; 1st Witness Statement of Wilfrido Saltos, paragraphs 36-40; Exhibit E-148, Agreement for the Unified Exploration and Exploitation of the Coca-Payamino Field dated May 2000.

⁸² *Petroproducción* was the first to assume operations, from February 1991 through February 1994. Oryx then operated the Unified Field from February 1994 through June 1997. Finally, *Petroproducción* assumed operations again from June 1997 through February 2000 (see 1st Witness Statement of Wilfrido Saltos, paragraph 38).

⁸³ Claimant's Counter-Memorial, paragraph 93, referring to IEMS ER II, Annex T; GSI ER I, Table 3.

⁸⁴ Exhibit CE-17/CE-CC-28, Participation Contract for the Exploration and Exploitation of Hydrocarbons for Block 7 of the Amazon Region, 23 March 2000 (translation resubmitted on 04-12-12) ("Block 7 Participation Contract").

⁸⁵ 1st Witness Statement of Wilfrido Saltos, paragraph 40; Exhibit CE-CC-8, Operational Agreement for the Unified Exploitation of Common Oil Deposits Basal Tena, Napo "U," Hollín Superior and Hollín Principal of the Coca Payamino Unified Field, April 26, 1992; Supplemental Memorial, paragraph 67; Exhibit E-148, Agreement for the Unified Exploration and Exploitation of the Coca-Payamino Field dated May 2000.

⁸⁶ Exhibits CE-CC-43, Ministerial Decree No. 342 from the Minister of Energy and Mines approving the transfer of Kerr McGee's interest in the Block 7 Participation Contract to Perenco Ecuador Limited and Burlington, May 9, 2002, Article 2, CE-CC-44, Ministerial Decree No. 343 from the Minister of Energy and Mines approving the transfer of Kerr McGee's interest in the Block 21 Participation Contract to Perenco Ecuador Limited and Burlington, May 9, 2002, Article 2; 1st Witness Statement of Alex Martinez, paragraph 6; Claimant's Counter-Memorial, paragraph 89. For a description of the development activities in Block 7, see paragraphs 63-74 of the Supplemental Memorial.

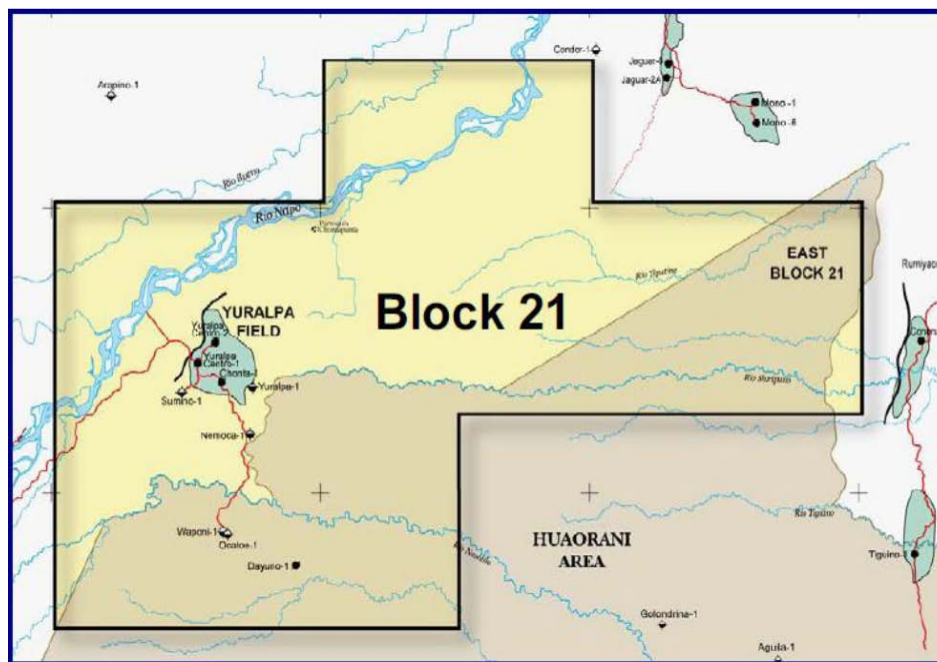
⁸⁷ A "CPF" is a central processing facility where fluids collected from oil and gas wells are collected and then processed for separation into three distinct streams: crude oil, natural gas and formation water (see GSI ER I, p 15).

⁸⁸ Claimant's Counter-Memorial, paragraph 91.

suspension of operations, the “Block counted 1 waste management area, 3 camps for employees (Payamino, Oso and Jaguar), 6 CPFs (Coca, Payamino, Gacela, Oso, Jaguar and Mono), and several platforms including: 7 in Gacela, 11 in Mono, 7 in Jaguar, 16 in Coca, 10 in Oso, 17 in Payamino, 4 in Lobo, plus the C ndor Norte platform.”⁸⁹

61. Block 21 lies to the south of Block 7, comprising 155,000 hectares located on the Eastern-Central Oriente Basin.⁹⁰ It extends over the Napo, Pastaza and Orellana provinces.⁹¹ It contains the Yuralpa field, the Sumino and Nemoca injection wells, the Dayuno well, the Chonta platform and the Waponi-Ocatoe platform.⁹²

Block 21⁹³



62. Oryx started operating Block 21 in March 1995.⁹⁴ It undertook various environmental studies, including three environment impact studies for seismic operations, four environmental impact studies for exploratory drilling and one environmental impact study for the construction

⁸⁹ Supplemental Memorial, paragraph 72.

⁹⁰ Claimant’s Counter-Memorial, paragraph 97; Supplemental Memorial, paragraph 75.

⁹¹ Supplemental Memorial, paragraph 77.

⁹² Supplemental Memorial, paragraph 79.

⁹³ Image taken from p 185 of Ecuador’s Counter-Memorial, referring to image on p 1 of Exhibit E-157, Block 21 Development Plan dated 2000.

⁹⁴ Exhibit CE-10/CE-CC-13, Participation Contract for the Exploration and Exploitation of Hydrocarbons in Block 21 of the Ecuadorian Amazon Region, March 20, 1995 (“Block 21 Participation Contract”) (translation resubmitted on 04-12-12), Section 2 and CE-CC-24, Environmental Impact Study for the Yuralpa Field Development and Production Program, Block 21, Oryx Ecuador Energy Company, August 1999; Claimant’s Counter-Memorial, paragraph 99; Supplemental Memorial, paragraph 81, footnote 68.

of the Yuralpa-Puerto Napo pipeline.⁹⁵ When the Consortium assumed operations of Block 21 in 2002, the block had not been developed to the same extent as Block 7 and the Coca-Payamino Unified Field. It contained a small number of wells and no operational CPF.⁹⁶

63. Ecuador submitted that in July 2009, Block 21 counted within it the Yuralpa field, the Chonta, Waponi-Ocatoe and Dayuno platforms, two injection wells (Sumino and Nemoca), one camp, one CPF, one waste management area and one pipeline (Yuralpa-Puerto Napo).⁹⁷ Perenco submitted that the producing field in Block 21, Yuralpa, “was largely developed by the Consortium”, and by July 2009 it had “increased the number of wells in Yuralpa field from three to 31.”⁹⁸

64. Perenco emphasised that in contrast to Block 7, which had been operated more extensively for a longer period of time, Block 21 accounted for “only 8.3% of Ecuador’s soil remediation claims and 16.7% of the total cost for groundwater remediation.”⁹⁹ The inference to be drawn, it appears, was that the lesser amount of contamination in Block 21 alleged by Ecuador when compared to that alleged in respect of Block 7 indicated that any Block 7 contamination was most likely attributable to the actions of the Consortium’s predecessors rather than to the Consortium itself.

B. The Framework of the Applicable Law

65. Ecuador began to develop an environmental regulatory regime for oilfield activities in the 1970s.¹⁰⁰ In 1971, it enacted the Hydrocarbons Law (*Ley de Hidrocarburos*); this was amended in 1982 to oblige Petroecuador and its contractors to comply with national environmental laws and regulations.¹⁰¹ In its 1984 Constitution, Ecuador recognised the individual’s right to live in an environment free from pollution and, in this connection, specified that the law should necessarily establish “restrictions to the exercise of certain rights or liberties for the sake of environmental protection.”¹⁰²

66. In 1995 Ecuador promulgated the Environmental Regulations for Hydrocarbon Operations in Ecuador (*Reglamento Ambiental para las Operaciones Hidrocarburiíferas en el*

⁹⁵ Claimant’s Counter-Memorial, paragraph 99; CE-CC-24, Environmental Impact Study for the Yuralpa Field Development and Production Program, Block 21, Oryx Ecuador Energy Company, August 1999.

⁹⁶ Claimant’s Counter-Memorial, paragraph 98; Supplemental Memorial, paragraphs 83-84.

⁹⁷ Supplemental Memorial, paragraph 85.

⁹⁸ Claimant’s Counter-Memorial, paragraphs 98-101; Supplemental Memorial, paragraph 84.

⁹⁹ Claimant’s Counter-Memorial, paragraph 98; GSI ER I, Table 3.

¹⁰⁰ Supplemental Memorial, paragraph 3; Reply, paragraph 17; 1st Expert Report of René Bedón, paragraph 11; 1st Expert Report of Ricardo Crespo Plaza, paragraph 13; Exhibit CE-CC-269, Chronology of Ecuador’s Environmental Laws and Regulations.

¹⁰¹ Exhibit CE-CC-269, Chronology of Ecuador’s Environmental Laws and Regulations. At the time, the Hydrocarbons Law referred to the *Corporación Estatal Petrolera Ecuatoriana* (CEPE), which was created in 1972 and then later replaced by Petroecuador (See 1st Expert Report of René Bedón, Appendix B). Also, in 1976, Ecuador enacted the Law for the Prevention and Control of Environmental Contamination (1st Expert Report of René Bedón, paragraph 12).

¹⁰² 1st Expert Report of René Bedón, paragraph 13, footnote 11, quoting from Annex CA-CC-9, 1978 Constitution, codified in 1984, and published in Official Register No. 763 of June 12, 1984, Article 19.

Ecuador (“**RAOHE**”¹⁰³) to regulate the exploration, development and production of crude oil, oil derivatives and natural gas. It designated the Undersecretariat for Environmental Protection and the National Directorate of Environmental Protection as the competent authority in environmental matters.¹⁰⁴

67. From 1995 to 2001, the principles of prevention, rehabilitation and prevention of environmental harm were introduced by Ecuador into its Constitution, and the 1999 Environmental Management Law (*Ley de Gestión Ambiental*) was enacted.¹⁰⁵ In 2001, the RAOHE was amended by Decree 1215 which introduced contaminant limits for soil.¹⁰⁶ In 2002, the Regulation of Hydrocarbon Operations (*Reglamento de Operaciones Hidrocarburíferas* (“**ROH**”)) was promulgated.¹⁰⁷ ROH differed from RAOHE in that it did not address contaminant limits or regulatory requirements relating to audits and reporting to the Ministry; rather it addressed specific steps in the hydrocarbon production process, such as in the drilling or sealing of a well, and how they should be carried out by the operator in such a way as to be protective of the environment.¹⁰⁸

68. In 2003, Ecuador promulgated the Unified Text of Secondary Environmental Legislation (*Texto Unificado de Legislación Ambiental Secundaria* (“**TULAS**”)), which sets out rules for the evaluation of the environmental impact of oilfield activities from a technical perspective to the extent they are not addressed in environmental regulation specific to the type of activity in question.¹⁰⁹ TULAS is of general application to all manner of activities that may cause an impact on the environment.¹¹⁰

69. On 20 October 2008, Ecuador amended its Constitution.¹¹¹ The 2008 Constitution’s relevance and significance for the counterclaim is an important matter and will be addressed in further detail in the Tribunal’s decision below.

¹⁰³ Exhibit EL-147, *Decree 1215 Reglamento Ambiental para las Operaciones Hidrocarburíferas en el Ecuador*, (“**RAOHE**”) published in the Official Register No. 265 on 13 February 2001 (unofficial translation of extracts).

¹⁰⁴ *Ibid.* RAOHE is addressed in further detail below.

¹⁰⁵ Exhibit CA-CC-33, July 30, 1999 Environmental Management Law (*Ley de Gestión Ambiental*) (“Environmental Management Law”), Codification 19, published in Supplemental Official Registry No. 418 of September 10, 2004 (revised translation submitted by Perenco together with its letter of 16 October 2013).

¹⁰⁶ On 13 February 2001. See Exhibit CE-CC-269, Chronology of Ecuador’s Environmental Laws and Regulations.

¹⁰⁷ Exhibit EL-148, *Reglamento de Operaciones Hidrocarburíferas* (“**ROH**”), Ministry Ruling No. 389, Official Register No. E 2, published on 26 September 2002.

¹⁰⁸ Exhibit EL-148, ROH cf. Exhibit EL-147, RAOHE.

¹⁰⁹ Exhibit EL-146, *Texto Unificado de Legislación Ambiental Secundaria*, (“**TULAS**”) published in the Official Register No. E 2 on 31 March 2003. Description of TULAS provided by Ecuador in footnote 564 of its Counter-Memorial: “The TULAS sets forth the rules for the evaluation of environmental impact from a technical perspective.” Further description of TULAS set out below. See also, 1st Expert Report of René Bedón, Appendix B, paragraph 5.

¹¹⁰ *Ibid.*

¹¹¹ 1st Expert Report of Ricardo Crespo Plaza, paragraph 14; Exhibit EL-89, 2008 Constitution of the Republic of Ecuador (“2008 Constitution”), Official Register No. 449, published on 20 October 2008. This did not mark the end of developments in environmental regulation in Ecuador. For instance, on 23 March 2009 the Ministry of the Environment issued Ministerial Agreement No. 14 which established the procedure for environmental licensing of hydrocarbon operations in Ecuador (see 1st Expert Report of René Bedón, Appendix B).

70. As a result of these developments, the legal regime in Ecuador recognises the protection of the environment as a fundamental constitutional imperative. The 2008 Constitution is the culmination of forty years of evolving Ecuadorian Constitutions and laws which have systematically included major environmental legal protections. It recognises nature itself as the subject of rights,¹¹² this realised through the enshrinement of environmental principles of prevention and precaution,¹¹³ the right of the Ecuadorian people to a healthy environment,¹¹⁴ a broad notion of environmental harm, the doctrine of strict liability and the State's obligation to take prompt policies and measures to prevent environmental damage.¹¹⁵

71. For its part, Perenco characterises the regime as “a stringent and comprehensive system of evaluation, permissible limits, remediation, monitoring, and reporting designed to limit environmental impacts and keep the environmental authorities apprised of all developments and incidents that occur in the course of hydrocarbon operations.”¹¹⁶ It requires the submission and approval of annual environmental audits and specifically-targeted environmental impact studies, including environmental management plans for a proposed activity. It extends to the requirement to notify the State of any spills of more than five barrels of oil,¹¹⁷ the submission of remediation plans and the regular monitoring of air, water and soil quality against specific regulatory standards.¹¹⁸

¹¹² Exhibit EL-89, 2008 Constitution, Chapter Seven, Article 71: “Nature, or *Pacha Mama*, where life is reproduced and occurs, has the right to integral respect for its existence and for the maintenance and regeneration of its life cycles, structure, functions and evolutionary processes. All persons, communities, peoples and nations can call upon public authorities to enforce the rights of nature. To enforce and interpret these rights, the principles set forth in the Constitution shall be observed, as appropriate. [...]”

¹¹³ See, for e.g., Article 73 of Exhibit EL-89, 2008 Constitution: “The State shall apply preventive and restrictive measures on activities that might lead to the extinction of species, the destruction of ecosystems and the permanent alteration of natural cycles. The introduction of organisms and organic and inorganic material that might definitively alter the nation's genetic assets is forbidden.” And Article 90 of the 1978 Hydrocarbons Law: “Fixing the amount of compensation: Compensation to be paid for the damage caused to land, crops, buildings or other property, due to exploration or development of oil exploitation, or any other phase of the hydrocarbon industries, shall be fixed by experts designated by the parties. In the case of disagreement, the Minister shall appoint an umpire.” (unofficial translation) Original: *Fijación del monto de las indemnizaciones - Las indemnizaciones que se deban pagar por los perjuicios ocasionados en terrenos, cultivos, edificios u otros bienes, con motivo de la exploración o el desarrollo de la explotación petrolera, o de cualquier otra fase de las industrias de hidrocarburos, serán fijadas por peritos designados por las partes. En caso de desacuerdo, el Ministerio del Ramo nombrará un dirimente.* (Exhibit CE-37, Hydrocarbons Law, Decree 2967 of the Supreme Government Council (in Spanish with additional translated excerpt, as resubmitted on 04-12-12)).

¹¹⁴ See, for e.g., Articles 399 and 404 of Exhibit EL-89, 2008 Constitution.

¹¹⁵ See, for illustration, Article 397 of Exhibit EL-89, 2008 Constitution; Ecuador's Counter-Memorial, paragraphs 653-654, section 8.1.1.1; 1st Expert Report of Ricardo Crespo Plaza, paragraphs 11- 16.

¹¹⁶ Claimant's Counter-Memorial, paragraph 103; 1st Expert Report of René Bedón, paragraphs 6(a), 7-17.

¹¹⁷ See Exhibit EL-147, RAOHE, Article 16 cf. Ecuador drew the Tribunal's attention to an exchange of correspondence between the Consortium and the Ministry of Mines and Oil in December 2008: Letter from the Ministry of Mines and Oil to the Consortium dated 5 December 2008: “In order to clarify what is described in the second paragraph of your letter, you are informed that a Socio-Environmental Evaluation is required for all spills, whether they exceed or not the threshold of five barrels.” (Unofficial translation of Spanish original), E-252. Letter from the Consortium to the Ministry of Mines and Oil dated 29 December 2008: “The operator is grateful for the clarification.” (Unofficial translation of Spanish original), E-253.

¹¹⁸ Claimant's Counter-Memorial, paragraphs 103-104.

72. In terms of enforcement and monitoring responsibility, until April 2009 environmental oversight and authority with respect to hydrocarbon operations was exercised by the National Environmental Protection Directorate or *Dirección Nacional de Protección Ambiental* (“**DINAPA**”), a section of the Office of the Undersecretary for Environmental Protection or *Subsecretaría de Protección Ambiental* (“**SPA**”) as part of the Ministry of Energy and Mines, now the Ministry of Non-Renewable Natural Resources (as earlier defined, “**the Ministry**”).¹¹⁹ Thereafter, the environmental oversight of oil operations was assumed by the Ministry of the Environment.¹²⁰

(1) The 2008 Constitution

73. The hierarchy of legal norms at the present time in Ecuador begins at its apex with the 2008 Ecuadorian Constitution,¹²¹ below which stands the Environmental Management Law,¹²² RAOHE¹²³ and, where applicable, TULAS.¹²⁴

74. Chapter Two of the Constitution, entitled ‘Biodiversity and Natural Resources’, addresses the powers and duties of the State with respect to the environment and the environmental protection imperatives upon which they are based.¹²⁵ In Section One (Nature and the Environment), the principles of sustainable development, strict liability for environmental damage, and the State’s obligation to act to ensure the “health and restoration of ecosystems” are recognised.¹²⁶ Section Two (Biodiversity) declares the conservation of biodiversity to be a matter of public interest, and Section Three (Natural Assets and Ecosystems) recognises the creation of a national system of protected areas in Ecuador.¹²⁷ Article 407 of Section Three provides that activities for “[t]he extraction of nonrenewable natural resources, including forestry exploitation, is prohibited in protected areas and in areas that have been declared intangible.”¹²⁸

75. In Sections Five and Six, the Constitution recognises soil and water conservation and management to be a matter of public interest and a national priority.¹²⁹ Article 409, for example, which addresses soil conservation, states “...[it] is a matter of public interest and a national priority. A regulatory framework shall be established for its protection and sustainable use to prevent its degradation, in particular as a result of pollution, desertification, and erosion. In areas affected by processes of degradation and desertification, the State shall develop and promote

¹¹⁹ 1st Expert Report of René Bedón, footnote 31; Claimant’s Counter-Memorial, paragraph 106.

¹²⁰ Exhibit E-177, Executive Decree No. 1630, published in the Official Register No. 561 on 1 April 2009; 1st Expert Report of René Bedón, footnote 31; Claimant’s Counter-Memorial, paragraph 106.

¹²¹ Exhibit EL-89, 2008 Constitution.

¹²² Exhibit CA-CC-33, Environmental Management Law.

¹²³ Exhibit EL-147, RAOHE.

¹²⁴ Exhibit EL-146, TULAS.

¹²⁵ Exhibit EL-89, 2008 Constitution, pp 122-127 of PDF.

¹²⁶ Exhibit EL-89, 2008 Constitution, pp 122-123 of PDF (quoting from Article 397, first paragraph).

¹²⁷ Exhibit EL-89, 2008 Constitution, pp 124-125 of PDF.

¹²⁸ Exhibit EL-89, 2008 Constitution, p 126 of PDF (the remainder of Article 407 states: Exceptionally, these resources may be tapped at the substantiated request of the President of the Republic and after a declaration of national interest issued by the National Assembly, which may, if it deems it advisable, convene a referendum.”).

¹²⁹ Exhibit EL-89, 2008 Constitution, pp 126-127 of PDF.

forestation, reforestation, and revegetation projects that avoid single-crop farming and preferably use native species adapted to the area.”¹³⁰

76. As noted above, Ecuador submitted that under the 2008 Ecuadorian Constitution oil operators in Ecuador are subject to a regime of strict liability for environmental harm and are required to undertake the costs of remediation in full.¹³¹ Ecuador directed the Tribunal’s attention to Articles 395 and 396 of the Constitution which provide as follows:

Article 395.- The Constitution recognizes the following environmental principles:

1. The State shall guarantee a sustainable model of development, one that is environmentally balanced and respectful of cultural diversity, conserves biodiversity and the natural regeneration capacity of ecosystems, and ensures meeting the needs of present and future generations.
2. Environmental management policies shall be applied and shall be of mandatory enforcement by the State at all of its levels and by all individuals or legal entities in this country’s territory.
3. The State shall guarantee the active and standing participation of affected persons, communities, peoples and nations in the planning, implementation and monitoring of all activities causing environmental impacts.
4. In the event of doubt concerning the scope of the legal provisions as regards environmental issues, their most favorable interpretation for the protection of nature shall obtain.¹³²

Article 396.- The State shall adopt timely policies and measures to avoid adverse environmental impacts where there is certainty about the damage. Should there be any doubt regarding the environmental impact stemming from an action or omission, although there is no scientific evidence of the damage, the State shall adopt effective and timely measures of protection.

Liability for environmental damage is strict. Any harm to the environment, in addition to the corresponding penalties, shall also give rise to an obligation to fully restore the ecosystems and compensate the individuals and communities affected.

Each of the participants in the production, distribution, commercialization and usage processes of goods and services shall be directly liable for preventing any environmental impact, mitigating and

¹³⁰ Exhibit EL-89, 2008 Constitution, p 126 of PDF. For water, the relevant provision is Article 411 of the 2008 Constitution: “The State shall guarantee the conservation, recovery and complete management of water resources and ecological flows associated with the water cycle. Any activity that may affect the quality and amount of water and the equilibrium of ecosystems shall be regulated, particularly in water replenishment sources and zones.” (unofficial translation).

¹³¹ Supplemental Memorial, paragraphs 12-23; EL-89, 2008 Constitution.

¹³² EL-89, 2008 Constitution p 122 of PDF (Chapter 2, Biodiversity and Natural Resources, Chapter 1, Nature and the Environment).

repairing the damages it has caused, and for maintaining a permanent environmental monitoring system.

The legal proceedings to prosecute and punish those responsible for environmental damages shall be imprescriptible.¹³³

77. Ecuador submitted that Article 396, in particular paragraph 3 thereof, established a strict liability regime which placed the burden on the operator to prove that any environmental harm was caused by another person in order for the operator be exonerated from its own responsibility.¹³⁴ Ecuador asserted that the operator was required to prove that the harm was caused “exclusively” by another person.¹³⁵

78. The import of these provisions and the Parties’ submissions relating thereto will be examined in greater detail below. It suffices to note for present purposes that with regard to the remedy sought by Ecuador in this proceeding, its submission is that since Perenco has left the Blocks and is as such no longer in a position to “restore [its] ecosystems” as required by Article 396, paragraph 2, Ecuador is entitled to claim monetary damages in lieu from Perenco.¹³⁶

(2) The Environmental Management Law

79. The Environmental Management Law (*Ley de Gestión Ambiental*) was enacted on 30 July 1999 to implement certain environmental principles adopted by the 1998 Constitution, such as sustainable development¹³⁷ and the liability of State agencies and concessionaries for environmental harm.¹³⁸

80. Article 1 of the Law explains that it “establishes the principles and guidelines of environmental policy, determines the obligations, responsibilities, levels of participation of the public and private sectors in environmental management and indicates the permissible limits, controls and sanctions in this matter.”¹³⁹ Chapter I refers to sustainable development and the obligations of State institutions in environmental protection and regulation.¹⁴⁰ Chapter II

¹³³ EL-89, 2008 Constitution, p 123 of PDF. Ecuador further relied on Article 11(3) of the Constitution, emphasising that it provided that its provisions were of “direct and immediate application”. “The rights and guarantees set forth in the Constitution and in human rights international instruments shall be of direct and immediate application by and before any public servant, administrative or judicial, *ex officio* or upon request by a party.” (Unofficial translation from Spanish original: “[I]os derechos y garantías establecidos en la Constitución y en los instrumentos internacionales de derechos humanos serán de directa e inmediata aplicación por y ante cualquier servidora o servidor público, administrativo o judicial, de oficio o a petición de parte”). (Supplemental Memorial, paragraphs 12-23).

¹³⁴ Counter-Memorial, section 8.1.2; Reply, sections 3.3.3 and 3.3.4.

¹³⁵ Transcript, Hearing on Counterclaims, Day 1, pp 30-32 (Opening Statement of Pierre Mayer).

¹³⁶ Supplemental Memorial, paragraphs 47-48.

¹³⁷ Exhibit CA-CC-33, Environmental Management Law, Chapter 1.

¹³⁸ 1st Expert Report of René Bedón, paragraphs 14-15; Exhibit CA-CC-33, Environmental Management Law, Article 12, p 16 of PDF.

¹³⁹ Exhibit CA-CC-33, Environmental Management Law.

¹⁴⁰ Exhibit CA-CC-33, Environmental Management Law, pp 16-17: “Article 12(b)...Carry out and verify compliance with the norms on environmental quality, permissibility and fixation of technological levels and those that the competent Ministry may establish.” (unofficial translation)

addresses generally the regulation of environmental management systems in Ecuador,¹⁴¹ for example, “requir[ing] environmental impact studies” as a prerequisite for issuing an environmental license.¹⁴² It also includes a glossary of definitions.¹⁴³ “Contamination” is defined as “[t]he presence in the environment of substances, elements or energies or a combination of them, in concentrations and duration superior or inferior to those established in the legislation in force.”¹⁴⁴ The Law’s definitions of “environmental harm” and “environmental impact” are discussed below.

81. One of Ecuador’s legal experts, Professor Ricardo Crespo Plaza, explained that the Environmental Management Law was inspired by the content of international instruments relating to environmental protection, such as the Rio Declaration, which, according to Article 3 of the Law, is a “guiding instrument for Ecuador’s environmental policy.”¹⁴⁵ Ecuador relied on the Environmental Management Law in its submissions in support of a broad definition of the term “environmental harm” (addressed below).¹⁴⁶ Perenco’s legal expert, Dr. René Bedón, asserted that “[t]he regulations and ministerial accords issued in order to regulate the Environmental Management Law, together with other previously issued regulations, were compiled in TULAS.”¹⁴⁷

82. The precise relationship between RAOHE, TULAS and the Environmental Management Law is a matter of dispute between the Parties. For present purposes, the Tribunal notes that two provisions of the Environmental Management Law lie at the heart of this disagreement.¹⁴⁸ They appear in its glossary and define the terms “environmental harm” and “environmental impact”:

Environmental Harm. – Any significant loss, diminution, detriment or impairment of the preexisting conditions in the environment or one of its components. It affects the functioning of the ecosystem or the renewability of its resources.

Environmental Impact. – The positive or negative alteration of the environment, provoked directly or indirectly by a project or an activity in a given area.¹⁴⁹

83. The crux of the Parties’ dispute is whether: (i) an operator which stays within the limits prescribed by the regulations may create an impact upon the environment which leaves it in a different state from that which existed prior to the commencement of hydrocarbon operations, but such impact is nevertheless considered to be a permissible change and is not to be equated

¹⁴¹ Exhibit CA-CC-33, Environmental Management Law, defined in its glossary as “[t]he body of closely linked policies, norms, operative and administrative activities of planning, financing and control that must be carried out by the State and society to guarantee sustainable development and the optimal quality of life.” (p 18 of PDF).

¹⁴² Exhibit CA-CC-33, Environmental Management Law, Article 22, p 17 of PDF.

¹⁴³ Exhibit CA-CC-33, Environmental Management Law, p 18 of PDF.

¹⁴⁴ *Ibid.*

¹⁴⁵ 1st Expert Report of Ricardo Crespo Plaza, paragraphs 46-47, Annex No. 12; see, for example, reference to it in Article 3 of the Environmental Management Law in Ecuador (Exhibit CA-CC-33, p 16 of PDF).

¹⁴⁶ Reply, paragraphs 246-251.

¹⁴⁷ 1st Expert Report of René Bedón, paragraph 15,

¹⁴⁸ Reply, paragraphs 246-248; Rejoinder, paragraphs 37-41.

¹⁴⁹ Exhibit CA-CC-33, Environmental Management Law, p 18 of PDF. The Parties do not disagree on the English translation of these definitions: see Reply, paragraph 246 and Rejoinder, paragraphs 37-38.

with an environmental harm and need not be remediated because it is an accepted and sustainable environmental cost of exploiting hydrocarbons (Perenco's position); or (ii) an operator that stays within the limits prescribed by the regulations may still create an impact on the environment which can also constitute an environmental harm which must be remediated (Ecuador's position). The Tribunal will revert to this disagreement in the course of its analysis.

(3) RAOHE

84. RAOHE contains 14 chapters and 6 annexes addressing many aspects of oil operations that could have an impact on the environment.¹⁵⁰ It obliges operators to submit environmental programmes and audits to the relevant Ministry (initially the Ministry of Energy and Mines, and subsequently, the Ministry of Non-Renewable Natural Resources, and more recently, the Ministry of the Environment), to undertake regular internal environmental monitoring and to identify and report environmental incidents and propose remediation programmes. In so doing, operators are required to apply "parameters, maximum benchmark values and permissible limits" as set out in detail in RAOHE's Annex II.¹⁵¹ Article 86 of RAOHE provides "[f]or liquid discharges, atmospheric emissions and disposal of soil waste to the environment, the subjects of control and their operators and related parties in the implementation of their operations shall comply with the permissible limits specified in Annexes Nos. 1, 2 and 3 to this Regulation...Should a permissible limit established in the annexes be exceeded, this must be reported immediately to the Undersecretariat of Environmental Protection, and the corrective actions taken must be justified."¹⁵²

85. Annex II comprises six tables (Tables 3 to 8) spelling out permissible limits or benchmark values, such as for "atmospheric emissions" (Table 3), for "waters and liquids discharges" in the exploration and production process (Table 4), for "discharges of black and gray waters" (Table 5), for the "identification and remediation of contaminated soils in all phases of the hydrocarbon industry" (Table 6), for leachates "for the final disposal of drilling muds and cuttings on the surface" (Table 7), and finally, specifying the criteria for the classification of waste from hydrocarbon operations and recommendations for their treatment and disposal (Table 8).¹⁵³

86. RAOHE's Table 6 establishes different applicable criteria according to three types of land use: industrial, agricultural and sensitive ecosystems.¹⁵⁴ Its logic is that the limits of permissible contamination are *most* stringent for sensitive ecosystems, *least* stringent for industrial areas, and agricultural lands fall *in the middle*. Footnotes to each of the different type of land use state that the "agricultural land" use criteria is "focused on the protection of soils and crops", "industrial land" use criteria is intended "for industrial sites (buildings, etc.)" and "sensitive ecosystems" criteria is for "the protection of sensitive ecosystems such as the National Heritage of Natural Areas and others identified in the corresponding Environmental Study."¹⁵⁵

¹⁵⁰ Exhibit EL-147, RAOHE.

¹⁵¹ See, for e.g., Article 86 of RAOHE (Exhibit EL-147, RAOHE, pp 45-46).

¹⁵² Exhibit EL-147, RAOHE (partial translation resubmitted on 10-18-2013).

¹⁵³ Exhibit EL-147, RAOHE (partial translation resubmitted on 10-18-2013).

¹⁵⁴ Exhibit EL-147, RAOHE, p 57.

¹⁵⁵ *Ibid.* (partial translation resubmitted on 10-18-2013)

87. Table 6 states that the “permissible limits to be applied in a determined project depend on the subsequent use (*uso posterior*) to be given to the remediated soil.”¹⁵⁶ The Parties dispute the meaning of the word “posterior” in the context of RAOHE.

88. As Chart I below shows, depending upon the classification of the land in question, different parameters relating to total hydrocarbons, polycyclic aromatic hydrocarbons, cadmium, nickel and lead are to be used in order to determine whether soil is contaminated:

CHART I
RAOHE Table 6¹⁵⁷

Parameter	Expressed in	Unit ¹	Agricultural Use ²	Industrial Use ³	Sensitive Ecosystems ⁴
Total hydrocarbons	TPH	Mg/kg	<2500	<4000	<1000
Polycyclic aromatic Hydrocarbons (PAH's)	C	Mg/kg	<2	<5	<1
Cadmium	Cd	Mg/kg	<2	<10	<1
Nickel	Ni	Mg/kg	<50	<100	<40
Lead	Pb	Mg/kg	<100	<500	<80

89. The classification of land usage is not the only possible criterion for judging which parameter applies. Certain substances generated in oilfield activities may also be naturally present in the soil of the area being exploited. For that reason, in the second introductory paragraph to RAOHE’s Table 6 it is stated that “[i]f natural (non-contaminated) soils in the area *present concentrations higher than the established limits*, the values of the respective parameter may be increased to this level, so long as this phenomenon has been statistically verified through monitoring of undisturbed and uninfluenced soils in the same area.”¹⁵⁸

90. RAOHE’s Table 7 establishes the permissible limits for the “final disposal on the surface” of “drilling muds and cuttings” that contain “leachates.”¹⁵⁹ Its introductory paragraph explains that the permissible limits “depen[d] on whether or not the final disposal site has impermeabilization of the base.”¹⁶⁰ For example, the maximum permissible limit for barium is 5 mg/l where the storage site lacks bottom sealing, but 10 mg/l if the site has a sealed bottom.¹⁶¹ This differential treatment depends on whether the operator laid a proper containment barrier in the bottom of the mud pit prior to disposing of drilling muds in the pit. It also requires that any sampling that is carried out in this respect to be conducted “so as to obtain representative

¹⁵⁶ Exhibit EL-147, RAOHE (partial translation resubmitted on 10-18-2013).

¹⁵⁷ Exhibit EL-147, RAOHE, p 57.

¹⁵⁸ Exhibit EL-147, RAOHE (partial translation resubmitted on 10-18-2013) [emphasis added].

¹⁵⁹ Exhibit EL-147, RAOHE (partial translation resubmitted on 10-18-2013).

¹⁶⁰ *Ibid.* (partial translation resubmitted on 10-18-2013) Ecuador contended in this regard that Table 7 seeks to determine whether there is a significant risk of the contaminants within a pit leaching and infiltrating the surrounding area but that it must be applied together with Table 6 which determines whether the internal soil content of the pits is in fact contaminated: Reply, section 3.1.5.

¹⁶¹ Exhibit EL-147, RAOHE, p 58.

composite samples as a function of total volume disposed of at the respective site.”¹⁶² RAOHE further mandates that the operator must comply with specific operational procedures and requirements in disposing of drilling muds and test crude.¹⁶³ The contents of any mud pit must be treated until it complies with the permissible limits of Table 7 and a follow-up by means of periodic sampling is required within seven days, three months and six months of storage.¹⁶⁴

91. Annex 5 of RAOHE, entitled “Analytical Method”, contains a table setting out, as its title suggests, the analytical testing methods to be applied when investigating water quality (also, soil and atmospheric emissions).¹⁶⁵ It has three columns, the first identifying the parameter (electrical conductivity, potential hydrogen, etc.); the second indicating the method (i.e., determination of electrical conductivity by calibration at two electrode points); and the third noting the relevant reference material (i.e., publications).¹⁶⁶ For example, testing whether barium, chromium, lead or vanadium exceeds the applicable parameter requires filtration and acidification using Atomic Absorption Spectroscopy.¹⁶⁷

92. RAOHE further requires that operators must undertake certain environmental programmes and audits. Article 10 requires operators to submit annual environmental programmes and budgets to the Ministry.¹⁶⁸ An operator is also required to commission an environmental impact study before the commencement of any new project, such study to be submitted to and approved by the Ministry.¹⁶⁹ Operators are required to submit annual environmental reports that “describe and evaluate the budgeted environmental activities that have been performed.”¹⁷⁰ The Ministry is empowered to request at any time additional reports on specific activities undertaken by the operator.¹⁷¹ Article 12 requires regular internal environmental monitoring of emissions, liquid and solid discharges, and soils undergoing remediation, the sampling points and results of which are to be submitted to the Ministry on a monthly basis when the operator is in the process of drilling a well, and otherwise on a quarterly basis.¹⁷² Article 16 of RAOHE obliges operators to report spills of more than five barrels of

¹⁶² *Ibid.* (partial translation resubmitted on 10-18-2013).

¹⁶³ Exhibit EL-147, RAOHE, Article 52.

¹⁶⁴ Exhibit EL-147, RAOHE, Table 7 (p 57) and Article 52(d).2.3.

¹⁶⁵ Exhibit EL-147, RAOHE, Annex 5, p 65 of PDF. For soil, it identifies as the method of sampling: “Composite representative sample (minimum 15 to 20 subsamples by hectare or equivalent, homogenising)” (unofficial translation).

¹⁶⁶ Exhibit EL-147, RAOHE, Annex 5, pp 65-66 of PDF.

¹⁶⁷ Exhibit EL-147, RAOHE, p 65 of PDF (unofficial translation): “*Filtración acidificación de la muestra, determinación directa por espectroscopia de absorción atómica (AAS)*”.

¹⁶⁸ Exhibit EL-147, RAOHE, pp 3-4 of PDF.

¹⁶⁹ Exhibit EL-147, RAOHE, Arts 13, 34, 35, 37, 48, 51, 55, 63, 70, 75, 84; 1st Expert Report of René Bedón, paragraph 20; examples of EIS’s undertaken by the Consortium can be found at Exhibits CE-CC-52, Complementary Environmental Impact Study to the EIS for the Development and Production Phase in Oso Field - Block 7, Project: Drilling of Development Wells Oso 3-4-5, March 2003 and CE-CC-71, Reevaluation of the Environmental Impact Study/Environmental Management Plan for the Development and Production Phase of the Yuralpa Field – Block 21, Project: Installation of a Water Injection Line to the Nemoca 1 Well, June 2004.

¹⁷⁰ Exhibit EL-147, RAOHE, Article 11.

¹⁷¹ *Ibid.*

¹⁷² Exhibit EL-147, RAOHE, Article 12.

crude or combustibles to the Ministry, mandating that they should submit remediation plans for all affected areas, including a final remediation report, to the Ministry for its approval.¹⁷³

93. In addition, all operators are also required to commission a comprehensive environmental audit at least once every two years, such audit to be conducted by an auditor and on such terms as approved by the Ministry:¹⁷⁴

ART. 42. – Environmental Audit. - The Undersecretariat of Environmental Protection, through the National Environmental Protection Directorate, shall audit, at least every two years, or whenever the Undersecretariat of Environmental Protection so orders upon detecting noncompliance with the Environmental Management Plan, the environmental aspects of the various hydrocarbons activities conducted by the subjects of control [sic].

The Undersecretariat of Environmental Protection, through the National Environmental Protection Directorate (DINAPA), shall determine the type and scope of the Environmental Audit for the operations of the subjects of control based on compliance with the Environmental Management Plan.

At least every two years, the subjects of control shall conduct an Environmental Audit of their activities, following approval of the corresponding Terms of Reference by the Undersecretariat of Environmental Protection, and they shall submit the respective audit report to the Undersecretariat of Environmental Protection.

Additionally, the parties, upon the termination of hydrocarbons exploration and exploitation, or in the event of a change of operator, shall conduct the audit referenced in Art. 11 of the Regulation to Law 44, amending the Hydrocarbons Law..

For purposes of the aforementioned audits, the subjects of control shall select an environmental auditor qualified by the Undersecretariat of Environmental Protection to carry out the monitoring and verification of compliance with the Environmental Management Plan, in accordance with the Terms of Reference previously approved by the Undersecretariat of Environmental Protection, in which the documentary framework is determined against which the audit shall be conducted.

¹⁷³ Exhibit EL-147, RAOHE, Article 16. Article 16 uses the phrase “five barrels”. The interpretation of this requirement was a matter of dispute between the Parties. Ecuador submitted that the operator was required to report all spills, and not just spills of more than five barrels (Reply, paragraph 49). Perenco submitted that “the Consortium’s practice was to report even more minor spills whenever those spills left the immediate confines of the platform. In fact, over 40% of all the spills reported to the Ministry during the Consortium’s operatorship – specifically, nine out of 22 total – consisted of volumes under five barrels.” (Claimant’s Counter-Memorial, paragraph 134 cf. Rejoinder, paragraphs 299-302).

¹⁷⁴ Exhibit EL-147, RAOHE, Article 42. (partial translation resubmitted on 10-18-2013).

94. Perenco submitted that it “consistently complied with government regulations”, “obtain[ing] both prior and often *ex post* approvals for all activities that could potentially affect the environment or alter the infrastructure of the Blocks” and performing all necessary environmental audits.¹⁷⁵ Moreover, “whenever an incident occurred that affected the environment, the Consortium promptly notified the State, performed all required repairs, remediation and cleanup, and obtained the State’s approval of the remediation.”¹⁷⁶ Notably, Perenco relied on the Consortium’s practice of producing remediation plans and reports that applied the criteria in Tables 6 and 7 of RAOHE to support its submission that those tables provided the relevant remediation criteria that should be applied in this claim.¹⁷⁷

95. In Ecuador’s view, Perenco’s position is “flatly contradicted” by the discovery of “widespread, undisclosed and non-remediated contamination throughout the oilfield facilities operated by the Consortium up to July 2009.”¹⁷⁸ There were, in Ecuador’s view, “numerous and significant failures by the Consortium to comply with the applicable Ecuadorian regulations”, this made out on the basis of the documents on record in this arbitration, such as the environmental audit reports commissioned by the Consortium in 2002, 2006 and 2008, correspondence with the Ministry, and internal documents prepared by the Consortium.¹⁷⁹ Ecuador went so far as to assert that there was evidence that the “Consortium actively sought to conceal environmental incidents from the Ecuadorian authorities.”¹⁸⁰

96. Finally, it asserted that the criteria in RAOHE were not comprehensive; there were other chemical indicators and heavy metals associated with hydrocarbons exploration and exploitation that were not covered by RAOHE, such as electrical conductivity, pH, barium and vanadium,¹⁸¹ and the Consortium’s past interpretation of the applicable regulatory criteria cannot determine conclusively the criteria that Ecuadorian law mandates be applied in an action for remediation of environmental damage.¹⁸²

(4) TULAS

97. Ecuador submitted that TULAS is relevant to the analysis of soil and groundwater remediation under Ecuadorian law.¹⁸³ It supported the basis for its Base Values case and was to be applied together with RAOHE.¹⁸⁴ This was because it addresses chemical indicators and

¹⁷⁵ Claimant’s Counter-Memorial, paragraphs 119-132, 140-144; 1st Witness Statement of Wilfrido Saltos, paragraphs 14-24. Perenco submitted that it complied with its obligation to contract independent environmental audits of the Blocks every two years, and provided them to the Ministry for approval: see Exhibits CE-CC-137 Letter of March 23, 2002 from Efficacitas to Perenco, attaching 2002 Environmental Audit of Block 21 (2002 environmental audit of Block 21); CE-CC-182, Biannual Environmental Audit of Block 7 and Coca-Payamino Unified Field, Two Years Prior to the Expiration of the Block 7 Participation Contract, November 2008 (2008 environmental audit of Block 7).

¹⁷⁶ Claimant’s Counter-Memorial, paragraphs 120, 133-139.

¹⁷⁷ Claimant’s Counter-Memorial, paragraph 137.

¹⁷⁸ Reply, section 2.1.1.1.

¹⁷⁹ Reply, paragraph 37, relying on RPS ER III, section 6.

¹⁸⁰ Reply, section 2.1.1.2.

¹⁸¹ Supplemental Memorial, paragraph 167.

¹⁸² Expert Report of Fabián Andrade Narváez, paragraph 16.

¹⁸³ Exhibit EL-146, TULAS; Supplemental Memorial, paragraph 164 and footnote 27.

¹⁸⁴ Supplemental Memorial, paragraphs 164, 166-167 and footnote 27: (paragraph 167): “It is important to note, however, that both the RAOHE and the TULAS expressly acknowledge that the Base Values may differ from the thresholds set in the regulations.”

heavy metals associated with hydrocarbon operations that are not included in RAOHE, such as electrical conductivity, pH, barium and vanadium.¹⁸⁵ It also provided that environmental audits could not be used to exonerate an operator in an action for environmental damage.¹⁸⁶

98. For his part, Perenco's expert, Dr. René Bedón, asserted that TULAS is applied in a "general manner to all of those activities that may cause an impact that requires environmental authorisation", adding that "activities that have a *specific* regulation due to their subject matter, *such as those for hydrocarbons*, mining or telecommunications, must be carried out pursuant to said specific regulation and resort to the regulations of TULAS *only in the absence of a specific regulation*, in which case TULAS will be applied in a *supplementary* manner."¹⁸⁷

99. TULAS also created a Single Environmental Management System which "contains the guidelines for the environmental impact evaluation procedure and implementation of the Decentralized Environmental Management System" and established the "State's obligation to perform environmental oversight of the regulated entities in order to ensure compliance with the environmental management plans pursuant to what is established in the environmental license or permit."¹⁸⁸

100. As with other issues of law, there is a difference of opinion between the Parties as to the precise relationship of TULAS to RAOHE. Ecuador considered that TULAS set forth "the rules for the evaluation of environmental impact from a technical perspective."¹⁸⁹ Perenco did not share this view; it submitted that RAOHE's requirements and parameters trumped "more general regulations such as [TULAS], except where the [RAOHE] is silent."¹⁹⁰ In short, Ecuador gives greater prominence to TULAS than Perenco does; for Perenco, RAOHE is the primary source of regulation, with TULAS applying only in a backup or gap-filling manner.

101. Table 2, Annex 2, Book VI of TULAS, entitled 'Soil Quality Standards', sets out non-site specific standards for the background values of 36 different elements that may be present in soil. Article 4.2.1 explains that Table 2 sets out the quality criteria for soil, defining this as "approximate background values or analytical detection limits for pollutants in the soil", "reflect[ing] the natural geological variations of undeveloped areas or areas free of the influence of generalized industrial or urban activities."¹⁹¹ Ecuador relied on Table 2 in its alternative

¹⁸⁵ Supplemental Memorial, paragraph 166.

¹⁸⁶ Supplemental Memorial, paragraphs 38-43, referring to Article 70 of TULAS (addressed in further detail in the summary of the Parties' submissions below).

¹⁸⁷ 1st Expert Report of René Bedón, Appendix B, paragraph 5(a) [Emphasis added.].

¹⁸⁸ 1st Expert Report of René Bedón, Appendix B, paragraph 5(b).

¹⁸⁹ Ecuador's Counter-Memorial, footnote 564; Supplemental Memorial, footnote 27 (in contrast to RAOHE, which Ecuador described as "regulatory provisions in relation to the procedure for evaluating environmental impacts that arise from hydrocarbon operations").

¹⁹⁰ Claimant's Counter-Memorial, paragraph 108.

¹⁹¹ See above at paragraphs 74-76, Exhibit EL-146, TULAS (unofficial translation) (partial translation resubmitted on 10-18-2013); (original) "**4.2.1 Criterios de Calidad del Suelo** Los criterios de calidad, son valores de fondo aproximados o límites analíticos de detección para un contaminante en el suelo. para los propósitos de esta Norma, los valores de fondo se refieren a los niveles ambientales representativos para un contaminante en el suelo. Los valores pueden reflejar las variaciones geológicas naturales de áreas no desarrolladas o libres de la influencia de actividades industriales o urbanas generalizadas. Los criterios de calidad de un suelo se presentan a continuación." It also provides criteria for other elements such as, arsenic, baron, cadmium, mercury, zinc, polycyclic aromatic hydrocarbons etc.

regulatory case as containing the applicable criteria for substances not included in Table 6 of the RAOHE, namely electrical conductivity, pH, barium and vanadium.¹⁹²

Excerpt of Table 2, Annex 2 of Book VI of TULAS¹⁹³

Substance	Unit	Soil
Electrical conductivity	mmhos/cm	2
pH	mmhos/cm	6 to 8
Barium	mg/kg	200
Vanadium	mg/kg	25
Total Chromium	mg/kg	20

102. Perenco observed that these values “can vary significantly from the actual properties of soils at a given site”¹⁹⁴ and submitted that Table 2 was *not* intended to be used as remediation criteria. Rather, Table 3, Annex 2, Book VI of TULAS was the rightful source of the applicable regulatory criteria.¹⁹⁵ Table 3, entitled “Criteria for Remediation and Restoration of Soils” is defined as “[s]tandards for Remediation or Restoration...established in accordance with the use of soil (agricultural, commercial, residential, and industrial).”¹⁹⁶ The standards in question are said to comprise the “maximum levels of concentration of contaminants in soil under remediation or restoration.”¹⁹⁷

¹⁹² Claimant’s Counter-Memorial, paragraph 280; Supplemental Memorial, paragraph 166.

¹⁹³ Exhibit EL-146, TULAS, pp 362-363.

¹⁹⁴ Claimant’s Counter-Memorial, paragraph 280.

¹⁹⁵ Claimant’s Counter-Memorial, paragraphs 280-281.

¹⁹⁶ Exhibit EL-146, TULAS, Article 4.2.2 as translated by the Claimant at paragraph 280 of its Counter-Memorial. (Unofficial translation) “Restoration Criteria and Soil Remediation Criteria for Remediation or Restoration are set according to land use (agricultural, commercial, residential and industrial), and are presented in Table 3 have the purpose of establishing the maximum concentration levels of contaminants in soil process remediation or restoration.” (Original) “**4.2.2 Criterios de Remediación o Restauración del Suelo** Los criterios de Remediación o Restauración se establecen de acuerdo al uso que del suelo (agrícola, comercial, residencial e industrial), y son presentados en la Tabla 3. Tienen el propósito de establecer los niveles máximos de concentración de contaminantes de un suelo en proceso de remediación o restauración.” [Bolding in original.]

¹⁹⁷ Exhibit EL-146, TULAS, Article 4.2.2, as translated by the Claimant at paragraph 280 of its Counter-Memorial.

Excerpt of Table 3, Annex 2, Book VI of TULAS¹⁹⁸

Substance	Unit	Land Use			
		Agricultural	Residential	Commercial	Industrial
Electrical conductivity	mmhos/cm	2	2	4	4
Barium	mg/kg	750	500	2000	2000
Cadmium	mg/kg	2	5	10	10
Nickel	mg/kg	50	100	100	100
Vanadium	mg/kg	130	130	130	130
Total Chromium	mg/kg	65	65	90	90
Zinc	mg/kg	200	200	380	380
Lead	mg/kg	100	100	150	150
Polycyclic Aromatic Hydrocarbons	mg/kg	<2		<5	<1

103. In this connection, the significance of Article 2.38 of Annex 2, Volume VI (Criteria for Contaminated Soil Remediation) of TULAS was also a matter of dispute between the Parties. It provides:

2.38 Background level

Denotes the prevailing environmental conditions, prior to any disturbance. That is to say, it signifies the conditions that would have predominated in the absence of anthropogenic activities, with only natural processes being active.¹⁹⁹

104. Article 2.38 is located in the ‘definitions’ section of Annex 2 (i.e., “For purposes of the application of this Standard, the following definitions apply:...”).²⁰⁰ Ecuador asserted that this was an example of TULAS’s express acknowledgment of Base Values: it “defines ‘quality criteria’ of the soil as its ‘background values’, i.e., the chemical concentration levels prior to any contamination.”²⁰¹ Ecuador added that according to TULAS, “any soils where concentrations of

¹⁹⁸ Exhibit EL-146, TULAS, pp 363-366 (unofficial translation).

¹⁹⁹ Exhibit EL-146, TULAS (unofficial translation) (partial translation resubmitted on 10-18-2013). Original: “**2.38 Línea de fondo (background)** Denota las condiciones ambientales imperantes, antes de cualquier perturbación. Es decir, significan las condiciones que hubieran predominado en ausencia de actividades antropogénicas, sólo con los procesos naturales en actividad.” [Bolding in original.] Perenco’s preferred translation: “...prevailing environmental conditions prior to any disturbance,...i.e., conditions that would have prevailed in the absence of anthropogenic activities, and as a consequence of natural processes only.” (Claimant’s Counter-Memorial, paragraph 253, footnote 306).

²⁰⁰ Exhibit EL-146, TULAS, p 341 (Original) “**2 DEFINICIONES** Para efectos de la aplicación de la presente Norma, se establecen las siguientes definiciones:...” [Bolding in original.]

²⁰¹ Reply, paragraph 253.

contaminants exceed three times the Base Value must be ‘immediately’ remediated” and “restored back to 1.5 times the Base Value.”²⁰²

105. Perenco responded that this ignored the point that Article 2.38 was expressly predicated on the absence of any human activities or development. It did not require remediation to the untouched state of a site, and to interpret it as implicitly requiring the same would render obsolete “the detailed regulatory regime setting forth permissible impacts from different types of activity in different circumstances [...]”²⁰³ Pertinently, the opening section to Annex 2 explains that its purpose is to provide the technical standards (“...issued under the umbrella of the Environmental Management Law and the Regulation to the Environmental Management Law for the Prevention and Control of Environmental Contamination and is subject to their provisions, is of mandatory application, and is binding throughout the national territory”) that should be used to “determine or establish” the “[s]tandards of general application for soils with different uses”, etc.²⁰⁴ The objective of Annex 2 is identified as establishing the “Environmental Standards” that must be used by the State and its agencies in its “actions intended to preserve, conserve, or recover the quality of soil resources.”²⁰⁵

106. Turning to the matter of groundwater remediation, Table 5, Annex 1, Book VI of TULAS provides the “reference quality criteria for groundwater, considering a soil with clay content between (0-25.0)% and organic material content between (0 -10.0)%.”²⁰⁶ Article 4.1.3.6 introduces Table 5 and states that any alteration of the quality of groundwater triggers an obligation to remedy the “contaminated groundwater and soil affected.”²⁰⁷

²⁰² Reply, paragraph 87.

²⁰³ Claimant’s Counter-Memorial, paragraph 254.

²⁰⁴ Exhibit EL-146, TULAS (partial translation resubmitted on 10-18-2013) (Original) “**O INTRODUCCION** La presente norma técnica ambiental es dictada bajo el amparo de la Ley de Gestión Ambiental y del Reglamento a la Ley de Gestión Ambiental para la Prevención y Control de la Contaminación Ambiental y se somete a las disposiciones de éstos, es de aplicación obligatoria y rige en todo el territorio nacional. La presente norma técnica determina o establece: a) Normas de aplicación general para suelos de distintos usos. b) Criterios de calidad de un suelo. c) Criterios de remediación para suelos contaminados. d) Normas técnicas para evaluación de la capacidad agrológica del suelo.” [Bolding in original.]

²⁰⁵ Exhibit EL-146, TULAS, Article 1 (partial translation resubmitted on 10-18-2013). (Unofficial translation) “1 OBJECTIVE The objective of the standard is the Prevention and Control of Environmental Contamination, with respect to soil resources. The principal objective of this standard is to preserve or conserve the quality of soil resources in order to safeguard and preserve the integrity of persons, and ecosystems and their interrelationships and the environment in general. Actions intended to preserve, conserve or recover the quality of soil resources must be carried out under the terms of this Environmental Technical Standard.” (Original) “**1 OBJETIVO** La norma tiene como objetivo la Prevención y Control de la Contaminación Ambiental, en lo relativo al recurso suelo. El objetivo principal de la presente norma es preservar o conservar la calidad del recurso suelo para salvaguardar y preservar la integridad de las personas, de los ecosistemas y sus interrelaciones y del ambiente en general. Las acciones tendientes a preservar, conservar o recuperar la calidad del recurso suelo deberán realizarse en los términos de la presente Norma Técnica Ambiental.” [Bolding in original.]

²⁰⁶ Exhibit EL-146, TULAS (partial translation resubmitted on 10-18-2013); IEMS ER II, p 151.

²⁰⁷ Exhibit EL-146, TULAS, Article 4.1.3.6. (Unofficial translation) (partial translation resubmitted on 10-18-2013) If there is proven alteration in the quality of water from a well, the responsible party, must perform the works required to remediate the contaminated groundwater and affected soil. Allowable quality criteria for groundwater, are presented below (see Table 5) (Original) “**4.1.3.6** De existir alteración comprobada de la calidad de agua de un pozo, el responsable, deberá ejecutar las obras necesarias para remediar las aguas subterráneas contaminadas y el suelo afectado. Los criterios de calidad admisibles para las aguas subterráneas, se presentan a continuación (ver tabla 5)” [Bolding in original]; Supplemental Memorial, paragraph 169.

Excerpt of Table 5, Annex 1, Book VI of TULAS²⁰⁸

Parameter	Chemical expression	Unit	Maximum Permissible Limit
Barium	Ba	µg/l	338
Cadmium	Cd	µg/l	3.2
Zinc	Zn	µg/l	433
Lead	Pb	µg/l	45
Mercury	Hg	µg/l	0.18
Arsenic	As	µg/l	35
Cobalt	Co	µg/l	60
Copper	Cu	µg/l	45
Chromium	Cr	µg/l	16
Molybdenum	Mo	µg/l	153
Nickel	Ni	µg/l	45
Total Petroleum Hydrocarbons		µg/l	325

107. Ecuador's environmental expert, IEMS, relied on Table 5 of TULAS to provide the reference criteria that it applied to evaluate the concentration of TPH (Total Petroleum Hydrocarbons) and heavy metals (zinc, lead, mercury, cadmium, arsenic, barium, cobalt, copper, chromium, molybdenum and nickel) in the samples it collected.²⁰⁹ Perenco's expert, GSI, took issue with the filtration method adopted by IEMS and IEMS' assertion that it was required to do so by Table 5, Annex 1 of TULAS. In GSI's view, IEMS should have used Annex 5 of RAOHE instead.²¹⁰

(5) The Participation Contracts

108. Having described in general terms the public law framework applicable to the claim, the Tribunal now turns to the obligations Perenco undertook in the Participation Contracts for Blocks 7 and 21.²¹¹

109. First, Perenco agreed to comply with all laws and regulations in Ecuador applicable to the Participation Contracts.²¹² Clause 5.1.18 of the Block 7 Contract, for example, provided:

Obligations of the Contractor: Without prejudice to the other obligations contained in this Contract, the Contractor is obliged to:

...

²⁰⁸ Exhibit EL-146, TULAS, pp 308-311 (unofficial translation).

²⁰⁹ IEMS ER I, section 2.5.2; IEMS ER II, pp 151-163; Ecuador's Counter-Memorial, paragraph 805; Reply, section 2.1.4.

²¹⁰ GSI ER I, section 3.4, paragraph 85.

²¹¹ Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12); Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12).

²¹² Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), Clause 5.1.18 (PER 04764); Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), Clause 5.1.17 (PER 04657).

5.1.18 Comply with and require that its subcontractors comply with all laws, regulations and other provisions applicable to this Contract in the Republic of Ecuador.²¹³

110. Second, Perenco agreed to preserve the existing ecological equilibrium in the Blocks and would clean up the area to allow the potential return to environmental conditions similar to those encountered at the beginning of operations. But it would not be liable for pre-existing “environmental conditions” (for Block 7, this referred to conditions that pre-existed the Service Contract; for Block 21, this referred to conditions that pre-existed the Participation Contract). Clause 5.1.20, opening paragraph, subsections (9), (10) and 5.1.21 of the Block 7 Contract and Clause 5.1.19 and 5.1.20 of the Block 21 Contract provided:

[Block 7] Obligations of the Contractor: Without prejudice to the other obligations contained in this Contract, the Contractor is obliged to:

...

5.1.20 Preserve the existing ecological equilibrium in the Contract Area, to which end keeping all its activities within the pertinent standards in force in the country and on the basis of the Environmental Impact Studies, as stated in Annex No. XI...

5.1.20.9 Employ qualified personnel, equipment, machinery, materials, operational procedures and, in general, technology which complies with environmental protection standards and practices used in the international hydrocarbons industry, without prejudice to compliance with existing standards in the country.

5.1.20.10 Take responsibility for the cleanup and reforestation of the area with species similar to those originally found at the site, in order to, with time, allow the potential return to environmental conditions similar to those encountered at the beginning of the operations; also take responsibility for the abandonment of wells and installations for which the Contractor has been responsible as a consequence of the execution of this Contract. Said cleanup, reforestation and return to similar conditions and abandonment activities shall be performed in accordance with the Environmental Regulation for Hydrocarbon Operations and the Environmental Impact Study. The Contractor shall not be liable for environmental conditions preexisting at the beginning of operations under the Services Contract. In cases in which the competent authorities order the remediation of the environment in the Contract Area, due to preexisting conditions, the costs and contracting [for this purpose] shall not be the responsibility of the Contractor.

...

5.1.21 Cooperate with state entities responsible for control of colonization in the Contract Area; however, the Contractor shall not be

²¹³ Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), Clause 5.1.18 (PER 04764). Clause 5.1.17 of the Block 21 Contract provides similarly that Perenco is obliged to “comply with all the laws, regulations and any other applicable provisions of the Republic of Ecuador.” Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), Clause 5.1.17 (PER 04657).

liable for environmental damage caused by said colonization, nor for damages caused by third parties within the Contract Area.²¹⁴

[Block 21] 5.1 Obligations of the Contractor: Without prejudice to any other obligations specific in the Contract, the Contractor undertakes to:
[...]

5.1.19 While conducting the operations, the Contractor shall take every necessary measure to ensure the preservation and safety of lives and properties and preserve the environment. The above notwithstanding, the Contractor shall not be responsible for changes to the ecosystem caused by third parties within the Contract Area.

5.1.20 The Contractor shall be responsible for the clean-up, reforestation, and abandonment of non-productive wells and facilities as a result of this Contract. These activities shall be carried out in accordance with the legislation in effect in Ecuador at the time that such clean-up, reforestation, or abandonment is carried out and as contemplated in the Environmental Impact Study.

The Contractor shall not be responsible for pre-existing environmental conditions at the start of the operations under the Contract.

In such cases where the competent authorities order mitigation of the environment in the Contract Area due to pre-existing conditions, any costs incurred in connection with such activities shall be assumed by the Ecuadorian State.

Nor shall the Contractor be responsible for environmental conditions resulting from operations by PETROECUADOR or third parties after the Contract Area is returned by the Contractor.²¹⁵

111. Third, the Contracts set out numerous reporting and audit requirements for Perenco; specifically, it was obliged to prepare and submit to the appropriate Ministry the information and audits commissioned in accordance with applicable regulations such as the Environmental Management Law, RAOHE and TULAS.

112. These were provided for in the Block 7 Participation Contract in Clause 5.1.4 (“Carry out the Environmental Impact Studies which may be necessary...”); 5.1.10 (“Provide the Ministry of Energy and Mines with the original, and PETROECUADOR with one (1) copy, of all technical, environmental and research information related to the Contractor’s activities...”); 5.1.11 (“Provide the Ministry of Energy and Mines with the originals of the Environmental Impact Studies as well as their supporting documentation...”); 5.1.20.4 (“Any Environmental Studies which may be required in the future for additional exploration or exploitation activities shall be submitted in accordance with the Environmental Regulation for Hydrocarbon Operations in Ecuador and with the Terms of Reference formulated by the relevant Ministry...”); 5.1.20.6

²¹⁴ Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), PER 04764, 04768, 04769.

²¹⁵ Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), PER 04659.

(“Environmental Impact Studies shall serve as a base reference for socio-environmental audits that must be conducted periodically by the relevant Ministry...”); and 5.1.20.7 (pre-termination audit).²¹⁶

113. Similar obligations could be found in the Block 21 Contract, but they were expressed in somewhat different terms given the Block’s green-field nature and the state of its development. Clause 5.1.9 required Perenco to “provide the Ministry of Energy and Mines with the original and PETROECUADOR with copies of all technical information...including those of a scientific, environmental and technical nature...”.²¹⁷ Clause 5.1.18 required the company to “perform an Environmental Impact Study for the seismic prospection phase within the first six months following the Effective Date. Therefore, prior to drilling the first exploratory well, an Environmental Impact Study for the first phase of exploratory drilling must be submitted and, finally, an Environmental Impact Study together with the Development Plan must be presented before continuing on to the Exploitation Period... These studies shall be the basis for socio-environmental audits that must be conducted periodically by the Ministry of Energy and Mines to ensure that the Contractor’s operations are being carried out with the least impact on human residential populations and the environment.”²¹⁸ Clause 5.5.5 referred to a comprehensive environmental audit that had to be commissioned two years before the expiry of the Block 21 Contract.²¹⁹

114. The Block 7 Contract included a reference to an environmental impact study that the first contractor was required to complete and submit to SPA for approval as a pre-condition for entry into the Contract. Clause 5.1.20.3 stated that “[a]s of the Effective Date of this Contract, the Contractor has completed the Environmental Impact Studies described in Annex Number XI, and these studies have been submitted and approved by the Undersecretary of the Environment of the relevant Ministry.”²²⁰ This provision does not appear in the Block 21 Contract.

C. The Parties’ Submissions on the Legal Issues

115. There was sharp divergence between the Parties on several areas regarding the application of Ecuadorian law and Perenco's obligations under the Participation Contracts.

(1) Strict Versus Fault-based Liability

116. The Parties diverged on whether the regime that governed the counterclaim was fault or strict liability based. They also disagreed on the precise way in which the regime that pre-dated the 2008 Constitution operated, and the circumstances in which the regime of the 2008 Constitution would apply.

117. Ecuador submitted that for a claim brought after the Constitution’s entry into force, an oil operator was liable under the strict liability regime if the State established that environmental

²¹⁶ Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12).

²¹⁷ Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), PER 04655.

²¹⁸ Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), PER 04654.

²¹⁹ Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), PER 04666.

²²⁰ Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), PER 04765.

harm²²¹ existed in the areas in which the operator undertook hydrocarbon activities.²²² The burden then shifted to the operator to prove that the environmental damage was “insignificant.”²²³ Ecuador noted in this respect that the Constituent Assembly of Ecuador, during the drafting of the 2008 Constitution, referred to:

“A presumption of innocence [that] should be established in favor of the environment. From this perspective, the burden of proof must be shifted to the defendant...”²²⁴

118. Accordingly, relying on the expert evidence of Professors Ricardo Crespo Plaza and Fabián Andrade Narváez, Ecuador contended that pursuant to Article 396 of the 2008 Constitution it was required to “only establish the existence of the environmental damage in Blocks 7 and 21, where Perenco operated” for Perenco to be held liable.²²⁵ The State was *not* required to demonstrate fault or that “there [was] a causal link between such a fault and the environmental harm found on the areas where the oil operator conducted operations.”²²⁶ Ecuador submitted that this was because certain activities, especially those in the hydrocarbons sector, “inherently generate[d] risks” to the environment” and, in this way, liability “[did] not derive from a single nefarious act, but, rather, from the decision to undertake a risky activity.”²²⁷

119. Professor Crespo added that the rationale behind this approach to environmental claims was that the protection of the environment had become a core philosophy of the 2008 Constitution²²⁸ and its drafters recognised that in claims for environmental damage “it [was] impossible or very difficult for the victim to establish that an environmental harm was caused by a fault.”²²⁹

²²¹ A note on nomenclature: in the course of submissions the terms used ranged from “damage” or “impact” or “alteration” or “harm” (for e.g., see Transcript, Hearing on Counterclaims, Day 1, p 27 (Opening Statement of Pierre Mayer)).

²²² Ecuador’s Counter-Memorial, paragraph 664; Supplemental Memorial, paragraphs 12-23; Reply, paragraph 7; 1st Expert Report of Ricardo Crespo Plaza, paragraphs 16, 26-41 cf. Rejoinder, paragraphs 242-251; Transcript, Hearing on Counterclaims, Day 1, p 20, lines 16-22 (Opening Statement of Sr. Procurador Diego García Carrión (“Ecuador has to show, first, a negative impact to the environment; and, two, the development of oil activities by Perenco in Blocks 7 and 21.”)).

²²³ Reply, section 3.1.2; paragraphs 361-367 cf. Rejoinder, paragraphs 75-79.

²²⁴ 1st Expert Report of Ricardo Crespo Plaza, Annex 9, Constituent Assembly of Ecuador, Final Report of Working Group 5 on Natural Resources and Biodiversity, 2008; Transcript, Hearing on Counterclaims, Day 1, p 29 (Opening Statement of Pierre Mayer).

²²⁵ Ecuador’s Counter-Memorial, paragraphs 654, 672. Ecuador also relied on Article 11(3), first paragraph: “The rights and guarantees set forth...shall be of direct and immediate application by and before any public servant, administrative or judicial ex officio or upon request by a party.” 1st Expert Report of Ricardo Crespo Plaza, paragraph 16 (“[A] strict liability regime is established, the shift of the burden of proof and the imprescribable [sic] nature of actions to prosecute and punish environmental damage”). Expert Report of Fabián Andrade Narváez, paragraphs 52-62.

²²⁶ Ecuador’s Counter-Memorial, paragraphs 665-667; Supplemental Memorial, paragraphs 16-20; Reply, paragraph 10 cf. Rejoinder, paragraphs 75-79.

²²⁷ Expert Report of Fabián Andrade Narváez, paragraphs 55-58; Transcript, Hearing on Counterclaims, Day 1, p 27 (Opening Statement of Pierre Mayer).

²²⁸ Amongst others, citing Articles 14, 71 and 72 of the 2008 Constitution (Exhibit EL-89).

²²⁹ Supplemental Memorial, paragraph 22; 1st Expert Report of Ricardo Crespo Plaza, paragraphs 33-35; Transcript, Hearing on Counterclaims, Day 1, p 28 (“The nature of the contamination is such that it is extremely

120. For this reason, Ecuador submitted that the 2008 Constitution relating to the environment applied to “all environmental damage *discovered* after its entry into force” and was not limited only to damage that *occurred* after October 2008.²³⁰ This was consistent with the Constitution’s Article 11(3), which stipulated that it was of “immediate application.”²³¹ Relying on the evidence of Professors Crespo and Andrade, Ecuador submitted the relevant date for determining Perenco’s liability was November 2011 when IEMS undertook its first inspection of the Blocks and concluded there was “widespread contamination.”²³² Alternatively, Ecuador relied on the principle of “continuing torts” in Ecuadorian law, contending that even if the relevant date for liability was the date that the damage was caused, the strict liability regime of the 2008 Constitution would still apply because the “cause of the damage” continued beyond the Constitution’s entry into force and in those circumstances the principle mandates that the damage is treated as having been caused at the moment the wrongful causative conduct ceases.²³³

121. Professor Crespo explained that the basis of the strict liability regime in Ecuador is that Nature (“*pacha mama*”) has rights, including the right to remediation,²³⁴ and the theory of risk, i.e., that “the burden should go hand in hand with the economic benefit of an activity (*ubi emolumentum ibi onus*)” such that “whoever creates risk in his or her benefit must also suffer its harmful consequences.”²³⁵ He referred in this latter respect to a 2002 ruling of the Ecuadorian Supreme Court, in *Delfina Torres v. Petroecuador*, which found that “the production, industrialization, transportation and operation of hydrocarbon substances [were], undoubtedly, high-risk or high-dangerousness activities.”²³⁶ He also relied on a report prepared by the Working

difficult to establish its exact origin; that the distinct harm was caused by a distinctive and identifiable action.”) (Opening Statement of Pierre Mayer)

²³⁰ Reply, paragraph 316 [Emphasis in original.]; Transcript, Hearing on Counterclaims, Day 1, pp 42-43 (Opening Statement of Eduardo Silva Romero).

²³¹ Exhibit EL-89, 2008 Constitution: “The rights and guarantees established in the Ecuadorian Constitution and in international human rights norms are directly and immediately applicable by and before any civil servant, executive or judicial, ex officio or at the individual’s request.” (Translation presented by Ecuador at footnote 365 of its Reply). See Transcript, Hearing on Counterclaims, Day 1, p 41 (Opening Statement of Eduardo Silva Romero).

²³² Reply, paragraph 317, referring to 1st Expert Report of Ricardo Crespo Plaza, paragraphs 37-41 and Expert Report of Fabián Andrade Narváez, paragraph 33. Alternatively, Ecuador submitted that even if the relevant date was the date damage was caused, the strict liability regime of the 2008 Constitution would still apply since the cause of the damage did not cease until after its enactment (i.e. Perenco was operating in the Blocks after the Constitution entered into force in November 2008).

²³³ Reply, section 3.2.2, paragraph 326.

²³⁴ 1st Expert Report of Ricardo Crespo Plaza, paragraphs 16 and 25 (“The public policy nature of the norms of protection of the environment in Ecuador is particularly true in the case of Articles 396 and 297 of the Constitution.”).

²³⁵ 1st Expert Report of Ricardo Crespo Plaza, paragraphs 27-28, 30-31, 39-40 and 86; see also, Transcript, Hearing on Counterclaims, Day 1, p 26 (Opening Statement of Pierre Mayer), lines 1-4 (“he who receives the profits must also bear the burden of the risk associated to the profit”); lines 11-18 (“He who created the risk and received the profit should bear the negative consequences, instead of externalizing them, as the tenets of law in economics would say, to the society at large”).

²³⁶ 1st Expert Report of Ricardo Crespo Plaza, paragraphs 27-28, 30-31, 39-40 and 86; Supreme Court of Justice Case No. 229-220 at EL-145. See also, Expert Report of Fabián Andrade Narváez, paragraphs 53-58. Professor Andrade also relied on the decision of Ecuador’s former Supreme Court of Justice in the case of *Andrade Medina v. CONELEC and others* (Supreme Court of Ecuador, Administrative Contentious Division, Resolution No. 168-2007, 11 April 2007, in case No. 62-2005 (Annex No. 14 to Expert Report of Fabián Andrade Narváez) (Expert Report of Fabián Andrade Narváez, paragraph 54).

Group on Natural Resources and Biodiversity in Ecuador, a committee of the Constituent Assembly that contributed to the drafting of the 2008 Constitution, which observed that:

“A presumption of innocence should be established in favor of the environment. From this perspective, the burden of proof must be shifted to the defendant (literal b of Article 1), that is, departing from the ancient principle according to which innocence is presumed until proven otherwise because, in environmental matters, strict liability would be the exception. The plaintiff will not be required to prove the causality link, which will fall on the defendant. This principle eliminates one of the barriers hindering access to environmental justice as is the cost of evidence and the technical requirement of proving environmental harm.”²³⁷

122. Professors Crespo and Andrade also asserted that the *Delfina Torres* case showed that even before the 2008 Constitution’s entry into force, Ecuadorian law contemplated a presumption of causation in environmental liability claims which operated in favour of the environment (relying also on the 1998 Constitution).²³⁸ Professor Crespo explained that in *Delfina Torres*, “the theory of risk and the shifting of the burden of proof...allowed liability to be placed on Petroecuador and its affiliates for environmental harm and damages to the health of the inhabitants of a neighbourhood in the city of Esmeraldas”, the Court’s having adopted a “theory of extra contractual civil liability for risky or dangerous activities” by holding that:

“*fault is presumed*, which relieves the victim from having to provide evidence of negligence, carelessness or lack of expertise...[it is] sufficient that the damages are a direct consequence of the events where they originated. It is merely strict liability.”²³⁹

123. In either case, Ecuador submitted that the only exceptions that the Constitution contemplated were where the operator could establish: “(i) the lack of harm; or that the harm result[ed] (ii) from *force majeure*; (iii) from actions or omissions of the victim of the harm; or (iv) from actions or omissions of a third party.”²⁴⁰ The experts asserted that this has been upheld by Ecuador’s former Supreme Court of Justice in *Delfina Torres* and in *Andrade Medina v.*

²³⁷ *Asamblea Constituyente del Ecuador* [“Constituent Assembly of Ecuador”], *Informe Final de la Mesa 5 de Recursos Naturales y Biodiversidad* [“Final Report of Working Group 5 on Natural Resources and Biodiversity”], 2008, p 17 (Annex No. 9), as quoted in paragraph 35 of 1st Expert Report of Ricardo Crespo Plaza.

²³⁸ 1st Expert Report of Ricardo Crespo Plaza, paragraphs 37-41; Expert Report of Fabián Andrade Narváez, paragraphs 55-58; Reply, paragraph 7, section 3.3 (paragraphs 345-351) cf. Rejoinder, paragraphs 309-317.

²³⁹ Annex No. 10 of 1st Expert Report of Ricardo Crespo Plaza, as translated and quoted by Professor Crespo at paragraphs 38 and 39 of his expert report; see also, Expert Report of Fabián Andrade Narváez, paragraphs 55-58 (“I insist, then, that the presumption of fault in the *Delfina Torres* decision, which accepted the theory of risk, implies in fact two distinct presumptions: one irrebuttable presumption of the existence of fault regarding hazardous activities and another rebuttable presumption with regards to causation, pursuant to which one may be exempted from one’s environmental liability by proving that the harm was caused by another.”); see also, Reply, paragraphs 348-350 [Emphasis of Ecuador in its Reply].

²⁴⁰ 1st Expert Report of Ricardo Crespo Plaza, paragraphs 38 and 91; Supplemental Memorial, paragraph 21, referring to EL-145, Supreme Court of Justice, Case 229-2003, Official Register No. 43, published on 19 March 2003; Reply, paragraphs 7, 335 (Ecuador confirming that these exceptions applied equally to the case of before and after the 2008 Constitution), 362 (citing *Delfina Torres*); Transcript, Hearing on Counterclaims, Day 1, p 27 (Opening Statement of Pierre Mayer).

*CONELEC and others.*²⁴¹ Ecuador further submitted that the burden of proof for any of the foregoing exceptions naturally fell on the party that invoked it, i.e., Perenco in the instant case.²⁴²

124. In this respect, Ecuador submitted that Perenco could not meet any of the exceptions.²⁴³ It could not, for that matter, rely on the 2008 environmental audits of Blocks 7 and 21,²⁴⁴ because they were not approved by the competent ministry and even if they had been approved, Ecuadorian law, specifically Article 11(6) of the Constitution and Article 70 of TULAS, did not permit the findings of any audit report to excuse Perenco from environmental liability.²⁴⁵

125. The 2008 audits were audits of Blocks 7 and 21 that Perenco was obliged contractually and by operation of Ecuadorian law to commission.²⁴⁶ They were submitted to SPA, part of Ecuador's Ministry of Mines and Petroleum, on 16 December 2008.²⁴⁷ In February and March 2009, there were a series of exchanges between SPA and Perenco regarding the 2008 audits, with SPA requesting further information.²⁴⁸ On 1 April 2009, however, events overtook the internal process of review within the Ministry because through Executive Decree No. 1630 the Ministry of Environment assumed the functions of the Ministry of Mines and Petroleum regarding the

²⁴¹ 1st Expert Report of Ricardo Crespo Plaza, paragraph 38, quoting from Annex No. 10 (*Delfina Torres vs. Petroecuador and affiliates*, No. 229-2003, published in Official Gazette No. 43 dated 19 March 2003, Twentieth Considerandum); and Expert Report of Fabián Andrade Narváez, paragraphs 54 (referring to case of Supreme Court of Ecuador, Administrative Contentious Division, Resolution No. 168-2007, 11 April 2007, in case No. 62-2005 (Annex No. 14 to Expert Report of Fabián Andrade Narváez)) and 56-57 (*Delfina Torres* at EL-145); Reply, paragraphs 365-367.

²⁴² Reply, paragraphs 261, 412-420. Ecuador submitted that Perenco must “positively establish that (1) *another, and only another, caused* the environmental harm (ii) *with regard to each and every site* for which [Perenco] claims that the contamination cannot be attributed to the Consortium.” (Reply, paragraph 418) [Emphasis in original.].

²⁴³ Supplemental Memorial, paragraph 38.

²⁴⁴ Exhibits E-144, *Auditoría Ambiental Bianual – Auditoría Ambiental de dos años antes de la finalización del Contrato de Participación del Bloque 7, incluyendo el Campo Unificado Coca-Payamino*, prepared by Ecuambiente Consulting Group for Perenco dated November 2008 (“2008 Block 7 Audit”) and E-145, *Informe de Auditoría Ambiental Bianual del Bloque 21 prepared by Abrus Ingeniería y Medio Ambiente Cía. Ltda.* dated November 2008 (“2008 Block 21 Audit”).

²⁴⁵ Supplemental Memorial, paragraphs 38-43; 1st Expert Report of Ricardo Crespo Plaza, paragraphs 22-25, 95-98; Reply, section 3.1.3. Recall that Article 11(6) of the 2008 Ecuadorian Constitution provides that “All principles and rights are inalienable, unwaivable, indivisible, interdependent and hold equal statute.” (Exhibit EL-89) Article 70 of TULAS provides that “[t]he approval of environmental management plans and other environmental studies shall not be used as exonerating evidence in environmental contamination incidents or accidents attributable to any activity, project or construction. The natural or juridical persons, public or private, that represent such activities shall be liable for payment of any applicable damages and penalties.” (Exhibit EL-146) (translation resubmitted on 10-18-2013) Transcript, Hearing on Counterclaims, Day 1, p 68 (Opening Statement of Eduardo Silva Romero).

²⁴⁶ Perenco was required contractually (Clause 5.1.20.7 of the Block 7 Contract) and pursuant to Ecuadorian law (Article 42 of RAOHE) obliged to commission and submit these audits to the Undersecretary of Environmental Protection of the Ministry of Mines and Petroleum or *Subsecretario de Protección Ambiental*. They did so on 16 December 2008. See Exhibits E-144, 2008 Block 7 Audit, E-145, 2008 Block 21 Audit; EL-147, RAOHE. See also, Reply, paragraph 11 and section 3.1.3.

²⁴⁷ Supplemental Memorial, paragraph 102.

²⁴⁸ Supplemental Memorial, paragraphs 103-104; Letter from the Ministry of Mines and Petroleum to Perenco regarding the Block 21 Environmental Audit dated 19 February 2009 and letter from the Ministry of Mines and Petroleum to Perenco regarding the Block 7 Environmental Audit dated 3 March 2009, E-174.

environmental aspects of hydrocarbon operations.²⁴⁹ The Undersecretary of Environmental Quality (“*Subsecretaría de Calidad Ambiental*”) of the Ministry of Environment was designated as the new authority in charge of approving the 2008 audits and it had not concluded their review when Perenco left the Blocks in July 2009.²⁵⁰ The review process continued with the Ministry of Environment sending a technical commission to perform an inspection of the Blocks from 29 to 31 July 2009 in order to “verify the results of Perenco’s Environmental Audits.”²⁵¹

126. The Block 7 audit found that there were several instances of non-compliance with regulatory requirements, namely, the improper disposal of contaminated soil from the Coca CPF and in the management of the discharge of black and grey waters from the Jaguar and Payamino camps.²⁵² These were ostensibly addressed in an Action Plan subsequently carried out by Perenco.²⁵³ The audit did not identify contaminated soil or water requiring remediation.²⁵⁴ The Block 21 audit concluded that Perenco’s activities complied with regulatory requirements and there were no indications of an impact on the environment detected in the Block and adjacent to areas of activities that would require remediation by Perenco.²⁵⁵

127. In contrast, the technical inspection conducted by the Ministry in July 2009 resulted in a report released in August 2009 recommending that Perenco be sanctioned for pervasive and “major non-conformities” with applicable Ecuadorian environmental regulations and technical requirements in Blocks 7 and 21.²⁵⁶ The “major non-conformities” in Block 7 referred (amongst others) to Perenco’s failure to comply with the plan for dismantling works when it left in July 2009, resulting in damage to the Gacela 2, Gacela 3, Lobo 4, Cónдор Norte, Jaguar 7 and 8, Jaguar 2, Jaguar 9, and Jaguar 1 wells, Perenco’s “repeate[d] fail[ure]” to comply with the approved limits for the treatment of black and grey water at the Payamino station, its “inadequate handling of the areas and soils contaminated with hydrocarbons” in the Coca and Payamino stations and failure to abide by permissible emission limits in its management of combustion engines in the Gacela, Payamino and Oso stations.²⁵⁷ In Block 21, the Ministry identified inadequate maintenance of the facilities and the lack of treatment and monitoring reports related to the residual waters and pit leachates.²⁵⁸ In addition to the sanctions it proposed, the Ministry recommended that Perenco should be required to cure the defects in its 2008 audits.²⁵⁹

128. Ecuador thus contended that the July 2009 technical inspection demonstrated that the 2008 audits did not prove that Perenco had complied with its environmental obligations under Ecuadorian law.²⁶⁰ They had not been approved by the Ministry, and even if they had been,

²⁴⁹ Supplemental Memorial, paragraph 105; Exhibit E-177, Executive Decree No. 1630, published in the Official Register No. 561 on 1 April 2009.

²⁵⁰ Supplemental Memorial, paragraph 106.

²⁵¹ Supplemental Memorial, paragraph 106; Exhibit E-176, *Informe Técnico No. 897-AA-DNPCA-SCA-MA-2009* dated 21 August 2009 (“Technical Inspection Report”).

²⁵² Exhibit E-144, 2008 Block 7 Audit, p 44.

²⁵³ *Ibid.*

²⁵⁴ Exhibit E-144, 2008 Block 7 Audit, pp 44-45.

²⁵⁵ Exhibit E-145, 2008 Block 21 Audit, p 7.

²⁵⁶ Exhibit E-176, Technical Inspection Report, p 16.

²⁵⁷ Exhibit E-176, Technical Inspection Report, pp 2-14.

²⁵⁸ Exhibit E-176, Technical Inspection Report, pp 14-16.

²⁵⁹ Exhibit E-176, Technical Inspection Report, p 16.

²⁶⁰ Supplemental Memorial, paragraphs 103-113; Reply, section 3.1.3.

Article 70 of TULAS provided that this could not exonerate Perenco because the State was not capable of waiving an environmental action based on strict liability. Article 70 states that “[t]he approval of environmental management plans and other environmental studies shall not be used as exonerating evidence in environmental contamination incidents or accidents attributable to any activity, project or construction[...].”²⁶¹ Ecuador also relied on Article 11(6), paragraph 1 of the 2008 Constitution which states that “[a]ll [its] principles and rights are inalienable, *unwaivable*, indivisible, interdependent...”.²⁶² Moreover, the technical inspection was held out by Ecuador as “no less than the 2008 Environmental Audits review process itself” and it determined that ‘approval’ would not be forthcoming because “none of the [audits] complied with the Consortium’s obligations.”²⁶³

129. Ecuador submitted that, in any event, the 2008 audits were unreliable because they examined whether the Consortium complied with permissible limits under RAOHE and TULAS but as discussed in detail below, these limits did not amount to the extent of recoverable environmental harm for which Perenco may now be held liable.²⁶⁴ Furthermore, Perenco selectively sampled areas of the Blocks that it knew would be less likely to display contamination, taking far fewer samples than that reasonably required for a credible and representative sampling program.²⁶⁵

130. Ecuador contended that Perenco’s culpability was compounded by its efforts to “systematically [...] mislead the Ecuadorian authorities as to the existence and extent of the environmental damages.”²⁶⁶ For example, it referred to an internal memorandum within Perenco regarding a February 2010 complaint by a local landowner about contamination in the Payamino 2-8 area.²⁶⁷ Perenco’s memorandum discussed the extent to which different individuals or organisations connected to the investigation were aware of the contamination and the “possible solutions” available to the company (for example, submitting an action plan to remedy the damage and compensate; “confine the problem and leave the site as is”, and finally, to contest liability).²⁶⁸ Ecuador emphasised the disparity between the results of an initial study of the site

²⁶¹ Ecuador’s Counter-Memorial, paragraphs 656, 687-688; Reply, paragraph 280; Exhibit EL-146, TULAS (as translated by Ecuador at paragraph 690 of its Counter-Memorial).

²⁶² Exhibit EL-89, 2008 Constitution [Emphasis added.]; Reply, paragraph 279.

²⁶³ Reply, paragraph 373; Exhibit E-176, Technical Inspection Report.

²⁶⁴ Reply, paragraphs 282-286 (“In sum, the Consortium’s audits could be relied upon – though it is not their aim – to establish the existence of environmental harm because any contamination above the permissible limits implies environmental harm *per se*. However, they cannot be used to establish the inexistence of environmental harm.”).

²⁶⁵ Counter-Memorial, paragraphs 687, 755, 757, 758, 780 (“a mere 12 days of field work”), 795 (“based on a mere 14 soil samples...decided not to collect and test any underground water sample in Blocks 7 and 21”); see also, 1st Witness Statement of Marco Puente, paragraph 19: “[A] former Perenco employee, Mr. Marco Puente, describes how the audits were taken by Perenco for sampling to carefully select sites where there was no or little pollution, or that had been previously remediated.” (quoting from Counter-Memorial, paragraph 796).

²⁶⁶ Ecuador’s Counter-Memorial, paragraph 656, section 8.2.2; Supplemental Memorial, paragraphs 87-101.

²⁶⁷ Ecuador’s Counter-Memorial, paragraphs 742-746; see Exhibit E-169, Letter from Mr. Daniel Jungal to Perenco dated 23 February 2010; Supplemental Memorial, paragraphs 93-101.

²⁶⁸ See Exhibit E-170, Memorandum prepared by Perenco on the characterization of the environmental issues in Payamino 2-8 (*Caracterización de Pendientes Ambientales Payamino 2-8*) in May 2010; Counter-Memorial, paragraphs 744-749. In its Counter-Memorial, Ecuador characterises the subsequent statement prepared by Perenco and submitted to the Minister of Environment on 11 June 2010, and a technical study it commissioned by Walsh Environmental Scientists and Engineers as part of a pattern of conduct to conceal information and disclaim liability

conducted by Grüntech laboratory, which concluded that the oil spill that caused the contamination occurred during the time Perenco was the operator, and that of a technical study conducted by Walsh Environmental Scientists and Engineers which reached a conclusion similar to that put forward by Perenco to the Ministry, namely, that the contamination resulted from the disposal of waste coming from the drilling of the Payamino 2 well by CEPE in April 1987, and to a lesser extent, an oil spill that occurred in January 1998 when *Petroproducción* operated the field.²⁶⁹

131. Ecuador adverted to other examples of similar behavior, such as Perenco's representation to the Ecuadorian Ministry of Environment in 2010 that no oil spills had ever been reported on or near the Payamino 2 and 8 wells while Block 7 was under Perenco's operatorship²⁷⁰, an assertion that was contradicted in its report to DINAPA in 2004 that 9 oil spills in Blocks 7 and 21 had occurred between 2000 and 2003.²⁷¹ Ecuador alleged that Perenco had failed to report at least 42 spills that occurred during its operatorship that now appeared on the record in this proceeding.²⁷²

132. Ecuador similarly raised instances where DINAPA, after having reviewed evidence of site-testing by Perenco in areas where oil spills had been reported by local communities, concluded that the company's inspections were deliberately conducted in areas located a considerable distance from the sites in question, and for that reason, were unrepresentative of the conditions of the site of concern.²⁷³ It further raised examples of what it characterised as deliberate omissions by Perenco in its regular reporting to the DINAPA.²⁷⁴ It relied on RPS' expert report which concluded that based on the documents on record it could "identif[y] numerous and significant failures by the Consortium to comply with Ecuadorian regulations."²⁷⁵

for possible contamination in the Blocks (see Exhibit E-163, *Informe Técnico: Caracterización del Pasivo Ambiental Adyacente a la Plataforma Payamino 2-8 – Campo Unificado Coca-Payamino* ("Walsh Technical Report"), dated October 2010).

²⁶⁹ Supplemental Memorial, paragraph 100; Exhibit E-163, Walsh Technical Report.

²⁷⁰ See Exhibit E-161, Letter from Perenco to the Minister of Environment dated 11 June 2010. The Tribunal notes that while Perenco in its letter does represent that it "carried out an exhaustive review of its archives and verified that during their operation there ha[d] never been a spill", it follows on to clarify that it did discover what appeared to be an "old oil spill" and inferred that it must have occurred during the time of Kerr McGee or Petroproducción.

²⁷¹ Ecuador's Counter-Memorial, paragraphs 736-737; Supplemental Memorial, paragraphs 88-90; Exhibit E-162, Letter from Perenco to the DINAPA dated 20 January 2004 (with a summary of oil spills, at least 6 of which seem from their description to have taken place in or about the Coca-Payamino fields). Ecuador relies in addition on the Walsh Technical Report, which, while it suggests that oil spills did occur, it also concluded that "[t]here are no references to the existence of any Environmental Liability in the area of influence of the Payamino 2-8 Platform" see Exhibit E-163, p 35). See also, examples Ecuador raises of complaints by local inhabitants at exhibits E-164 to E-166, and Exhibit E-172, *Perenco ou les tribulations d'un pétrolier français en Equateur*, Mediapart.fr, 26 April 2009.

²⁷² Reply, paragraphs 44-51, referring to GSI ER I, Appendix B.3 and 2nd Witness Statement of Manuel Solis, paragraph 76.

²⁷³ Supplemental Memorial, paragraphs 90-91; see e.g., Exhibit E-167, Letter from DINAPA to Perenco dated 10 April 2008.

²⁷⁴ Counter-Memorial, paragraphs 738-740; Supplemental Memorial, paragraph 92; see, for e.g., Exhibit E-168, Letter from DINAPA to Perenco dated 21 November 2006.

²⁷⁵ Reply, paragraph 360; RPS ER III, section 6 cf. e.g., in Rejoinder, paragraph 292 (contending that the claim that the Consortium diluted contaminants found in pits contrary to TULAS is incorrect because TULAS's

133. Finally, Ecuador submitted that the notion of harm covered by the Constitution's strict liability regime was broad, "covering as many types of environmental harm as possible" including "affectation to hydric sources", "loss of vegetation", "loss of air quality", "affectation to health of local populations", "impact to the local economy", "socio-environmental conflicts" and "affectation to tangible and intangible cultural heritage."²⁷⁶ This contributed to the specific evaluative criteria that Ecuador submitted its environmental experts were required to apply when evaluating the state of Blocks 7 and 21 (discussed in further detail below in Section III.C(5)).

134. Perenco's position was that fault-based liability, *not* strict liability, governed Ecuador's environmental claim.²⁷⁷ In its view, strict liability was not the standard applicable under Ecuadorian law until the 2008 Constitution was adopted and to apply it to the Consortium's operations would be contrary to the principles of non-retroactivity and legal security.²⁷⁸ Ecuador's Civil Code applied to the Consortium's operations prior to October 2008, and the code provided that "he who has committed a tort", defined elsewhere as constituting an illegal action committed "with the intention to cause harm", which "has caused harm to another", is "obligated to indemnify".²⁷⁹ This required a "breach of a duty of care which result[ed] in harm."²⁸⁰ Thus, Perenco's contention was that Ecuador's claims were deficient because it had failed to establish in IEMS' experts reports that the Consortium "deliberately or negligently breached its duty of care",²⁸¹ and that it "*caused* the alleged contamination."²⁸²

135. Relying on its own Ecuadorian law expert, Dr. René Bedón, Perenco rejected Professor Crespo's reliance on *obiter dicta* from *Delfina Torres*²⁸³ to assert that in any event strict liability for environmental claims existed in Ecuador before October 2008, arguing that he had misinterpreted the decision.²⁸⁴ Dr. Bedón stated that even as the Court in *Delfina Torres* shifted the burden of proof to the defendant, requiring it to prove that it had adopted appropriate measures to prevent the damage alleged by the claimant, it still required a finding of fault, albeit "presumed fault."²⁸⁵ He asserted that:

prohibition on the use of water to dilute effluents was not in force at the time of the closure of the Coca 18 and Payamino 24 pits about which Ecuador complains).

²⁷⁶ Counter-Memorial, paragraphs 674-676; Supplemental Memorial, paragraphs 26-28; 1st Expert Report of Ricardo Crespo Plaza, paragraphs 75-76.

²⁷⁷ Claimant's Counter-Memorial, paragraph 199 cf. Reply, section 3.3.

²⁷⁸ Claimant's Counter-Memorial, paragraphs 199-205. Perenco relied on Article 7 of Ecuador's Civil Code, which states "[t]he law does not provide but for what is to come; it has no retroactive effect." (Exhibit CA-CC-38) (translation resubmitted 10-16-2013) It also pointed to Article 82 of Ecuador's Constitution, which established the right to legal security, based upon "the existence of prior legal regulations that are clear, public and applied by the competent authorities." (EL-89, 2008 Constitution) 1st Expert Report of René Bedón, paragraphs 79-81.

²⁷⁹ Exhibit CA-CC-38, Articles 2184 and 2214; Claimant's Counter-Memorial, paragraphs 200-201.

²⁸⁰ Claimant's Counter-Memorial, paragraph 201.

²⁸¹ Claimant's Counter-Memorial, paragraphs 22 [*Italics in original*], 196; Rejoinder, paragraphs 289-297.

²⁸² Perenco submitted that many of the incidents said to produce alleged contamination "were in fact caused by Ecuador's own operation of the fields, either before the Consortium commenced operations or after Petroamazonas took over operations in July 2009." (Claimant's Counter-Memorial, paragraph 22).

²⁸³ Exhibit EL-145, *Comité Pro Mejoras Barrio Delfina Torres vda. de Concha v. Petroecuador, Petrocomercial and their affiliates*, Official Register No. 43 of March 19, 2003, Twentieth ("*Delfina Torres*").

²⁸⁴ Claimant's Counter-Memorial, paragraphs 211-213; Rejoinder, paragraphs 309-317.

²⁸⁵ 1st Expert Report of René Bedón, paragraphs 60-61; Rejoinder, paragraphs 310-312 c.f. 1st Expert Report of Ricardo Crespo Plaza, paragraphs 37-41.

“In that ruling, after reaffirming that ‘it is *considered necessary to have a requirement of fault* for the sake of justice of those responsible’, the Court made the following statement:

‘However, since the burden of proof of such fault is almost impossible or very difficult to be borne by the victim, *shifting the burden of proof* was considered necessary...In other words, the *presumption of the fault* of the person using and taking advantage of the risky thing causing the harm was established. This theory has increasingly gained acceptance, particularly in case law...We fully agree with this position and such is the reason why we adopt it as foundation for this ruling...’²⁸⁶

136. Dr. Bedón also adverted to a subsequent decision of the Supreme Court of Justice in *Medardo Luna v. AECA*.²⁸⁷ This “clarified” the *Delfina Torres* ruling by confirming that it “had been issued based on the fault-based liability regime”, shifting “only the burden of proof with respect to the element of negligence or intent”, and quoted the following statement from the decision: “This ruling [*Delfina Torres*] categorically state[d] that the respondents *incurred in fault-based liability* and, on this basis, were ordered to pay damages...”.²⁸⁸

137. Perenco submitted that the Supreme Court of Ecuador (now the National Court of Justice) has recognised in three cases – *Delfina Torres*, *Medardo Luna*²⁸⁹ and *Andrade Medina*²⁹⁰ – that before the 2008 Constitution entered into force the Ecuadorian legal regime for liability for hazardous activities like oilfield operations was fault-based with a rebuttable presumption of fault or a rebuttable presumption that there had been a breach of the duty of care.²⁹¹ These decisions confirmed that “proof of compliance with the operator’s duty of care rebut[ted] the presumption of fault and thereby exonerate[d] the operator from liability.”²⁹²

138. Perenco further argued that:

[...] Ecuador does not explain why Articles 20 and 91 of the 1998 Constitution, which concern the vicarious liability of the State for the

²⁸⁶ 1st Expert Report of René Bedón, paragraph 60, quoting from Exhibit EL-145, p 28 [Italics in original]; Rejoinder, paragraphs 309-311.

²⁸⁷ Exhibit CA-CC-32, *Medardo Luna v. AECA*, Supreme Court of Justice, First Civil and Commercial Chamber, February 5, 2004 (“*Medardo Luna*”); 1st Expert Report of René Bedón, paragraph 62; Claimant’s Counter-Memorial, paragraph 212; Rejoinder, paragraph 312.

²⁸⁸ Exhibit CA-CC-32, *Medardo Luna* [Emphasis in original]; 1st Expert Report of René Bedón, paragraph 62.

²⁸⁹ “That case affirmed the meaning of *Delfina Torres*, namely, that in cases involving hazardous activities, the operator would be exonerated from liability if it can ‘prove that all care and precautions necessary have been observed so as to avoid the accident that has caused said damage[.]’”: Rejoinder, paragraph 312; referring to Exhibit CA-CC-32, p 4. [Emphasis in original.] Rejoinder, paragraph 313.

²⁹⁰ Rejoinder, paragraph 315, citing from CA-CC-42, *Andrade Medina v. Empresa Eléctrica Manabí S.A. (EMELMANABÍ)*, Supreme Court of Justice, Contentious Administrative Chamber, published in Judicial Gazette No. 4 of April 11, 2007 (“*Andrade Medina*”), pp 6-7.

²⁹¹ Rejoinder, paragraphs 309-317 (“The Court [in *Delfina Torres*] made clear that the rule involved ‘reversing the burden of proof’ such that ‘guilt is presumed’ rebuttably (*iuris tantum*). That the Court described this as a ‘*iuris tantum*’ presumption disproves conclusively the contention of Ecuador and its expert that *Delfina Torres* applied an ‘irrebuttable’ presumption of fault.”).

²⁹² Rejoinder, paragraphs 314-315.

acts of its public servants or agents or for the defective provisions of a public service, are applicable to the Consortium's activities. Both the express text of those provisions and the very decision cited by Ecuador, *Andrade Medina*, confirm that this administrative liability regime applie[d] *only* to harm caused by the State or its public servants or agents.²⁹³

139. Thus, Perenco submitted it is able to prove that it satisfied its duty of care, comprising the standard of care expected of a reasonably prudent operator,²⁹⁴ because it consistently complied with contractual and regulatory requirements to report, audit and remediate.²⁹⁵

140. In the alternative, should the Tribunal consider that the counterclaim was governed by a strict liability regime, Perenco submitted that Ecuador still had to prove that Perenco had caused environmental harm (consisting of regulatory exceedances of contaminants) by engaging in “wrongful (negligent or malicious)” conduct, and not just that there was environmental damage in Blocks 7 and 21 (the very existence of which, to a large extent, Perenco disputed).²⁹⁶

141. Perenco submitted that it was insufficient for Ecuador to allege there has been an *impact* in the environment of Blocks 7 and 21 in order to shift the burden to Perenco to offer proof of its insignificance.²⁹⁷ In its view, in the course of its submissions Ecuador had conceded that the burden rested on the claimant in an action for environmental liability in a strict liability regime to establish the existence of environmental harm.²⁹⁸ Referring to the testimony of Professor Crespo, as set out above, Ecuador's case at its highest is that it was required to “only establish *the existence of the environmental damage* in Blocks 7 and 21, where Perenco operated” for Perenco to be held liable.²⁹⁹ In its written pleadings, Ecuador contended it “need only establish the *existence of the environmental damage*” or “that environmental harm *exists*.”³⁰⁰ Ecuador could not retreat from this by claiming that Article 397(1) of the 2008 Constitution shifted the burden of proof to the Perenco to prove the inexistence of harm in such a way that it relieved Ecuador of the duty to first establish that harm actually exists.³⁰¹

142. Finally, on the issue of temporality, relying on Dr. Bedón's report, Perenco maintained that the law which applied in an environmental claim was the law in force at the date of the occurrence of the act alleged to have caused harm, rather than the law in force at the point of time that the harm was purportedly discovered.³⁰² Dr. Bedón responded in this respect to Professor Crespo's view that the relevant date for determining Perenco's liability was November

²⁹³ Rejoinder, paragraph 316 [Emphasis in original.].

²⁹⁴ Claimant's Counter-Memorial, paragraph 498-504.

²⁹⁵ Claimant's Counter-Memorial, paragraphs 498-504; Rejoinder, paragraphs 289-297 cf. Reply, section 3.3.

²⁹⁶ Claimant's Counter-Memorial, paragraph 190, taken from the 1st report of its legal expert Dr René Bedón, at paragraph 49; Rejoinder, paragraphs 75-79 cf. Reply, paragraphs 361-367.

²⁹⁷ Rejoinder, paragraphs 75-79 [Emphasis added.].

²⁹⁸ Rejoinder, paragraphs 75-79.

²⁹⁹ Ecuador's Counter-Memorial, paragraphs 654, 672 [Emphasis added.].

³⁰⁰ Supplemental Memorial, paragraph 4 [Emphasis added.]; Ecuador's Counter-Memorial, paragraph 409 [Emphasis added.].

³⁰¹ Rejoinder, paragraphs 78; 242-251.

³⁰² 1st Expert Report of René Bedón, paragraphs 77-82; Claimant's Counter-Memorial, paragraphs 206-210.

2011, the time of IEMS' first inspection of the Blocks, and that since this followed the 2008 Constitution's entry into force, the Constitution's strict liability regime was engaged.³⁰³

143. Dr. Bedón asserted that the principle on which he relied, namely, that "the fact that determines the applicable law is the date of the *occurrence* of the act", was validated by the statute of limitations rules governing torts in Ecuador, "which establishe[d] that the statute of limitations is counted from the date *on which the allegedly harmful act occurred*."³⁰⁴ He referred in this respect to Article 2235 of Ecuador's Civil Code which provides for a "statute of limitations of four years, *counted from the perpetration of the act*."³⁰⁵

144. Any other approach, Perenco contended, would be contrary to the basic principle of non-retroactivity that exists under Ecuadorian law as accepted by Ecuador in the course of its submissions in this arbitration.³⁰⁶ It rejects any suggestion that an exception should be made on the basis that claims for environmental liability are advanced in the "general interest of nature and the Ecuadorian general public."³⁰⁷ This is not a position provided for in Ecuador's 2008 Constitution or in any decisions of its courts.³⁰⁸ There is "no basis on which to derogate from the express constitutional principle of non-retroactivity."³⁰⁹ Consequently, the strict liability regime of the 2008 Constitution should not be applied to conduct occurring prior to its entry into force on 20 October 2008.³¹⁰

145. In sum, Perenco argued that it could not be held liable for any damage occurring after the July 2009 takeover or before January 2007 (the furthest back in time that Ecuador's four-year statute of limitations permitted a claim to be made).³¹¹

(2) Burden of Proof in Relation to Causation

146. The Parties also diverged on the matter of causation. In light of Ecuador's position that the 2008 Constitution continued a strict liability regime that was already in force since 2002, it argued that while it bore the burden of presenting evidence of environmental "impact" in the Blocks, it was not, either prior to or after the 2008 Constitution, required to demonstrate that the defendant had caused the exceedances claimed in order for it to be found liable.³¹²

147. Perenco disagreed. It maintained that whether before or after the 2008 Constitution, the State was required to demonstrate causation. It acknowledged that under the post-2008 strict

³⁰³ 1st Expert Report of René Bedón, paragraphs 77-82 cf. 1st Expert Report of Ricardo Crespo Plaza, paragraphs 37-41; Claimant's Counter-Memorial, paragraphs 205-229.

³⁰⁴ Claimant's Counter-Memorial, paragraph 208 [Italics in original]; see 1st Expert Report of René Bedón, paragraph 78.

³⁰⁵ Exhibit CA-CC-38, Ecuadorian Civil Code, published in Official Registry No. 46 of June 24, 2005 ("Civil Code") [Emphasis added.]; 1st Expert Report of René Bedón, paragraph 78.

³⁰⁶ Rejoinder, paragraphs 318-328.

³⁰⁷ Rejoinder, paragraph 320; cf. Ecuador's Counter-Memorial, paragraphs 336 and 338.

³⁰⁸ Rejoinder, paragraph 321. Perenco argued against the authoritative nature of jurisprudence from other jurisdictions: Rejoinder, paragraphs 323-325.

³⁰⁹ Rejoinder, paragraph 327.

³¹⁰ Rejoinder, paragraph 328.

³¹¹ Claimant's Counter-Memorial, paragraphs 21-24; 190-198.

³¹² See, for e.g., Transcript, Hearing on Counterclaims, Day 1, p 21 (Opening Statement of Sr. Procurador Diego García Carrión ("The strict liability system of the 2008 Constitution does not take into account the notion of guilt and this link of causality is presumed.")).

liability regime, it sufficed if the State demonstrated the incidence of “wrongful (negligent or malicious)” conduct coupled with proof of the existence of environmental damage; this would trigger the operation of a presumption of causation.

148. Ecuador submitted that “both under the 2008 Ecuadorian Constitution and under the prior environmental liability regime, it may be presumed that operators of inherently dangerous activities caused any environmental harm found in the area of their operations of the kind that potentially result from such activities.”³¹³ It relied on the evidence of Professors Crespo and Andrade. The latter asserted that “the presumption of fault in the *Delfina Torres* decision, which accepted the theory of risk, implies in fact two distinct presumptions: one irrebuttable presumption of the existence of fault regarding hazardous activities and *another rebuttable presumption with regards to causation, pursuant to which one may be exempted from one’s environmental liability by proving that the harm was caused by another.*”³¹⁴

149. As for Professor Crespo, his expert evidence was that under a strict liability regime, causation is presumed. He cited the drafting history of the 2008 Convention, where the Working Group on Natural Resources and Biodiversity referred to a “presumption of innocence...in favour of the environment” and explained that, consequently, the “plaintiff will not be required to prove the causality link, which will fall on the defendant.”³¹⁵ On cross-examination, he clarified that it was not the case that causation has been done away with. Instead, it was that Ecuador had to prove that there was environmental harm (“an alteration; that is, a modification with a negative impact of the environment”)³¹⁶ and that an operator had been operating in the area where the harm was found in order to trigger the presumption that that operator was responsible for the harm created.³¹⁷ Professor Crespo was pressed further on the issue of burden of proof in the course of his oral evidence. He testified that the victim of the harm “should show that there is a negative environmental impact in the area of operation” and “with the indication of a negative environmental impact, the other Party has to prove that that damage does not exist or doesn’t have causation” on the basis of the exceptions discussed.³¹⁸

150. Ecuador further submitted that this approach to the burden of proof in relation to causation of environmental harm is consistent with what was provided for under the Participation Contracts. Clause 5.1.20.10 of the Block 7 Participation Contract provided that “[t]he Contractor shall not be liable for environmental conditions preexisting at the beginning of operations under

³¹³ Reply, paragraph 371.

³¹⁴ Expert Report of Fabián Andrade Narváez, paragraph 58 as cited in Reply, paragraph 372.

³¹⁵ 1st Expert Report of Ricardo Crespo Plaza, Annex 9, Constituent Assembly of Ecuador, Final Report of Working Group 5 on Natural Resources and Biodiversity, 2008, p 17; 1st Expert Report of Ricardo Crespo Plaza, paragraph 35. The quote follows on to add: “This principle eliminates one of the barriers hindering access to environmental justice as is the cost of evidence and the technical requirement of providing environmental harm.” See also, Transcript, Hearing on Counterclaims, Day 1, p 29, lines 9-18 (Opening Statement of Pierre Mayer).

³¹⁶ Transcript, Hearing on Counterclaims, Day 1, p 30 (the language used by Ecuador in the hearings).

³¹⁷ Transcript, Hearing on Counterclaims, Day 4, p 931 (Testimony of Ricardo Crespo Plaza).

³¹⁸ Transcript, Hearing on Counterclaims, Day 4, pp 934-936 (Testimony of Ricardo Crespo Plaza). Similarly, in the event that the existence of liability is conceded, but the cost of remediation is disputed, Professor Crespo’s position was that the burden rested on the operator who has been found liable to prove the non-existence of the full extent of damage claimed.

the Services Contract”,³¹⁹ and Clause 5.1.20, second paragraph, of the Block 21 Participation Contract similarly provided “[t]he Contractor shall not be responsible for pre-existing environmental conditions at the beginning of operations under the Services Contract.”³²⁰ In its view, this suggested, first, that the Contracts intended that the Contractor shall be held liable for any and all environmental conditions in the Blocks for the duration of the Contracts. Second, since this is a limitation on the Contractor’s liability, and whether prior to or after the 2008 Constitution’s entry into force, the burden rested on the operator to establish any exception or limitation in its favour: “while the Contractor’s liability for environmental damage under the Participation Contracts [did] not extend to conditions existing prior to the execution of the Block 7 Services Contract (18 December 1985) and Block 21 Participation Contract (20 March 1995), it is for the Contractor to prove that such limitations apply in the instant case.”³²¹

151. Turning to the evidence, Ecuador submitted that IEMS’ evidence demonstrated that the hydrocarbons operations had a significant impact on the environment in Blocks 7 and 21. This triggered the presumption that Perenco was liable, and Perenco had not discharged its burden of disproving that it had caused the harm (or that another available defence could be made out). Ecuador contended that Perenco did not dispute that the oil operations it conducted were hazardous or high-risk and likely to cause contamination of the environment, only that *all* the contamination found in Blocks 7 and 21 might not necessarily be associated with oilfield operations.³²²

152. Ecuador further contended that Perenco’s expert, GSI, applied “indicator parameters” so as to distinguish between exceedances that could be attributed to hydrocarbon operations as opposed to those which could not be linked to hydrocarbon operations, and in doing so used the indicia of Total Petroleum Hydrocarbons (“TPH”) and barium only, while excluding testing for heavy metals.³²³ Ecuador asserted that this approach flew in the face of Ecuador’s environmental regulations for hydrocarbon operations (such as RAOHE) which included permissible contamination limits for all other heavy metals: lead, nickel, cadmium and vanadium *etc.*³²⁴

153. For its part, Perenco submitted that regardless of whether the applicable legal regime was a fault-based or a strict liability regime, Ecuador had conceded that it bore the burden of establishing that it had “suffered harm.”³²⁵ Under the pre-2008 regime, the existence of harm was a “separate and necessary predicate to tortious liability.”³²⁶ The claimant in a tortious action

³¹⁹ Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), PER 04764, 04768, 04769.

³²⁰ Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), PER 04659.

³²¹ Reply, paragraphs 383-388.

³²² Reply, paragraph 378

³²³ Reply, paragraph 378, referring to GSI ER I, paragraph 225.

³²⁴ Reply, paragraphs 379-380.

³²⁵ Claimant’s Counter-Memorial, paragraphs 214-217, referring to statement made by Ecuador in its Supplemental Memorial, paragraph 4, and Crespo in his first expert report at paragraph 91; Rejoinder, paragraphs 241-242.

³²⁶ Claimant’s Counter-Memorial, paragraphs 215, 222-229.

was required to demonstrate a “causal nexus between the tortfeasor’s actions and the harm for an action in tortious liability to succeed.”³²⁷

154. Even under the post-2008 regime, causation remained a critical element.³²⁸ Perenco contended Ecuador and its legal experts acknowledged this in the course of their submissions, with Professor Andrade stating that “the causal link, as a condition for liability, does not disappear in environmental matters, either under the strict liability regime of the 2008 Constitution or under the previous regime.”³²⁹ Perenco emphasised that Article 396 of the 2008 Constitution provides that “[e]ach of the participants...shall be directly liable for...repairing the damages *it has caused*[.]”³³⁰

155. Rather than a rebuttable presumption of causation in favour of the environment, the burden being on the operator to challenge the presumption, Perenco submitted that the burden, first and foremost, remained on Ecuador to “affirmatively *prove* the existence of a causal link.”³³¹ Perenco’s legal expert challenged the applicability of the Ecuadorian judicial decisions relied upon by Ecuador to argue that a strict liability regime existed prior to the 2008 Constitution, submitting instead that they stood for the proposition that in order for a presumption to arise, the State is required to establish causation.³³² Ecuador could not retract from its position that this regime then carried over to the 2008 Constitution.

156. In the *Medardo Luna* case, Ecuador’s Supreme Court stated “the harmed party must...demonstrate: the fact, the damage, and *the relationship of causal link among them*[.]”³³³ In *Delfina Torres*, the Court held that “[t]he claimant had to prove: a) the harm of which it claims it is a victim; b) its amount or quantum; and c) *the events that caused such harm*.”³³⁴ Professor Crespo concluded that a claim for environmental damage is made out where “the State has proven: the *occurrence* of environmental damage, and [t]hat the operator/defendant performed any of the activities described in Articles 397 or 408 of the Constitution [..]”³³⁵

157. Perenco interpreted the use of the word “occurrence” as an affirmation of the requirement that the State must prove causation. Dr. Bedón opined that this burden required Ecuador to prove, both in law and in fact that there was an impact on the environment that exceeded the

³²⁷ Claimant’s Counter-Memorial, paragraph 222, referring to 1st Expert Report of René Bedón, paragraphs 54-55, 67-69, 82 cf. the evidence of Professor Crespo in his first expert report at paragraphs 80, 101-102.

³²⁸ Claimant’s Counter-Memorial, paragraphs 222-226 c.f. Reply, paragraph 10; Rejoinder, paragraphs 242-271.

³²⁹ Rejoinder, paragraph 244; citing Expert Report of Fabián Andrade Narváez, paragraph 63.

³³⁰ Claimant’s Counter-Memorial, paragraph 226 [Emphasis of the Claimant], referring to Exhibit EL-89, 2008 Constitution, p 123 of PDF.

³³¹ Rejoinder, paragraph 246 [Emphasis added.].

³³² 1st Expert Report of René Bedón, paragraphs 60-63.

³³³ Exhibit CA-CC-32, *Medardo Luna*, p 4; Claimant’s Counter-Memorial, paragraph 215.

³³⁴ Exhibit EL-145, *Delfina Torres*, p 32.

³³⁵ 1st Expert Report of Ricardo Crespo Plaza, paragraph 91. Article 397 of the 2008 Constitution does not list specific activities (see above where the provision is quoted). Article 408 states “non-renewable natural resources and, in general, the products of the subsoil, mineral deposits and hydrocarbons reservoirs, substances with a nature other than that of soil, even those found in areas covered by waters of the territorial seas and maritime zones, as well as the biodiversity and its genetic patrimony and the radioelectric spectrum, are of the State’s inalienable, imprescriptible and unseizable property. These goods may only be exploited in strict compliance with the environmental principles set forth in the Constitution.”

permissible regulatory limits, and that this could be attributed to the operator.³³⁶ He claimed that Ecuador's argument, that there was a presumption of causation that Perenco was required to rebut, was based on a misreading of *Delfina Torres*.³³⁷ The court, in his view, "established a presumption of breach of the duty of care, and not of causation"³³⁸ and he cited the following passage from the decision in *Delfina Torres* in support of this view:

Harm, as a factual phenomenon, is different from legal damage. The latter arises only when certain essential features are met, which must concur to the detriment or impairment of the harmed party. The harm is legal and, as such, shall be able to be redressed when certain. Certainty of its existence is an essential assumption, as harm, for the purposes of liability, is anywhere its existence has been scientifically proven. Hypothetical or future harm cannot be compensated. In these matters, claiming harm in the abstract or its mere possibility is not enough, real and effectively suffered harm must be proven; harm that has not been demonstrated procedurally, with evidentiary elements which externalize a harm, does not legally exist.³³⁹

158. This was consistent with the provisions of the Participation Contracts which, in Perenco's view, "exonerate the Claimant from responsibility for harm caused by others."³⁴⁰ They provided that the operator would not be "responsible for pre-existing environmental conditions" preceding the start of the participation contract in the case of Block 21 and the service contract in the case of Block 7.³⁴¹ Moreover, Clause 5.1.19 of the Block 21 Contract provided that the "Contractor shall not be responsible for changes to the ecosystem caused by third parties within the Contract Area."³⁴² Clause 5.7.3 of the Block 7 Contract stated that "[i]n performing this Contract, neither party shall be liable for damages...unless the damage...was caused by the Party's own acts."³⁴³

159. Perenco submitted that Ecuador had failed to discharge its burden of demonstrating that the harm that it alleged existed in the Blocks could be traced back to the Consortium's

³³⁶ 1st Expert Report of René Bedón, paragraph 18.

³³⁷ Rejoinder, paragraph 246; 2nd Expert Report of René Bedón, paragraphs 133-137.

³³⁸ 2nd Expert Report of René Bedón, paragraphs 133-136; Rejoinder, paragraph 246.

³³⁹ Exhibit EL-145, *Delfina Torres* as quoted in footnote 18 of 1st Expert Report of René Bedón, paragraph 18 for the point that "[f]rom a legal standpoint, the concept of 'environmental damage' is a key component in the correct analysis of environmental liability in Ecuador."

³⁴⁰ Rejoinder, paragraph 248.

³⁴¹ Clause 5.1.20 of Block 21 Contract (Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12)) and Clause 5.1.20.10 of the Block 7 Contract (Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12)).

³⁴² Clause 5.1.19 in full: "While conducting the operations, the Contractor shall take every necessary measure to ensure the preservation and safety of lives and properties and preserve the environment. The above notwithstanding, the Contractor shall not be responsible for changes to the ecosystem caused by third parties within the Contract Area." (Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), PER04659)

³⁴³ Clause 5.7.3 in full: "In performing this Contract, neither party shall be liable for damages, including the death or illness of any person employed by the other Party, including employees, representatives and subcontractors and/or damage to any property owned or used by the other Party, unless the damage, death or illness was caused by the Party's own acts. Each Party shall defend the other Party and hold the other Party harmless in the event of any claim resulting from the situations referred to above." (Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), PER04783)

activities.³⁴⁴ Moreover, it contended that “[e]ven though it [was] not Claimant’s burden to disprove causation, historical records demonstrate that Ecuador’s own State oil companies caused much of the damage of which it now complains – either in the period prior to assumption of operations by private contractors or in the period since July 2009, when it took over operation of the Blocks.”³⁴⁵ It stated that GSI had located and provided to the Tribunal “substantial evidence – not mere allegations, as Ecuador assert[ed] – that Ecuador or other operators caused a significant portion of the damages about which it now complains”, providing as examples the Payamino 2-8 contamination which it contended could be traced back to CEPE³⁴⁶, and to Petroecuador in the case of the *Chalá* swamp in Coca CPF.³⁴⁷

(3) Liability of operators *inter se*

160. Ecuador submitted that under its law “all the authors of a tort [...] are jointly liable to its victim.”³⁴⁸ Thus, it was entitled to proceed against Perenco or Burlington “or any author of the environmental harm caused” and “[h]ow the different authors of the environmental harm should ultimately share liability and pay money back to each other [was] a matter of no concern to Ecuador.”³⁴⁹ (It also rejected any attempt to lay blame on CEPE (now Petroecuador) or *Petroproducción* for this reason, adding that in any event since they possessed “their own legal personality” they were “therefore third parties to the instant dispute, as different entities from the Ecuadorian State.”³⁵⁰)

161. Ecuador referred to Article 396, paragraph 3, of the 2008 Constitution, which provides in relevant part that “[e]ach of the participants in the processes of production, distribution, commercialization and usage of goods and services shall be directly liable for preventing any environmental impact, for mitigating and repairing the harm that *it has caused* [...]”³⁵¹ This indicated that the operator shall be held liable “for the damages it has caused and will not be liable for the damages another participant has caused.” However, “since there is a presumption of causation that links each element of damage to each participant, it follows that it is for each participant, for the [Claimant] to prove that a certain damage was caused, not by [it], but exclusively by another participant.”³⁵²

162. Perenco responded that joint and several liability applied only where the actors at issue had contributed to the *same* act for which their liability had otherwise been established. It did not apply to successive operators whose actions were factually distinguishable from each other.³⁵³ Perenco could not be held liable for harm that had been caused exclusively by other operators

³⁴⁴ Claimant’s Counter-Memorial, section III.B, paragraphs 434-487.

³⁴⁵ Claimant’s Counter-Memorial, paragraphs 194 [Italics in original], 218-221, Part III, Section B; Rejoinder, paragraphs 241-275.

³⁴⁶ Rejoinder, paragraphs 255-272.

³⁴⁷ Rejoinder, paragraphs 253-275.

³⁴⁸ Reply, paragraph 8.

³⁴⁹ Reply, paragraphs 8, 422.

³⁵⁰ Reply, paragraphs 9, 429-435, citing the Tribunal’s Decision on Jurisdiction.

³⁵¹ Exhibit EL-89, 2008 Constitution [Emphasis added.].

³⁵² Transcript, Hearing on Counterclaims, Day 1, pp 31-32 (Opening Statement of Pierre Mayer).

³⁵³ Rejoinder, paragraphs 277-283 [Emphasis added.]; 2nd Expert Report of René Bedón, paragraphs 113-118.

and especially by *prior* operators as this has been specifically excluded by operation of clauses 5.1.20 (Block 21) and 5.1.20.10 (Block 7) of the Participation Contracts.³⁵⁴

163. Perenco further contended “if [Ecuador’s] conception of joint and several liability is accepted, Ecuador’s State-owned oil companies would be jointly and severally liable for all of the environmental harm that allegedly exists in the Blocks.”³⁵⁵ It submitted that this was the result in principle regardless of whether the Tribunal could in fact act on the principle and pronounce upon that liability by exercising jurisdiction over them.³⁵⁶

164. Recalling Article 396, paragraph 3, of the Constitution, the experts disagreed on the significance of this provision in the context of oil blocks that have been worked by different operators over their life-span.

165. Professor Andrade explained that under Ecuadorian law, where the environmental harm may be attributed to several polluters, each of them is jointly liable for the full amount of the relevant harm.³⁵⁷ In this regard, he cited Article 2217 of the Civil Code which states that “[i]f a willful or negligent tort has been committed by two or more people, each one of them shall be jointly and severally liable for any loss resulting from said willful or negligent tort.”³⁵⁸ This principle existed in Ecuadorian law prior to the 2008 Constitution.³⁵⁹

166. Professor Andrade further asserted that tribunals possessed a broad discretion to establish the proportion of liability of each of the participants in causing the contamination, applying criteria such as the length of time of their operations and their intensity, but that this required the tribunal to exercise jurisdiction over the participants and that was not the case in this instance.³⁶⁰ This related to Perenco’s submission that State-linked or owned oil companies bore some extent of liability in several instances of alleged contamination in Blocks 7 and 21.³⁶¹ Ecuador submitted that Perenco’s contention ignored the fact that CEPE, *Petroproducción* and Petroamazonas were entities that were distinct and independent from the Ecuadorian State and as such their conduct could not be attributed to it.³⁶² In any event, the Tribunal has determined that it does not have jurisdiction over these entities in this arbitration.³⁶³

167. During the course of his examination, Professor Crespo testified that in the instance where there have been successive operators managing the Blocks, their liability is governed by the principle of joint and several liability. The State was entitled to proceed against one of the operators, and then “he can go to the others and ask for their portion.”³⁶⁴ He added that this was

³⁵⁴ Rejoinder, paragraphs 277-283.

³⁵⁵ Rejoinder, paragraphs 283-287; Transcript, Hearing on Counterclaims, Day 4, p 932 (Testimony of Ricardo Crespo Plaza).

³⁵⁶ Rejoinder, paragraphs 283-287. Perenco submitted that the Tribunal has held, and Ecuador has treated, Petroecuador as its agent.

³⁵⁷ Expert Report of Fabián Andrade Narváez, paragraphs 72-79; Reply, paragraphs 423-427.

³⁵⁸ Exhibit CA-CC-38, Civil Code. (translation resubmitted on 10-16-2013)

³⁵⁹ Expert Report of Fabián Andrade Narváez, paragraph 74, referring Exhibit EL-145, *Delfina Torres*, p 38.

³⁶⁰ Reply, paragraphs 427-435.

³⁶¹ Claimant’s Counter Memorial, paragraphs 434-487.

³⁶² Reply, paragraphs 429-435.

³⁶³ Reply, paragraphs 429-435 referring to the Decision on Jurisdiction, paragraph 219.

³⁶⁴ Transcript, Hearing on Counterclaims, Day 4, pp 940-941 (Testimony of Ricardo Crespo Plaza).

the case “irrespective of whether [the operator] acted within the requirements of the law throughout the time of [its] stewardship of the resource.”³⁶⁵

(4) Imprescriptibility

168. Ecuador submitted in the first instance that under the 2008 Constitution environmental claims were deemed imprescriptible i.e., not subject to limitation periods.³⁶⁶ In the alternative, Ecuador submitted that the 2008 Constitution applied to any harm *discovered* after its entry into force (the “discovery rule”) and it was the date of discovery of environmental harm that mattered for statute of limitation purposes.³⁶⁷

169. Ecuador noted that Article 396, paragraph 4, of the Constitution provides that “[l]egal actions to prosecute and sanction environmental harm shall be imprescriptible.”³⁶⁸ It also adverted to the decisions of the Ecuadorian Supreme Court of Justice in *Nelson Alcívar*³⁶⁹ and *Delfina Torres*³⁷⁰ to suggest that environmental tort claims cannot expire and that even if there were a statute of limitations, the limitation period would begin to run only as of the date that the harm was discovered.³⁷¹ In *Nelson Alcívar*, the Provincial Court of Justice of Sucumbíos declared that Article 396, paragraph 4, of the Constitution (on imprescriptibility) applied despite the fact that the relevant conduct occurred before the 2008 Constitution entered into force.³⁷² In *Delfina Torres*, the Supreme Court of Justice of Ecuador recognised that the statute of limitations began to run not from the date on which the damage was perpetrated but the date on which it

³⁶⁵ Transcript, Hearing on Counterclaims, Day 4, pp 941-942 (Testimony of Ricardo Crespo Plaza).

³⁶⁶ Reply, section 3.4.1.1.

³⁶⁷ Transcript, Hearing on Counterclaims, Day 1, pp 41-43 (Opening Statement of Eduardo Silva Romero) cf. Transcript, Hearing on Counterclaims, Day 1, p 195 (Opening Statement of Mark Friedman); Reply, sections 3.4.1.1 and 3.4.1.2.

³⁶⁸ Exhibit EL-89, 2008 Constitution, (partial translation resubmitted on 10-18-2013). Ecuador further relied on Article 11(3) of the Constitution, emphasising that it provided that its provisions were of “direct and immediate application”. “The rights and guarantees set forth in the Constitution and in international human rights instruments shall be of direct and immediate application by and before any public, administrative or judicial servant, *ex officio* or upon request by a party.” (Unofficial translation from Spanish original: “[l]os derechos y garantías establecidos en la Constitución y en los instrumentos internacionales de derechos humanos serán de directa e inmediata aplicación por y ante cualquier servidor público, administrativo o judicial, de oficio o a petición de parte”). Supplemental Memorial, paragraphs 12-23.

³⁶⁹ Judgment of the Provincial Court of Justice of Sucumbíos, *Nelson Alcívar Cadena y Otro c. Compañía de Oleoductos de Crudos Pesados (OCP)* (“*Nelson Alcívar*”), Annex No. 29 to Expert Report of Fabián Andrade Narváez. Transcript, Hearing on Counterclaims, Day 1, pp 41-43 (Opening Statement of Eduardo Silva Romero); Ecuador submitted this approach had been recognised by Ecuadorian courts, relying on the decision in *Nelson Alcívar* which it claimed stood for the proposition that the 2008 Constitution applied “to all claims filed after its entry into force and not just to harm discovered after that date.” Transcript, Hearing on Counterclaims, Day 1, pp 44-46 (Opening Statement of Eduardo Silva Romero). Dr. Silva Romero quoted from the decision, that “[t]he environmental action protects a common good that is essential to humanity’s existence, and, therefore, it is logical that the current Constitution does not contemplate a term for a statute of limitations for this type of action...”.

³⁷⁰ Exhibit EL-145, *Delfina Torres*.

³⁷¹ Transcript, Hearing on Counterclaims, Day 1, pp 50-51 (Opening Statement of Eduardo Silva Romero).

³⁷² Exhibit EL-145, *Delfina Torres*; Transcript, Hearing on Counterclaims, Day 1, p 44, lines 1 to p 45, line 5 (Opening Statement of Eduardo Silva Romero). Professor Andrade referred to the academic writing of A. Vidal Olivares in “*Las acciones emanadas del dano ambiental y el régimen de responsabilidad aplicable*”, nº 4, Julio 2007, nota 20, Annex No. 32 to Expert Report of Fabián Andrade Narváez: “The authors agree that when damage manifests itself after the illicit action is verified; the statute of limitations should be calculated from the manifestation of the damage.”

could be discerned.³⁷³ It emphasised that any doubts regarding the interpretation of the applicability of the 2008 Constitution and its provision on imprescriptibility should be resolved “in favour of environmental protection,”³⁷⁴ relying on the following passage from *Nelson Alcívar*:

“It must be emphasized that, on account of the constitutional principle that states that in doubt the rule that most favours environmental protection shall apply, because it is a norm that generates ample protection for the environment it always falls to apply what is foreseen in the current Constitution, over and above the provisions of the Environmental Management Law or the 1998 Constitution. In addition, the provisions of the current Constitution in all that relates to environmental issues and environmental protection should be preferably applied, given that, in procedural matters, the rules in force at the time of filing the action apply, and not those in force when the legal situation arose.”³⁷⁵

170. In this regard, Ecuador’s experts, Professors Crespo and Andrade, submitted that it was the date of discovery or the “verification” of environmental harm that mattered for limitation purposes.³⁷⁶ It was the “very nature of environmental harm require[d] that this be so.”³⁷⁷

“...unlike traditional, simple figures of torts, the effects of soil and groundwater pollution are not immediately manifest. Instead, they surface progressively over a long period of time. Verification requires extensive tests and scientific analyses. Without these, the environmental damage remains for the most part invisible. Thus, if the relevant date for limitation purposes were the moment the damaging act occurred, in most occasions environmental liability would simply become unenforceable.”

171. Since in this case the harm was discovered in 2011 after the 2008 Constitution and its provision regarding imprescriptibility entered into force, Perenco’s submission that the 4-year limitation under Article 2235 of the Ecuadorian Civil Code applied to bar claims for damage occurring over 4 years before the counterclaim was filed could carry no weight.³⁷⁸ In any event, less than 4 years elapsed between the discovery of the environmental harm and the filing of the present counterclaim.³⁷⁹

172. Ecuador submitted in the further alternative that environmental harm is susceptible to the “general principle of tort law” that recognises “continuing torts”, defined as “civil wrongs committed not at a specific point in time but continuously throughout a certain period” and which are thus considered “to have occurred at the moment when the wrongful conduct ceases.”³⁸⁰ The limitation period can only start to run from the date that the wrongful conduct is

³⁷³ Transcript, Hearing on Counterclaims, Day 1, p 52 (Opening Statement of Eduardo Silva Romero).

³⁷⁴ Transcript, Hearing on Counterclaims, Day 1, p 45 (Opening Statement of Eduardo Silva Romero).

³⁷⁵ Annex No. 29 to Expert Report of Fabián Andrade Narváez (partial translation resubmitted on 10-18-2013), *Nelson Alcívar*; Expert Report of Fabián Andrade Narváez, paragraph 29.

³⁷⁶ Reply, paragraph 14.

³⁷⁷ Reply, paragraph 398.

³⁷⁸ Reply, paragraph 14.

³⁷⁹ Reply, paragraph 14; Expert Report of Fabián Andrade Narváez.

³⁸⁰ Reply, paragraph 326, section 3.4.1.3.

deemed to have ceased.³⁸¹ As a result, since the harm in this case is “not the result of an individual act...but rather the accumulated result of the entirety of the low-cost oil operation” conducted by Perenco from 2002 to 2009, the wrong is deemed to have been committed as of 2009, when Perenco left the Blocks, and a year after the 2008 Constitution’s entry into force.³⁸²

173. Ecuador also invoked Article 11(3) of the 2008 Constitution, namely, that “[t]he rights and guarantees set forth in the Constitution...shall be of *direct and immediate application* by and before any public, administrative or judicial servant, *ex officio* or upon request by a party.”³⁸³ It used this to contend in the alternative that the relevant point of time was the time the claim was filed rather than the time the claim was said to have arisen (i.e., discovered).³⁸⁴

174. In other words, the 2008 Constitution and its provision on imprescriptibility applied without limitation to the claims advanced in this arbitration because they were filed after it entered into force in October 2008.³⁸⁵ Ecuador further contended that the strict liability regime put into place by Article 396 of the Constitution indicated, by the choice of strict as opposed to a fault-based liability, that the intention was to home in on the existence of harm rather than the chain of causation leading to the harm.³⁸⁶

175. Also in the alternative, Ecuador argued that if the Tribunal was not convinced by the ‘discovery rule’, the principle of ‘continuing torts’ or the consequence of Article 11(3), with the result that the imprescriptibility of the strict liability regime only took effect in 2008, the Constitution’s prohibition on retroactive application did not apply to laws aimed at a public interest, such as laws “issued to protect broad sectors of the public which are considered to be in a vulnerable situation, *vis-a-vis* other sectors of society.”³⁸⁷ In its submission, the 2008

³⁸¹ Reply, paragraph 330; relying on Expert Report of Fabián Andrade Narváez, paragraph 51; and the work of M. Peña Chacón, “*Daño ambiental y prescripción*”, published in *Revista electrónica de Derecho Ambiental No. 19*, July 2009 (Annex No. 31).

³⁸² Reply, paragraphs 325-331.

³⁸³ Exhibit EL-89, 2008 Constitution, (partial translation resubmitted on 10-18-2013) [Emphasis added].

³⁸⁴ Reply, paragraph 396.

³⁸⁵ Reply, paragraph 396.

³⁸⁶ Transcript, Hearing on Counterclaim, Day 1, pp 41-43 (Opening Statement of Eduardo Silva Romero): “First, from the perspective of the conditions for liability, fault-based liability requires, as its name indicates, proof of fault. For strict liability, fault is indifferent. Second...from the perspective this time of the object of the rule of liability, fault-based liability regulates conduct; whereas, strict liability is addressed at harm...from the perspective of the function, fault-based liability seeks to prevent faulty or illegal conduct. Strict liability seeks to guarantee the reparation of the harm under all circumstances.” Ecuador submitted this approach had been recognised by Ecuadorian courts, relying on the decision in *Nelson Alcívar* (Expert Report of Fabián Andrade Narváez, Annex 29) which it claimed stood for the proposition that the 2008 Constitution applied “to all claims filed after its entry into force and not just to harm discovered after that date.” Transcript, Hearing on Counterclaims, Day 1, pp 44-46 (Opening Statement of Eduardo Silva Romero). Dr. Silva Romero quoted from the decision, that “[t]he environmental action protects a common good that is essential to humanity’s existence, and, therefore, it is logical that the current Constitution does not contemplate a term for a statute of limitations for this type of action...”

³⁸⁷ Reply, section 3.2.3; Transcript, Hearing on Counterclaims, Day 1, pp 47-48 (Opening Statement of Eduardo Silva Romero). Ecuador relied on the judgment of the Supreme Court of Justice of Ecuador in *Baquerizo v. Shulton*, 25 September 2003 (Exhibit CA-CC-29): “It is true that the majority of the laws of public order are applied with a retroactive effect because they affect the general interest of the collective public...those laws that were issued to protect broad sectors of the public, which are considered to be in a vulnerable situation vis-à-vis other sectors of society.”

Constitution's provisions relating to the protection of the environment naturally fell within the exception to retroactivity.³⁸⁸

176. In response to this series of arguments, Perenco responded that the Tribunal should “apply the law that was actually in force in Ecuador at the times the alleged environmental conditions were created – all of which predate[d] the 2008 Constitution.”³⁸⁹ This was tied to its position that prior to the 2008 Constitution's entry into force, the operative regime was fault-based and therefore an operator could not be found liable if it could demonstrate it had been operating in accordance with its duty of care at all relevant times and consistently with applicable regulations.³⁹⁰ Perenco contended that this was an attempt by Ecuador to escape its burden of proving that the Consortium was at fault, and to accept it would be to condone a violation of Ecuador's “own constitutional principle of legal certainty.”³⁹¹

177. Perenco further submitted that the Consortium cannot be held liable for harm that may have occurred “after Ecuador's July 2009 takeover of the Blocks, or before January 2007, which is when the four-year statute of limitations window since Ecuador first asserted its counterclaims ends.”³⁹² Ecuador's statute of limitation for tort claims runs for four years from the date when the allegedly damaging act occurred.³⁹³ This is provided for expressly in Article 2235 of the Ecuadorian Civil Code.³⁹⁴ Perenco contended that since “Ecuador filed its first set of counterclaims in January 2011 in the *Burlington* case, any claims for incidents [that occurred] before January 2007 [were] time-barred.”³⁹⁵

178. Perenco also challenged Ecuador's reliance on the 2008 Constitution's provision on imprescriptibility, asserting it was inapplicable to this claim and thus did not affect the statute of limitation analysis.³⁹⁶ Professor Crespo's opinion that the new constitutional provisions relating to the protection of the environment were of immediate application because they were a matter of public policy could not mean that they applied retroactively; the proscription against the retroactive application of law remained part of Ecuadorian law and the 2008 Constitution.³⁹⁷

³⁸⁸ *Ibid.* Transcript, Hearing on Counterclaims, Day 1, pp 48-49 (Opening Statement of Eduardo Silva Romero), quoting from the decision in Exhibit CA-CC-29, *Baquerizo v Shaulton*. Ecuador further relied on Article 14 of the 2008 Constitution which referred to environmental conservation as a matter of public interest: see Exhibit EL-89, 2008 Constitution, p 13 of PDF. Transcript, Hearing on Counterclaims, Day 1, p 39, citing Article 14 of the 2008 Constitution which provides that “[e]nvironmental conservation, the protection of ecosystems, biodiversity and the integrity of the country's generic assets, the prevention of environmental damage, and the recovery of degraded natural spaces are declared matters of public interest.” Transcript, Hearing on Counterclaims, Day 1, p 69, lines 2-3 (Opening Statement of Eduardo Silva Romero).

³⁸⁹ Claimant's Counter-Memorial, paragraph 24; Rejoinder, paragraphs 329-344.

³⁹⁰ Claimant's Counter-Memorial, paragraph 23; Rejoinder, paragraphs 309-317.

³⁹¹ Claimant's Counter-Memorial, paragraph 24.

³⁹² Claimant's Counter-Memorial, paragraphs 23, 194, 488-497.

³⁹³ Claimant's Counter-Memorial, paragraph 489, citing Exhibit CA-CC-38, Civil Code, Article 2235 and 1st Expert Report of René Bedón, paragraph 78.

³⁹⁴ Exhibit CA-CC-38, Civil Code, p 151 of PDF: (Original) Art. 2235.- *Las acciones que concede este Título por daño o dolo prescriben en cuatro años, contados desde la perpetración del acto.*

³⁹⁵ Claimant's Counter-Memorial, paragraph 489 [Italics in original].

³⁹⁶ Rejoinder, paragraphs 341-344.

³⁹⁷ Claimant's Counter-Memorial, paragraph 492, 1st Expert Report of Ricardo Crespo Plaza, paragraphs 52-55 c.f. Reply, section 3.2.3.

Perenco also rejected Professor Crespo's use of a 'verification' approach, contending he could not provide any authority under Ecuadorian law to support the theory.³⁹⁸

179. Perenco further submitted that the "discovery rule" and "continuing torts" theories advanced by Ecuador did not exist in Ecuadorian law.³⁹⁹ Ecuador and Professor Andrade did not provide any authority to support these rules and their acceptance would undermine the express words of Article 2235 of the Civil Code.⁴⁰⁰ Perenco contended that Ecuador accepts that Article 2235 expressly provides that the statute of limitation runs from the date on which the allegedly harmful act was perpetrated⁴⁰¹ and Professor Andrade cited no Ecuadorian judicial authority in support of the proposition that a derogation from Article 2235 can occur in environmental cases.⁴⁰²

180. Perenco further claimed that Ecuador did not understand the concept of the "discovery rule" (while simultaneously maintaining its position that the rule did not exist in Ecuadorian law) which enabled the suspension of the limitations period "for so long as the claimant could not reasonably have discovered the alleged harm."⁴⁰³ Such a rule "[did] not allow a tribunal to suspend the limitations period when the claimant knew of, or could reasonably have discovered, the alleged harm and yet failed to act."⁴⁰⁴ In this case, Ecuador was on "constant notice" of the environmental condition of the Blocks through the "regular reporting, audit, inspection and verification process" and thus cannot claim to have not been in a position to advance the claims if it saw fit to do so.⁴⁰⁵

181. Perenco similarly rejected the applicability of a "continuing torts" theory, contending that the exceedances (whether of background values or of regulatory criteria) were not, using Ecuador's pleaded language, "the result of an individual act that took place at a specific point in time".⁴⁰⁶ Incidents that may have caused contamination were not "a continuous and undefined act" or one "aggregate act."⁴⁰⁷

182. Perenco maintained that the only period for which claims would be imprescriptible "would be between October 20, 2008 (when the Constitution entered into effect) and July 16,

³⁹⁸ Claimant's Counter-Memorial, paragraphs 492-495; cf. Reply, paragraph 336: Ecuador submitted that Perenco's position is contradicted "by the very case-law that it cites. The *Baquerizo* judgment, cited erroneously in its support, only states that "laws *normally* do not apply retroactively" (emphasis added). However, the judgment continues to say, "most public law regulations apply retroactively because they affect the general interest of society". The Ecuadorian Supreme Court then considers for instance that all regulations that seek to protect a vulnerable sector of society have retroactive effect. (Exhibit CA-CC-29, Supreme Court of Justice, Third Civil and Mercantile Chamber, published in Judicial Gazette No. 12 of September 25, 2003); Expert Report of Fabián Andrade Narváez, paragraphs 45-46.

³⁹⁹ Rejoinder, paragraph 329.

⁴⁰⁰ Rejoinder, paragraphs 329-331.

⁴⁰¹ Exhibit CA-CC-38, Civil Code.

⁴⁰² Rejoinder, paragraph 331; Expert Report of Fabián Andrade Narváez, paragraph 95.

⁴⁰³ Rejoinder, paragraph 333; Expert Report of Fabián Andrade Narváez, paragraph 95.

⁴⁰⁴ Rejoinder, paragraphs 333-336.

⁴⁰⁵ Rejoinder, paragraphs 333-336.

⁴⁰⁶ Rejoinder, paragraphs 338-340.

⁴⁰⁷ Rejoinder, paragraph 338.

2009 (when Petroamazonas assumed the operation of Blocks 7 and 21).⁴⁰⁸ Every incident raised by Ecuador in this counterclaim occurred before 20 October 2008.⁴⁰⁹

(5) Remediation criteria

183. As noted above, Perenco submitted that Ecuador had conceded that a predicate of a tortious claim for liability in an environmental claim is proof of environmental harm.⁴¹⁰ Perenco contended that environmental harm under Ecuadorian law did not encompass “any impact to the environment, but [rather] an *impermissible* impact to the environment.”⁴¹¹ It made this point in response to Ecuador’s and IEMS’ use of “background values”, which was in turn premised on Ecuador’s position that any presence in the environment of petroleum hydrocarbons or certain metals associated with hydrocarbon operations above the average background values (“*valores de fondo*”⁴¹²) was legally impermissible. For this reason, IEMS compared its test samples against the “level of contaminants naturally present in the area under study” or “Base Values” rather than against the level of exceedances permitted by the Ecuadorian regime governing hydrocarbon resources exploitation.⁴¹³

184. Perenco emphasised that when IEMS submitted its report to the *Burlington* tribunal about 10 months before its first submission to this Tribunal,⁴¹⁴ in selecting its criteria for evaluating the Consortium’s compliance with environmental standards, IEMS referred to the notion of “tolerable” levels of contaminants.⁴¹⁵ IEMS had stated that “on properties that are used for productive purposes related with petroleum activities, we tolerate certain concentrations of contaminants”, because they represented “an alteration of little relevance.”⁴¹⁶ It concluded that this was represented by RAOHE and TULAS, the permissible limits of which “ma[de] it possible to establish whether the presence of contaminants at certain levels and components of the environment (soil, surface water and underground water) [was] tolerable”, and added it was “not necessary to consider international comparison criteria considering that the environmental regulations in Ecuador specify precise criteria for all these parameters or contaminants [...]”⁴¹⁷

⁴⁰⁸ Claimant’s Counter-Memorial, paragraphs 496-497.

⁴⁰⁹ Claimant’s Counter-Memorial, paragraph 497.

⁴¹⁰ Claimant’s Counter-Memorial, paragraphs 215-217; Bedón ER, paragraphs 18-45.

⁴¹¹ Claimant’s Counter-Memorial, paragraphs 214 [Italics in original], 219. Dr. Bedón used the term “environmental damage” in his expert reports but it seems it was used interchangeably with “environmental harm” (see, for example, paragraph 18 of his first report). See 1st Expert Report of René Bedón, paragraphs 18-45.

⁴¹² Perenco argued that this term has been incorrectly translated by Ecuador as “base values”, and refers to Supplemental Memorial, paragraph 138.

⁴¹³ Supplemental Memorial, paragraph 158; 4th Expert Report of IEMS dated 4 September 2013 (“IEMS ER IV”), p 7 (“IEMS has undertaken this evaluation consistent with the Ecuadorian regulations. Indeed, our approach was even more technically-sound than these regulations (and it should be noted that our process resulted in background levels that are less stringent, more tolerant, to contamination”).

⁴¹⁴ Exhibit CE-CC-251, IEMS Environmental Evaluation Report, Hydrocarbon Activities, Consortium for Block 7 and Block 21, *Burlington v. Ecuador*, ICSID Case No. Arb/08/5, January 11, 2011 (“IEMS Report in Burlington”), PER_CC0010165 (IEMS concluded that there were incidences of contamination of soil and groundwater in the Blocks, amounting to a preliminary remediation cost estimate of US \$250,224,240 (subject to further studies)).

⁴¹⁵ Exhibit CE-CC-251, IEMS Report in Burlington, PER_CC0010136.

⁴¹⁶ Exhibit CE-CC-251, IEMS Report in Burlington, PER_CC0010136.

⁴¹⁷ Exhibit CE-CC-251, IEMS Report in Burlington, PER_CC0010136.

185. IEMS' report in *Burlington* further characterised RAOHE and TULAS as the criteria that "establish[ed] the obligation to carry out the clean up and/or restoration of the environment [...]." ⁴¹⁸ It added that "permissible limits specified in the environmental regulations of a country foster the performance of productive activities that avoid the accumulation of contaminants in the environment at levels that cause damage to the productive activities itself, human health, or the environment." ⁴¹⁹

186. It was not until the filing of its second report in *Burlington* that IEMS introduced its "background values" hypothesis. ⁴²⁰ Perenco noted that in its proposal to the Office of the Attorney General of Ecuador (*Procuraduría General del Estado*) on 25 July 2011 on the matter of its expert evidence in these arbitrations, IEMS referred to the fact that in its initial environmental assessment 29 out of the 93 facilities inspected "had contaminated areas exceeding the clean-up criteria established in Ecuadorian environmental regulations." ⁴²¹ The proposal referred to a request that IEMS had received to undertake a more detailed investigation "with the object of: ...2. Strengthening the prior soil and groundwater sampling results via the determination and evaluation of background levels for those contaminants whose presence may be attributable to natural conditions or other causes." ⁴²² (In its supplemental report in this arbitration, in the course of responding to the evidence of its former employee, Mr. Gilberto Martínez, who, amongst other things, challenged IEMS' decision to employ background values, ⁴²³ IEMS stated "[w]e also find it very strange that Mr. Martínez should criticize us for assessing the presence of contamination against the background values of the Blocks. This issue was never discussed, especially since the instruction to employ this criterion came from our lawyers." ⁴²⁴)

187. In Perenco's view, IEMS had changed its evaluative criteria not because of its own views as to how to properly evaluate the Blocks' conditions, but rather because it was instructed to do so by its client. In acceding to that instruction, it had abandoned its prior (correct) position that only contaminants that exceeded the applicable regulatory criteria (so-called "regulatory exceedances") amounted to contamination under Ecuadorian law. On its prior approach, environmental harm was determined by whether contamination in a specific case exceeded the permitted levels, not by measuring soil samples against "background values." This was the approach which Perenco itself employed.

188. Ecuador responded to Perenco's criticism in defence of IEMS' use of the 'background values' approach on the ground that "Ecuadorian regulatory criteria [did] not provide for full remediation of the contamination and, therefore, [did] not fully protect the environment or

⁴¹⁸ Exhibit CE-CC-251, IEMS Report in Burlington, PER_CC0010137.

⁴¹⁹ Exhibit CE-CC-251, IEMS Report in Burlington, PER_CC0010136.

⁴²⁰ Rejoinder, paragraph 72.

⁴²¹ Rejoinder, paragraph 71.

⁴²² Exhibit CE-CC-356, IEMS proposal for additional work in Blocks 7 and 21 and undated letter from Dechert LLP to IEMS confirming and adding terms, July 25, 2011, PER_CC0012084 [Emphasis added.]. Perenco also raised the example of IEMS' report in the case of *City Oriente Limited v. Republic of Ecuador and Empresa Estatal Petróleos del Ecuador (Petroecuador)*, ICSID Case No. ARB/06/21 [hereinafter *City Oriente v. Ecuador*] (Exhibit CE-CC-169), where IEMS referred to remediating affected areas up to the permissible limits set forth in RAOHE. (Rejoinder, paragraph 73).

⁴²³ Witness Statement of Gilberto Martínez, paragraphs 7-27.

⁴²⁴ IEMS ER IV, p 8 [Emphasis added.].

human health.”⁴²⁵ It considered that since there could be no expectation that hydrocarbons-related substances occur naturally in the environment of Blocks 7 and 21, the Base Value employed should be 0 mg/Kg.⁴²⁶ It further contended that this was in line with the import of the Consortium’s contractual obligations to require the complete restoration of the environment in the Blocks (relying on Clause 5.1.20.10 of the Block 7 Contract⁴²⁷ and Clause 5.1.20 of the Block 21 Contract).⁴²⁸

189. Against that backdrop, Ecuador submitted that the “notion of repairable harm is not in fact defined in TULAS and RAOHE through ‘permissible limits’, but rather in the [Environmental Management Law].”⁴²⁹ It relied on the Law’s definition of the term ‘environmental harm’ and asserted that the Constitutional Court has confirmed that this is the operative definition under Ecuadorian law and it defines the extent of the obligation to repair:

Environmental Harm. – Any *significant loss*, diminution, detriment or impairment of the *preexisting conditions* in the environment or one of its components. It affects the functioning of the ecosystem or the renewability of its resources.⁴³⁰

190. Ecuador also pointed to Ministerial Decree 169 on the “Principles and Definitions of Environmental Public Policy”, Article 1 of which defines “environmental damage” as follows:

“[It is] the negative environmental impact to the environmental conditions present in a given space, caused by the development of development projects, which lead to an imbalance in the ecosystems’ functions and that alter the supply of the services that such ecosystems contribute to society.”⁴³¹

191. Ecuador also relied on the evidence of Professor Andrade who asserted that RAOHE and TULAS were confined to setting the thresholds within which hydrocarbon activities could be undertaken in Ecuador and, in that connection, while administrative sanctions may be imposed on the operators for illicit hydrocarbon activities, they did not purport to define the notion of

⁴²⁵ Supplemental Memorial, paragraph 158; Reply, section 3.1.1; Transcript, Hearing on Counterclaims, Day 1, p 59 (Opening Statement of Eduardo Silva Romero).

⁴²⁶ Supplemental Memorial, paragraph 162.

⁴²⁷ “Take responsibility for the cleanup and reforestation of the area with species similar to those originally found at the site, in order to, with time, allow the potential return to environmental conditions similar to those encountered at the beginning of the operations; also take responsibility for the abandonment of wells and installations for which the Contractor has been responsible as a consequence of the execution of this Contract...” (Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), PER 04764, 04768, 04769).

⁴²⁸ “The Contractor shall be responsible for the clean-up, reforestation, and abandonment of non-productive wells and facilities as a result of this Contract...” (Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), PER 04659); Rejoinder, paragraph 50.

⁴²⁹ Reply, paragraph 246; see also, Reply, paragraph 6; Transcript, Hearing on Counterclaims, Day 1, pp 59, line 12 to 60, line 10 (Opening Statement of Eduardo Silva Romero).

⁴³⁰ Exhibit CA-CC-33, p 18 [Emphasis added.]. The Parties evidently do not disagree on the English translation of these definitions: see Reply, paragraphs 246-258 and Rejoinder, paragraphs 37-38.

⁴³¹ Translation of Respondent: Exhibit EL-193, Ministerial Decree 169, Article 1; Transcript, Hearing on Counterclaims, Day 1, p 60 (Opening Statement of Eduardo Silva Romero).

environmental harm for the purpose of the constitutional requirement to remedy any and all environmental harm.⁴³²

192. Ecuador contended that Perenco's position in effect contradicted the reference to "full restoration" in Article 396 of the Constitution and Clause 5.1.20.10 of the Block 7 Participation Contract, and to background values and the requirement to restore contaminated soil to its "prior condition" in Article 4.1 of TULAS.⁴³³ Furthermore:

"The fact that an activity is lawfully conducted does not mean, in environmental law, that the harm caused need not be repaired. That is precisely the point of a regime of strict liability, to guarantee that the harm is always repaired no matter whether the activity that caused that harm was lawful or not."⁴³⁴

193. Ecuador also referred to the preparatory material of the 2008 Constitution in support of its position; for example, the view of one assembly member, Mr. Sergio Chacón Padilla, in a minority report on the "rights of nature", in which he states that "instead of speaking of reparation we should use the notion of restoration or re-composition, given that reparation could be understood in the simple sense of 'compensating', while the re-composition or restoration would imply bringing things back to their original state or place, without prejudice to the obligation to compensate for the harms or damages caused to those affected directly."⁴³⁵ Ecuador submitted that to accept Perenco's position would be to "render part of Ecuadorian regulations obsolete."⁴³⁶

194. In short, Ecuador's position was that Ecuadorian administrative law contemplated a separation between the notions of reparable harm and unlawful conduct. This meant that, "with regards to TULAS and RAOHE, an operator that complies entirely with its obligations under both regulations, including the obligation to abide by the permissible limits, will nevertheless be

⁴³² Reply, paragraphs 6, 241-247; Constitutional Court Case No. 1457-07-RA, published in the Official Register Supplement No. 1, 18 August 2009, (Expert Report of Fabián Andrade Narváez, Annex 4); Transcript, Hearing on Counterclaims, Day 1, pp 62-63 (Opening Statement of Eduardo Silva Romero). See, in particular, Expert Report of Fabián Andrade Narváez, paragraphs 18, 21, 26(c) and 27: "Perenco and Burlington claim that this interpretation of the concept of environmental harm causes the permissible limits contained in the TULAS and the RAOHE to lose all effect. As I explained, this is not true: these limits mark the boundaries from which a given activity is operating in a lawful manner, regardless of the general duty to repair the damage actually caused. Moreover, it is Prof. Bedón who actually commits the error eviscerating the technical rules invoked, because, according to his interpretation, the "baseline values" or "quality criteria", also set by the TULAS would be irrelevant. The only interpretation that preserves the coherence of the system is as follows: while baseline values determine the scope of the obligation to repair the environmental harm, the permissible limits define the activities that can be carried out lawfully."

⁴³³ Reply, paragraph 252: referring to Article 397 of the 2008 Constitution (Exhibit EL-89) and Article 4.1 of Volume VI Annex 2 of TULAS (Exhibit EL-146). It also submitted that Perenco's position was incompatible with two fundamental principles of environmental law: "that operators should internalize the environmental costs of their economic activities" and the "principle of nature as a bearer of rights."

⁴³⁴ Transcript, Hearing on Counterclaims, Day 1, pp 62-63 (Opening Statement of Eduardo Silva Romero).

⁴³⁵ Exhibit EL-195, Minority Report of the Assembly Member on the rights of nature (translation resubmitted on 10-18-2013); Transcript, Hearing on Counterclaims, Day 1, p 57 (Opening Statement of Eduardo Silva Romero).

⁴³⁶ Reply, paragraph 254.

obliged to repair the contamination it has caused.”⁴³⁷ Recoverable environmental harm was “any significant negative impact, particularly if it affects the functioning of the ecosystem or the renewal of its resources.”⁴³⁸ The burden was on Perenco to demonstrate that the damage suffered by the environment in Blocks 7 and 21 was “insignificant.”⁴³⁹

195. In the alternative, Ecuador submitted that even considering the regulatory thresholds in RAOHE and TULAS, 92% of the areas IEMS tested were polluted with hydrocarbons and/or heavy metals, and 100% of the 18 sites tested for water pollution similarly yielded concentrations of contaminants above the regulatory values.⁴⁴⁰

196. In reply to this submission, Perenco argued that Ecuador had “failed cogently to rebut the point that *not every impact* on the environment gives rise to recoverable environmental harm under Ecuadorian law.”⁴⁴¹ First, when invoking Perenco’s contractual obligations Ecuador omitted the reference in the same provisions to the requirement that the Contractor should carry out its obligations in accordance with RAOHE or more generally, the applicable “legislation in effect in Ecuador at the time that such clean-up, reforestation, or abandonment is carried out.”⁴⁴²

197. Perenco submitted that, in any event, these obligations were concerned with decommissioning at the end of the useful life of a well or field and did not apply to ongoing operations.⁴⁴³ Blocks 7 and 21, however, were “decades away from being decommissioned, as evidenced by Ecuador’s current expansion.”⁴⁴⁴ Therefore, these obligations could not be invoked by Ecuador.⁴⁴⁵

198. Second, Perenco did not deny that the definition of environmental law in the Environmental Management Law was relevant; its position was rather that the permissible limits in RAOHE and TULAS implemented the “significant harm” standard.⁴⁴⁶

199. Ecuador replied that this could not be the relationship between the definition and RAOHE/TULAS, because the “two [would then be] essentially contradictory”, explaining that TULAS and RAOHE “seek to impose limits on economic activities that are potentially dangerous to the environment, whereas the ‘significant damage’ standard define[d] recoverable

⁴³⁷ Reply, paragraphs 243-258; citing the work of two scholars, Betancor Rodríguez (Exhibit EL-196) and Peña Chacón (Expert Report of Fabián Andrade Narváez, Annex 31); see also, Transcript, Hearing on Counterclaims, Day 1, pp 62-63 (Opening Statement of Eduardo Silva Romero).

⁴³⁸ Reply, paragraph 258.

⁴³⁹ Reply, section 3.1.2, relying on Article 397.1 of the 2008 Ecuadorian Constitution (Exhibit EL-89).

⁴⁴⁰ Supplemental Memorial, paragraph 176; the only exceptions were Puerto Napo, Waponi, PAD F, Gacela 3 and Payamino 9 which IEMS found presented contamination above Base Values but not above regulatory thresholds. (IEMS ER II, Annex T).

⁴⁴¹ Rejoinder, paragraph 23 [Emphasis added].

⁴⁴² Quoting from Clause 5.1.20 of the Block 21 Contract (Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), PER 04659). Clause 5.1.20.10 also similarly provided that “[s]aid cleanup, reforestation and return to similar conditions and abandonment activities shall be performed in accordance with [RAOHE]...”. (Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), PER 04764, 04768, 04769). See Rejoinder, paragraphs 49-54.

⁴⁴³ Rejoinder, paragraph 51.

⁴⁴⁴ Rejoinder, paragraph 51.

⁴⁴⁵ Rejoinder, paragraphs 49-54.

⁴⁴⁶ Rejoinder, paragraphs 23 and 39.

environmental harm.”⁴⁴⁷ The ‘significant harm’ standard [was] perfectly operational without the need for numerical standards”, the Environmental Management Law’s definition providing “two operational criteria, by qualifying [significant harm] as all impact that ‘affect[ed] the functioning of the ecosystem or renewal of its resources’.”⁴⁴⁸

200. Perenco countered that this ignored the distinction that the Environmental Management Law must have intended when it stipulated two separate definitions for “environmental harm” and “environmental impact.”⁴⁴⁹ It followed that “‘environmental harm’ [was] not a mere impact above background values, but [rather] an impact that [was] a ‘significant’ loss, such that it ‘affects the functioning of the ecosystem or renewal of its resources’.”⁴⁵⁰ The permissible limits in RAOHE and TULAS must be a reflection of this distinction in the Law and if their purpose was to prevent, using Ecuador’s words, “inasmuch as possible that any such harm [to the environment] should occur” then “an impact that is permitted [by them] cannot constitute harm.”⁴⁵¹ RAOHE and TULAS provided operators with legal certainty about what kind of ‘impacts’ were ‘significant’ and triggered the requirement to remediate.⁴⁵² In fact, Ecuador’s reliance on the Environmental Management Law exposed a flaw in its ‘background values’ case: it was premised on proving a “mere ‘alteration of the environment’” which the Environmental Management Law classified as an “impact” rather than the indicator of “environmental harm”.⁴⁵³

201. Ecuador also relied on Professor Crespo’s evidence to support the basis of its “background values” approach. Professor Crespo’s testimony was that RAOHE and TULAS’s criteria for remediation must to be understood in light of constitutional provisions, namely, the obligation to “fully restore” the environment in the event of environmental damage required by Article 396, paragraph 2, and the reference to “complete reparation” in Article 397 which concerned duties of the State in the event of environmental damage in proceeding against the operator(s) of the harmful activity.⁴⁵⁴ His evidence was that “[b]ackground values are the ones that are – that allow for the comprehensive reparation; that is to say, for the reparation – for the remediation back to the original level. That is the way that we should understand background values; that is to say, as stated in the comprehensive remediation.”⁴⁵⁵

⁴⁴⁷ Ecuador’s Reply, paragraph 248, footnote 273 cf. Rejoinder, paragraph 24.

⁴⁴⁸ Ecuador’s Reply, paragraph 249. [emphasis omitted]

⁴⁴⁹ Rejoinder, paragraphs 32-48. In this connection, Perenco responded to Ecuador’s argument that reliance on RAOHE and TULAS was incompatible with the principle of “full restoration” under Ecuador’s Constitution, stating that “principle of ‘full restoration’ (*restitutio in integrum*) requires only that harm be eliminated, not that all impact must be obliterated.” (Rejoinder, paragraph 47).

⁴⁵⁰ Rejoinder, paragraphs 37-39.

⁴⁵¹ Rejoinder, paragraph 35.

⁴⁵² Rejoinder, paragraphs 36-39.

⁴⁵³ Rejoinder, paragraph 41.

⁴⁵⁴ Transcript, Hearing on Counterclaims, Day 4, p 923 (Testimony of Ricardo Crespo Plaza): “RAOHE should be applied based on Constitutional regulations, within that context. That is to say, to remediate within the context of the Constitution of Ecuador, yes, it should remediate. The concept of remediation, as explained in RAOHE, should be applied. That is to say, to return the harmed ecosystem to the original state as stated in the Constitution.”

⁴⁵⁵ Transcript, Hearing on Counterclaims, Day 4, pp 924-925 (Testimony of Ricardo Crespo Plaza). Counsel for Perenco pressed Professor Crespo on this evidence, posing the question: “Remediating according to the permissible limits in RAOHE and according to what RAOHE says is consistent with that principle; correct?”. Professor Crespo responded: “Yes. Yes. Agreed. But the concept of full remediation or reparation should prevail;

202. Perenco's expert, Dr. Bedón, expressed a different view, stating that there were three kinds of ways in which human activity could have a negative impact on the environment: (i) through "tolerable impacts" (activities carried out in the normal course of affairs without the need for an environmental permit and unregulated by the State), (ii) through "authorized impacts" (activities carried out in compliance with an environmental permit or license and within permissible limits) and (iii) through "environmental damage or harm".⁴⁵⁶ In his opinion, Professor Crespo "fail[ed] to distinguish [between] these concepts, and erroneously treated them as equivalent categories."⁴⁵⁷

203. Dr. Bedón considered that Professor Crespo erred in arriving at his conclusion because in citing Articles 396 and 397 of the 2008 Constitution he was suggesting "without any grounds that environmental impact and environmental damage [were] equivalent terms."⁴⁵⁸ In Dr. Bedón's view, Articles 396 and 397 referred to the duty of the State to adopt legislation to address "negative environmental impacts", not just any impact on the environment, and established a strict liability regime for environmental matters and reiterated the duty of the State to take action to safeguard human health and restore ecosystems.⁴⁵⁹ However, there was no reference to the necessity of adopting background values in substitution of regulatory criteria such as that provided by RAOHE and TULAS.

204. Dr. Bedón referred in this regard to an academic authority cited by Professor Crespo, that of the author Mario Peña Chacón, in a work titled *Daño, responsabilidad y reparación ambiental* ["Environmental Damage, Liability and Reparation"] which distinguished between "legally relevant environmental damage" and "acts or omissions [that] are considered legal":

The legality or illegality of conduct that damages the environment depends on its conformity or nonconformity with the legal order. Acts or omissions are considered legal if they accord with the body of laws in force and, thus, it has the approval or permit of the relevant authorities...

Legally relevant environmental damage is that damage that falls within the category of intolerable, thus it is not every type of damage that interests environmental law.⁴⁶⁰

205. Perenco further relied on the work of Andrés Betancor, "one of only two academic sources quoted in [Ecuador's] Constituent Assembly[']s report on strict liability for the 2008

that is to say, without prejudice of the standard values in RAOHE, full restoration is the original state, the original condition of the harmed ecosystems. So, we work with background values based on the original values in the harmed ecosystem." On re-examination, Professor Crespo reiterated this but added with respect to interpreting RAOHE consistently with the principles of the 2008 Constitution that "in case of doubt, the Constitution prevails." (Transcript, Hearing on Counterclaims, Day 4, p 934 (Testimony of Ricardo Crespo Plaza)).

⁴⁵⁶ 1st Expert Report of René Bedón, paragraphs 19-23 ("The fact that Petroamazonas have continued operating the sites bears no relationship to the existence of widespread pollution left behind by the Consortium").

⁴⁵⁷ 1st Expert Report of René Bedón, paragraph 19.

⁴⁵⁸ 1st Expert Report of René Bedón, paragraph 24 cf. 1st Expert Report of Ricardo Crespo Plaza, paragraphs 75-79.

⁴⁵⁹ 1st Expert Report of René Bedón, paragraph 25.

⁴⁶⁰ PEÑA CHACÓN, Mario, *Daño, responsabilidad y reparación ambiental [Environmental Damage, Liability and Reparation]*, pages 12-14. Annex No. 8 to Professor Crespo's 1st Report, cited at paragraph 26 of 1st Expert Report of René Bedón.

Constitution”, and who in a text entitled *Instituciones de Derecho Ambiental* [Institutions for Environmental Law] opined:

If the licit act causes damages in accordance with the Law...there would be no sanction or reparation. The legal problem refers to when the damage is licit: licit damage is damage which is not covered by any legal duty to repair, because the law tolerates or allows it to because it is not significant or important, according to the social value legally formalized...Consequently *the acts covered by the standards and the authorizations, and that cause damages [sic] do not constitute an environmental violation and there is no duty to repair them.*⁴⁶¹

206. Replying on Dr. Bedón’s evidence, Perenco submitted that the “very purpose” of RAOHE and TULAS was to “define what constitute[d] impermissible harm to the environment under Ecuadorian law.”⁴⁶² The opening lines of Table 6 of RAOHE confirmed this in providing that RAOHE established “[p]ermissible limits for the identification and remediation of contaminated soils in all phases of the hydrocarbon industry.”⁴⁶³ These limits were constructed with the specific purpose “of encouraging sustainable development.”⁴⁶⁴ “By employing specific regulatory limits instead of background values, states such as Ecuador [made] it possible for industry to operate within clearly defined parameters while still preserving human health and the environment.”⁴⁶⁵

207. Perenco argued that this did not change after the making of the 2008 Constitution and the introduction of a strict liability regime for environmental liability.⁴⁶⁶ Article 396 of the Constitution provides that the obligation to restore the ecosystem is triggered by evidence of environmental “harm”, which in turn remains defined by Ecuador’s environmental regulations relating to permissible limits for contaminant and remediation criteria, namely, RAOHE and (to the extent that RAOHE was inapplicable) TULAS.⁴⁶⁷

208. Perenco submitted that this had been accepted by IEMS as far as its evaluative criteria in the *Burlington* and the *City Oriente* proceedings were concerned.⁴⁶⁸ It contended that IEMS then changed its position in this case without basis⁴⁶⁹ and that “Ecuador fail[ed] to provide even one example in which an Ecuadorian court, legal authority, or scholar ha[d] adopted more restrictive ‘background values’ as the test for environmental harm in place of the regulatory criteria.”⁴⁷⁰ Furthermore, the audits, impact studies and environmental management plans of both the

⁴⁶¹ Exhibit CA-CC-22, Betancor Rodríguez, Andrés, *Instituciones de Derecho Ambiental* (2001), pp 1246-1247 (English translation); see also, Claimant’s Counter-Memorial, paragraph 220 [Emphasis added.].

⁴⁶² Claimant’s Counter-Memorial, paragraph 245.

⁴⁶³ Claimant’s Counter-Memorial, paragraph 245, Exhibit EL-147, RAOHE.

⁴⁶⁴ Claimant’s Counter-Memorial, paragraph 246; 1st Expert Report of René Bedón, paragraph 32.

⁴⁶⁵ Claimant’s Counter-Memorial, paragraph 246; Perenco referred to p 20 of IEMS’ report in the *Burlington* proceedings: Exhibit CE-CC-251, IEMS Report in *Burlington*, p 20.

⁴⁶⁶ Claimant’s Counter-Memorial, paragraphs 256-257.

⁴⁶⁷ Claimant’s Counter-Memorial, paragraph 257.

⁴⁶⁸ Claimant’s Counter-Memorial, paragraphs 246-248; referring to Exhibits CE-CC-251, IEMS Report in *Burlington*, PER CC_0010136; CE-CC-169, IEMS Environmental Evaluation Report for the Hydrocarbons Activities of City Oriente Ltd., Block 27, submitted in *City Oriente v. Ecuador*, PER_CC0005712; Rejoinder, paragraphs 221-223.

⁴⁶⁹ Claimant’s Counter-Memorial, paragraphs 246-248.

⁴⁷⁰ Claimant’s Counter-Memorial, paragraph 249.

Consortium and Petroamazonas consistently tested for compliance with permissible limits rather than background values.⁴⁷¹

209. Also central to Ecuador's case that background values must be applied in order to establish the full extent of environmental remediation was its reliance on the 2008 Constitution's recognition that Nature ("*pacha mama*") was itself the subject of rights as well as the codification of the principles of sustainable development and the right of the human being to live in an environment free from contamination.⁴⁷²

210. Perenco responded that these principles have been part of Ecuadorian law since the 1970s, particularly in the 1984 and 1998 Constitutions, and during this time RAOHE and TULAS were promulgated and applied. In this regard, at the hearing, counsel for Perenco took Professor Crespo through a chronological review of various instruments applicable in Ecuador in the 1970s, 80s and 90s, to demonstrate that while strict liability became a feature of the 2008 Constitution, many of the environmental principles recognised in the Constitution, from which RAOHE and TULAS derived their content and approach, were in fact carried over from Ecuadorian legal rules that pre-dated the 2008 Constitution.⁴⁷³

211. For example, Professor Crespo acknowledged that the Hydrocarbons Law, promulgated in 1971, manifested the "obligation of sustainability for operators", that "Ecuador [had recognised] a constitutional duty for the State to protect the environment since 1983",⁴⁷⁴ that the "1978 Constitution was amended in 1983 to recognize a right of the human being to live in an environment free of contamination",⁴⁷⁵ and this carried over to the 1998 Constitution (Article 86) and then to the 2008 Constitution.⁴⁷⁶ These were not novel principles that in turn caused a fundamental shift in the scope of environmental harm.

212. Thus, Perenco submitted that the "background values" approach had "no basis in law or accepted scientific practice."⁴⁷⁷ It would require "operators to explore and produce oil without making any impact on the environment whatsoever", and would render "obsolete" Ecuador's "detailed regulatory regime governing permissible impacts."⁴⁷⁸ It would require oilfields to be remediated to a "pristine state of nature, as they existed before any human activity ever took place on the land in question, *even when the fields continue to be in operation*", a reference to the

⁴⁷¹ Rejoinder, paragraphs 64-65 (see e.g., Exhibit CE-CC-137, Letter of March 23, 2002 from Efficacitas to Perenco, attaching 2002 Environmental Audit of Block 21, p 7; 1st Witness Statement of Wilfrido Saltos, paragraphs 79-83).

⁴⁷² Reply, paragraphs 248-258.

⁴⁷³ Transcript, Hearing on Counterclaims, Day 4, p 919 (Testimony of Ricardo Crespo Plaza).

⁴⁷⁴ Transcript, Hearing on Counterclaims, Day 4, p 914 (Testimony of Ricardo Crespo Plaza).

⁴⁷⁵ *Ibid.*

⁴⁷⁶ Transcript, Hearing on Counterclaims, Day 4, p 915 (Testimony of Ricardo Crespo Plaza).

⁴⁷⁷ Claimant's Counter-Memorial, paragraphs 10, 243-276 (261: "The alleged 'possibility' that Ecuador's own legal limits are not protective enough is neither a scientific nor a legal reason for the Tribunal to refuse to apply Ecuador's own laws regarding environmental harm") (265: "GSI undertook a comparison of Ecuador's regulatory standards to these conservative risk-based screening levels...[it] confirmed that the permissible limits in the Ecuadorian regulations are actually more stringent than the health-based screening levels.").

⁴⁷⁸ Claimant's Counter-Memorial, paragraphs 9-12, 218-221.

fact that since July 2009 when the Consortium suspended operations, Ecuador has sustained and in some instances expanded oil production in the Blocks.⁴⁷⁹

213. Perenco contended that the real reason why background values had been employed in this case was the “obvious tactical purpose” of inflating the remediation costs by over US\$1.3 billion, this accounting for “*more than half*” of Ecuador’s claim.⁴⁸⁰

214. Perenco also challenged Ecuador’s alternative case, based on RAOHE and TULAS. In its view, Ecuador “misapplie[d] these regulations by mischaracterizing areas that are almost entirely ‘industrial’ or ‘agricultural zones’ – with permissible threshold limits suitable to such areas – as more demanding ‘sensitive ecosystems’.”⁴⁸¹ The “vast majority” of the areas in Blocks 7 and 21 are not “sensitive ecosystems”.⁴⁸² It submitted that “[s]uch a mistaken characterization defies the actual use of the land that is plainly apparent to any observer – areas that with Ecuador’s prior approval include wells, pits, flares, tanks, cement berms, and roads” and stood in stark contrast to “Ecuador’s own longstanding practice prior to the onset of the present dispute...[i]n countless environmental impact studies, requests for approval, environmental audits and other documents...that the areas in the Blocks where the Consortium’s operations took place are industrial zones.”⁴⁸³

215. Mr. Wilfrido Saltos, Perenco’s Quality, Safety, Health and Environment supervisor for Blocks 7 and 21, testified that in his experience, the Consortium and Ecuador routinely applied the industrial and agricultural land-use criteria in Blocks 7 and 21, particularly with respect to well pads and CPFs that were consistently characterised as being subject to industrial soils criteria.⁴⁸⁴ Much of the land surrounding Blocks 7 and 21 platforms and facilities are cultivated with African palm trees, plantains and cocoa trees.⁴⁸⁵ Mr. Saltos affirmed that areas bordering Coca CPF, Coca 6, Coca 8, Gacela 2, Gacela CPF, Lobo 1, Lobo 3 and Oso 9, among others,

⁴⁷⁹ Claimant’s Counter-Memorial, paragraph 244 [Emphasis in original]; 1st Expert Report of René Bedón, paragraph 37; Rejoinder, paragraph 29 (“It would essentially compel Claimant to pay for an exceptionally demanding end-of-life decommissioning for fields that are still being operated and further developed by Petroamazonas and will remain in operation for decades.”); cf. Reply, paragraph 290-291.

⁴⁸⁰ Claimant’s Counter-Memorial, paragraphs 14, 276 [Italics in original]. Moreover, Perenco cited GSI’s conclusion that even when the risk assessment formula is applied, only 2% of IEMS’ and GSI’s combined 3,183 soil sampling locations exceeded the conservative health-based screening criteria, and “none of these exceedances were physically present in locations that would threaten human health, livestock or even ecological receptors[.]” (Claimant’s Counter-Memorial, paragraph 269, GSI ER I, paragraph 241.)

⁴⁸¹ Claimant’s Counter-Memorial, paragraphs 15-17.

⁴⁸² *Ibid.*

⁴⁸³ Claimant’s Counter-Memorial, paragraphs 15-17; 1st Witness Statement of Wilfrido Saltos, paragraphs 57-71.

⁴⁸⁴ 1st Witness Statement of Wilfrido Saltos, paragraphs 57-68. Mr. Saltos cited a 11 March 2003 remediation report for contamination in an area which included Payamino CPF, Payamino Sanitary Landfill, Payamino 22, Coca CPF and Jaguar CPF, which based its remediation criteria on industrial soil criteria of Table 6 of RAOHE and noted that this was approved by the National Directorate of Environmental Protection of the Ministry of Energy and Mines on 13 June 2003. (See Exhibits CE-CC-51, Letter of January 28, 2003 from Perenco to DINAPA, attaching the Remediation Program for Block 7, including Coca-Payamino field; CE-CC-53, Letter of March 11, 2003 from Perenco to DINAPA and CE-CC-57, Letter of June 13, 2003 from the Undersecretariat of Environmental Protection).

⁴⁸⁵ 1st Witness Statement of Wilfrido Saltos, paragraphs 72-74.

were used for agricultural activities and should be subject to agricultural land-use criteria rather than “sensitive ecosystems” criteria.⁴⁸⁶

216. Perenco asserted that two-thirds of the samples tested by IEMS (and included in its report submitted with Ecuador’s Counter-Memorial) would have been found compliant had the proper land use criteria been applied.⁴⁸⁷ This accounted for over US\$885 million of Ecuador’s US\$2.4 billion claim.⁴⁸⁸ (This will be examined in further detail below in the discussion of the expert evidence presented by GSI and IEMS.)

D. Introduction to the expert evidence on the state of the Blocks

217. The Parties’ experts referred to a number of key concepts when defining an impact on the environment. The most important such concept is the notion of a “regulatory exceedance.” This occurs “when the concentration of a particular contaminant in a given sample of soil or water exceed[ed] the legal limit.”⁴⁸⁹

218. Turning to the experts’ evaluation of the environmental conditions of the Blocks, Ecuador submitted that IEMS’ evidence demonstrated that the contamination left behind in the Blocks posed a health risk and has affected, and is continuing to affect, “the functioning of the ecosystem and the renewability of natural resources”, a phrase taken from the definition of “environmental harm” in the Environmental Management Law and relied upon by Ecuador as triggering Perenco’s obligation to “fully restore” the Blocks in accordance with Article 396 of Ecuador’s Constitution.⁴⁹⁰

219. IEMS undertook a series of site investigation and sampling programmes in Blocks 7 and 21.⁴⁹¹ It conducted four rounds of on-field investigation, collecting and testing soil and groundwater samples for hydrocarbon compounds and heavy metals.⁴⁹² In total, IEMS took some 2,786 soil samples and 92 groundwater samples from Blocks 7 and 21.⁴⁹³

220. Ecuador contended that applying Base Values to the results of the samples tested was the “only methodology that accord[ed] with the strict liability regime of the 2008 Ecuadorian Constitution...and the mandate to fully restore the ecosystems.”⁴⁹⁴ It submitted that both RAOHE and TULAS “expressly acknowledge[d]” Base Values, and in some cases that this exceeded the regulatory thresholds.⁴⁹⁵ Thus, where the level of an oilfield-related element revealed by the sample exceeded the values at which it naturally appeared, as discerned from samples taken in areas of the Blocks untouched by hydrocarbon activities (the “Base Values” case), IEMS concluded there was soil contamination that required remediation.⁴⁹⁶ IEMS also

⁴⁸⁶ 1st Witness Statement of Wilfrido Saltos, paragraph 74.

⁴⁸⁷ Claimant’s Counter-Memorial, paragraphs 16-17.

⁴⁸⁸ *Ibid.*

⁴⁸⁹ Claimant’s Counter-Memorial, paragraph 62.

⁴⁹⁰ Reply, paragraph 263.

⁴⁹¹ Its analyses were presented in four expert reports: 1st Expert Report dated 5 December 2011 (IEMS ER I), 2nd Expert Report dated 26 April 2012 (IEMS ER II), 3rd Expert Report dated 21 February 2013 (IEMS ER III), 4th Expert Report dated 4 September 2013 (IEMS ER IV).

⁴⁹² IEMS ER III, pp 5-11.

⁴⁹³ GSI ER I, p 11; Reply, paragraph 185.

⁴⁹⁴ Counter-Memorial, paragraph 255.

⁴⁹⁵ Supplemental Memorial, paragraph 167.

⁴⁹⁶ Counter-Memorial, paragraph 798.

prepared an alternative case, its “regulatory exceedances” case, in which it measured its sampling results against the standards stipulated by RAOHE, and where applicable, TULAS.⁴⁹⁷

221. IEMS asserted that it had found significant volumes of contaminated soil in the Blocks, around 1,867,835 m³ above background levels or 691,444 m³ above regulatory criteria and ground water pollution by hydrocarbons and/or heavy metals in all locations that it tested.⁴⁹⁸ IEMS’ and Ecuador’s criticism of the analysis performed by Perenco’s expert, GSI, was that they did not undertake a proper analysis of the environmental condition of the Blocks in accordance with the principles of the 2008 Constitution because they failed to apply Base Values, whether in Perenco’s 2008 audits or in the studies GSI prepared for the purpose of this arbitration.⁴⁹⁹ In the alternative, Ecuador submitted that if the regulatory criteria of RAOHE applied, GSI had failed to apply the correct criteria when investigating the Blocks.⁵⁰⁰ In its view, the stricter standards prescribed by RAOHE for a “sensitive ecosystem” ought to have been used, rather than the less stringent industrial and agricultural area standards.⁵⁰¹

E. First round of expert reports of IEMS and GSI

222. IEMS submitted its first expert report in December of 2011.⁵⁰² Its stated objective was to “determine whether the operations of the Block 7 and Block 21 Consortium ha[d] resulted in soil and groundwater pollution in its respective areas of operation.”⁵⁰³ It asserted that its methodology was based on the “general guidelines of the standards of the American Society of Testing Materials.”⁵⁰⁴

223. Its study was undertaken in three stages: a preliminary assessment of the blocks to identify sites that were likely to evince contamination (otherwise referred to as “Recognized Environmental Conditions” or “RECs”), testing of samples taken from the sites and a further examination of the blocks and information that it was provided in order to identify other potentially contaminated sites.⁵⁰⁵ In its first stage, IEMS identified 29 sites, and in its second stage confirmed that 27 of the 29 sites were contaminated by hydrocarbons, heavy metals or a

⁴⁹⁷ Supplemental Memorial, paragraph 176; IEMS ER II, Annex T.

⁴⁹⁸ Reply, paragraph 224 (taking into account three sets of corrections as explained in section 2.2.1 of its Reply); Counter-Memorial, paragraph 771; Supplemental Memorial, paragraph 293-299; 2nd IEMS ER, pp 180-181, Annex T (In its second expert report, IEMS quantified the volume of soil that required remediation at 1,086,883 m³ (Base Values) or 1,012,245 m³ (regulatory limits). IEMS reported that 100% of the 18 sites it had tested yielded concentrations above the thresholds set by Ecuadorian regulations: in the Payamino, Coca, Oso, Gacela, Jaguar and Mono fields of Block 7 and the Yuralpa, Dayuno and Waponi fields of Block 21. It identified a further 52 sites it intended to investigate for possible groundwater contamination.). See also, 2nd IEMS, pp 180-181 (In its second report, IEMS reported that 100% of the 18 sites it had tested yielded concentrations above the thresholds set by Ecuadorian regulations: in the Payamino, Coca, Oso, Gacela, Jaguar and Mono fields of Block 7 and the Yuralpa, Dayuno and Waponi fields of Block 21. It identified a further 52 sites it intended to investigate for possible groundwater contamination.)

⁴⁹⁹ Supplemental Memorial, paragraph 163; Reply, paragraphs 282-285, section 3.1.4.

⁵⁰⁰ Reply, section 3.1.4.

⁵⁰¹ Counter-Memorial, paragraph 800.

⁵⁰² IEMS ER I.

⁵⁰³ IEMS ER I, p 3.

⁵⁰⁴ IEMS ER I, p 11.

⁵⁰⁵ IEMS ER I, p 3. In the first stage, an IEMS team visited the facilities in Block 7 from 25 to 30 October and 8 to 12 November 2010, and in Block 21 from 22 to 26 November 2010.

combination of the two.⁵⁰⁶ These sites were located within the Gacela, Lobo, Coca, Payamino, Oso, Mono, Jaguar and C6ndor fields of Block 7, and the Yuralpa, Waponi, Sumino and Nemoca fields of Block 21.⁵⁰⁷

224. In determining whether the sites were contaminated, IEMS advocated for the application of Base Values. It asserted that in “its expert opinion...the criteria provided for in Ecuadorian legislation ... should not, as a rule, be used to determine the environmental liability of operators of hydrocarbon activities.”⁵⁰⁸ It reasoned that since everyone possessed the right to an “environment in optimum conditions for human development”, any release of contaminants that caused an “unacceptable risk to the health of the surrounding population must be mitigated.”⁵⁰⁹ IEMS concluded that the regulatory limits should not be applied because they “[*did*] not appear to be based on the protection of the health of the ecosystem or of the people who live in the impacted areas.”⁵¹⁰ For this purpose, IEMS collected and tested 12 soil samples in areas with no industrial activity in Blocks 7 and 21 “in order to determine the concentrations of contaminants naturally existing in the environment.”⁵¹¹ These formed its Base Values.⁵¹² It applied these values to the classification of any impact caused by heavy metals (nickel, cadmium, lead, barium and vanadium).⁵¹³ Where heavy metal concentration was above the “analytical detection limit” but below the base value, it was classified a “low impact”.⁵¹⁴ IEMS did not apply this analysis to the classification of Total Petroleum Hydrocarbons because it considered that “in view of the characteristics of the area of study, this element is not expected to naturally exist in the soil”.⁵¹⁵ It concluded that a Base Value of 0 mg/kg would apply.⁵¹⁶ IEMS also included in its analysis parameters that were not set by RAOHE; namely, pH (an indication of acidity or alkalinity), electrical conductivity, barium and vanadium.⁵¹⁷

225. IEMS also prepared an alternative case based on the regulatory criteria that it considered applied: RAOHE Annex 2 of Table 6 (TPH, polycyclic aromatic hydrocarbons, cadmium, nickel and lead) and TULAS Book 6, Annex 2, Table 2 (barium and vanadium).⁵¹⁸ It stated that “due to the fragility of the environment and the importance of preserving environmental resources in the area, [it] decided, based on its expert criteria, to apply the permissible limits for sensitive ecosystems” in Table 6, Annex 2, of RAOHE.⁵¹⁹

⁵⁰⁶ IEMS ER I, p 3.

⁵⁰⁷ IEMS ER I, pp 5-6 for full list. See also, Counter-Memorial, paragraphs 811-860.

⁵⁰⁸ IEMS ER I, p 18.

⁵⁰⁹ IEMS ER I, p 19.

⁵¹⁰ IEMS ER I, p 19 [*Italics in original*].

⁵¹¹ IEMS ER I, p 20.

⁵¹² IEMS ER I, Tables 3-3 and 3-4, pp 47-49. For example, while Book 6, Annex 2, Table 2 of TULAS provides that the criteria for electrical conductivity is 2 mmhos/cm, since the base value IEMS determined was lower at 0.01949 mmhos/cm (or 19.49 μ S/cm), IEMS applied that in its analytical study of its samples. IEMS ER I, p 51 and see examples at pp 53, 54, 55, 56, 57, 59 et seq. Where the reference criteria was nearly the same as the Base Value, IEMS adopted the regulatory limit (such as in the case of cadmium, nickel, lead). IEMS ER I, pp 51-52.

⁵¹³ IEMS ER I, p 20.

⁵¹⁴ IEMS ER I, p 20.

⁵¹⁵ IEMS ER I, p 21.

⁵¹⁶ IEMS ER I, p 21.

⁵¹⁷ IEMS ER I, pp 23-24.

⁵¹⁸ IEMS ER I, pp 21-27; 48-61.

⁵¹⁹ IEMS ER I, p 22.

226. IEMS reported that “over 93% of the areas [it] tested...yielded concentrations of hydrocarbons and/or heavy metal contaminants above” Base Values, this translating to 96,908 m³ of soil requiring remediation.⁵²⁰ In its alternative regulatory thresholds case, IEMS reported that some 89% of the areas tested exceeded the permitted exceedances standards, this translating to 63,169 m³ of soil requiring remediation.⁵²¹ In determining the quantity of soil requiring remediation, IEMS utilised ArcView GIS 10.0 geostatistical modeling software.⁵²²

227. IEMS also collected 61 groundwater samples from seven sites in the Blocks⁵²³ and reported that 50 samples evinced contamination by heavy metals (such as zinc, barium, copper, chrome, nickel) in concentrations exceeding the regulatory limits.⁵²⁴ (In testing the groundwater, IEMS did not use Base Values because that would have “required complex, lengthy and costly hydrological studies of Blocks 7 and 21.”⁵²⁵ Instead, as noted in its second report, it compared its sampling results to the values set forth in Table 5, Annex 1, Book VI, of TULAS.⁵²⁶)

228. IEMS informed the Tribunal in its first report that since its investigation was ongoing it would present its overall estimation of remediation costs at a later date.⁵²⁷ Its preliminary estimate was US\$ 405 million to remediate contaminated soil (Base Values) or US\$ 243 million (regulatory limits), and a range of US\$ 12 million to US\$ 79 million for groundwater remediation.⁵²⁸

229. As noted above, the third stage of IEMS’ investigation was identifying additional potentially contaminated sites based on recognised environmental conditions (“RECs”). In its first report IEMS reported that this stage was ongoing, but it had identified 44 more sites in addition to the 27 it had already concluded exhibited contamination that merited an assessment.⁵²⁹ These sites were located in the Coca, Gacela, Jaguar, Lobo, Oso, Mono, Payamino and Punino fields in Block 7, and the Yuralpa field in Block 21.⁵³⁰

⁵²⁰ IEMS ER I, p 65, Table 3-8; Counter-Memorial, paragraph 806.

⁵²¹ IEMS ER I, p 65, Table 3-8; Counter-Memorial, paragraph 806. Its second expert report replaced this figure with 94% of the areas tested for soil pollution (70 of the 74 locations examined), and 92% respectively (68 of the 74 locations examined).

⁵²² IEMS ER I, p 63. This was explained in greater detail in the second report at Annex A.8.

⁵²³ Waponi, Collection and Waste Disposal Area in the Yuralpa Field, Dayuno, Payamino 2 and 8, Coca CPF, Oso 9 and Mono CPF (IEMS ER I, p 62).

⁵²⁴ IEMS ER I, pp 62-63. The 7 sites tested were Payamino 2 and 8, the Coca CPF, Oso 9, the Mono CPF, the Yuralpa Waste Management Area, Dayuno and Waponi fields (IEMS ER I, pp 72-73; Counter-Memorial, paragraphs 872-874). IEMS stated that while remediation costs would be presented in due course, it estimated the costs of groundwater remediation to range from US\$ 12 million to US\$ 79 million depending on the type of treatment used (IEMS ER I, p 69). IEMS named other sites it intended to investigate for groundwater contamination; in Gacela 6 and 9, Estacion Yuralpa, Coca 6, Coca 15, Jaguar 2, Jaguar 5, Jaguar 9, Lobo 3, Lobo 4, Mono 1, Oso 1, Payamino 13, Payamino 15, Payamino 18 and Estacion Payamino.

⁵²⁵ Counter-Memorial, paragraph 805; Supplemental Memorial, paragraph 169.

⁵²⁶ IEMS ER II, p 153; Ecuador submitted that TULAS obliged the operator to remedy the underground water source as well as the corresponding affected soil if contaminants were found in concentrations above the thresholds in Table 5 (Counter-Memorial, paragraph 805; Supplemental Memorial, paragraph 169).

⁵²⁷ IEMS ER I, p 26; Counter-Memorial, paragraph 786.

⁵²⁸ IEMS ER I, p 70.

⁵²⁹ IEMS ER I, pp 3, 8 and 72. Note that the Respondent at paragraph 809 of its Counter-Memorial stated that IEMS had identified 37 potentially contaminated “facilities” (rather than sites) to investigate. The full list of sites can be found at IEMS ER I, pp 3-5 and Counter-Memorial, paragraph 809.

⁵³⁰ IEMS ER I, pp 8-10.

230. These sites were the subject of IEMS' second report, which was produced in April 2012 and stood as a more comprehensive evaluation of the information it had collected from the 74 operational sites in Blocks 7 and 21.⁵³¹ The results reflected "more than 2,900 soil and underground water samples [collected] at different depths" by IEMS.⁵³² IEMS reported that it confirmed soil contamination in 70 out of the 74 sites studied (94% of the sites investigated).⁵³³ The sites were located in the Coca, Gacela, C6ndor Norte, Gacela, Jaguar, Lobo, Mono, Oso, Payamimo, Punino, Yuralpa, Chonta, Dayuno, Nemoca and Sumino fields.⁵³⁴ The volume of soil that IEMS quantified as requiring remediation was 1,086,883 m³ (Base Values) or 1,012,245 m³ (regulatory limits).⁵³⁵ As for groundwater contamination, it reported that 100% of the 18 sites it had tested yielded concentrations above the thresholds set by Ecuadorian regulations: in the Payamimo, Coca, Oso, Gacela, Jaguar and Mono fields of Block 7 and the Yuralpa, Dayuno and Waponi fields of Block 21.⁵³⁶ It identified a further 52 sites that it intended to investigate for possible groundwater contamination.⁵³⁷

231. In quantifying the volume of soil to be remediated, IEMS utilised ArcView GIS 10.0 software.⁵³⁸ IEMS drew a 10-meter radius around each sample ("the buffer") and defined the boundary of the area ("the bounds") by connecting the outer limits of the outermost buffers within a platform.⁵³⁹ It then added calculations for the volume to be estimated, modeling 6 different layers of depth (from 0 to 1 meter deep, 1.01-2 meters and so on).⁵⁴⁰ It assessed each layer separately, determining whether it contained contaminated soil on the basis of whether it contained at least 3 samples displaying contamination.⁵⁴¹ If it contained less than 3 samples, "these samples were not considered in the quantification model."⁵⁴² IEMS then divided the area within each boundary into cells of 1 square meter each, categorised them (as either non-contaminated, contaminated with concentrations above Base Values but below the regulatory thresholds, or contaminated with concentrations above regulatory levels), and then applied the 'inverse distance weighed' method of interpolation within ArcView GIS.⁵⁴³ This method estimated cell values "by averaging the values of sample data points in the area surrounding each cell", meaning that the closer a sampling point was to the centre of the cell being estimated, the more influence or weight it had in the average.⁵⁴⁴

232. In total, IEMS determined that its estimated cost of remediation amounted to US\$ 2,200,480,958 (base values case) or US\$ 895,553,066 (regulatory case) for soil remediation,

⁵³¹ IEMS ER II, p 1. 'Operational sites' were described by IEMS as sites it had been informed were worked by the Consortium (Burlington and Perenco), and included sites which were presently being operated by Petroamazonas (IEMS ER I, p 1).

⁵³² IEMS ER II, p 1.

⁵³³ IEMS ER II, p 180.

⁵³⁴ IEMS ER II, pp 138-142 for full list.

⁵³⁵ IEMS ER II, pp 180-181.

⁵³⁶ IEMS ER II, p 180; Supplemental Memorial, paragraphs 176, 288-289.

⁵³⁷ IEMS ER II, p 181.

⁵³⁸ IEMS ER II, Annex A.8 (developed by ESRI[®]).

⁵³⁹ Supplemental Memorial, paragraph 171; see IEMS ER II, Annex A.8.

⁵⁴⁰ Supplemental Memorial, paragraph 172; Reply, paragraph 191.

⁵⁴¹ Supplemental Memorial, paragraph 172; Reply, paragraph 191.

⁵⁴² Supplemental Memorial, paragraph 172; Reply, paragraph 191.

⁵⁴³ Supplemental Memorial, paragraph 173; Reply, paragraphs 191-192.

⁵⁴⁴ Reply, paragraph 192.

adding to this water remediation at a range of US\$ 41,277,600 (best case scenario) to US\$ 265,601,700 (worst case scenario).⁵⁴⁵ These costs were premised on *ex-situ* remediation⁵⁴⁶ (with the exception of the best case scenario method for groundwater remediation), based on “the treatment costs suggested by the Federal Remediation Technologies Roundtable (FRTR) and other international bibliographical sources.”⁵⁴⁷ Its breakdown of estimated cost according to the kind of contamination was as follows:

- (i) Soil contaminated with petroleum hydrocarbons: US \$280 per cubic metre of soil. This is “between the ranges of costs for the remediation of similar contaminated soils by treatments of the same type that IEMS ha[d] recently used.”⁵⁴⁸
- (ii) Soils contaminated with heavy metals: US\$ 320 per cubic metre of soil. This was arrived at on the “basis of the works conducted by IEMS and its commercial partners in various projects in Latin America (particularly in Mexico) during the last 5 years.”⁵⁴⁹
- (iii) Soil contaminated with petroleum hydrocarbons and heavy metals: US\$ 240 per cubic metre of soil. This was based “partially” “on information provided orally by providers of remediation work in the area.”⁵⁵⁰
- (iv) Contamination of groundwater: The best and worst case scenario related to two different methods for the treatment of underground water, using cost estimates taken from studies conducted by the Environmental Protection Agency of the United States of America.⁵⁵¹ The worst case scenario was based on the Pump and Treat System, which consists of extracting contaminated underground water for *ex situ* treatment, and quantified at an average yearly cost of US\$ 9,870,000.⁵⁵² The best case scenario was based on the Permeable Reactive Intercepting Barriers method, an *in-situ* treatment requiring, as its name suggests, installation below the

⁵⁴⁵ IEMS ER II, p 181, Annex T. IEMS sought an additional US\$ 3,380,000 for groundwater tests. Reply, section 2.2.2; Supplemental Memorial, paragraphs 305-311; IEMS ER II, Annex R.11. IEMS stated that since 100% of the locations it tested for underground water contamination was positive, it was of the view that all the remaining production facilities of Blocks 7 and 21 should be tested. It identified the cost of undertaking such a comprehensive evaluation as a further US\$ 3,380,000. (Supplemental Memorial, paragraph 311.) Finally, aside from soil and water pollution in the Blocks, IEMS noted environmental damage in the form of deforestation, reduction in air quality and noise pollution were also likely effects of oilfield operations but were difficult to quantify (IEMS ER II, p 3).

⁵⁴⁶ IEMS ER II, pp 166-179.

⁵⁴⁷ IEMS ER II, p 168, Annex R.

⁵⁴⁸ IEMS ER II, p 170.

⁵⁴⁹ IEMS ER II, p 172.

⁵⁵⁰ IEMS ER II, p 173 and footnote 36 (“IEMS, understands, however, that these providers do not provide all of the services required for a remediation consistent with the standards which truly allow for a protection of the environment (and which are used in other countries), and, therefore, its costs only constitute part of the total cost considered.”).

⁵⁵¹ IEMS ER II, p 174; see Supplemental Memorial, paragraph 300 (“...according to the US Army Corps of Engineers and US EPA’s publication *A Guide to Developing and Documenting Costs Estimates During the Feasibility Study* (EPA-540-R-00-002 dated July 2000)”) [Italics in original].

⁵⁵² IEMS ER II, p 174.

surface of a barrier to remove contaminants as water flows through it.⁵⁵³ This method cost an estimated US\$ 1,680,000 per year.⁵⁵⁴

233. Added to this was an “environmental monitoring cost” of US\$ 500, a 30% contingency factor for soil remediation, and for groundwater remediation, a “dismantling cost...and restoration cost” of 5% to 15% of the estimated cost and a similar contingency factor of 30%.⁵⁵⁵

234. In response, Perenco’s expert, GSI, contended that Ecuador’s claim of widespread environmental damage was completely unfounded and inconsistent with objective contemporaneous evidence.⁵⁵⁶ In its first report of 20 September 2012, GSI noted that it had been tasked to “provide an objective evaluation of the work conducted by IEMS and, at the same time, achieve a comprehensive assessment of current environmental conditions for each of the 74 oilfield facilities investigated by IEMS.”⁵⁵⁷

235. GSI explained that its investigation began with a review of IEMS’ first and second reports in order to “identify locations where soil impacts may be present based on applicable Ecuador criteria and to characterize apparent data gaps, errors and deficiencies” in IEMS’ work.⁵⁵⁸ This was followed by a “detailed visual and physical inspection” of 58 facilities, this including “54 of the 55 facilities for which IEMS had made claims regarding soil remediation costs per their ‘regulatory’ criteria (i.e., all 55 sites except the Dayuno well site, due to access restrictions).”⁵⁵⁹ GSI used this information for its sampling and testing campaign, undertaking field investigations in the Blocks from March through to June 2012, collecting soil samples at 24 sites and groundwater samples at 16 sites.⁵⁶⁰ GSI analysed sampling results both from its own and IEMS’ fieldwork, amounting to a total of 3,194 soil samples and 113 groundwater samples.⁵⁶¹ It screened IEMS’ test results in the first instance by using the “primary indicators of oilfield materials”⁵⁶²: TPH (or Total Petroleum Hydrocarbons), barium, electrical conductance or chloride.⁵⁶³ It used the sampling results it considered relevant to delineate those areas where

⁵⁵³ IEMS ER II, p 174.

⁵⁵⁴ IEMS ER II, p 175.

⁵⁵⁵ This not exhaustive: IEMS ER II, pp 169 and 177; see also, Supplemental Memorial, paragraphs 300-304, 418. In total, Ecuador concluded on the basis of IEMS’ evidence that to remediate 1,867,835 (background) or 691,444 (regulatory) cubic metres of soil it would cost a maximum of US \$2,279,544,559 (Base Values) and a minimum of US \$831,363,368 (regulatory criteria).

⁵⁵⁶ Claimant’s Counter-Memorial, paragraph 232; GSI ER I, paragraphs 2-11.

⁵⁵⁷ Claimant’s Counter-Memorial, paragraph 233; GSI ER I, paragraphs 2-4.

⁵⁵⁸ GSI ER I, paragraph 3.

⁵⁵⁹ Claimant’s Counter-Memorial, paragraph 233, and GSI ER I, paragraphs 2-4, Appendix D, Table D.10 and D.11.

⁵⁶⁰ GSI ER I, paragraph 4.

⁵⁶¹ Claimant’s Counter-Memorial, paragraph 235; GSI ER I, paragraphs 4-5 (“These campaigns included soil sampling at a total of 24 sites, groundwater sampling at 16 sites, and other miscellaneous sampling activities that, in combination with the prior analyses conducted by IEMS, comprise a database of 3194 soil samples, 113 groundwater samples, 18 sheen samples, 11 soil leachate samples from within closed mud/cuttings pits, 8 samples of crude oil, and 8 samples of produced water.”), Appendix D, Table D.19.

⁵⁶² GSI ER I, section 2.4.3. It defined indicator parameters as “chemicals or groups of chemicals that are present at significant concentrations in the source material and are readily detectable by field or laboratory analysis.”

⁵⁶³ GSI ER I, paragraphs 36-38 (addressed below in more detail).

“chemicals related to oilfield activities are present in soil or groundwater at concentrations in excess of applicable Ecuador regulatory criteria.”⁵⁶⁴

236. GSI concluded there was “no evidence of widespread adverse environmental or ecological effects in the Blocks”, and what environmental impact there was in the Blocks was minimal and in volumes and intensity that posed no danger to human health or the environment.⁵⁶⁵ In this connection, it asserted that Ecuadorian regulatory criteria were “more stringent than internationally accepted health-based screening levels.”⁵⁶⁶ It reported that 53 of the 74 facilities investigated by IEMS were in fact “free of environmental impacts, as defined based upon applicable regulations and health-based screening levels.”⁵⁶⁷ In the remaining sites, GSI discovered some incidence of concentrations of oilfield related chemicals in excess of regulatory limits: “[f]ive principal facilities (Payamino 2-8, Payamino 1, Mono CPF, Gacela 1-8 and Coca 18-19) present[ed] impacted soil volumes of 1000 cubic meters (m³) or more, while smaller soil volumes are present at an additional 11 sites, corresponding to a total soil volume of approximately 33,415 m³ for all sites combined.”⁵⁶⁸ Its preliminary estimate for the cost of remediating the soil at these sites was US\$ 9.1 million,⁵⁶⁹ based on “the actual costs for engineering, labor, equipment, and related remediation services in Ecuador” and reflecting on-site containment and remediation procedures.⁵⁷⁰

237. GSI qualified this estimate in asserting that remediation may not be necessary because “no risk is posed to human health at any of these locations and the majority of the soil impacts (95% of cost) are related to causes that pre-date current regulatory standards, as well as Consortium operations.”⁵⁷¹ GSI further submitted that approximately 76% of the total soil remediation costs were related to events that occurred “prior to October 1990.”⁵⁷² In addition, GSI reported that it had found no groundwater impacts in the 18 sites identified by IEMS, and asserted that IEMS’ findings resulted from “incorrect sampling methods.”⁵⁷³

238. GSI employed a delineation approach to estimate the volume of soil that required remediation.⁵⁷⁴ It explained that this method included linear interpolation amongst sampling points, rather than applying the “inverse distance weighted” method as IEMS did, and all the

⁵⁶⁴ GSI ER I, paragraph 5.

⁵⁶⁵ GSI ER I, paragraphs 219-22, Table 3.

⁵⁶⁶ GSI ER I, paragraph 7.

⁵⁶⁷ GSI ER I, paragraph 6.

⁵⁶⁸ GSI ER I, paragraph 7: GSI noted that “[a]t 5 additional sites (which represent less than 2% of the IEMS soil remediation claim), data presented by IEMS suggest that small volumes of soils in excess of applicable Ecuador limits may be present; however, in the time available for our field program, GSI did not conduct sampling and testing to confirm or delineate the extent of impacted soils at these 5 locations.”

⁵⁶⁹ GSI ER I, paragraphs 8, 219, Table 3. Claimant’s Counter-Memorial, paragraph 236. GSI stated this would rise to US\$ 9.87 million if the closure of 4 unused open pits (US\$ 0.07 million) and the well plugging and abandonment of 7 wells (US\$ 0.70 million) was included. (GSI ER I, paragraph 11(6)).

⁵⁷⁰ GSI ER I, paragraph 11(6). GSI added that “[e]xcavation, treatment, and disposal costs are based upon government-approved remediation contractors that are presently conducting similar work for many oil and gas operators in the Oriente region, including the Ecuador state-owned operators, Petroamazonas and Petroecuador.”

⁵⁷¹ GSI ER I, paragraph 8.

⁵⁷² GSI ER I, paragraph 8.

⁵⁷³ GSI ER I, paragraph 9.

⁵⁷⁴ GSI ER I, p 5, Appendix D.

while accounted for the surrounding topography and site features.⁵⁷⁵ This method meant “starting with any sample point that show[ed] an exceedance and then taking more samples surrounding that point, continuing to step outwards until clean soil [was] found.”⁵⁷⁶ GSI said that it performed this for each of the 1 metre depths that IEMS considered and which GSI identified depicted sampling results that merited an assessment.⁵⁷⁷ GSI submitted that in contrast to IEMS’ “hypothetical projections” in its inverse distance weighted interpolation, its method was based on “abundant actual data”, making “use of *all* the samples – including all of IEMS’ own data – as well as real topographic and other features particular to each site.”⁵⁷⁸

239. A significant portion of GSI’s report was devoted to its review of IEMS’ expert evidence in its first and second reports.⁵⁷⁹ GSI asserted that the methodology that IEMS had adopted to locate, investigate and model samples in the Blocks were marked by “pervasive and systematic flaws.”⁵⁸⁰

240. First, GSI asserted that its use of “indicator parameters” was to be preferred to the approach taken by IEMS.⁵⁸¹ It identified three primary sources of potential environmental effects in the oil production process.⁵⁸² These were drilling muds, crude oil and formation water.⁵⁸³

241. Drilling muds were used to lubricate and loosen the earth through which the drill bit must pass, and once that has been achieved are pulled back up to the surface along with chunks of soil, crushed rock and small traces of crude.⁵⁸⁴ GSI observed that in the early 1990s, the then-practice in Ecuador of discharging the mud cuttings into the surrounding environment was suspended, and operators were required to contain the substances in specially prepared “mud pits” in order for them to be re-vegetated.⁵⁸⁵ Drilling mud can be water-based (generally consisting of water, bentonite and barite) or oil-based (diesel).⁵⁸⁶ Water-based muds, which are commonly used in Ecuador, can contain large quantities of barium sulphate or barite.⁵⁸⁷ Thus, it is natural to find quantities of barium in mud pits.⁵⁸⁸

242. Turning to the second possible source of contamination, when a well is initially drilled, it produces “test crude”, which is crude used to determine the well’s production capacity and the quality of the oil.⁵⁸⁹ In GSI’s opinion, the only relevant measurement for detecting the presence

⁵⁷⁵ GSI ER I, Appendix D, D.5.1.

⁵⁷⁶ Rejoinder, paragraph 12.

⁵⁷⁷ GSI ER I, Appendix D, D.5.1.

⁵⁷⁸ Rejoinder, paragraph 12; GSI ER I, Appendix D, D.2.1.3 [Emphasis in original.].

⁵⁷⁹ GSI ER I, section 3, pp 29-63.

⁵⁸⁰ Claimant’s Counter-Memorial, paragraphs 18-19, 231-239. Outside of those set out in detail in the following paragraphs, GSI in its first report at paragraph 154 lists several other flaws it submitted affected IEMS’ findings.

⁵⁸¹ GSI ER I, paragraph 225.

⁵⁸² Claimant’s Counter-Memorial, paragraph 60.

⁵⁸³ *Ibid.*

⁵⁸⁴ GSI ER I, paragraph 16(1); 1st Witness Statement of Wilfrido Saltos, paragraph 172; Claimant’s Counter-Memorial, paragraph 68.

⁵⁸⁵ 1st Witness Statement of Wilfrido Saltos, paragraphs 170, 173, 181-187; GSI ER I, paragraph 16(1); Claimant’s Counter-Memorial, paragraphs 70-72.

⁵⁸⁶ GSI ER I, paragraph 16(1); Claimant’s Counter-Memorial, paragraphs 67-68.

⁵⁸⁷ GSI ER I, paragraph 34(3); Claimant’s Counter-Memorial, paragraph 69.

⁵⁸⁸ GSI ER I, paragraph 225; Claimant’s Counter-Memorial, paragraphs 68-69.

⁵⁸⁹ GSI ER I, paragraph 16(2); Claimant’s Counter-Memorial, paragraph 74.

of test crude was to test for “Total Petroleum Hydrocarbons” or “**TPH**” in the surrounding soil and groundwater.⁵⁹⁰ (“TPH” refers to hydrocarbon compounds derived from petroleum.⁵⁹¹):

As a basis for design of our field sampling program, the IEMS soil test results were carefully reviewed to identify locations where soil impacts are present or absent, based upon consideration of applicable Ecuador regulatory criteria. For characterization of oilfield-related soil impacts, the IEMS soil test results for the *primary indicators of oilfield materials* (i.e., *barium for drilling mud; TPH for crude oil; soil electrical conductance for produced water*) were compared to Ecuador regulatory criteria for the relevant land use. *The presence of other chemicals in the soil, in the absence of a primary indicator (e.g., nickel in the absence of elevated barium or TPH), cannot be caused by an oilfield material and was therefore not retained for further investigation.* Similarly, soil test results from within closed mud/ cuttings pits were not considered evidence of soil impacts, as these closed pits are specifically authorized and required under applicable Ecuador regulations (Acuerdo 621, Decree 2982, and RAOH Decree 1215) and the government-approved Environmental Management Plans (EMPs) for oilfield operations in the Consortium area.

Evaluation of the full IEMS database of soil tests results provides the following information regarding the nature of potential soil impacts among the 1243 soil sample locations collected outside of closed mud/ cuttings pits (excluding the 192 clean soil samples used by IEMS for characterization of background soil conditions):

- No Evidence of Soil Impact by Oilfield Materials: **91%** of soil sample locations
- Apparent Drilling Mud Impact: **6%** of soil sample locations (elevated barium, outside of proper mud/ cuttings pit)
- Apparent Crude Oil Impact: **4%** of soil sample locations (elevated TPH)
- Apparent Drilling Mud and Crude Oil Impact at Same Location: **0.7%** of soil sample locations
- Apparent Produced Water Salinity Impact: **0.1%** of soil sample locations (elevated electrical conductance)

These data show that, at the vast majority of the IEMS soil sample locations (91%), there is no evidence of impact by oilfield materials.”⁵⁹²

243. In arguing that the only relevant indicators of contamination from oilfield operations was TPH, barium (for drilling mud) and soil electrical conductance (for produced water),⁵⁹³ GSI differed from IEMS, which considered that the presence of heavy metals in the soil could also

⁵⁹⁰ GSI ER I, paragraphs 36, 225; Claimant’s Counter-Memorial, paragraph 76.

⁵⁹¹ Claimant’s Counter-Memorial, paragraph 76.

⁵⁹² GSI ER I, paragraph 181(1) [Emphasis added in italics, underlining and bold in original]; Reply, paragraph

73.

⁵⁹³ GSI ER I, paragraph 181(1).

result from drilling operations.⁵⁹⁴ GSI disagreed with IEMS on this, arguing that crude oil was not a significant source of heavy metals and, asserting that in fact “the crude produced in Blocks 7 and 21 contain[ed] far less heavy metal content than the area’s soils.”⁵⁹⁵ It asserted that IEMS’ allegations of contamination by heavy metals could not be correct because none of these metals other than barium exist in any oilfield materials (crude, produced water, or drilling muds) in concentrations above the naturally occurring levels found in local soils.⁵⁹⁶

244. GSI noted further that there were other types of naturally occurring hydrocarbons in the environment that were unrelated to petroleum exploitation.⁵⁹⁷ A certain level of TPH may be naturally present in the environment due to the presence of decaying carbon, such as rotting plant matter.⁵⁹⁸

245. Thirdly, a fluid known as “formation water” or “production water” is produced by wells throughout their operational lives.⁵⁹⁹ The presence of formation water in soil is marked by high concentrations of chloride and high electrical conductivity.⁶⁰⁰ Formation water was at one time discharged into the environment, but in the late 1990s, operators began re-injecting it into wells.⁶⁰¹ GSI explained that Oryx began using this method “near the end of its operatorship of Block 7 in 1997” and the Consortium “subsequently implemented a comprehensive reinjection program, repurposing or drilling multiple wells as injection wells.”⁶⁰² Thus, throughout Perenco’s operation of the blocks, formation water was not being discharged but rather was being re-injected into the wells. In any event, GSI asserted that the formation water produced in Blocks 7 and 21 did not contain significant amounts of heavy metals.⁶⁰³

246. Aside from the alleged conceptual flaw in IEMS’ even employing a “background values” case, GSI challenged IEMS’ method for calculating the “background values”, stating “because [it] calculates these supposed ‘background values’ as the *average* level at which the particular compounds occur in soil samples taken from unaffected areas, Ecuador is effectively contending that even some of the admittedly unaffected natural soil is actually ‘contaminated’ and requires remediation simply because it contains ‘above average’ levels of naturally occurring compounds.”⁶⁰⁴ Instead of using the upper range of the observed sampling results from its “clean

⁵⁹⁴ GSI ER I, paragraph 225(1) cf. IEMS ER III, p 3.

⁵⁹⁵ GSI ER I, paragraph 225; Claimant’s Counter-Memorial, paragraph 77.

⁵⁹⁶ GSI ER I, paragraph 225(1): “[T]he concentrations of barium, cadmium, chromium, lead, nickel and vanadium measures in 8 samples of crude oil collected from 6 production stations in the CPUF, Block 7 and Block 21 are significantly less than the background concentrations of these metals in clean natural soils in this area. This finding is consistent with many prior investigations of crude oil composition, which demonstrate that metals are not a significant component of crude oils.” Claimant’s Counter-Memorial, paragraphs 238 and 270; cf. IEMS ER II, p 3.

⁵⁹⁷ Claimant’s Counter-Memorial, paragraph 76.

⁵⁹⁸ Claimant’s Counter-Memorial, paragraph 76; and Exhibit CE-CC-241, Expost Environmental Impact Study and Environmental Management Plan for Coca Complex, Block 7, June 2010, Section 3, p 18 (2010 environmental study commissioned by Petroamazonas, noting that “[t]he TPH values of 183, 250, 132, and 157 mg/kg [in the soil samples] . . . must correspond to the organic material in the upper levels of the samples.”).

⁵⁹⁹ GSI ER I, paragraph 16(3); Claimant’s Counter-Memorial, paragraph 80.

⁶⁰⁰ GSI ER I, paragraph 225; Claimant’s Counter-Memorial, paragraph 83

⁶⁰¹ 1st Witness Statement of Wilfrido Saltos, paragraph 297; Claimant’s Counter-Memorial, paragraph 82.

⁶⁰² 1st Witness Statement of Wilfrido Saltos, paragraphs 297-298; Claimant’s Counter-Memorial, paragraph 82.

⁶⁰³ GSI ER I, paragraph 225; Claimant’s Counter-Memorial, paragraph 83.

⁶⁰⁴ Claimant’s Counter-Memorial, paragraphs 13 [Italics in original], 274, referring to GSI ER I, paragraphs 92-93, Appendix I; Rejoinder, paragraphs 96, 101-111.

soil samples”, IEMS had calculated the 99% upper confidence limit which “represents a small margin of uncertainty added onto the mean concentration, resulting in an adjusted mean concentration that is slightly above the average, but far below the upper range of concentrations observed in clean samples.”⁶⁰⁵ As a result, IEMS “erroneously declared” 80% of the “clean soils at all sites to be ‘contaminated.’”⁶⁰⁶

247. GSI also asserted that IEMS mischaracterised areas that were “almost entirely ‘industrial’ or ‘agricultural’ zones – with permissible threshold limits suitable to such areas – as more demanding ‘sensitive ecosystems’.”⁶⁰⁷ “Approximately two-thirds of the samples that Ecuador claimed show[ed] ‘contamination’ under these incorrect criteria (‘sensitive ecosystems’) were in fact fully compliant under proper land use criteria (‘industrial’ or ‘agricultural’),” this accounting for over US\$885 million of Ecuador’s US\$2.4 billion claim.⁶⁰⁸

248. As previously noted, RAOHE Table 6 and TULAS Table 3 present multiple sets of criteria, and the permissible limits for industrial land use are more permissive than those for agricultural land use, and in turn for ‘sensitive ecosystems’. Perenco contended that the land in and around the oilfield sites in Blocks 7 and 21 were either used for an industrial or an agricultural purpose.⁶⁰⁹ This was said to be consistent with RAOHE, Table 6, which pointed to the “posterior use that will be given to the remediated soil”, and referred specifically to the Heritage of State Natural Areas (*Patrimonio de Áreas Naturales del Estado*), and Ecuador’s own practice.⁶¹⁰ Examples of Ecuadorian authorities’ having accepted the application of *industrial* land-use criteria in Blocks 7 and 21 were to be found in the January 2003 Remediation Plan relating to the Payamino Sanitary Landfill, Payamino 22, Payamino CPF, Coca CPF and Jaguar CPF approved by the Ministry,⁶¹¹ the report of a clean-up of a spill at Payamino 19 in June 2009,⁶¹² the Consortium’s Environmental Impact Study for the construction of the Oso A and

⁶⁰⁵ GSI ER I, paragraphs 92-94.

⁶⁰⁶ GSI ER I, paragraph 94.

⁶⁰⁷ Claimant’s Counter-Memorial, paragraphs 15, 277-311, referring to GSI ER I, paragraph 11(7); Rejoinder, paragraph 97.

⁶⁰⁸ Claimant’s Counter-Memorial, paragraphs 16-17, 277-282; GSI ER I, paragraph 11(7). GSI submitted that IEMS’ failure to apply the correct regulatory criteria resulted in the incorrect categorization of 568 samples as contaminated: GSI ER I, paragraph 11(7), Exhibit 3.

⁶⁰⁹ Claimant’s Counter-Memorial, paragraph 279.

⁶¹⁰ Claimant’s Counter-Memorial, paragraph 283, section III.B.2(c). Perenco submitted that the majority of its operations in Blocks 7 and 21 would result in the classification of the land-use as industrial (Claimant’s Counter-Memorial, paragraph 289). Examples of practice of Ecuadorian authorities applying industrial criteria at paragraphs 292-297 of its Counter-Memorial.

⁶¹¹ Exhibits CE-CC-51, Letter of January 28, 2003 from Perenco to DINAPA, attaching the Remediation Program for Block 7, including Coca-Payamino field; CE-CC-54, Letter of April 22, 2003 from Perenco to DINAPA, p 1; Claimant’s Counter-Memorial, paragraph 292.

⁶¹² Claimant’s Counter-Memorial, paragraph 293, referring to Exhibit CE-CC-86, Sandblasting, Painting, and Mechanical Repairs to Gacela Station Tank (101-Tk).

Oso B platforms and the Yuralpa Norte platform in April and October 2006,⁶¹³ and in the environmental impact studies commissioned by Ecuador in 2010.⁶¹⁴

249. Similarly, examples of Ecuadorian authorities' having accepted the application of *agricultural* land-use criteria to the areas surrounding platforms in Blocks 7 and 21 were in the Ministry-approved remediation plan for the May 2007 spill from the Oso 2 flow line,⁶¹⁵ the January 2008 Ministry-approved remediation plan for a spill in the Gacela-Payamino flow line in October 2007,⁶¹⁶ and in the environmental impact studies commissioned by Ecuador in 2010.⁶¹⁷

250. Perenco contended moreover that IEMS had conceded in this arbitration that the areas surrounding Coca 6, Coca 8, Lobo 3, Lobo 1, Oso 9, Mono CPF, and Payamino CPF were used for agriculture.⁶¹⁸ GSI submitted that its assessment of the land-use surrounding each platform revealed that "95% of the areas surrounding the inspected platforms constitute[d] agricultural areas or secondary forests."⁶¹⁹

251. Perenco and GSI submitted that the 'sensitive ecosystems' criteria would at best apply only to a "tiny number of sites in the Blocks [which] intersect with designated 'sensitive ecosystem' areas, and even within those areas, the land use is actually agricultural – not a nature preserve."⁶²⁰ These sites were: Payamino CPF, Payamino 1, Payamino 2-8, Payamino 19,

⁶¹³ Exhibit CE-CC-110, Environmental Impact Study for the Construction of Platforms Oso A and Oso B, Access Road, and Drilling and Production Activities in Block 7, April 2006; CE-CC-122, Environmental Impact Study and Environmental Management Plan for the Construction of the Yuralpa Norte Platform, Access Road, and Drilling and Production Activities, October 2006; Claimant's Counter-Memorial, paragraph 294.

⁶¹⁴ Exhibits CE-CC-241, Expost Environmental Impact Study and Environmental Management Plan for Coca Complex, Block 7, June 2010, section 3, p 17 (EIS contracted by Petroamazonas for Coca, Payamino and Gacela fields); CE-CC-242, Expost Environmental Impact Study and Environmental Management Plan for Mono Complex, Block 7, June 2010, section 3.1.6.2, pp 15-17 (EIS contracted by Petroamazonas for Mono and Jaguar fields); CE-CC-236, Expost Environmental Impact Study and Environmental Management Plan for the Oso Complex in Block 7 and the Drilling of Three Additional Wells in Oso A, June 2010 section 3.1.6.3 (EIS contracted by Petroamazonas for Oso field).

⁶¹⁵ Exhibits CE-CC-116, Letter of June 4, 2006 from the Consortium to DINAPA; CE-CC-153, Letter of January 11, 2008 from the Consortium to DINAPA; CE-CC-138, Letter of August 14, 2007 from Ministry of Mines and Petroleum to the Consortium; CE-CC-197, Letter of February 11, 2009 from the Undersecretariat of Environmental Protection to the Consortium.

⁶¹⁶ Exhibits CE-CC-140, Letter of October 8, 2007 from the Consortium to DINAPA; CE-CC-151, Letter of January 10, 2008 from the Consortium to Undersecretariat of Environmental Protection; CE-CC-203, Letter of February 25, 2009 from the Consortium to DINAPA.

⁶¹⁷ Exhibits CE-CC-241, Expost Environmental Impact Study and Environmental Management Plan for Coca Complex, Block 7, June 2010, section 3, pp 79-81; CE-CC-242, Expost Environmental Impact Study and Environmental Management Plan for Mono Complex, Block 7, June 2010, section 3, pp 51, 175 (Mono, Jaguar and Condor fields featured crops and livestock).

⁶¹⁸ IEMS ER II, Annex H, pp 7, 56, 60, 78; Claimant's Counter-Memorial, paragraphs 300-311; 1st Witness Statement of Wilfrido Saltos, paragraph 74.

⁶¹⁹ GSI ER I, Appendix C, p 3, paragraph 197; Claimant's Counter-Memorial, paragraphs 302-304. Perenco further submitted that Ecuadorian authorities had up till the point of this proceeding treated the land surrounding the platforms as attracting agricultural land-use criteria (Claimant's Counter-Memorial, paragraphs 304-308).

⁶²⁰ Claimant's Counter-Memorial, paragraphs 278-279; 1st Witness Statement of Wilfrido Saltos, paragraphs 75-77.

Waponi-Ocatoe and Nemoca.⁶²¹ The Payamino sites were examples of sites that intersected with a protected area but which in fact were used for industry and agriculture.⁶²²

252. GSI applied sensitive ecosystems criteria to “the small amount of land that f[ell] within a designated protected area, despite the fact that the actual land use [did] not accord with the designation”, correlating to 89 of IEMS’ 1243 sampling locations.⁶²³ It otherwise applied agricultural or industrial land-use criteria in its analysis.⁶²⁴

253. GSI asserted further that IEMS had “systematically manipulated laboratory data” by assigning positive values to samples that in fact reported no detectable presence of target compound.⁶²⁵ For example, “if the detection limit for Total Petroleum Hydrocarbons (“TPH”) [was] 200 mg/kg, and the laboratory actually found no detectable presence of TPH, IEMS nevertheless identified the sample as containing a contamination of 199.99 mg/kg of TPH”.⁶²⁶ GSI asserted that this was in breach of accepted protocols, which in the event that a laboratory reports “non-detectable”, requires the sample to be labeled as “clean.”⁶²⁷ GSI contended that this “infected 79% of the results” or 2082 of the 2620 soil samples represented in its first and second reports.⁶²⁸ In this connection, GSI challenged IEMS’ classification of samples as presenting concentrations above the detection limit but below “background values” as a “low impact”, stating that under common use of the term “soil would only be considered ‘impacted’ if the concentration exceeded both the regulatory limit and natural background”, this corresponding to the “final ‘highly impacted’ tier of the IEMS classification system.”⁶²⁹

254. IEMS was also alleged to have “systematically” treated the contents of “clearly defined ‘pits’”, which are “areas specially constructed – with Ecuador’s approval – to hold oil drilling byproducts, especially so-called ‘drilling muds’ that contain heavy metals like barium”, as if they were “regular soil.”⁶³⁰ It took samples from inside closed mud pits, applied the testing methodology for regular soil instead of that applicable to mud pits, namely leachate testing, and compared the results to the permissible levels for regular soil in RAOHE Table 6 rather than for

⁶²¹ Claimant’s Counter-Memorial, paragraph 284.

⁶²² Claimant’s Counter-Memorial, paragraph 285; 1st Witness Statement of Wilfrido Saltos, paragraphs 75-77 (Mr. Saltos testified that Certificates of Intersection were “a key component in determining whether an area constitutes a protected area.” They are administrative acts issued by the Ministry of the Environment through which the Government certifies whether a specific area intersects with the National System of Protected Areas, Protective Forests and Forest Assets of the State. He raised an example of a Certificate of Intersection for Lobo 3 when the Consortium attempted to drill three additional wells on the platform. It provided the Ministry with the coordinates and the Ministry, on 13 December 2005, certified that the area did not intersect (Exhibits CE-CC-102; see also, CE-CC-39 (Yuralpa CPF)). Mr. Saltos admitted that “limited portions of the Blocks intersect with protected areas, but this does not mean that the entire extension of the Blocks should be treated as sensitive ecosystem.” (1st Witness Statement of Wilfrido Saltos, paragraphs 75-77).

⁶²³ Claimant’s Counter-Memorial, paragraph 288, footnote 352; GSI ER I, Appendix F.5.

⁶²⁴ Claimant’s Counter-Memorial, paragraphs 288, 300-311.

⁶²⁵ Claimant’s Counter-Memorial, paragraph 18; GSI ER I, section 3.3.

⁶²⁶ Claimant’s Counter-Memorial, paragraph 18; GSI ER I, section 3.3.

⁶²⁷ GSI ER I, paragraph 75.

⁶²⁸ Claimant’s Counter-Memorial, paragraphs 18, 380, 397-404 [Emphasis in original]; GSI ER I, paragraphs 74-75 cf. IEMS ER II, Annex I.3.a.

⁶²⁹ GSI ER I, paragraphs 75-76.

⁶³⁰ Claimant’s Counter-Memorial, paragraphs 18, 313-333; relying on GSI ER I, paragraphs 108-110; Rejoinder, paragraphs 98, 128-140.

leachates from mud pits in Table 7.⁶³¹ The significance of this is that IEMS came to the “conclusion that the areas [were] ‘contaminated’ when in fact they simply contain[ed] the very compounds that they [were] supposed to contain under Ecuadorian law.”⁶³² This invalidated any samples IEMS took from inside *closed* pits, that is, pits that had already been converted with Ministry approval into containment areas to prevent migration of contaminants, this representing “22% of the 2,629 samples” in question.⁶³³

255. This also invalidated sampling results that were evaluated against Table 6 of RAOHE, rather than Table 7. In Perenco’s view, mud pits are to be tested using a different methodology and criteria under RAOHE, Table 7, rather than Table 6, because they are designed to contain the discharge of industrial substances stemming from the drilling process, and naturally contain concentrations of barium higher than that found in the surrounding soil.⁶³⁴ Thus, Table 7 permits higher levels of an environmental impact than Table 6 permits. Perenco submitted that Ecuadorian authorities had historically acknowledged this and applied the Table 7 regulatory criteria to the investigation of mud pits, such as in the case of the 2008 environmental audit of Block 7.⁶³⁵ IEMS did likewise in its expert report in the *City Oriente* proceeding.⁶³⁶

256. Table 7 also employed a different methodology for testing because, in line with a mud pit’s function, it is concerned not with contaminants in the material contained within the pit but “whether the contents ‘leach’ impermissible amounts of various substances into underground water sources.”⁶³⁷ This explains why RAOHE Table 6 sets out concentrations in mg/kg, compared to Table 7, which provides concentration limits in mg/l.⁶³⁸ It is also evidenced in how Table 7 distinguished between the limits applicable to pits which have an impermeable liner and those which do not, and imposes stricter limits for the latter.⁶³⁹

257. Perenco submitted that this was the methodology endorsed by the State up until this proceeding, relying in this regard on a 2003 environmental report on specific sites in Block 21 (Yuralpa Centro 1 pit) and the 2008 audit of Block 7, where leachate testing was used and its

⁶³¹ Claimant’s Counter-Memorial, paragraphs 313-333. It cited as examples Coca 18, the Chonta platform, and Oso 9.

⁶³² Claimant’s Counter-Memorial, paragraphs 18, 313-333; GSI ER I, section 3.7.

⁶³³ Claimant’s Counter-Memorial, paragraphs 18, 316; GSI ER I, section 3.7, Appendix F.4, Appendix D, Table D.3 (summarising IEMS’ soil samples from pit locations).

⁶³⁴ Claimant’s Counter-Memorial, paragraphs 318-321, Section II.A.2(a).

⁶³⁵ Cf. Supplemental Memorial, paragraph 3: “...instead of applying the criteria applicable to soil contamination in sensitive ecosystems, Perenco’s audits applied those relating to agricultural and industrial areas”, and footnote 162 “The 2008 Environmental Audits considered that there was soil pollution and, consequently, a duty to remediate only where contaminants were found in concentrations above the thresholds set out in the RAOHE, (Annex 2, Table 6) for ‘soil for agricultural use’”.

⁶³⁶ Exhibit CE-CC-182/E-144, Biannual Environmental Audit of Block 7 and Coca-Payamino Unified Field, Two Years Prior to the Expiration of the Block 7 Participation Contract, November 2008, pp 67-68; CE-CC-169, IEMS Environmental Evaluation Report for the Hydrocarbons Activities of City Oriente Ltd., Block 27, submitted in *City Oriente v. Ecuador*, ICSID Case No. Arb/06/21, pp 16, 19 (5 mud samples obtained from pits compared against Table 7 of RAOHE); see also, 1st Witness Statement of Wilfrido Saltos, paragraphs 58, 128, 186, 194, 264; Claimant’s Counter-Memorial, paragraph 320.

⁶³⁷ Claimant’s Counter-Memorial, paragraph 324.

⁶³⁸ Claimant’s Counter-Memorial, paragraph 324.

⁶³⁹ Claimant’s Counter-Memorial, paragraphs 324-325.

results submitted to the Ministry.⁶⁴⁰ IEMS did not employ the leachate testing method in collecting its 624 samples.⁶⁴¹

258. For its part, GSI submitted that its analysis of the 624 soil samples “confirm[ed] that the concentrations of cadmium, lead, nickel, and vanadium in these drilling materials [were] actually *below* the background levels that exist[ed] naturally in area soils” and barium, which was detected in some areas at levels higher than those found in natural soils, appeared in a non-toxic form; barium sulfate – “the only source of barium in oilfield operations” – rather than barium chloride, and for that reason posed no harm to human health or the environment.⁶⁴²

259. GSI also contended that IEMS’ estimation of the volume of allegedly contaminated soil was exaggerated and significantly in error as a result of the misuse of the ArcView GIS Spatial Analyst software.⁶⁴³ The software is designed to “*interpolate* between two points” but “IEMS programmed it to *extrapolate* from a given point outwards without any constraining boundary”, and as a result “falsely depict[ed] vast and sweeping areas of contamination” which included areas in which no soil sampling had been taken that demonstrated an exceedance or which defied sampling results that depicted no contamination, and all the while ignoring the actual topography of the area which would influence how the contamination might naturally spread.⁶⁴⁴

260. GSI explained that the mapping algorithm of the software, the “Inverse-Distance Weighted Averaging” or IDW, is intended for use “in interpolation *between* measured data position, with very limited extrapolation *beyond* the immediate area of the sample locations.”⁶⁴⁵ It added that IDW was “very poor” at extrapolation, but that is precisely what IEMS used it towards with the result that their modeling was “extrapolation to extreme distances beyond the footprint of their data points.”⁶⁴⁶

261. Thus, the manner in which the bounds of each site within the model are drawn stood to have a compounding impact on the extent of the contamination marked by the software. Examining IEMS’ method, GSI reported that they assumed that each soil sample represented concentrations within a 10-meter radius ‘buffer area’ surrounding the data point, which it represented by circles inscribed around each sampling location.⁶⁴⁷ This despite the fact that “many of the soil samples collected by IEMS within 10 m of each other display[ed] very different chemical concentrations.”⁶⁴⁸ IEMS then drew a ‘boundary’ “corresponding to a rectangular area drawn tangential to the outermost buffer areas” within a site, and programmed

⁶⁴⁰ Claimant’s Counter-Memorial, paragraphs 326-327; Exhibit CE-CC-182/E-144, Biannual Environmental Audit of Block 7 and Coca-Payamino Unified Field, Two Years Prior to the Expiration of the Block 7 Participation Contract, November 2008, pp 67-68; CE-CC-213, Compilation of the Consortium’s annual environmental reports for Blocks 7 and 21, pp 51, 61.

⁶⁴¹ IEMS ER II, pp 47-48, Table IV-4 cf. GSI ER I, Appendix D, p 18; IEMS ER II, Annex C (Oso 9).

⁶⁴² Claimant’s Counter-Memorial, paragraphs 271-272 [Emphasis of the Claimant], GSI ER I, paragraphs 64-69, 225 cf. IEMS ER II, p 7.

⁶⁴³ Claimant’s Counter-Memorial, paragraphs 18, 379, 383-396; Rejoinder, section II(A)(3).

⁶⁴⁴ Claimant’s Counter-Memorial, paragraphs 18, 379, 383-396 [Italics in original]; GSI ER I, paragraphs 77, 120-129.

⁶⁴⁵ GSI ER I, paragraph 120.

⁶⁴⁶ GSI ER I, paragraphs 121-124; cf. IEMS ER I, Annex A.8; 2nd IEMS, Annex A.8.

⁶⁴⁷ GSI ER I, paragraph 122.

⁶⁴⁸ GSI ER I, paragraphs 122-123.

the software to extrapolate and fill in the area.⁶⁴⁹ In programming the software, IEMS input parameters which resulted in its extrapolating and filling in the boundary area with model soil “impacts” which in many cases ignored the fact that there was no data or the data showed no such condition.⁶⁵⁰

262. GSI claimed that this method was “novel and unique to IEMS and [was] not supported by either publications or common standards of practice for geostatistical mapping.”⁶⁵¹ This led Perenco to assert that this erroneous approach, coupled with other errors discussed in this section, “invalidate[d] *every single one* of IEMS’ soil volume calculations.”⁶⁵² Proper delineation, incorporating the topography and using compliant samples to define the boundaries of the contaminated area, would produce results which, in GSI’s opinion, established volumes of contamination that at best amounted to 1% or 2% of the volumes presented by IEMS for the same sites.⁶⁵³

263. GSI then asserted that IEMS had “systematically failed to properly filter groundwater samples”, resulting in the laboratory results’ reflecting particulates of which were essentially soil and, as such, producing values which were “scientifically impossible”, thereby “invalidat[ing] *all* of IEMS’ groundwater samples.”⁶⁵⁴ When GSI sampled groundwater using the correct filtration methods, all of those samples were fully compliant.⁶⁵⁵

264. In order to properly sample groundwater, technical guidelines require that the samples be clear of soil particles.⁶⁵⁶ Annex 5 of RAOHE provides that the methodology for testing the presence of heavy metals in water shall include filtration.⁶⁵⁷ GSI inspected the monitoring wells left in place by IEMS and “confirm[ed] that they [did] not conform to industry standards for groundwater sampling.”⁶⁵⁸ This gave rise to unreliable sampling results because when IEMS added nitric acid preservative in order to stabilise dissolved metal concentrations prior to testing, the acid dissolved the solid sediment particles that had been trapped, thereby exponentially elevating the metal concentrations to levels that could not be naturally present in water.⁶⁵⁹ For example, IEMS reported barium levels in its groundwater results as high as 8.28 mg/L, when in fact the maximum solubility limit for barium sulfate in groundwater is 3.1 mg/L.⁶⁶⁰

265. Moreover, IEMS failed to apply the correct regulatory criteria to the results of its groundwater tests.⁶⁶¹ It used the reference criteria of TULAS, Book VI, Annex 1, Table 5, which GSI explained applied only to water obtained from soil with a clay content of less than 25% and

⁶⁴⁹ GSI ER I, paragraphs 124-129.

⁶⁵⁰ GSI ER I, paragraph 125.

⁶⁵¹ GSI ER I, paragraphs 122-124.

⁶⁵² Claimant’s Counter-Memorial, paragraphs 18, 383-396 [*Italics in original*]; GSI ER I, paragraphs 117-119.

⁶⁵³ GSI ER I, paragraphs 120-127, Table 3; Claimant’s Counter-Memorial, paragraphs 384-395.

⁶⁵⁴ GSI ER I, section 3.4; Claimant’s Counter-Memorial, paragraphs 18, 334-340; Rejoinder, paragraphs 100, 144-156.

⁶⁵⁵ GSI ER I, paragraphs 79, 83, 226-228; Claimant’s Counter-Memorial, paragraphs 18, 334-340.

⁶⁵⁶ GSI ER I, section 3.4, paragraph 85.

⁶⁵⁷ Exhibit EL-147, RAOHE, Annex 5; Claimant’s Counter-Memorial, paragraph 335.

⁶⁵⁸ Claimant’s Counter-Memorial, paragraph 336; GSI ER I, paragraph 84.

⁶⁵⁹ Claimant’s Counter-Memorial, paragraphs 337-339; GSI ER I, paragraph 230; Rejoinder, paragraph 145.

⁶⁶⁰ GSI ER I, paragraph 81; cf. IEMS ER II, p 156, Table IV-12 (groundwater results for Mono CPF).

⁶⁶¹ GSI ER I, paragraph 86.

an organic material content less than 10%.⁶⁶² IEMS applied Table 5 to all of its samples regardless of the type of soil from which the sample was obtained: “Review of geologic logs from locations at or near the groundwater monitoring wells (available for 49 IEMS groundwater sample points) shows that, at 56% of the IEMS groundwater sampling locations, the soil composition [was] primarily clay.”⁶⁶³

266. GSI sampled 15 of the locations identified by IEMS, and reported that their tests confirmed that the presence of metal compounds above the Ecuadorian regulatory standards occurred “entirely as a result of extraneous soil particles.”⁶⁶⁴ For these reasons, Perenco submitted that Ecuador’s claim for remediation of contaminated groundwater lacked any foundation.⁶⁶⁵

267. Finally, GSI challenged IEMS’ remediation cost estimates as wholly unsupported, asserting IEMS had failed to “cite a single source for remediation cost estimates in Ecuador, or justify the enormous percentages added for alleged planning and contingency.”⁶⁶⁶ IEMS ignored actual cost data for the clean-up of sites by companies operating within Ecuador.⁶⁶⁷ GSI submitted that a reasonable and justifiable estimate was “in fact below US\$100 per cubic meter”, but IEMS’ average remediation unit price was US\$280 per cubic meter, this in turn inflating its claim “by over 400%.”⁶⁶⁸

F. Third expert report of IEMS and second expert report of RPS

268. IEMS’ third report, submitted in February 2013, responded to GSI’s criticisms and confirmed the reliability of its modeling and the results it produced as reported in its first and second reports (with the exception of three errors).⁶⁶⁹ IEMS explained that it undertook a fourth site inspection following the receipt of GSI’s report, and collected additional soil samples at 22 sites.⁶⁷⁰ It asserted that, as a result, “[w]ith the exception of a few spreadsheet errors, GSI’s contentions are without merit and IEMS’ conclusions as to the extent of contamination and the costs of remediation are correct.”⁶⁷¹ In its view, GSI had relied upon a “false and misleading methodology and, hence, reached incorrect conclusions in their misplaced attempts to downplay the full extent of the environmental damage” in Blocks 7 and 21.⁶⁷²

⁶⁶² GSI ER I, paragraph 86.

⁶⁶³ GSI ER I, paragraph 86.

⁶⁶⁴ GSI ER I, paragraphs 86, 182 and 229; Claimant’s Counter-Memorial, paragraph 339.

⁶⁶⁵ Claimant’s Counter-Memorial, paragraphs 334-340.

⁶⁶⁶ Claimant’s Counter-Memorial, paragraphs 18, 381, 405-433; Rejoinder, paragraphs 200-216.

⁶⁶⁷ Rejoinder, paragraphs 14 (“Even the very minimal evidence of local costs that IEMS has submitted with its Reply is far below IEMS’ cost estimates. IEMS’ assertion that no one in Ecuador is capable of remediating the oilfield in Ecuador cannot be reconciled with that fact that local companies certified by Ecuador have been remediating oilfields there for decades.”), 211.

⁶⁶⁸ Claimant’s Counter-Memorial, paragraph 18 [*Italics in original*] cf. IEMS ER II, p 170.

⁶⁶⁹ IEMS ER III, p 3. Reply, section 2.2.1; Ecuador explained that “minor corrections” were required for the values inputted into the modeling for Payamino CPF/Payamino 1 (total estimated volume above background levels is 187,104 m³ (formerly 192,593 m³, a reduction of 5,489 m³), and the estimated volume above regulatory reference criteria is 40,513 m³ (formerly 92,597 m³, a reduction of 52,084 m³)), Yuralpa Pad A (less 21,420 m³ of barium), Coca CPF (less 8,246 m³), Coca 8 (less 279 m³), Dayuno (less 1,424 m³).

⁶⁷⁰ IEMS ER III, pp 1-3.

⁶⁷¹ IEMS ER III, p 2; Reply, paragraph 5.

⁶⁷² Reply, paragraph 5.

269. Ecuador also challenged GSI's credibility and in particular that of its President, Mr. John Connor.⁶⁷³ It alleged that: throughout "his career, Mr. Connor has been at the service of private oil companies, systematically testifying in their favour and refusing to allocate liability for environmental harm" and pointed specifically to work that Mr. Connor and GSI had done in the well-known dispute between Ecuador and Chevron which suggested that GSI had engaged in a results-driven exercise of looking only at clean samples in order to exonerate the party which had retained it.⁶⁷⁴

270. Turning to IEMS' third report, IEMS first asserted that the list of contaminants that it examined in the samples it collected were elements "properly associated with oilfield activities" and, in any event, represented the chemicals that the regulations were concerned with and "set forth action levels for...without any requirement that these chemicals be associated with hydrocarbons, produced water or barium sulfate in order to call for remediation."⁶⁷⁵ In its view, GSI's approach rendered "null and void" key elements of RAOHE and TULAS.⁶⁷⁶ GSI's approach was said to be further contradicted by Perenco's own prior practice, as evidenced in an 'Environmental Protection Guide' it had produced during the course of its operatorship in which Perenco listed a total of 19 indicators including TPH, barium, cadmium, chromium, lead, and polycyclic aromatic hydrocarbons.⁶⁷⁷

271. Second, IEMS defended its use of the upper end of the confidence interval of the mean concentrations of the 189 'clean' soil samples it had tested in order to arrive at its background values.⁶⁷⁸ It asserted that its approach was consistent with RAOHE and TULAS, stating that it "believes that the intent of the regulations is not merely to estimate the sample mean but also the true population mean."⁶⁷⁹ In order to arrive at a true population mean, the traditional approach would have been to collect and test all clean soil in the Blocks, but since IEMS could not practically perform such an exercise, the next best alternative was to apply confidence intervals.⁶⁸⁰ It asserted that by applying the upper end of the confidence interval, it was selecting a higher concentration and in so doing acting conservatively in the circumstances.⁶⁸¹ It further argued that GSI's proposed method of arriving at background values was inconsistent with regulatory requirements in Ecuador.⁶⁸²

272. IEMS also responded to GSI's statement that Ecuadorian regulatory criteria were in fact more stringent than health-based screening levels, asserting the "risk assessment performed by GSI is unacceptably flawed and biased"; "[i]t did not include ecological risk" and it "consider[ed] only one of several human exposure pathways necessary to fully evaluate the potential risk to human health."⁶⁸³

⁶⁷³ Reply, paragraphs 21-24.

⁶⁷⁴ Reply, paragraph 22. Cf Footnote 12.

⁶⁷⁵ IEMS ER III, p 2, section 3.1

⁶⁷⁶ IEMS ER III, section 3.1, pp 13-14.

⁶⁷⁷ IEMS ER III, section 3.1, p 14 referring to Attachment 3 to the report.

⁶⁷⁸ IEMS ER III, section 3.2.1, pp 15-18.

⁶⁷⁹ IEMS ER III, p 15 [Emphasis in original].

⁶⁸⁰ IEMS ER III, pp 16-17.

⁶⁸¹ IEMS ER III, p 17.

⁶⁸² IEMS ER III, pp 18-21.

⁶⁸³ IEMS ER III, p 47 (section 3.2.3.1).

273. Third, IEMS asserted that, contrary to GSI's claims that drilling mud and the contents of mud pits were relatively innocuous and posed no significant health risk: "[a]lthough barium sulfate is relatively insoluble under oxidizing conditions, it is fairly soluble in acidic and anaerobic conditions, which means that, variations in pH conditions could result in the dissolution of barium from barium sulfate; thereby, barium would be released to water and soil during the disposal of drilling wastes."⁶⁸⁴ Moreover, the relevant reference criteria were to be found in Table 6, not Table 7, of RAOHE because Table 7 applied only during the pit closure process and for a short period thereafter.⁶⁸⁵ IEMS challenged GSI's testing method, submitting that it collected "samples of the clean soil covers that had been placed over the mud pits at the time of closure, which implie[d] that: 1) GSI samples represent only the quality of the clean soil surface; 2) GSI did not identify and therefore, did not know the toxicity of the waste disposed within pits, and 3) GSI misinterpreted their results equating the concentration of the cover soil to the fill material of the pits."⁶⁸⁶

274. IEMS further challenged GSI's use of Table 7(b) of RAOHE (criteria governing lined pits) rather than the more stringent limits established in Table 7(a) (governing unlined pits). It stated that the choice was "unfounded, as there [was] no evidence of intact impermeable liners beneath [the] pits" examined in Blocks 7 and 21, but there was evidence that the pits were not lined, or that their liners had seriously deteriorated.

275. RPS, Ecuador's other expert, noted in this regard that GSI's use of Table 7(b) of RAOHE (criteria governing lined pits) ran afoul of the Consortium's own practice of applying Table 7(a). RPS cited examples of pit closure documents for Jaguar 9 from November 2000 and Coca 19 from October 2004 which referred to Table 7(a).⁶⁸⁷ RPS asserted that if GSI had applied Table 7(a) limits, it would have concluded that four of the seven pits that GSI had tested should be remediated.⁶⁸⁸

276. IEMS submitted in addition that GSI ignored "significant shortcomings" in the Consortium's management of mud pits, inconsistent with their obligations under RAOHE and TULAS.⁶⁸⁹ The pits were constructed in disregard of applicable regulations,⁶⁹⁰ they were not monitored timeously, they were not tested timeously upon their closure (7 days, 3 months and 6 months after), and their contents were allegedly mixed with clean soil or water in order to dilute the contamination, a practice that TULAS prohibited.⁶⁹¹ The consequences of such omissions by

⁶⁸⁴ IEMS ER III, section 3.2.2, p 25. IEMS added that GSI's statement that oil-based muds were rarely used in the blocks was a bald-faced assertion which it could not verify because "the Consortium does not present the drilling records of the wells, or any other records demonstrating which pits are likely to contain the oil-based wastes, it is not reasonable to assert that the contents of the pits are similar to normal soils and benign." (p 25).

⁶⁸⁵ IEMS ER III, p 27; see also, Ecuador's Counter-Memorial, paragraph 305.

⁶⁸⁶ IEMS ER III, section 3.2.2.3; Reply, paragraphs 91, 304-312; RPS ER II, section 2, p 8.

⁶⁸⁷ Reply, paragraphs 92-93; RPS ER II, section 5, pp 81-83; IEMS ER III, section 3.2.2.

⁶⁸⁸ RPS ER II, section 5, pp 82-83; see Appendix A to Claimant's Reply Post-Hearing Brief on Counterclaims dated 22 November 2013.

⁶⁸⁹ IEMS ER III, section 3.2.2.

⁶⁹⁰ Cites the example of collapse of C6ndor Norte pit.

⁶⁹¹ Reply, paragraph 39; IEMS ER III, section 3.2.2. The reference to TULAS is the reference to Article 4.2.1.3 which provides that "[t]he use of any kind of water to dilute untreated liquid effluents is forbidden." (EL-146, TULAS).

the Consortium had not been identified by GSI because of the unreliability of its method of investigating the pits in Blocks 7 and 21.⁶⁹²

277. IEMS asserted that GSI also incorrectly delineated the size of the pits and the areas that needed to be tested for leachates. Proper delineation was required to determine whether the pit was leaking contaminants. IEMS argued that GSI either presented the pits as being “larger than they really are so as to give the impression that they [were] not leaking and that the pits and their surrounding areas accordingly require[d] no remediation” or failed to act on evidence of contamination in area surrounding mud pits such as in the case of the Coca 8 pit where IEMS had proved exhibited serious contamination but GSI “failed to meaningfully assess the source of the contamination.”⁶⁹³

278. Fourth, IEMS asserted that the GSI misinterpreted and misapplied the regulatory criteria applicable to the environment in the Blocks.⁶⁹⁴ “GSI considered that the regulatory levels to be used were based on the *current* land use of the areas, completely ignoring the express provisions of Table 6 of the RAOHE (referring to the *future* land use).”⁶⁹⁵ IEMS defended its use of the sensitive ecosystems criteria,⁶⁹⁶ stating that while areas in the Blocks may not be designated protected areas, their ecological studies suggested that most displayed characteristics “similar to those of a National Natural Area.”⁶⁹⁷ The fact that several sites are currently being operated or have been used for industrial purposes in the past is “of no relevance to *future* land use.”⁶⁹⁸

279. Ecuador submitted that the significance of classifying the land based on future use was so as to “*facilitate site reuse*”, a term taken from the lexicon of the US Environmental Protection Agency.⁶⁹⁹ Since the oilfields are “carved out in the middle of the Amazonian jungle”, “entirely surrounded by rainforest” and their present use for oilfield operations will “inevitably run out” they are destined to be re-absorbed by the rainforest and can reasonably be anticipated to revert back to their natural, sensitive ecosystem state.⁷⁰⁰

280. Fifth, IEMS defended its treatment of non-detect analytical results, criticising GSI for “attempting to obfuscate IEMS’ use of a conservative yet standard technique for handling non-detect data.”⁷⁰¹ It asserted that its method was “a reasonable way to deal with the uncertainty of laboratory results when these results are reported at below the detection limit, but when field

⁶⁹² Reply, section 2.1.3.2.

⁶⁹³ Reply, paragraphs 94-95; IEMS ER III, section 3.2.4.

⁶⁹⁴ IEMS ER III, section 3.2.3.

⁶⁹⁵ IEMS ER III, p 45 (italics in original); Exhibit EL-147, RAOHE, p 7 of PDF; see also, Reply, paragraphs 294-303; Transcript, Hearing on Counterclaims, Day 1, pp 70-72 (Opening Statement of Eduardo Silva Romero).

⁶⁹⁶ IEMS ER III, p 48: “The activities performed during this fourth stage of the assessment confirmed that the area where Blocks 7 and 21 are located must be considered a sensitive ecosystem.”

⁶⁹⁷ IEMS ER III, p 41, see also, pp 41-47.

⁶⁹⁸ Reply, paragraph 297 [Emphasis in original].

⁶⁹⁹ Reply, paragraph 298 [Emphasis in original.], referring to Exhibit EL-178, United States Environmental Protection Agency Memorandum, *Considering Reasonably Anticipated Future Land Use and Reducing Barriers to Reuse at EPA-lead Superfund Remedial Sites*, p 2.

⁷⁰⁰ Reply, paragraph 299; Transcript, Hearing on Counterclaims, Day 1, pp 70, line 4 to 72, line 15 (Opening Statement of Eduardo Silva Romero); Ecuador cited in support Exhibits E-275, Confidential memorandum, ConocoPhillips, Huarani Reserve and Block 21 map, p 36, and E-273, Oilfield Sites and Sumaco Biosphere Reserve Map.

⁷⁰¹ IEMS ER III, section 3.2.4, p 49.

conditions are indicative of the presence of the contaminant of concern, at some level”, an approach that has been “strongly recommend[ed]” by the US EPA which has opined that “non-detect samples [are] never [to] be considered to be zero or omitted from the data set (USEPA, 1989).”⁷⁰²

281. In this regard, IEMS cited instances in which GSI itself had substituted non-detect or other results in its sampling. For example, it used a substitution of 50% of the detection limit for non-detects on samples for determining background values.⁷⁰³

282. Sixth, IEMS responded to GSI’s criticisms of its modeling technique using the ArcGIS software.⁷⁰⁴ It submitted that its choice and use of the IDW algorithm was sound.⁷⁰⁵ It characterized the parameters that it employed in its geo-mapping software as conservative.⁷⁰⁶ IEMS explained that its buffer was limited to a 10-meter radius around each sample,⁷⁰⁷ and in assessing whether one of the layers should be mapped it required at least 3 samples exhibiting contamination.⁷⁰⁸ If it contained less than 3 samples, “these samples were not considered in the quantification model.”⁷⁰⁹ It defended the use of the inverse distance weighted method of ArcGIS as “appropriate and [...] generally accepted by the international scientific community.”⁷¹⁰ It challenged the modeling method adopted by GSI as unrealistically stopping at the position of the sample that establishes contamination if there are no additional samples further in that direction, ignoring the factual likelihood that there is further contamination in the area.⁷¹¹

283. IEMS contested each of the so-called “key errors” that GSI had identified, asserting they were “falsely alleged.”⁷¹² For example, the location and the extension of the bounds did not have a significant impact on the modeling, which is influenced in large part by the algorithm and the parameters inputted.⁷¹³ In any event, “[i]n light of the fact that there was no information about the environmental liabilities left by the operators of the oilfields prior to 2009, and that complete records of spills, mud pits, and other environmental incidents were not available, the evaluation of large bounds was a reasonable and prudent approach.”⁷¹⁴ Its main criticism of GSI’s approach was that it assumed that the dispersion of contaminants was uniform and predictable⁷¹⁵ when in

⁷⁰² IEMS ER III, section 3.2.4, p 49, see also, p 50 (“This is an extreme and unrealistic position on how to manage a censored dataset (that is, a dataset containing results that are either too high or too low to be quantified) and is not considered acceptable by most regulatory agencies (US EPA 2000, US EPA, 2002, US EPA 2007, Hesel, 2007)”).

⁷⁰³ IEMS ER III, section 3.2.4, p 50.

⁷⁰⁴ IEMS ER III, section 3.2.5.

⁷⁰⁵ IEMS ER III, section 3.2.5.

⁷⁰⁶ Supplemental Memorial, paragraphs 170-174.

⁷⁰⁷ Supplemental Memorial, paragraph 171.

⁷⁰⁸ Supplemental Memorial, paragraph 172.

⁷⁰⁹ Supplemental Memorial, paragraph 172.

⁷¹⁰ Reply, paragraph 195; Supplemental Memorial, paragraph 173.

⁷¹¹ Reply, paragraph 196.

⁷¹² IEMS ER III, p 54.

⁷¹³ IEMS ER III, section 3.2.5.1, p 54.

⁷¹⁴ IEMS ER III, p 56.

⁷¹⁵ IEMS ER III, p 72: “This is very far from reality. As all the models (including the method that GSI used) are based on the assumption that the soil contamination follows a certain pattern, the only way to estimate the true extent of soil contamination would be through sampling of all the soil within the area, which is not what GSI has done.”

fact it was “radial and [...] not influenced by the location of the samples.”⁷¹⁶ For this reason, IEMS used a variable search radius set to 12 samples but in an attempt to keep its results “conservative” applied a power value (i.e., the extent of the effect of a relatively higher concentration sample on the samples in its vicinity) of 3 which tended to decrease the size of the “hot spot” in the modeling: “If the power is higher, the size of the hotspot will decrease, as the effect of the high concentration sample will be limited to the nearest cells.”⁷¹⁷ IEMS reasoned that a higher power took into account the topography of the area.⁷¹⁸

284. IEMS added that it used an internal cross-validation option of the software to ensure that its results were sound,⁷¹⁹ and while it did identify a number of errors, it largely confirmed the results of its first and second reports.⁷²⁰ It collected a further 157 soil samples in 22 different sites to determine whether the estimations produced by the ArcGIS model matched the actual conditions on site.⁷²¹ The result of this exercise confirmed “(i) the predictions of IEMS’ modeling, showing contamination not only within the area modeled by IEMS (pursuant to the predicted level, *i.e.*, above background values and regulatory limits) but also outside the bounds used (confirming the conservative approach adopted by IEMS) and (ii) that sites GSI completely ignored in its purported attempt to confirm and delineate the contamination demonstrated by IEMS [were] in fact highly contaminated.”⁷²² IEMS reported that the cross-validation exercise confirmed its estimation of contamination in the following 22 sites: Mono CPF, Mono 10-12, Jaguar 2, Jaguar 3, Jaguar 7-8, Payamino 1 and CPF, Payamino 3, Payamino 4, Payamino 16, Payamino 21, Payamino 23, Coca 1, Coca 4, Coca 8, Coca 9, Coca 12, Coca 18-19, Gacela 4, Gacela 6-9, Cónдор Norte, Lobo 1 and Lobo 2.⁷²³

285. Seventh, IEMS asserted that GSI’s treatment of the testing of groundwater and its results was contrary to Ecuadorian regulations and accepted scientific practice.⁷²⁴ It submitted that the applicable regulation was TULAS (Book VI, Annex 1, Section 4.1.3), *not* RAOHE (Annex 5), because the latter regulated water quality for superficial bodies and wastewater discharges, not groundwater.⁷²⁵ Annex 5 of RAOHE referred to filtration, but TULAS did not.⁷²⁶ In fact, TULAS mandates analysis of the total concentration of heavy metals, and is not restricted to the dissolved concentration: “The difference between the two criteria is that the total concentration includes the dissolved, colloidal and suspended fractions of the contaminants within the sample, while the dissolved concentration does not include the colloidal and suspended fractions.”⁷²⁷ For this reason and on the basis of standards promulgated by the Ecuadorian Standardization Institute

⁷¹⁶ IEMS ER III, p 56.

⁷¹⁷ IEMS ER III, p 59.

⁷¹⁸ IEMS ER III, p 60.

⁷¹⁹ IEMS ER III, pp 66-72; Attachments 36 and 37; Reply, paragraph 201.

⁷²⁰ IEMS ER III, pp 66-72; Attachments 36 and 37; Reply, paragraph 201.

⁷²¹ Reply, paragraphs 198-202.

⁷²² Reply, paragraph 201; IEMS ER III, section 4.2 and Attachments 36 and 37.

⁷²³ Reply, paragraphs 164-170, 202; IEMS ER III, section 4.2 and Attachments 36 and 37; RPS ER II, section 3.4 cf. Rejoinder, paragraphs 144-156.

⁷²⁴ IEMS ER III, section 3.3.

⁷²⁵ IEMS ER III, p 76; Reply, paragraph 166; RPS ER II, section 3.4, pp 22-23; IEMS ER III, section 3.3.

⁷²⁶ IEMS ER III, p 75.

⁷²⁷ IEMS ER III, p 75. [Emphasis omitted].

(INEN 2169:98 and 276:98)⁷²⁸, IEMS submitted that GSI's method of filtering samples with 0.45 um filters (micrometers) was incorrect and invalidated its groundwater sampling conclusion.⁷²⁹ Moreover, it asserted that GSI did not measure the TPH in the groundwater, as required by TULAS, but instead chose to test three other different parameters: Gasoline Range Organics, Diesel Range Organics and Oil Range Organics and compared them individually to the criteria in TULAS.⁷³⁰ This compounded its error in filtering its samples.⁷³¹

286. IEMS' rebuttal to GSI's criticism that TULAS cannot be applied to soil located in areas with a content of clay greater than 25% was that it "recognize[d] that a number of monitoring wells may be located in [such] areas", but "[g]iven the conditions of the area, and if it is demonstrated that the TULAS regulation does not apply, then the correct standard for remediation in these areas is the background levels...which would in all likelihood be even stricter than the TULAS permissible levels."⁷³² For the purpose of its third report, IEMS undertook two rounds of confirmation tests, taking filtered and unfiltered samples: installing six monitoring wells and performing sampling from 17-19 December 2012, and a further re-sampling of the same wells from 22-24 January 2014. Its conclusion was that there was a "very small difference between the filtered and unfiltered samples", and in the instances that the concentration of contaminants did decrease between filtered and unfiltered samples from the same monitoring well, IEMS submitted that "[t]his reduction could have been the result of dilution due to heavy rains happening during the days when the sampling process was performed."⁷³³

287. Eighth, on the matter of remediation, IEMS asserted that the experts were together on the issue of whether hydrocarbon-impacted soils should be sent off-site for treatment: GSI proposed that such soil be sent to an officially-approved soil remediation facility in the city of Coca for treatment while IEMS proposed that it is sent to an unspecified offsite bio-treatment facility.⁷³⁴ Where they diverged was on the treatment of soils contaminated by heavy metals; GSI proposed an on-site lined landfill, while IEMS proposed an off-site landfill.⁷³⁵

288. IEMS asserted that since the operations in the Blocks are located in a sensitive ecosystem and "given that it is expected that the oilfield areas will return to their original condition at the completion of petroleum operations, the presence of several landfills scattered throughout the Blocks containing contaminated material is not compatible with the future use of the areas."⁷³⁶ GSI's approach to estimating the unit costs of remediation were also said to be unrealistic, contrary to industry practice and ignored the "specificities of the jungle environment" in Blocks 7 and 21.⁷³⁷ For example, IEMS contended that "GSI's figure of US\$80/m³ is based on a very limited scope of work that [did] not take into account the challenges of performing these

⁷²⁸ IEMS ER III, p 76: Barium, cadmium, total chromium, cobalt, cooper, lead, molybdenum, zinc and nickel: acidification only (i.e., no filtering).

⁷²⁹ IEMS ER III, section 3.3, in particular, pp 75-76.

⁷³⁰ IEMS ER III, pp 73-74.

⁷³¹ IEMS ER III, section 3.3.

⁷³² IEMS ER III, p 77.

⁷³³ IEMS ER III, p 79.

⁷³⁴ IEMS ER III, section 3.2.6.

⁷³⁵ IEMS ER III, section 3.2.6, p 73.

⁷³⁶ IEMS ER III, p 73.

⁷³⁷ Reply, section 2.2.1.3; paragraphs 213-231.

remediation works in the Amazon region and does not include the costs for excavation and cross-country transportation.”⁷³⁸ It also responded to GSI’s criticism of its basis for the cost of remediating groundwater (i.e., using a US EPA survey of costs for groundwater remediation in the United States) by asserting that what GSI ignored was that “local remediation providers in Ecuador do not have the necessary expertise to perform these remediation works” and GSI itself did not put forward “any alternative quantification based on local costs.”⁷³⁹ IEMS’ costs, in contrast, were said to be “in line with common practice for these types of remediation projects in Ecuador as is confirmed by a recent economic price quotation from a local company (GPower).”⁷⁴⁰

289. Accounting for corrected estimated contaminated soil volumes for Coca 8, Coca CPF, Payamino CPF/Payamino 1, Dayuno and Pad A, IEMS reported that its updated total estimated contaminated soil volumes was 1,867,835 m³ (background values case) and 691,444 m³ (regulatory reference criteria).⁷⁴¹ It asserted its remediation cost estimate remained reasonable and that GSI’s proposed cost estimate was based on the use of site landfills which was inappropriate for the Blocks and “failed to account for the enormous difficulty (and significant cost) of working safely and protectively in the Amazon.”⁷⁴² Its revised estimated cost of remediation of contaminated soil was US\$ 2,279,544,559 (background values) and US\$ 831,125,954 (regulatory reference criteria).⁷⁴³ It maintained the same estimate cost of groundwater remediation as in its second report.⁷⁴⁴

290. As noted above, IEMS’ third expert report was submitted together with an expert report from RPS which reviewed and responded specifically to GSI’s first report.⁷⁴⁵ RPS submitted that significant flaws in GSI’s site investigation method “fundamentally undermine[d] the resulting conclusions reached by GSI on the environmental conditions in the CPUF, Block 7 and Block 21 and the risk they pose to human health.”⁷⁴⁶ RPS opined that there were significant flaws in GSI’s testing and sampling methodology, in the choice and application of regulatory criteria, and in the modeling that GSI adopted.⁷⁴⁷

291. The first such flaw was that GSI’s investigation was deliberately narrow in scope, in that GSI conducted inspections at only 58 of the 74 sites investigated by IEMS, and collected samples from a “mere 24 of the 74 sites studied by IEMS (85% of them being collected from

⁷³⁸ Reply, paragraph 217.

⁷³⁹ Reply, paragraph 229; IEMS ER III, section 5.3.

⁷⁴⁰ Reply, paragraph 218.

⁷⁴¹ IEMS ER III, p 112; IEMS in its third report conceded there was a typographical error in its excel spreadsheet setting out the cost-proposal for remediation, explaining that it used a 30% mark-up for implementation of safety measures when this should have been 3%, resulting in an overestimation of around US \$110,000,000 (Reply, paragraph 221; IEMS ER III, section 5.5).

⁷⁴² IEMS ER III, pp 113-125.

⁷⁴³ IEMS ER III, p 123.

⁷⁴⁴ IEMS ER III, p 112.

⁷⁴⁵ Reply, paragraphs 181-186; RPS ER III, paragraphs 1.1-1.3. RPS was engaged by Ecuador to “provid[e] a further independent assessment of *‘the environmental investigation conducted by GSI, the risk assessment GSI purports to perform, and the conclusions GSI reached based on their activities’.*” (RPS ER III, Section 1.3, p 3 [Italics in original]).

⁷⁴⁶ RPS ER III, section 2, p 5; Reply, paragraph 174.

⁷⁴⁷ Reply, section 2.1.

only 18 sites)” for soil contamination testing.⁷⁴⁸ In the case of alleged groundwater contamination, GSI similarly collected samples at only 15 out of the 18 sites identified.⁷⁴⁹ This was because GSI restricted itself to investigating only reports of soil contamination that surpassed regulatory or risk-based thresholds (i.e., it did not investigate reports of soil contamination above base values but below regulatory or risk-based limits).⁷⁵⁰ Even so, there were five sites where IEMS had reported the presence of contamination above the regulatory criteria employed by GSI which the latter ignored without explanation; “GSI also ignored other sites for which IEMS had collected soil samples showing environmental impacts within platform areas, even though platforms are not exempted from remediation for environmental damage.”⁷⁵¹

292. Second, the selective use of “indicator parameters” invalidated GSI’s approach to the investigation of the Blocks.⁷⁵² It resulted in their excluding sites in the face of clear evidence of possible contamination. RPS cited the example of an area near Payamino 1 that GSI had identified as exhibiting “oil residue associated with a former produced water surface impoundment” but which it then excluded on the basis that samples from the site did not indicate impacts based on electrical conductance.⁷⁵³ GSI’s approach also resulted in its excluding all heavy metal contamination found in Blocks 7 and 21; in RPS’s view, this was an “absurd consequence [that] render[ed] the Ecuadorian regulations that provide[d] for acceptable limits of certain heavy metals wholly pointless.”⁷⁵⁴ Finally, RPS submitted that this approach was inconsistent with the Consortium’s own practice, referring to an Environmental Protection Guide that Perenco had developed while it operated the Blocks which identified 16 chemical substances that should be monitored and did not condition them on whether they were associated with hydrocarbon, barium or any other indicator substance.⁷⁵⁵

293. Third, RPS responded to GSI’s criticism of IEMS’ calculation of background values, contending that GSI had misrepresented IEMS’ approach and had ignored applicable Ecuadorian regulations. Recalling that IEMS had arrived at Base Values by calculating the *mean* concentration of ‘clean samples’ and GSI had countered that the appropriate methodology should be the *upper range* of concentrations exhibited, Ecuador submitted that GSI’s approach was “not consistent with Ecuadorian regulations” and “neither GSI nor [Perenco] [were] capable of pointing to a single legal authority for calculating Base Values” in this manner.⁷⁵⁶ In contrast, IEMS’ approach was validated by TULAS which specified that Base Values should be determined as the “mean” concentration.⁷⁵⁷ TULAS further specified that the maximum permissible limits were defined by multiplying the mean concentration obtained by three, but that this was not the standard applicable to remediation which TULAS stipulated was back to 1.5 times the Base Value.⁷⁵⁸

⁷⁴⁸ Reply, paragraphs 68-69; RPS ER III, section 3.1, pp 10-13.

⁷⁴⁹ Reply, paragraph 69; RPS ER III, section 3.1, pp 10-13.

⁷⁵⁰ GSI ER I, paragraphs 2-5.

⁷⁵¹ Reply, paragraph 70, referring to GSI ER 1, paragraph 7; relying on RPS ER III, section 3.1.

⁷⁵² RPS ER III, section 3.2; Reply, section 2.1.2.2.

⁷⁵³ Reply, paragraph 74; RPS ER III, section 3.2.

⁷⁵⁴ Reply, paragraph 76; RPS ER III, section 3.2.

⁷⁵⁵ Reply, paragraph 77.

⁷⁵⁶ Reply, section 2.1.3.1; RPS ER III, paragraph 92.

⁷⁵⁷ Reply, paragraph 87; referring to Exhibit EL-146, TULAS, Article 4.1.3.3.

⁷⁵⁸ Reply, paragraphs 87; referring to Exhibit EL-14, TULAS, Article 4.1.3.3.

294. Ecuador asserted that, in any event, GSI misrepresented the results of IEMS' calculation of Base Values using the mean of clean samples when it alleged that this resulted in 80% of the clean samples to be deemed contaminated.⁷⁵⁹ GSI assumed that IEMS had concluded a sample was contaminated if a single element exceeded Base Values, but IEMS' approach was in fact to examine the eight criteria identified in RAOHE and TULAS (TPH, barium, cadmium, nickel, lead, vanadium, electrical conductivity and pH) before making such determination.⁷⁶⁰

295. Fourth, GSI was alleged to have failed to properly test for groundwater contamination in the Blocks, by employing the wrong sampling technique and discarding samples which exhibited contamination by classifying them as "false positives."⁷⁶¹ RPS responded to GSI's submission that Annex 5 of RAOHE required IEMS to apply proper filtration methods in its groundwater sampling.⁷⁶² RAOHE, however, "d[id] not apply to groundwater, but only to surface water and wastewater", and the regulation that governed groundwater sampling was instead TULAS, which did not require the filtration of groundwater samples.⁷⁶³

296. RPS asserted that the use of field filters could lead to biased analytical results that report lower concentrations of contaminants than are actually present in groundwater.⁷⁶⁴ IEMS had taken both filtered *and* unfiltered samples on two separate occasions in December 2012 and January 2013, the results of which demonstrated that "the levels of contaminants found in the groundwater samples were not affected by solid particles."⁷⁶⁵ This was in contrast to GSI's investigation which IEMS asserted selectively addressed samples exhibiting contamination (such as in Coca CPF and Mono CPF), proceeding to "discard these troublesome samples (at least from the Consortium's perspective) by classifying those as 'false positive' and performing further sampling."⁷⁶⁶ Moreover, RPS submitted that IEMS' procedures, which applied TULAS, were consistent with those employed by the Consortium's predecessor, Oryx.⁷⁶⁷

297. Fifth, Ecuador challenged any attempt by Perenco and GSI in the case of 5 sites which it had admitted contained contaminated volumes of soil in excess of 1,000 cubic meters (the Payamino 2 & 8 platform, Mono CPF, Payamino 1, Gacela 1 & 8 and the CPF, and Coca 18 & 19) to avoid its liability by pointing at events that occurred before it acquired its interests in Blocks 7 and 21 or after the State took over the Blocks in July 2009.⁷⁶⁸

298. For instance, in the case of the Payamino 2 and 8 platform, in particular the swamp northeast of the platform in lands owned by Mr. Jungal, which Perenco admitted exhibited contamination by crude or heavy metal, Perenco had alleged that the cause of contamination

⁷⁵⁹ Reply, paragraph 88.

⁷⁶⁰ Reply, paragraph 88; IEMS ER III, section 3.2.1.2.

⁷⁶¹ Reply, paragraphs 164-170; IEMS ER III, Section 3.3; RPS ER I, section 3.4 cf. Rejoinder, paragraphs 144-156.

⁷⁶² Claimant's Counter-Memorial, paragraphs 334-340; Rejoinder, paragraphs 144-156.

⁷⁶³ Reply, paragraph 166; RPS ER III, section 3.4, pp 22-23; IEMS ER II, section 3.3.

⁷⁶⁴ RPS ER III, section 3.4; Reply, paragraph 167 cf. Rejoinder, paragraphs 145-155.

⁷⁶⁵ Reply, paragraph 168; IEMS ER III, section 3.3.

⁷⁶⁶ Reply, paragraph 169; IEMS ER III, section 3.3.1.

⁷⁶⁷ RPS ER III, section 3.4, p 23.

⁷⁶⁸ Reply, section 2.1.3.3.

could likely be traced back to a pre-1992 rupture of test pits built for the drilling of the Payamino 2 well by CEPE in 1987.⁷⁶⁹

299. This, however, in Ecuador's submission, stood at stark contrast with the evidence of environmental audits of the site since 1992 which proved that the area had been remediated and did not show any significant contamination (the audits in question were performed in March 1992 by Oryx⁷⁷⁰, in May 1994 by Oryx,⁷⁷¹ in March 1996 by Oryx,⁷⁷² in January 1999 by Oryx,⁷⁷³ in September 2000 by Kerr-McGee,⁷⁷⁴ and Perenco's own audit in December 2002⁷⁷⁵).

300. Perenco had also ignored the evidence of a complaint in early 2007 to the Provincial Council of Orellana of the "presence of large volumes of crude oil adjacent to Payamino 2 & 8", and the results of a subsequent inspection which confirmed that a "large area of approximately 20,000 m² was found containing crude oil residues in large quantities."⁷⁷⁶ Ecuador found it significant that "Payamino 2 & 8 was not even tested by the Consortium's auditors during the purportedly comprehensive 2008 Environmental Audit of Block 7."⁷⁷⁷

301. Seventh, GSI's risk assessment approach was said to be incomplete and "strewn with errors, over-simplifications, shortcuts, and omissions that utterly undermine GSI's resulting conclusion that '[o]ilfield-related environmental conditions in the CPUF, Block 7, and Block 21 area pose no measurable risk to human health'."⁷⁷⁸ RPS opined that:

GSI's risk assessment approach has 'cherry picked' elements from two standardized procedures that have been adopted worldwide for human health and ecological risk assessment, the ASTM (American Society for Testing and Materials) International risk-based corrective action (RBCA) process and the United States Environmental Protection Agency's (USEPA's) baseline risk assessment (BLRA) process. [...] The BLRA is a step-wise process to characterize the current and potential threats to human health and the environment that may be posed by contaminants in

⁷⁶⁹ Reply, paragraph 99, referring to Claimant's Counter-Memorial, paragraphs 452-455.

⁷⁷⁰ Exhibit E-260, Laboratory result for water sample from swamp nearby Payamino 2 & 8, 6 October 1992.

⁷⁷¹ Exhibit CE-CC-12, Environmental Assessment of Oryx Ecuador Energy Company - Coca-Payamino Field, Audit Utilized for the Transfer of Operations of the Coca-Payamino Unified Field from Petroproducción to Oryx on February 12, 1994, performed by Ecomapa/Western Oilfield, pp 8 and 38 (p 38: "There was an oil spill at this site in 1991 which flowed east off the site into a swampy area. The area has been revegetated and is doing well; there are no obvious signs remaining of the spill.").

⁷⁷² Exhibit E-261, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated May 1994, pp CP-22 and 29.

⁷⁷³ Exhibit CE-CC-21, Environmental Audit of Petroproducción's Operation of the Coca-Payamino Field, January 1999, pp 3, 16-17.

⁷⁷⁴ Exhibit E-265, *Diagnóstico Ambiental del Campo Unificado Coca - Payamino* prepared by Entrix for Kerr-McGee Ecuador Energy Corporation, September 2000, p 1-1.

⁷⁷⁵ Exhibit E-266, *Auditoría Ambiental Bloque 7 - 2002, Perenco Ecuador Limited*, December 2002, p. 59. (Spanish original: "Los niveles y concentraciones de los parámetros medidos son menores a los límites permisibles enunciados en la tabla 4A del RAOH 1215"), Table 4-16, p 132; Reply, paragraphs 102-113.

⁷⁷⁶ Reply, paragraphs 115-122; referring to Exhibit E-269, *Informe de inspección N° 07-07, H. Consejo Provincial de Orellana - Departamento del Ambiente*, 10 April 2007, p 2.

⁷⁷⁷ Exhibit E-144, *Auditoría Ambiental Bianual - Auditoría Ambiental de dos años antes de la finalización del Contrato de Participación del Bloque 7, incluyendo el Campo Unificado Coca-Payamino*, prepared by Ecuambiente Consulting Group for Perenco dated November 2008.

⁷⁷⁸ Reply, paragraph 179.

environmental media. Although GSI has stated that they ‘applied the Risk-Based Corrective Action (RBCA) framework’ in their risk assessment, significant elements from RBCA and BLRA were missing or improperly applied, resulting in a superficial evaluation of risk to human health and no evaluation of the environmental risk that is posed by the CPUF, Block 7, and Block 21 sites [...]⁷⁷⁹

G. Second expert report of GSI and Dr. Rouhani’s analysis of IEMS’ modelling

302. In its Rejoinder, Perenco filed a second expert report by GSI together with a report prepared by an expert on geostatistics and spatial modeling, Dr. Shahrokh Rouhani, a professor at the Georgia Institute of Technology and CEO of NewFields Companies, LLC. Dr. Rouhani analysed IEMS’ use of ArcGIS modeling as compared to GSI’s delineation method and concluded that IEMS’ modeling “suffer[ed] from a number of fundamental deficiencies” that rendered its results statistically unreliable and liable to contradiction by actual soil sampling results.⁷⁸⁰ GSI’s delineation approach was, in contrast, conducted “in an effective manner” and passed a reliability test using probability plot analyses.⁷⁸¹

303. Dr. Rouhani concluded that setting aside the errors and assumptions that IEMS had inputted into the ArcGIS software and the latter’s failure to use the tools available within the software to confirm the validity and reliability of its model,⁷⁸² the critical flaw in IEMS’ analysis is that it chose an “inverse distance weighting” (IDW) interpolation approach from a number of the approaches available in the ArcGIS software rather than a site-specific field delineation approach.⁷⁸³ The IDW interpolation approach, in his view, was not an appropriate method for modeling soil contamination because “it cannot make predictions within any acceptable range of reliability.”⁷⁸⁴

304. Dr. Rouhani opined that the methodology that GSI employed, known as “hand-contouring” and premised on delineation from actual data points, was the comparatively more reliable method for measuring the extent of contamination in a given area.⁷⁸⁵ To reiterate GSI’s approach, this involved “sampling known or suspected areas of contamination and then ‘delineating’ these areas by taking additional samples until clean soil is reached” and working with the topographical features to create the contours of the contaminated area.⁷⁸⁶ This led

⁷⁷⁹ RPS ER III, section 2, pp 6-9; section 4, pp 27-74; IEMS ER III, section 3.4.

⁷⁸⁰ Rouhani ER, paragraphs 99-100.

⁷⁸¹ Rouhani ER, paragraphs 99-100. The Respondent sought for and was granted leave to file a response to Dr. Rouhani’s evidence (see Procedural Order No. 8 dated 2 September 2013). It did so in the form of a Supplemental Expert Report from IEMS (IEMS ER IV).

⁷⁸² Rejoinder, paragraphs 186-198; Dr. Rouhani testified that validating testing was a necessary element of any modeling exercise of this sort, and had IEMS undertaken this it would have discovered that its model was unacceptably inaccurate (Rouhani ER, paragraphs 38-39); cf. IEMS ER III, p 66 (cross-validation exercise by IEMS of Coca 8); Rejoinder, paragraph 92 and Rouhani ER, paragraphs 19, 26-28, 30-33, 50, 55, 61, 65, 69, Table A.1 (Dr. Rouhani explained that IEMS should have tested for data correlation using the variogram method which demonstrates whether the data relate to each other across an area of space.).

⁷⁸³ Rejoinder, paragraphs 157-174, 176-; Rouhani ER, paragraphs 50, 69, 88, 98, 100; IEMS ER II, Annex A.8 (to show there are a number of methods available in the ArcGIS software).

⁷⁸⁴ Rejoinder, paragraphs 157-185.

⁷⁸⁵ Rouhani ER, paragraphs 88, 98, 100; Rejoinder, paragraphs 163-164.

⁷⁸⁶ Rejoinder, paragraph 163; 2nd Expert Report of GSI dated 2 July 2013 (“GSI ER II”), paragraph 49(c); Rouhani ER, paragraph 88, 100.

Perenco to submit that “GSI’s delineation results have not only been confirmed by GSI’s latest field visit and sampling campaign, but were also verified by IEMS’ additional testing at 22 sites in December 2012.”⁷⁸⁷

305. For its part, GSI defended its use of indicator parameters as “entirely rational” and based on scientific practice.⁷⁸⁸ The parameters (i.e., TPH, barium and electrical conductivity) had been selected by GSI on the basis of a sampling of crude, produced water and drilling muds from the Blocks.⁷⁸⁹ GSI “properly concluded that exceedances of ‘non-indicator’ analytes were not related to releases from oil operations unless they were found in combination with the ‘indicator’ of TPH or barium.”⁷⁹⁰ In any event, Perenco submitted that the use of indicator parameters concerned at most 39 off-platform soil samples – “1% of the approximately 3,500 soil samples taken in the Blocks – because only those 39 samples [were] located outside of GSI’s remediation areas and show[ed] an exceedance of non-indicator analytes without an accompanying presence of TPH or barium.”⁷⁹¹

306. GSI also reiterated its criticism of the use of background values. Recalling that Ecuador, IEMS and RPS contended that Article 4.1.3.3 of TULAS mandated this approach,⁷⁹² it asserted that this was contradictory since the premise of Ecuador’s background values case was the claimed inability to rely on its existing regulatory parameters and it ignored the fact that Article 4.1.3.3 of TULAS was triggered only in the event of “the inapplicability of any parameter established in the present regulation in a specific case or the absence in the regulation of a parameter relevant to the soil under study”.⁷⁹³ For example, the TULAS parameters cannot be used if the naturally-occurring levels are higher than the TULAS limits.⁷⁹⁴ This is consistent with RAOHE Table 6 which provides that “[i]f the natural (non-contaminated) soils in the area present concentrations higher than the established limits, the values of the respective parameter may be increased to this level.”⁷⁹⁵

307. In connection with the background values debate, Dr. Rouhani opined that using the mean as the ‘background threshold value’ was unacceptable and produced scientifically unreliable results.⁷⁹⁶ GSI and Dr. Rouhani maintained the position that the correct approach was to employ the upper range of the background concentrations that presented.⁷⁹⁷ This was the recommended scientific practice and is referred to in the United States EPA’s 2010 technical guidelines on the subject.⁷⁹⁸

⁷⁸⁷ Rejoinder, paragraph 171.

⁷⁸⁸ Rejoinder, paragraphs 141-143.

⁷⁸⁹ Rejoinder, paragraph 141.

⁷⁹⁰ Rejoinder, paragraph 142.

⁷⁹¹ Rejoinder, paragraph 143.

⁷⁹² Counter-Memorial, paragraphs 86; IEMS ER III, pp 18; RPS ER III, pp 18-19; c.f. Rejoinder, paragraphs 106-111.

⁷⁹³ Rejoinder, paragraphs 108-109.

⁷⁹⁴ Rejoinder, paragraph 109.

⁷⁹⁵ Exhibit EL-147, RAOHE, Table 6 (partial translation resubmitted on 10-18-2013); Rejoinder, paragraph 109.

⁷⁹⁶ Rouhani ER, paragraphs 72-73; Rejoinder, paragraph 102.

⁷⁹⁷ GSI ER I, paragraph 91; Rouhani ER, paragraph 73; Rejoinder, paragraphs 101-103.

⁷⁹⁸ Rouhani ER, paragraph 73; Rejoinder, paragraph 103.

308. As to the treatment of mud pits, GSI characterised IEMS' rebuttal as based on a selective reading of Article 59, the opening line of which indicated it addressed "pits that contain[ed] weathered crude or that have been poorly managed."⁷⁹⁹ Pits left in such a state understandably required more stringent remediation action compared to pits closed according to regular industrial practice in the ordinary course of operations – dehydrated, compacted and covered with clean soil and new vegetation – in accordance with Article 52(d)(2) of RAOHE.⁸⁰⁰ It reiterated its view that mud pits are not inherently harmful to the environment; "their contents are stable and non-toxic."⁸⁰¹

309. On the question of groundwater contamination, GSI submitted that IEMS' testing method was a misconstruction of Ecuadorian regulations and credible scientific practice.⁸⁰² First, RAOHE Annex 5 made no distinction between different water types or sources; its section on water was labelled only "*Aguas*" and referred to groundwater in its text (including groundwater in the list of media to be identified for remediation in Article 16).⁸⁰³ As was the case with soil parameters, Ecuador was required to apply the specific provisions of RAOHE in this instance instead of the general provisions of TULAS.⁸⁰⁴ In any event, TULAS did not prohibit filtration; for example, it states that "material in suspension, sediments, algae and other microorganisms must be removed at the time the sample is taken or immediately afterward by filtration" with the exception of the substances or concentrations subject to analysis.⁸⁰⁵ The filtration employed by GSI "remove[d] only sediment particles – and not concentrations in the water itself".⁸⁰⁶ Moreover, Perenco contended that "Ecuador's complaints about filtration do not resolve that, when IEMS conducted further groundwater testing in January 2013, it obtained lower results than its prior field visits."⁸⁰⁷ GSI maintained that it was IEMS' groundwater claim, amounting to US \$265 million in damages, that was "unreliable and unsound."⁸⁰⁸

H. IEMS' response to Dr. Rouhani's analysis

310. The Respondent sought and was granted leave to file a response to Dr. Rouhani's expert evidence filed with the Rejoinder and did so in the form of a Supplemental Expert Report from IEMS dated 4 September 2013.⁸⁰⁹ IEMS described Dr. Rouhani's conclusions as "misleading" and flawed, and failing to "address the overall approach that [IEMS] took in estimating the level of contamination at Blocks 7 and 21."⁸¹⁰ It characterised its model as "not designed to predict exact concentrations as the final outcome, but rather whether concentrations were likely to be in

⁷⁹⁹ Rejoinder, paragraphs 129-132.

⁸⁰⁰ Rejoinder, paragraphs 129-132.

⁸⁰¹ Rejoinder, paragraph 136.

⁸⁰² Rejoinder, paragraphs 144-165.

⁸⁰³ Rejoinder, paragraph 150; Exhibit EL-147, RAOHE, Annex 5; the evidence of 2nd Expert Report of René Bedón ER, paragraphs 160-162.

⁸⁰⁴ Rejoinder, paragraph 150.

⁸⁰⁵ Rejoinder, paragraph 151; Exhibit CE-CC-349, Ecuadorian Institution of Normalization: Ecuadorian Technical Norm, NTE INEN 2 169:98, Water - Water Quality - Sampling - Handling and Maintenance of Samples, January 2010, paragraph 4.5.1.

⁸⁰⁶ Rejoinder, paragraph 151.

⁸⁰⁷ Rejoinder, paragraphs 154-156.

⁸⁰⁸ Rejoinder, paragraph 154.

⁸⁰⁹ Procedural Order No. 8 dated 2 September 2013. The Respondent sought leave to respond to Dr. Rouhani's report and the witness statement of Mr. Gilberto Martínez.

⁸¹⁰ IEMS ER IV, p 1.

the range requiring remediation.”⁸¹¹ In contrast, Dr. Rouhani’s critique was premised on taking “each estimated data *point*” and assessing its statistical reliability in depicting the precise level of contamination that actually existed at that point.⁸¹²

311. IEMS further contended that Dr. Rouhani’s analysis proceeded on the assumption that the ArcGIS variogram tools were “adequate to review data sets that were not designed for use with variograms and were not compiled on an incremental basis using the variogram (and kriging) techniques in mind.”⁸¹³ It added that IEMS had chosen the IDW interpolation technique precisely because it “[did] not require or anticipate the use of variograms and kriging.”⁸¹⁴ Moreover, the variogram and kriging methods used in Dr. Rouhani’s analysis were “modeled using an algorithm for uniform characteristics” and in this way were unsuited to the anisotropic character of the contamination that presented in the Blocks. In this connection, in contrast to Dr. Rouhani’s criticism that the IDW method that IEMS employed failed to take into account the topography and other site specific characteristics, Annexes A.1, A.3 and A.12 of IEMS’ April 2012 report showed that in designing its sampling program IEMS exhaustively studied and took “full account of the physical and geographic features of each site.”⁸¹⁵ IEMS submitted that its investigations confirmed that the contamination at each site was “generally of an anisotropic nature (the contamination was ‘directional’ rather than uniform and equally distributed in all directions)” and that the IDW method “performs better to represent contamination of differential and directional characteristics.”⁸¹⁶

312. In any event, IEMS submitted that when it repeated the ArcGIS modeling exercise using the data it collected in December 2012 within the bounds of 15 sites it had inspected for the purpose of its 2013 report,⁸¹⁷ the results demonstrated that its modeling was reliable although it revealed they “had underestimated the volumes to be remediated under background values in Blocks 7 and 21 by 8.29% (and overestimated volumes to be remediated under regulatory criteria by 7%).”⁸¹⁸ This translated to an increase of nearly US\$ 320 million in Ecuador’s ‘background values’ case.

I. Contemporaneous Evidence Noted by the Experts and the Parties

313. The Tribunal notes that in addition to the expert reports filed by both Parties, there is contemporaneous evidence pertaining to the Blocks’ conditions during the Consortium’s operatorship and at and around the time of the takeover in July 2009 which was submitted by each party.

314. Perenco submitted that studies and audits of Blocks 7 and 21 conducted “before and after July 2009 show that the Blocks were in exemplary condition.”⁸¹⁹ It relied, amongst other things,

⁸¹¹ IEMS ER IV, p 1.

⁸¹² IEMS ER IV, p 1 [Emphasis in original].

⁸¹³ IEMS ER IV, p 3.

⁸¹⁴ IEMS ER IV, p 3.

⁸¹⁵ IEMS ER IV, p 2.

⁸¹⁶ IEMS ER IV, p 3.

⁸¹⁷ These are Coca 1, Coca 8, Coca 9, Coca 12, Coca 18 & 19, Payamino CPF, Payamino 4, Payamino 16, Payamino 21, Payamino 23, Gacela 4, Gacela 6 & 9, Mono 10 & 12, Jaguar 3, and Jaguar 7 & 8. IEMS stated it used data Attachment 32 of IEMS ER III.

⁸¹⁸ IEMS ER IV, pp 1-2.

⁸¹⁹ Claimant’s Counter-Memorial, paragraphs 173-179, 341-366; Rejoinder, paragraph 17.

on the biannual audit conducted in 2002 in Block 21⁸²⁰ which found that Perenco's operations conformed "with environmental legislation"⁸²¹, the biannual audits conducted in 2008, which in its submission, revealed that, in Block 7, "soil samples taken in 13 locations revealed exceedance of regulatory standards in the Payamino Sanitary Landfill...[but all] other samples were compliant"⁸²², and in Block 21, "did not identify a single major non-conformity",⁸²³ and finally, the six *ex post* environmental impact studies commissioned by Petroamazonas and reported in July 2010, which identified only a selected number of major non-conformities and did not identify any groundwater contamination.⁸²⁴

315. Ecuador attacked the credibility of the audits commissioned by Perenco, relying on IEMS' evidence⁸²⁵ and on the technical report issued by the Ministry in August 2009 (noted above). To reiterate, the technical report recorded the Ministry's recommendation that Perenco should be sanctioned and made to cure defects in its 2008 audits because the Ministry's team had identified major non-compliances with Ecuadorian environmental regulations.⁸²⁶ Ecuador contended that the State had not, and it in fact could not have, approved the results of the 2008 audits.⁸²⁷ Ecuador also pointed out that such audits were supposed to be conducted every two years and Perenco had failed to comply with its obligation to conduct the audits in 2004 (with a resulting gap in audits from 2002 to 2006).⁸²⁸

316. Perenco's response was that the non-conformities identified by the Ministry resulted either from Ecuador's mismanagement of the Blocks after the Consortium left the Blocks, or else were very minor.⁸²⁹ It contended further that regardless of whether Ecuador ultimately approved

⁸²⁰ Exhibit CE-CC-137, Letter of March 23, 2002 from Efficacitas to Perenco, attaching 2002 Environmental Audit of Block 21, pp 73-78.

⁸²¹ Exhibit CE-CC-137, Letter of March 23, 2002 from Efficacitas to Perenco, attaching 2002 Environmental Audit of Block 21, pp 10-11 ("Due to the fact that development activities are not yet taking place in the zone, samples were taken from outside the grease traps, which would be the most likely places to be contaminated. The laboratory results reveal that the TPH value is under the detection limit. All the other parameters measured are inside the [RAOHE] requirements."), 73-78 ("Based on the analysis of the results of the soil samples, it was concluded that there was no contamination due to the activities carried out at Block 21.").

⁸²² Claimant's Counter-Memorial, paragraph 173, referring to Exhibit CE-CC-182/E-144, Biannual Environmental Audit of Block 7 and Coca-Payamino Unified Field, Two Years Prior to the Expiration of the Block 7 Participation Contract, November 2008, p 66.

⁸²³ Claimant's Counter-Memorial, paragraph 174, referring to Exhibit CE-CC-183/E-145, Biannual Environmental Audit of Block 21, November 2008, section 6. Perenco also relied on *ex post* environmental impact studies of the Blocks performed by Petroecuador after July 2009 which it submitted were "consistent with the [2008] audits and noted only very limited environmental non-compliances." (Claimant's Counter-Memorial, paragraph 179, referring to Exhibits CE-CC-244, Ex-post Environmental Impact Study and Environmental Management Plan for Yuralpa Complex, Block 21, July 2010, section 3, pp 287-288; CE-CC-241, Ex-post Environmental Impact Study and Environmental Management Plan for Coca Complex, Block 7, June 2010; CE-CC-242, Expost Environmental Impact Study and Environmental Management Plan for Mono Complex, Block 7, June 2010; CE-CC-236, Programming and maintenance services contract between Proyectos Integrales del Ecuador (PIL) and Petroamazonas, June 3, 2010; CE-CC-243, Ex-post Environmental Impact Study and Environmental Management Plan for Waponi-Ocatoe Complex, Block 21, July 2010.

⁸²⁴ *Ibid.*; Claimant's Counter-Memorial, paragraphs 362-366; Rejoinder, paragraph 68.

⁸²⁵ IEMS ER II, Annex P, p 1; see also, Supplemental Memorial, paragraphs 110 and 114.

⁸²⁶ Exhibit E-176, Technical Inspection Report.

⁸²⁷ Supplemental Memorial, paragraphs 108, 115-122; referring to Exhibit E-176, Technical Inspection Report.

⁸²⁸ RPS ER I, section 6; Reply, paragraph 37.

⁸²⁹ Claimant's Counter-Memorial, paragraph 177.

of the results of the earlier 2008 audits, it had “approved the proposed scope of the audits before they were performed, approved the auditing firm that carried them out, sent its *own engineers* to supervise the audit, and largely approved in substance the results of a verification of the audits.”⁸³⁰ The ‘approval in substance’ referred to the same inspection by the Ministry in August 2009.⁸³¹ Similarly, Perenco responded to IEMS’ offering an opinion in this regard by stating it was “unclear how IEMS could possibly make such a determination, or how Ecuador could comfortably rely on it, given that the 2008 audits were based on terms of reference that the Ministry had itself approved.”⁸³² In its view, it was significant that this inspection and the 2012 Environmental Impact Studies commissioned by Petroamazonas similarly found limited environmental non-compliances.⁸³³

⁸³⁰ Claimant’s Counter-Memorial, paragraphs 351-355 [Claimant’s emphasis]; Rejoinder, paragraphs 67-69.

⁸³¹ Claimant’s Counter-Memorial, paragraph 356, referring to Exhibit E-176, Technical Inspection Report.

⁸³² Claimant’s Counter-Memorial, paragraph 178, referring to Exhibit CE-CC-172, Letter of August 11, 2008 from DINAPA to the Consortium.

⁸³³ Rejoinder, paragraphs 67-69.

IV. FINDINGS

A. The Tribunal's Approach to the Counterclaim as it Currently Stands

317. Having reviewed the Parties' written submissions, expert reports and the oral testimony and submissions of counsel at the hearing, and after extensive deliberation, the Tribunal has arrived at a number of conclusions as to the manner in which the counterclaim was put and the state of evidence after the written and oral phase of the current proceeding was completed. These conclusions will be set out over the course of this Findings section of the Decision.

318. In particular, the Tribunal will make certain findings of fact and law which shall be applied to ascertain the extent of damage for which Perenco will be held liable. Such findings can be grouped under two sets of questions: (i) what can be called the major questions of law and fact, the resolution of which will narrow the claim's analysis; and (ii) certain subsidiary issues concerning the interpretation of RAOHE, TULAS and the Environmental Management Law. During the course of its analysis, the Tribunal will also decide on the reliability of the mapping exercise employed by IEMS.

B. The Tribunal's Findings on the Legal Framework Governing the Dispute

(1) The Constitution and the Applicable Regulatory Regime

319. The first and foremost legal question presented to the Tribunal concerns the impact of the 2008 Ecuadorian Constitution on the legal framework governing the Tribunal's consideration of the counterclaim. The Constitution's objective of full restoration and the protection of nature itself as a subject of environmental rights, its rule on the imprescriptibility of environmental torts, its potential impact on the burden of proof and causation issues (i.e., through its creation of a strict liability regime) and the Constitution's temporal application has given rise to a number of issues that have divided the Parties.

320. In the Tribunal's view, the two most important issues in this regard are: (i) the relationship between the Constitution's emphasis on full restoration, on the one hand, and the environmental impact that oilfield operations are permitted to have under RAOHE and TULAS, on the other; and (ii) whether the Constitution's establishment of a strict liability regime can be applied to all of Perenco's activities, given that most of them (i.e., until 20 October 2008) took place when the 1998 Constitution was in effect.

(2) The Relationship Between the Constitution and the Hydrocarbons Environmental Regulations

321. After carefully considering the arguments and the evidence, the Tribunal does not accept Ecuador's arguments that its hydrocarbons regulatory regime does not sufficiently protect the environment and therefore should give way to the "background values" or "base values" methodology employed by IEMS as its primary means of evaluating the Blocks.⁸³⁴ The Tribunal

⁸³⁴ In its Counter-Memorial, Ecuador referred to IEMS' analysis of the regime and asserted: "IEMS explains that the Ecuadorian regulatory criteria, when compared to the Base Values for Blocks 7 and 21, do not provide for full remediation of the contamination and, therefore, do not fully protect the environment or the health of the population. Thus, according to IEMS, a proper environmental audit must not stop at the regulatory thresholds, but must evaluate the level of contaminants in comparison with the [b]ase [v]alues. This is what IEMS did in its Expert Report." [Footnote omitted.] (Ecuador's Counter-Memorial, paragraphs 797-799); see also, IEMS ER I, p 19.

found Ecuador's (and IEMS') arguments on this point to be counter-intuitive and after due consideration finds that it must apply the detailed statutory and regulatory provisions of Ecuadorian law rather than use a "background values" approach.⁸³⁵ The Ecuadorian system might perhaps not be as rigorous as Perenco has sought to portray it, but it is, to the Tribunal, a considered regulatory regime that has been developed by Ecuador over the years and it has been administered in a generally consistent manner by regulators and operators alike.

322. The Tribunal can well appreciate the novelty of certain legal questions presented in this counterclaim when the generally worded prescriptions of Ecuador's highest law are considered. It can also appreciate the basic logic of the "background values" thesis employed by IEMS, given the Constitution's focus on full restoration. There is no doubt that the Constitution attaches great importance to the protection of the environment and to the restoration of environmentally disturbed ecosystems. As shall be seen, the Tribunal considers that the Constitution's focus on environmental protection means that when choosing between certain disputed (but reasonable) interpretations of the Ecuadorian regulatory regime, the interpretation which most favours the protection of the environment is to be preferred.

323. Having carefully considered the Parties' submissions and the expert reports, however, the Tribunal considers that although the 2008 Constitution contains important provisions dealing with the protection of the environment and has effect as a set of foundational legal rules, it does not purport to prescribe the environmental regulatory regime governing hydrocarbon operations. Rather, the specific rules governing the environmental aspects of hydrocarbon exploitation are to be found within RAOHE, TULAS, and the Environmental Management Law, all of which preceded the 2008 Constitution's making but which have continued to remain in force since its entry into force.⁸³⁶

324. Had the 2008 Constitution effected a significant alteration of the normative regime in which the State's environmental regulations were to be made and applied, the Tribunal believes that Congress and the Executive would have enacted new laws and/or promulgated new regulations in order to implement the new environmental edicts. Yet this has not been done. No evidence was given to the Tribunal to show that after the 2008 Constitution's entry into force the Congress or the Executive decided to replace RAOHE, TULAS and the Environmental Management Law with more stringent rules. To the contrary, all have continued in force since 2008 and have been applied in a more or less consistent fashion by the responsible authorities *vis-à-vis* Blocks 7 and 21 and, as far as the evidence shows, to other oilfields as well.

325. The Tribunal starts with the relationship between the Environmental Management Law with RAOHE and TULAS, and the thrust of TULAS itself, which supports the view that, even though those instruments preceded the Constitution's making, they continue to provide

⁸³⁵ IEMS' witness, Mr. Alfaro, observed that their "own initial instinct was to apply the regulatory limits." Transcript, Hearing on Counterclaims, Day 4, pp 1081-1082 (Testimony of IEMS).

⁸³⁶ As Perenco noted in its Post-Hearing Submission, at paragraph 10, guidelines issued jointly by the Ministry of the Environment and the Ministry of Non-Renewable Resources after the Constitution's promulgation (as to which Professor René Bedón was not cross-examined) stated that: "in the event that ... any event (accident) occurs or is detected where, regarding key components of the social and natural environment, *the reported parameters are outside of the permissible limits established by the environmental norms in force*, the contingency plan shall be put into place, and *the damage to the environmental and social components shall then be characterised and evaluated.*" [Emphasis added.]; Exhibit CA-CC-55, p 4.

regulatory limits for remediation of soil and groundwater contamination that are consistent with the Constitution’s environmental precepts.

326. In defending the use of “background values”, the Respondent and its legal expert, Professor Andrade, referred to the definition of the term “environmental harm” in the Environmental Management Law. The Tribunal recalls that the Law refers to “[a]ny significant loss, diminution, detriment or impairment of the preexisting conditions in the environment or one of its components. It affects the functioning of the ecosystem or the renewability of its resources.”⁸³⁷ Ecuador contended that the definition provided the notion of “repairable environmental harm” which was consistent with the constitutional imperative to remedy any and all environmental harm (i.e., “full restoration”).⁸³⁸ It submitted further that RAOHE and TULAS are confined to setting the thresholds within which hydrocarbon activities could be undertaken in a lawful fashion and in that connection, when administrative sanctions could be imposed on operators for illicit hydrocarbon activities, but they did not purport to define the notion of *repairable* harm.⁸³⁹

327. This, in the Tribunal’s view, did not fully reflect the situation. The Environmental Management Law preceded RAOHE by two years, and TULAS by four years.⁸⁴⁰ It refers to sustainable development in its first chapter and its objective of establishing the “principles and guidelines” of environmental policy and management in Ecuador in Article 1.⁸⁴¹ In its glossary of definitions, in addition to defining “Environmental Harm” as noted above, the Law provides definitions for the terms “Contamination” and “Environmental Impact”. “Contamination” refers to “concentrations ... *superior or inferior to those established in the legislation in force.*”⁸⁴² “Environment Harm” refers not just to “any loss, diminution, detriment or impairment” but “[a]ny *significant* loss, diminution, detriment or impairment...”.⁸⁴³ The Law thus contemplates degrees of disturbance ascertainable by reference to law, not the equation of “environmental impact” with “environmental harm”. Ecuador has not demonstrated how RAOHE and TULAS interacted with these provisions of the Environmental Management Law in any way other than in their logical role as more detailed regulations governing all or virtually all environmental issues that can arise out of hydrocarbons exploitation in furtherance of the Environmental Management Law’s general framework.

⁸³⁷ Exhibit CA-CC-33, Environmental Management Law, p 18 of PDF. The Parties do not disagree on the English translation of these definitions: see Reply, paragraph 246 and Rejoinder, paragraphs 37-38.

⁸³⁸ Reply, paragraphs 6 and 246; Transcript, Hearing on Counterclaims, Day 1, pp 59-60 (Opening Statement of Eduardo Silva Romero).

⁸³⁹ *Ibid.*

⁸⁴⁰ The Environmental Management Law (*Ley de Gestión Ambiental*) was first enacted on 30 July 1999; see Exhibits CA-CC-33, Environmental Management Law, Chapter 1; CE-CC-269, Chronology of Ecuador’s Environmental Laws and 1st Expert Report of René Bedón, paragraph 15. The document on record in this arbitration is Exhibit CA-CC-33/Annex 12 to 1st Expert Report of Ricardo Crespo Plaza. It is dated as having been published in Official Gazette No. 418 on 10 September 2004 and is titled Codification of the Environmental Management Act (term used by Professor Ricardo Crespo Plaza in footnote 23 of his 1st Expert Report). RAOHE was published in the Official Register on 13 February 2001 (EL-147), TULAS was published in the Official Register on 21 March 2003 (EL-146).

⁸⁴¹ Exhibit CA-CC-33, Environmental Management Law, p 17 of PDF.

⁸⁴² Exhibit CA-CC-33, Environmental Management Law, p 18 of PDF [Emphasis added.].

⁸⁴³ Exhibit CA-CC-33, Environmental Management Law, p 18 of PDF [Emphasis added.].

328. RAOHE and TULAS articulate in detail the “parameters, maximum reference values and permissible limits” that operators are required to observe when complying with their environmental obligations.⁸⁴⁴ RAOHE, in particular, as the instrument of more specific application to hydrocarbon activities, provides expressly in its Article 86 that, as regards their operations, operators are required to comply with the permissible limits set forth in its Annexes, such as in Table 6, entitled, “identification and remediation of contaminated soils in all phases of the hydrocarbons industry.”⁸⁴⁵

329. TULAS likewise recognises the distinction between environmental impact and environmental harm, and in this way it accepts that Ecuadorian environmental law gives meaning and effect to the principle of sustainable development by accepting that the development of the Nation’s physical resources will inevitably have an environmental impact and therefore a balance must be struck between what is an acceptable anthropogenic disturbance of the natural environment and what is unacceptable environmental damage triggering the obligation to remediate.

330. The distinction is discernable in Tables 2 and 3 in Annex 2 of TULAS. Table 2 (“Soil Quality Standards”), establishes non site-specific standards for the background values of 36 different elements that may be present in soil. Its values are lower than those set out in Table 3, entitled (significantly, in the Tribunal’s view), “Criteria for Remediation and Restoration of Soils”, which provides site-specific standards (four different types of land use) that establish the “maximum levels of concentration of contaminants in soil under remediation or restoration.”⁸⁴⁶ This is further bolstered by the definition proffered by TULAS of the term “Baseline (background)” which: “Denotes the prevailing environmental conditions, prior to any disturbance. *That is to say, it signifies the conditions that would have predominated in the absence of anthropogenic activities...*”⁸⁴⁷ The Respondent relies on TULAS to support its “background values” approach and to provide, in the form of Table 2, its alternative regulatory criteria for the remediation of soil.⁸⁴⁸ The framework within TULAS, however, suggests that this is not exactly what it provides. The Tribunal will revert to this below.

331. Moreover, RAOHE and TULAS are consistent with the supreme law’s embrace of the principle of sustainable development.⁸⁴⁹ On this the experts agreed; in tracing the development of environmental laws in Ecuador from the 1970s and the influence of the Rio Declaration in

⁸⁴⁴ Phrase taken from title of RAOHE, Annex II (Exhibit EL-147, RAOHE) (partial translation resubmitted on 10-18-2013).

⁸⁴⁵ Introductory paragraph of RAOHE, Article 86 (Exhibit EL-147, RAOHE) (partial translation resubmitted on 10-18-2013)

⁸⁴⁶ See above at paragraph 101; see also, Claimant’s Counter-Memorial, paragraph 280; Supplemental Memorial, paragraph 166.

⁸⁴⁷ Exhibit EL-146, TULAS [Emphasis added.] (partial translation resubmitted on 10-18-2013). In the Claimant’s proffered translation of Article 2.38 of Annex 2, Volume VI (Criteria for Contaminated Soil Remediation), the relevant parts are: “prevailing environmental conditions prior to any disturbance...i.e, conditions that would have prevailed in the absence of anthropogenic activities, and as a consequence of natural processes only.” (Claimant’s Counter-Memorial, paragraph 253, footnote 306). See above at paragraphs 103-105.

⁸⁴⁸ Claimant’s Counter-Memorial, paragraph 280; Supplemental Memorial, paragraph 166.

⁸⁴⁹ Exhibit EL-89, 2008 Constitution, pp 122-123 of PDF (quoting from Article 396), Article 3 of the Environmental Management Law (Exhibit CA-CC-33, Environmental Management Law, pp 16-17); 1st Expert Report of Ricardo Crespo Plaza, paragraph 16; 1st Expert Report of René Bedón, paragraph 32.

1992, they indicated that ‘sustainable development’ informed the precepts of the Environmental Management Law, RAOHE, TULAS and other Ecuadorian regulatory instruments.⁸⁵⁰ The Tribunal considers that this is relevant to the distinction drawn by the Environmental Management Law between the definitions of “environmental harm” and “environmental impact.” The Tribunal will return to this when examining RAOHE’s and TULAS’s role in the regulation of hydrocarbon operations.

332. The Tribunal also notes that Ecuador and its state-owned entity, Petroamazonas, have over the years consistently treated RAOHE and TULAS as providing the regulatory limits applicable to the evaluation of the environmental condition of lands on which hydrocarbon operations have been permitted to take place. It was also RAOHE, and not background values, that was identified in the terms of reference proposed by Kerr-McGee to be used as the basis for its audits of Blocks 7 and 21 during its operatorship and, as required by Ecuadorian law, this was subject to the review and approval of Ecuadorian authorities.⁸⁵¹ This carried over to the 2002 biennial audits provided to DINAPA around the time that the operatorship was transferred from Kerr-McGee to Perenco (in December 2002).⁸⁵² RAOHE and TULAS were also applied consistently by the authorities (in some instances on their own initiative rather than at the operator’s prompting) in environmental audits and remediation proposals resulting from hydrocarbon operations.

333. There are numerous examples on the record, but the Tribunal has chosen a few to illustrate the point. For example, in September 2007, the National Environmental Protection Directorate (DINAPA) dismissed a complaint filed by the Orellana Human Rights Permanent Committee related to the operation of the Punino 1 well.⁸⁵³ Its explanation to the Committee was that Perenco had provided DINAPA with physico-chemical analyses of samples it had taken during an inspection of the area, and the “values obtained compl[ied] with the permissible limits established in Tables 4a, 4b and 6 of [RAOHE], which show[ed] that *there is no contamination as a result of the hydrocarbons activities* that are carried out on the mentioned platform.”⁸⁵⁴

334. This approach continued while the Constitution was being finalised during the course of 2008. In January 2008, for example, the Consortium presented to the National Director for Environmental Protection and the Minister of Mines and Petroleum laboratory results of samples taken from an area where a remediation programme had been carried out for a crude-oil spill that occurred on 26 May 2007 from the flow line of the Oso 2 well.⁸⁵⁵ The sampling results were

⁸⁵⁰ Under cross-examination, Professor Crespo conceded that even after the 2008 Constitution, “the way that remediation is carried out under RAOHE is by applying the permissible limits” and this was consistent with Nature’s right to full restoration under the Constitution: see Transcript, Hearing on Counterclaims, Day 4, pp 922-924 (Testimony of Ricardo Crespo Plaza).

⁸⁵¹ Exhibit EL-147, RAOHE, Article 42.

⁸⁵² See, for e.g., Exhibit E-266, *Auditoria Ambiental Bloque 7 – 2002, Perenco Ecuador Limited*, December 2002, p. 59. (Spanish original: “*Los niveles y concentraciones de los parámetros medidos son menores a los límites permisibles enunciados en la tabla 4A del RAOH 1215*”), Table 4-16, p 132.

⁸⁵³ Exhibit CE-CC-328, Letter from DINAPA to Orellana regarding alleged contamination at Punino 1, September 14, 2007, PER_CC0011693.

⁸⁵⁴ Exhibit CE-CC-328, Letter from DINAPA to Orellana regarding alleged contamination at Punino 1, September 14, 2007, PER_CC0011693 [Emphasis added].

⁸⁵⁵ Exhibit CE-CC-152, Letter of January 11, 2008 from the Consortium to DINAPA, PER_CC0005054.

evaluated pursuant to Table 6 of Annex 2 of RAOHE and this was accepted, without objection, by the Ministry.⁸⁵⁶

335. In another instance, following a complaint in February 2008 from landowners in the Parish of Nuevo Paraiso regarding contamination said to have resulted from the operation of the Coca 7, 11, 12, 13 and 15 wells, Ecuador's Undersecretary for Environmental Protection ordered a technical environmental inspection to be carried out in coordination with the Regional Delegate of Environmental Protection of the Amazon.⁸⁵⁷ This included the physico-chemical analysis of water and soil samples. On 25 June 2008, the Undersecretary informed the complainants that the results obtained "compl[ie]d with the allowable limits established in Tables 4a, 4b and 6 of Annex 2 of [RAOHE]", demonstrating "that *there is no evidence of contamination* from hydrocarbons due to activities carried out by [Perenco] on the Platform of wells Coca 7, 11, 12, 13 and 15."⁸⁵⁸

336. On 28 August 2008, the Undersecretary for Environmental Protection wrote to Perenco's General Manager regarding an environmental remediation programme that the company was carrying out in the Province of Orellana stemming from a cut in the Gacela Payamino gas pipeline on 6 October 2007.⁸⁵⁹ A representative of the Ministry of Mines and Petroleum was sent to investigate whether the remediation programme was carried out effectively, and this was performed under the supervision of Ecuador's Regional Department of Environmental Protection for the Amazon-Orellana province on 5 May 2008. The inspection concluded that the physico-chemical analysis of water and soil samples submitted by Perenco in June 2008 "*compl[ie]d with the allowable limits established in Tables 4a, 4b and 6 of the Annex to [RAOHE].*"⁸⁶⁰ It ordered the original complaint to be archived since it considered that the remediation was properly done.⁸⁶¹

337. In essence, the Undersecretary's determinations mirrored Perenco's submissions in the present case that oilfield activities that result in the emission of certain controlled substances that disturb background values but do not exceed the permitted levels stipulated by RAOHE or TULAS, as the case may be, do not create an environmental harm of such significance as to require remediation. That is, an activity that has an effect on the environment below the levels

⁸⁵⁶ Exhibit CE-CC-152, Letter of January 11, 2008 from the Consortium to DINAPA, PER_CC0005055; see Exhibit CE-CC-138, Letter of August 14, 2007 from Ministry of Mines and Petroleum to the Consortium, PER_CC0004697.

⁸⁵⁷ Exhibit CE-CC-333, Letter from DINAPA to Perenco regarding complaint from Sr. Dorado with respect to Coca wells, June 25, 2008, PER_CC0011721.

⁸⁵⁸ Exhibit CE-CC-333, Letter from DINAPA to Perenco regarding complaint from Sr. Dorado with respect to Coca wells, PER_CC0011722 [Emphasis added].

⁸⁵⁹ Exhibit CE-CC-335, Letter from DINAPA to Perenco regarding complaint of Sra. Tapuy with respect to Gacela field, August 28, 2008, PER_CC0011757.

⁸⁶⁰ Exhibit CE-CC-335, Letter from DINAPA to Perenco regarding complaint of Sra. Tapuy with respect to Gacela field, August 28, 2008, PER_CC0011757 [Emphasis added].

⁸⁶¹ Other examples before the 2008 Constitution entered into force: *Petroproducción's* remediation of Cuyabeno 8 in 2007 (Exhibit CE-CC-139, Letter of September 10, 2007 from Petroproducción to DINAPA, attaching the Report on the Treatment of Materials Contaminated with Hydrocarbons as a Result of the Cuyabeno 8 Spill PER_CC0004722), and ENAP Sipec's remediation of Biguno 1 in 2007 (Exhibit CE-CC-144, Letter of October 31, 2007 from ENAP SIPEC to DINAPA, attaching Remediation Plan for the Spill in the Flow Line in the Y-Denominated Sector of the Malanga (Biguno 1), PER_CC0004883 ("none of the parameters after removal exceed the Maximum Permissible Limit established in Table 6 of Appendix 2 of [RAOHE] for agricultural use").

prescribed by law does not, as a matter of Ecuadorian law, constitute an environmental harm for which the operator is legally responsible.

338. This legal situation continued, evidently without change, after the 2008 Constitution entered into force on 20 October 2008. There are numerous instances of the authorities deeming the presence of permitted substances associated with hydrocarbons activities within the limits prescribed by RAOHE and TULAS, as the case may be, to be legally permissible.

339. From June to August 2009, Ecuambiente Consulting Group was commissioned by the OCP to carry out remediation of soil contaminated by a spill from the OCP pipeline in the Santa Rosa district.⁸⁶² In a section of its report entitled, “Legal Framework”, it stated “[t]he project to remediate the contaminated soils created in the OCP spill must comply with the provisions of the Substitute Regulations of the Regulations for Hydrocarbon Operations in Ecuador (RAOHE) published in Official Registry No. 265 dated February 13, 2001, through Ministerial Agreement 1215, Table 6, which determines the parameters and permissible limits that must be controlled in the remediation of soils contaminated in all phases of the Hydrocarbons industry.”⁸⁶³ It added that “[i]n addition, the provisions of the United Text of Secondary Environmental Legislation, Book VI, Annex 2, must be taken into account, specifically Table 3, which stipulates the Remediation or Restoration criteria set according to the use of the soil.” Nevertheless, “[g]iven that the limits for Agricultural soil use in both Table 3 from TULAS and Table 6 from the RAOHE are similar for all the parameters being studied, those of Table 6 of the RAOHE 1213 will be taken as the officially stipulated ones.”⁸⁶⁴

340. There is also the example of an *ex post* EIS for Coca-Payamino commissioned by Petroamazonas and conducted by ENTRIX in July 2010 in which it consistently compared the results of its samples to RAOHE and TULAS.⁸⁶⁵ Similarly, there is evidence that the Ministry routinely employed not just one land-use classification (i.e., sensitive ecosystems) from Table 6 of RAOHE, but all three of its land-use classifications.⁸⁶⁶

341. This continued, and notably, in March 2011, a manual was developed with the involvement of PRAS (“*Programa de Remediación Ambiental y Social*”), an agency within the Ecuadorian Ministry of Environment (and one with which one of the Ecuador’s experts, Professor Crespo, was affiliated).⁸⁶⁷ The manual described the procedures used “during the environmental remediation works carried out on the pits and flow lines of the Atacapi 2 oil well, in the Liberatador field” between July 2009 and August 2010.

⁸⁶² Exhibit CE-CC-231, Report on the Biorremediation of Contaminated Soils Generated by the OCP Spill, 2010, PER_CC0007205.

⁸⁶³ Exhibit CE-CC-231, Report on the Biorremediation of Contaminated Soils Generated by the OCP Spill, 2010, PER_CC0007205 (Section 3).

⁸⁶⁴ Exhibit CE-CC-231, Report on the Biorremediation of Contaminated Soils Generated by the OCP Spill, 2010, PER_CC0007205.

⁸⁶⁵ CE-CC-241, PER_CC0008585 and PER_CC0008600: Table 3.1-4 and 8.6-2 refer to RAOHE and TULAS limits.

⁸⁶⁶ 1st Witness Statement of Wilfrido Saltos, paragraph 62.

⁸⁶⁷ Transcript, Hearing on Counterclaims, Day 4, p 926 (Testimony of Ricardo Crespo Plaza); see Exhibit CE-CC-253, University of Guayaquil and Ministry of the Environment, Procedural Manual for the Remediation of Zones Contaminated due to the Hydrocarbons Industry: Pits and Flow Line of the Atacapi 2 Well, March 2011.

342. During cross-examination, all the while noting that the “document is not a regulation or standard, [it was] drafted in order to provide future manual users with guidelines in terms of environmental remediation techniques”,⁸⁶⁸ Professor Crespo was taken to relevant pages of the Manual which recorded that the criteria employed were “based on [RAOHE] ..., in its table 6...which deals with the permissible limits for the identification and remediation of contaminated soils.”⁸⁶⁹ It followed on stating that in the case in question the parameters relating to “agricultural land” use would be applied.⁸⁷⁰ Professor Crespo acknowledged that in proposing to carry out its remediation program using the criteria in RAOHE, the agency was acting consistently with the 2008 Constitution.⁸⁷¹

343. Perenco further pointed to statements of Minister Germánico Pinto and IEMS which, in its view, established that the permissible limits in RAOHE and TULAS continued to be the applicable standards after the 2008 Constitution’s promulgation. Minister Pinto, who became the Minister of Non-renewable Resources in June 2009, described his Ministry as the “principal regulator of the hydrocarbons industry.”⁸⁷² He was also Petroecuador’s Chairman of the Board and a member of Petroamazonas’ Board at the time. On cross-examination, Minister Pinto agreed that Petroecuador and Petroamazonas were bound to apply RAOHE and the other applicable regulations in force in the performance of their functions.⁸⁷³

344. The Tribunal also notes that IEMS’ first expert report in *Burlington* characterised RAOHE and TULAS as representing the limits below which the Ecuadorian State had determined that “on properties that are used for productive purposes related with petroleum activities, we tolerate certain concentrations of contaminants.”⁸⁷⁴ IEMS did not use “background values” or “[b]ase [v]alues”, but rather referred to the notion of “tolerable” levels of contaminants. It applied RAOHE and TULAS “to establish whether the presence of contaminants at certain levels and components of the environment (soil, surface water and underground water) [was] tolerable.”⁸⁷⁵

345. It was not until the filing of its second report in the *Burlington* proceeding that IEMS introduced the notion of “background values” or “[b]ase [v]alues” into its investigation of the Blocks, and there is an indication that this hypothesis was prompted by the instruction of the Office of the Attorney-General of Ecuador to “[s]trengthen the prior soil and groundwater

⁸⁶⁸ Exhibit CE-CC-253, University of Guayaquil and Ministry of the Environment, Procedural Manual for the Remediation of Zones Contaminated due to the Hydrocarbons Industry: Pits and Flow Line of the Atacapi 2 Well, March 2011, PER_CC0010261.

⁸⁶⁹ Quote from Manual, p 14, Exhibit CE-CC-253, University of Guayaquil and Ministry of the Environment, Procedural Manual for the Remediation of Zones Contaminated due to the Hydrocarbons Industry: Pits and Flow Line of the Atacapi 2 Well, March 2011, quoted in Transcript, Hearing on Counterclaims, Day 4, p 929 (Testimony of Ricardo Crespo Plaza) [Emphasis added.].

⁸⁷⁰ Exhibit CE-CC-253, University of Guayaquil and Ministry of the Environment, Procedural Manual for the Remediation of Zones Contaminated due to the Hydrocarbons Industry: Pits and Flow Line of the Atacapi 2 Well, March 2011, p 14, as quoted in Transcript, Hearing on Counterclaims, Day 4, p 929 (Testimony of Ricardo Crespo Plaza).

⁸⁷¹ Transcript, Hearing on Counterclaims, Day 4, p 930 (Testimony of Ricardo Crespo Plaza).

⁸⁷² Transcript, Hearing on Counterclaims, Day 2, p 348 (Testimony of Germánico Pinto).

⁸⁷³ Transcript, Hearing on Counterclaims, Day 2, p 355 (Testimony of Germánico Pinto).

⁸⁷⁴ Exhibit CE-CC-251, IEMS Report in *Burlington*, PER_CC0010136-0010136.

⁸⁷⁵ Exhibit CE-CC-251, IEMS Report in *Burlington*, PER_CC0010136-0010137.

results via the determination and evaluation of background levels for those contaminants whose presence may be attributable to natural conditions or other causes.”⁸⁷⁶

346. The Tribunal does not see this instruction as nefarious; one can reasonably ask whether Articles 396 and 397 of the 2008 Constitution required a shift in the content and enforcement of Ecuadorian environmental law such as to incorporate background values as the regulatory regime’s dominant criteria. But the evidence does not show that the 2008 Constitution prompted the Executive or the Congress to make significant changes to Ecuador’s then-extant hydrocarbons environmental regulatory regime.

347. Nothing precludes Ecuador from promulgating new regulations that hold oilfield operators to more stringent environmental standards (or indeed to prohibit such activities altogether in areas which it considers to be ecologically sensitive), provided that this is done consistently with the Constitution’s requirements and any international legal obligations voluntarily assumed by the State. Had the Tribunal been presented with evidence that all oilfield operators were being held to background values remediation standards after October 2008, it would have been bound to recognise that as a matter of Ecuadorian law a fundamental change in environmental law enforcement had been effected and that Perenco, like all other operators, was obliged to meet the higher standard that the State had seen fit to elaborate. Indeed, the Tribunal will do precisely that for the period in time in which the 2008 Constitution governed Perenco’s operatorship.

348. But Perenco has shown that the Constitution did not change the substantive environmental standards to be applied to oilfield operations and seeking to hold an operator to “background values” standards said to be applicable as a matter of law in an international arbitration when the evidence points to less stringent standards that have been applied on a regular basis by the State – including to State-owned operators – outside of the arbitration, cannot be right as a matter of Ecuadorian law or international law. The Tribunal is concerned with Ecuadorian law and regulation as written and as applied.

349. It follows from the foregoing that Ecuador’s primary case based on background values cannot be accepted in substitution for the applicable standards – both prior to and after the 2008 Constitution’s entry into force. Accordingly, it is unnecessary for the Tribunal to determine the many disputed issues pertaining to the background values methodology employed by IEMS and adopted by Ecuador.

350. This is not to say that as Ecuador’s foundational governing law, the 2008 Constitution has no role to play in answering the questions presented to the Tribunal. It constitutes the State’s supreme legal framework within which the Environmental Management Law, RAOHE, TULAS and other regulations specific to hydrocarbon activities within Ecuador must operate.⁸⁷⁷

⁸⁷⁶ As shall be seen, when it responded to the witness statement of Mr. Gilberto Martínez filed with Perenco’s Rejoinder, IEMS itself adverted to an instruction from the client to consider background values (see IEMS ER IV, p 8). Perenco also raised the example of IEMS’ report in the ICSID case of *City Oriente v Ecuador* (Exhibit CE-CC-169), where IEMS referred to remediating affected areas up to the permissible limits set forth in RAOHE (Rejoinder, paragraph 73). See above at paragraph 208.

⁸⁷⁷ Transcript, Hearing on Counterclaims, Day 1, p 209 (Opening Statement of Mark Friedman) (“the basic structure of environmental protection”).

Accordingly, where the Constitution has effected a change in the law, it must be given effect, although the Tribunal must ensure that the Constitution as a whole must be applied.⁸⁷⁸

351. Finally, the Tribunal notes that IEMS prepared an alternative valuation approach based upon the criteria in RAOHE, Table 6, Annex 2, specifically, that applicable to sensitive ecosystems. For chemical indicators other than TPH, polycyclic aromatic hydrocarbons, cadmium, nickel and lead, such as “electrical conductivity, pH, barium and vanadium” it relied on Table 2 of TULAS.⁸⁷⁹ The situation with respect to the results of its groundwater sampling was different, IEMS explaining that while it similarly took the view that Base Values should be applied this was not feasible in the circumstances and relied on the values in Table 5, Annex 1, Book VI of TULAS.⁸⁸⁰

(3) Conclusion on the Relationship Between the Constitution and the Hydrocarbons Environmental Regulations

352. In sum, the Tribunal does not accept that the 2008 Constitution *per se* establishes the applicable technical standards governing the environmental conditions in the Blocks. The Constitution’s provisions might have relevance to providing answers to specific issues that arise in this counterclaim. However, insofar as the environmental aspects of hydrocarbons operations are concerned, the Tribunal must look at the Ecuadorian technical standards as promulgated by the relevant bodies of the Ecuadorian State and as applied “on the ground” both before and after the 2008 Constitution’s promulgation. Subject to the Tribunal’s further findings on the applicable regulatory criteria, this is the case that Perenco must meet.

(4) Does the Constitution’s Strict Liability Regime Apply to Perenco’s Activities Conducted Prior to 20 October 2008?

353. With respect to the temporal application of the 2008 Constitution, given that Article 13.1 holds that the constitutional rights and guarantees are of “immediate application”, the Tribunal is bound to hold that for any contamination in excess of regulatory standards shown to have occurred after 20 October 2008 up until the Consortium suspended operations on 16 July 2009, in accordance with the Constitution, Perenco is strictly liable.

354. Ecuador has gone further to argue that the promulgation of the 2008 Constitution means that since the counterclaim was filed after the new Constitution’s entry into force, and since the Constitution created strict liability for environmental claims, *all* of Perenco’s activities and any contamination occurring prior to 20 October 2008 are to be evaluated within that new legal framework with the result that Ecuador is relieved of the need to prove any fault, even though a fault-based regime governed Perenco’s oilfield activities (and those of its predecessors) prior to

⁸⁷⁸ Article 11(6) of the 2008 Constitution provides that all constitutional rights are “interdependent and hold equal stature.” Article 427 provides that: “Constitutional provisions shall be interpreted by the literal meaning of their wording that is most closely in line with the Constitution as a whole. In the event of any doubt, [constitutional provisions] shall be interpreted in the manner most favourable to the full force and effect of rights and that best respects the will of the constituent, in accordance with the general principles of constitutional interpretation.” (Exhibit EL-89, 2008 Constitution).

⁸⁷⁹ Claimant’s Counter-Memorial, paragraph 280; Supplemental Memorial, paragraph 166; IEMS ER I, pp 21-27; 48-61.

⁸⁸⁰ IEMS ER I, section 2.5.2; IEMS ER II, pp 151-163; Ecuador’s Counter-Memorial, paragraph 805; Reply, section 2.1.4

20 October 2008.⁸⁸¹ According to Ecuador, as of 20 October 2008, fault became irrelevant to establishing Perenco's liability.

355. The Tribunal observes that even on Ecuador's appraisal of the strict liability regime, it is not so strict as to admit of no exceptions. In Ecuador's view, there was a "presumption of causation" and "Perenco can only escape liability by establishing that the contamination was caused by *force majeure*, Ecuador or a third party."⁸⁸² At another point in its post-hearing submissions, Ecuador repeated this point in similar terms: "As a result of the presumption of causation established by the 2008 Constitution, the entity responsible for operations in an adversely impacted area bears the burden of demonstrating that such an impact was not caused by its own operations."⁸⁸³

356. With respect to Ecuador's contention that the entirety of Perenco's operatorship is to be adjudged under the 2008 Constitution's strict liability regime, the Tribunal does not read the "immediate application" text of the Constitution to have retroactive effect. The general rule under Ecuadorian law is that laws may not in principle be given retroactive effect and that rule has been continued in the 2008 Constitution.⁸⁸⁴ The Tribunal is aware of the "public order" exception to the Constitution's prohibition against the retroactive application of law, but it has not been satisfactorily shown that this has occurred in Ecuadorian legal practice.⁸⁸⁵ The Tribunal therefore does not agree with Ecuador's arguments in favour of giving the Constitution's regime of strict liability an application which to the Tribunal appears to be retroactive.⁸⁸⁶ Based on its understanding of the Ecuadorian case law that the Parties put before the Tribunal in their pleadings and reviewed with the legal experts at the hearing, a distinction must be drawn between the pre-and post-2008 constitutional regimes.

357. The Tribunal considers that where a particular regime that can give rise to damages claims has governed the conduct of a complex activity such as hydrocarbons exploitation, although the standards can be made more stringent with respect to activities engaged in *after* their entry into force, in respect of attempts to impose tortious liability after the fact, an operator can in general be held only to the legal standards that applied to its conduct at the time.

⁸⁸¹ Implicit in the Tribunal's description of the issue above is a finding that the 1998 Constitution did not itself create a strict liability regime and the Tribunal's rejection of Ecuador's argument based on Article 20 of the 1998 Constitution. On the Tribunal's reading, the phrase "... shall be obligated to compensate individuals for the damages caused as a consequence of the defective provision of public services or of the acts of their public servants and employees, in the performance of their duties" does not amount to a strict liability regime. However, the Tribunal is of the view that decisions of the Ecuadorian courts have strengthened the presumptions in favour of a finding of liability in the case of damage caused through hazardous activities.

⁸⁸² Ecuador's Post-Hearing Submission, paragraph 7.

⁸⁸³ Ecuador's Post-Hearing Submission, paragraph 45

⁸⁸⁴ Exhibit EL-89, 2008 Constitution, Articles 76(3) and 86.

⁸⁸⁵ On cross-examination, Professor Andrade acknowledged that he had not shown any case in which an Ecuadorian court had applied any Ecuadorian Constitution retroactively on grounds of public order. Transcript, Hearing on Counterclaims, Day 4, p 989 (Testimony of Fabián Andrade Narváez): "Q: In those 30-odd years, on your theory, the Constitution could have been applied retroactively by the Ecuadorian courts that whole time? A: It could have been, yes. Q: Now, in your report you don't provide any case in which the Ecuadorian courts have actually done that, do you? A: No, I don't."

⁸⁸⁶ Ecuador's Post-Hearing Submission, paragraphs 21-22.

Accordingly, for the period commencing 4 September 2002,⁸⁸⁷ when Perenco acquired its interests in the Blocks from Kerr-McGee, through to 19 October 2008,⁸⁸⁸ the Tribunal must apply the fault-based regime. This does not mean that certain issues cannot be affected by subsequent constitutional action, but it does mean that the basic legal standards against which Perenco was to conduct itself cannot later be changed and applied retroactively to impose liability where none existed under the then-applicable standard.

358. All of this said, the Tribunal adds that having regard to the way in which Ecuadorian case law has developed, it does not see major differences between the two regimes given that: (i) it appears that ultimately all of the experts agreed that even under the strict liability regime there are still questions of causation;⁸⁸⁹ and (ii) Ecuadorian law prior to 2008 presumed that the party engaged in a harmful activity was responsible for any environmental damage and the burden shifted to that party to demonstrate that some other party was responsible. As the Tribunal understands the law, prior to 2008 Ecuadorian law created a strong presumption that the operator was responsible for the damage and this presumption could only be rebutted by demonstrating that some other party was responsible.

(5) Conclusion on the Strict Liability Regime's Application

359. In sum, the 2008 Constitution applies to any post-20 October 2008 damage resulting from regulatory exceedances. For any damage occurring during this period up to its being succeeded by Ecuador in operating the Blocks, Perenco is strictly liable. Perenco has asserted that no such damage occurred during this period, so if that is correct, the strict liability regime does not have any application to this dispute in practical terms; whether Perenco is correct that no damage occurred after the Constitution's entry in force remains to be seen.⁸⁹⁰ In cases of doubt, where it appears that the damage might have occurred prior to that time, the fault-based liability regime which applied to Perenco from the date of its acquiring its interests in the Blocks until 20 October 2008 must apply.

(6) The Time Bar Defence

360. Turning to Perenco's contention that the claim is partly time-barred by virtue of the application of Article 2235 of the Civil Code, Ecuador has responded that that rule can only apply to a fault-based regime and since 2008 the regime has been one of strict liability based on the imprescriptibility of environmental claims.⁸⁹¹ As for claims relating to events occurring

⁸⁸⁷ Exhibits CE-27, Assignment Contract of Kerr-McGee's interest in the Participation Contract for Block 21 to Perenco and Burlington, 4 September 2002 (in Spanish), and CE-28, Assignment Contract of Kerr-McGee's interest in the Participation Contract for Block 7 to Perenco and Burlington, 4 September 2002 (in Spanish).

⁸⁸⁸ The 2008 Constitution was published in Official Register No. 449 on 20 October 2008: see EL-89, 2008 Constitution.

⁸⁸⁹ Perenco's Post-Hearing Submission, paragraph 19, and the record references cited thereto.

⁸⁹⁰ During his cross-examination, Mr. Wilfrido Saltos testified that on 11 July 2009 (i.e., after the 2008 Constitution entered into force), there was an 11 barrel spill in Block 7 which was "reported by an association of farmers that are within the operational area of the Payamino Field. This group is called Los Vencedores." He indicated that the spill had been cleaned up. Transcript, Hearing on Counterclaims, Day 5, pp 1438-1439 (Testimony of Wilfrido Saltos). Perenco observed in its Post-Hearing Reply Brief that in a lawsuit (the *Los Vencedores* case) the Court of Appeals of the Orellana District upheld the lower court's dismissal of the claim on the basis that the Ministry of Environment had certified that Perenco had complied with the environmental remediation plan. (Perenco's Reply Post-Hearing Brief, paragraph 13.)

⁸⁹¹ Ecuador's Post-Hearing Submission, paragraph 24;

before that date, Ecuador argued that even if it was wrong that the 2008 Constitution could have retroactive effect, when it came to a limitation period issue, in the *Nelson Alcívar* case the court applied Article 396.4 (pursuant to which environmental claims cannot expire).

361. There is no time bar for the claim insofar as it relates to events occurring after the 2008 Constitution's entry into force. As for claims arising out of the prior fault-based regime and outside of the Civil Code's four year period, the imprescriptibility provision of the 2008 Constitution does have an impact on Perenco's limitations period defence. Statutes of limitation are of a procedural nature and since the claim as a whole was brought after October 2008, the Civil Code's rule gives way to Article 396.⁸⁹²

362. At the hearing, Professor Andrade testified against the strict application of a four-year limitation period where the harm may not be discoverable within that period after the act has occurred. In his opinion, "not even in the system of general liability has this norm been applied in that way."⁸⁹³ Ecuador found support for this view in the "generally accepted maxim *agere non valentem non currit praescriptio* (that is, the period of statute of limitation does not run for he who cannot assert a claim)."⁸⁹⁴ Ecuador argued that otherwise a claim for an environmental harm would expire every time the harm was neither disclosed by the perpetrator nor readily apparent (as in the present case).⁸⁹⁵

363. The Tribunal observes that Perenco's expert, Dr Bedón, appeared to hold the same view in one of his prior writings where he asserted that "continued environmental harm should be subject to the normal statutory limitation relating to torts of four years, but starting from the discovery of the harm."⁸⁹⁶ Perenco conceded that Dr Bedón made such a comment, but argued that this was his view *de lege ferenda*.⁸⁹⁷

⁸⁹² Annex No. 29 to Expert Report of Fabián Andrade Narvárez ("TWELFTH. – Regarding the substantive matter, this Chamber has considered, and believes pertinent to note in this case, that the environmental action to request redress for harm, cannot be classified as equal, in any way, to the civil action for damages. Both protect legal assets of a completely different relevance. The environmental action protects a common good that is essential to humanity's existence, and therefore, it is logical that the current Constitution does not contemplate a term for a statute of limitations for this type of action, as noted by Art. 396 of the Supreme State Rule. The action that is only Civil for damages, instead, protects other legal assets, related to the property of the individual that, although they are important, do not have relevance to the collective right to the environment. For this reason, for example the statute of limitations for actions for damages that are only civil is limited, as per Art. 2235 of the Civil Code. It is important that we highlight that the constitutional principle that states that in doubt, the rule that most favors environmental protection shall apply, as it is a standard that generates ample protection, the matters contemplated by the current Constitution will apply, as it is a standard that creates a broad protection to the environment, above the matters outlined by the Environmental Management Law or the 1998 Constitution. The provisions of the current Constitution as it relates to environmental issues and its protection is also preferably applied, since, in procedural matters, the rules in force at the time of filing the action apply, and not those that were in force when the legal situation was created. In this case, we observe the moment on which the appeal was filed for application of constitutional rules in procedural matters, related to the environmental case, in application of the provisions of Art. 7, point 20 of the Civil Code).

⁸⁹³ Transcript, Hearing on Counterclaims, Day 4, pp 960-961 (Testimony of Fabián Andrade Narvárez).

⁸⁹⁴ Ecuador's Post-Hearing Submission, paragraph 25.

⁸⁹⁵ Transcript, Hearing on Counterclaims, Day 8, p 2160 (Closing Statement of Eduardo Silva Romero); Ecuador's Post-Hearing Submission, paragraph 25.

⁸⁹⁶ Exhibit EL-191 (translation resubmitted on 10-18-2013)

⁸⁹⁷ Ecuador's Post-Hearing Brief, paragraph 43.

(7) Conclusion on the Time Bar Defence

364. The Tribunal concludes that because of the peremptory wording of Article 396, the four-year limitation period defence is to be rejected. Its view of this effect of Article 396 is supported by certain additional factors, namely: (i) the court in the *Nelson Alcívar* case applied Article 396.4 after the Constitution's entry into force to a case where the damage occurred prior to that date;⁸⁹⁸ (ii) Ecuadorian law does not give preclusive effect to any audit performed at the request of an operator even if approved by state agencies (although this does not exclude an audit's use as evidence in discharging its burden of proof);⁸⁹⁹ (iii) the administration of the environmental laws depends upon the operator's self-reporting; and (iv) as Perenco's witness, Mr. Wilfrido Saltos himself acknowledged (see below), it is sometimes difficult to ascertain exactly when and where oilfield environmental contamination has occurred. These factors, considered in light of Article 396, argue in favour of an interpretation of Ecuadorian law which is to be resolved in favour of the protection of the environment. Thus, a four-year limitation period which is said to admit of no discovery exception must yield to Article 396 of the 2008 Constitution.

(8) The Legal Effect of Petroamazonas' Succeeding Perenco in Blocks 7 and 21

365. Ecuador has argued that the combined effect of the 2008 Constitution's emphasis on "full restoration" as well as various provisions of the Participation Contracts means that Perenco must put the two Blocks back into their pre-existing condition, that is, their state prior to the commencement of hydrocarbons exploitation. The Tribunal considers this to be impossible given the fact that the Blocks continue to be used for oil production.

366. Perenco adduced extensive evidence showing that when Petroamazonas took over Blocks 7 and 21, it proceeded to undertake a significant expansion of the operational capacity of the Blocks, and in so doing has drilled 78 new wells, has built new mud pits and is estimated to be producing about twice the amount of oil that Perenco was producing in July 2009.⁹⁰⁰ A new pipeline is being constructed by Petroamazonas in areas where IEMS considered that Perenco is liable to remediate the land.⁹⁰¹ Perenco argued that it cannot be under a legal obligation to pay the cost of removing platforms, pipelines, and other appurtenances of oilfield operations that are still being used or even expanded upon by the succeeding operator. Perenco noted, for example, that some areas alleged to be contaminated such as the new pipeline's right of way, where contamination was detected by IEMS, are said to be covered by the environmental claim.⁹⁰²

⁸⁹⁸ In its Post-Hearing Brief, Perenco argued that the *Nelson Alcívar* case was wrongly decided. This may be so, but as found in the Tribunal's earlier Decision on the Remaining Issues of Jurisdiction and on Liability, the Tribunal must seek to apply Ecuadorian law as the Ecuadorian courts have applied it. See Decision, paragraph 331.

⁸⁹⁹ Transcript, Hearing on Counterclaims, Day 1, p 68 (Opening Statement of Eduardo Silva Romero); referring to Exhibit EL-146, TULAS, Book VI, Art. 70: "the approval of environmental management plans, and other environmental studies shall not be used as exonerating evidence in environmental contamination incidents or accidents attributable to any activity, project or construction."

⁹⁰⁰ Transcript, Hearing on Counterclaims, Day 1, pp 174-176 (Opening Statement of Mark Friedman).

⁹⁰¹ A reference to the SOTE pipeline: Transcript, Hearing on Counterclaims, Day 1, p 176 (Opening Statement of Mark Friedman).

⁹⁰² Examples of this as submitted by Perenco are the Coca 13 site, the Coca 18-19 wells, Oso A: Transcript, Hearing on Counterclaims, Day 1, pp 174-178 (Opening Statement of Mark Friedman).

367. The Tribunal agrees that it makes little sense to assume away the existence of Petroamazonas' activities and posit a remediation target which would imagine that the Blocks are no longer used for the production of oil at all. The Participation Contracts have been brought to an end. Petroamazonas has taken over the Blocks and continues to operate them and has expanded production thereon. The Tribunal cannot ignore this significant fact.

368. The Tribunal recognises that with the passage of time, in the course of conducting oilfield operations, Petroamazonas might have caused spills and other contamination. The key period of time was that falling between July 2009 and the time in which the Parties' experts conducted their sampling activities. During this period, it is possible that the condition of the Blocks could have been adversely affected by the succeeding operator and this must be borne in mind. To the extent that there is any evidence of environmental harm occurring in the Blocks during the post-16 July 2009 period, Perenco bears no liability. Under the 2008 Constitution, Petroamazonas is strictly liable for any such contamination.

369. It can reasonably be asked why a company whose ownership interests in the Blocks have been brought to an end is nevertheless to be held responsible for any contamination in excess of regulatory standards which occurred while it was the operator. The Tribunal considers that this question is answered by the fact that it has already been established in the Decision on Remaining Issues of Jurisdiction and on Liability that Ecuador was in breach of its contractual and Treaty obligations. As a result, Perenco has the right to the payment of compensation in accordance with the applicable legal standards governing quantum as if it had continued to perform the Participation Contracts in the absence of the breaches. In circumstances where the State's breaches are appropriately compensated, and at the end of its contracts' terms, the contractor is obliged to return the Blocks in a suitable condition, the assumption must be that the private contractor itself would act consistently with its public and private law obligations.⁹⁰³ In light of the foregoing analysis, it need hardly be said that the Tribunal rejects Perenco's alternative argument (based on the 2008 Constitution) that it bears no responsibility for the Blocks on the ground that since Petroamazonas is now the operator, it has substituted for Perenco as the succeeding operator.⁹⁰⁴

(9) Conclusion on the Succession of the Operatorship

370. The Tribunal finds that the only remediation obligation that Perenco can have is for regulatory exceedances that predate Petroamazonas' activities and which themselves have not been overtaken by Petroamazonas' new works.

⁹⁰³ Under the Participation Contracts Perenco is responsible for any environmental damage resulting from its operatorship, as well as its positive obligations to "[t]ake responsibility for the cleanup and reforestation of the area with species similar to those originally found at the site, in order to, with time, allow the potential return to environmental conditions similar to those encountered at the beginning of the operations", Perenco must bear the cost of remediating the damage and for those areas in which its oilfield activities were retired by taking the appropriate cleanup and reforestation measures. (See Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), PER 04764, 04768, 04769 ; Exhibit CE-10/CE-CC-13, Block 21 Participation Contract (translation resubmitted on 04-12-12), PER 04659. Above at paragraph 81.)

⁹⁰⁴ Claimant's Post-Hearing Brief, paragraph 32.

(10) The Tribunal's Approach to the Fault-based Regime

371. In the Tribunal's view, having regard to the Ecuadorian case law, the approach taken by the Ecuadorian courts prior to 2008 was to employ a relatively stringent burden of proof rule which presumed that the operator engaged in a hazardous activity and benefiting therefrom was responsible for any resulting damage.⁹⁰⁵ This, however, is a rebuttable presumption.

372. In considering the burden of proof, the Tribunal is mindful of the problems of proof when an oilfield is operated over a period of years by a single operator or, to make matters more complicated, by successive operators. The problem here is that the environmental claim is not based on a single event but rather on an accumulation of discrete events occurring at different sites at different times (and in circumstances where the operator is itself responsible for reporting any spills or other contamination). How, for example, does a tribunal differentiate between the acts of successive operators or even differentiate between the cumulative effect of the acts of the same operator on a particular platform? While it agrees with Perenco that it cannot presume that Perenco is the author of all harm that has been detected, once a regulatory exceedance resulting from a potentially hazardous activity is shown, Perenco is *prima facie* responsible therefor.

373. Proof of causation in relation to an environmental tort raises very difficult issues. How is the Tribunal to determine whether the operator fell below its duty of care in every specific instance of contamination? The *Delfina Torres* case speaks of the "events that caused the harm"; this could be taken to refer to specifically identified acts of negligence; equally it could refer to the carrying on of a particular hazardous activity that is likely to cause harm.⁹⁰⁶ If the latter conception is to be applied, the oil industry would seem to be such an activity.

374. Given the special difficulties attendant in proving the commission of an environmental tort, it appears to the Tribunal to be wrong in principle that an operator can simply plead that a spill occurred in the ordinary course of business and it is not liable therefor unless it is proved to have acted negligently. The Tribunal is thus inclined to employ a strong rebuttable presumption that if there is a regulatory exceedance, that in itself is evidence of fault. Any alternative approach would make it too onerous for a claimant because it would likely lack sufficient evidence to demonstrate that the operator failed in its duty of care in many if not most instances in which regulatory exceedances have occurred. The Tribunal considers that regulatory exceedances are indicative of operational failures and therefore should be taken as falling below the standard of care.

375. In the Tribunal's view, this approach is also consonant with industry practice. The Participation Contracts excluded environmental damage caused by the State before the start of the Contracts' terms (in Block 7's case, before the start of the term of the original Service Contract, and in the case of Block 21, before the start of the term of the Participation Contract). This of course required a succeeding operator to evaluate the state of the Blocks in order to avoid the possibility of its later being held liable for the acts of its predecessor. If it did not take steps

⁹⁰⁵ In *Delfina Torres*, the court held that: "The claimant had to prove: a) the harm of which it claims it is a victim; b) its amount or quantum; and c) the events that caused the harm." Exhibit EL-145, *Delfina Torres*, p 32.

⁹⁰⁶ Referring to the *Delfina Torres*, *Medardo Luna* and *Andrade Medina* cases, at paragraph 39, Perenco's Post-Hearing Brief puts the matter thus: "All of these cases confirm that prior to the 2008 Constitution the liability of an operator of a hazardous activity requires fault as a constitutive element, but that fault is rebuttably presumed."

to ascertain the Blocks' condition, it ran the risk that it could be held liable for the acts of its predecessor due to the challenge of proving that the predecessor caused the environmental contamination.

376. Thereafter, the Participation Contracts left it to the contractor to ensure that the environmental conditions were preserved. They are clear that the contractor was responsible to ensure that no environmental harm was caused by its activities, and a failure to do so would entail its liability. To the extent that one operator was succeeded by another operator, the industry practice was that the succeeding operator would conduct its own audit with a view to ensuring that it did not inherit an environmental liability for which it might be held responsible.⁹⁰⁷ In this respect, the Tribunal agrees with Ecuador that it was for the contractors to allocate the risks *inter se* to determine where liability for environmental damage arising during the course of the Participation Contracts would land. This was not a matter for the State to determine.⁹⁰⁸

377. Turning to the terms of the Participation Contracts, the way in which Clause 5.1.20.10 was framed indicated that as between Petroecuador and the private contractor, there was a clear and general imposition of responsibility on the State for the Blocks' condition at the time of the first private contractor's commencement of operations. Likewise, the contractor bore responsibility for their return to their original environmental condition. This suggests that the contractual regime was broadly consistent with the fault-based regime, and even with the strict liability regime later established by the 2008 Constitution. (The Tribunal recalls Ecuador's disclaiming that its claim in the current proceeding sounded in contract. For the Tribunal, the Participation Contracts' relevance to the present case lies in their general approach to environmental stewardship and the Blocks' conditions at the time of their surrender.)

378. Given the problems of proof when seeking to shift responsibility for tortious claims, it is possible that an operator might end up being found liable for an act of contamination possibly caused by its predecessor. The best way for the contractor to protect its legal interests was for it to comprehensively document the environmental condition of the Blocks at the time that it assumed responsibility for them.

⁹⁰⁷ Transcript, Hearing on Counterclaims, Day 6, pp 1592-1594 (Testimony of Alex Martínez): "Q: In this case you just happened to acquire a company that had an interest in Ecuador, so you were essentially buying whatever they had. But is it my understanding, then, that if - is this the practice in the oil industry that buying a specific asset, so going into a specific operation you would want to know what - whether there was contamination in the oil fields that has been caused by the previous operator for the purposes of allocating responsibility? A: That's correct. That's the normal process. We go and do due diligence on that particular asset to the best of our capability. I mean, that's--you know, we'd do as much as we could to figure out what was there. And we will do that. I mean, other properties that we've, you know, we've gone through an acquisition, we'll go in and make sure our agency folks go and review all of that. So, yes. That's a normal practice, except in this case I was telling--at least for ConocoPhillips."

⁹⁰⁸ Ecuador contends that this was accepted by Perenco, which in practice and in its evidence in this arbitration demonstrates it as remediating contamination left behind by the previous operator in the Blocks (referring to the evidence of Mr. Saltos, in particular). Transcript, Hearing on Counterclaims, Day 1, p 77 (Opening Statement of Eduardo Silva Romero).

(11) Conclusion on the Fault-based Regime

379. In sum, if a regulatory exceedance occurred, Perenco is to be taken to have fallen below the requisite duty of care and will be held liable unless it can prove on a preponderance of evidence: (i) an occurrence of a *force majeure* event; (ii) that it did not fall below the standard of care in respect of that specific instance of contamination; or (iii) that some other person caused the harm.

(12) Determining the State of Blocks 7 and 21 at the Time of Perenco's Acquisition of its Interests

380. In both the Parties' written pleadings and in their experts' reports, there was considerable debate over whether certain instances of contamination were attributable to the actions of Perenco or to other parties who carried on operations in what became Blocks 7 and 21 before Perenco arrived on the scene. In view of the Tribunal's finding that under the fault-based regime Perenco can avoid liability if it can demonstrate that a particular instance of contamination resulted from the acts of another person, this necessarily requires the Tribunal to consider the environmental condition of the two Blocks at the time that Perenco acquired its interests from Kerr-McGee.

381. In response to a question from the Tribunal, Mr. Alexis Martínez, a witness for Perenco, explained the general practice of oil companies when it comes to acquiring interests in ongoing operations. Mr. Martínez testified that: (i) an incoming operator seeks to ascertain the extent of any existing environmental liabilities by conducting some form of audit prior to or immediately upon acquiring its interest (as in fact Oryx did when it became involved with the Blocks⁹⁰⁹, ConocoPhillips did when it acquired Burlington's assets in Ecuador⁹¹⁰ and, as Mr. Saltos appeared to recall, Perenco did when it acquired its interests in the Blocks);⁹¹¹ (ii) incoming operators typically obtain representations and warranties from their predecessor-in-interest on the block's environmental condition as at the time of its sale;⁹¹² and (iii) purchasers typically require the inclusion of indemnification provisions in the Sale and Purchase Agreement (SPA) so that

⁹⁰⁹ Exhibit E-261, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated May 1994; see also, Exhibit E-260, Laboratory result for water sample from swamp nearby Payamino 2 & 8, 6 October 1992; Exhibit CE-CC-12, Environmental Assessment of Oryx Ecuador Energy Company - Coca-Payamino Field, Audit Utilized for the Transfer of Operations of the Coca-Payamino Unified Field from Petroproducción to Oryx on February 12, 1994, performed by Ecomapa/Western Oilfield.

⁹¹⁰ Exhibit CE-CC-126, HSE & SD Assessment and Other Technical Services, Assets in Ecuador, Report prepared by ERM for Conoco-Phillips, dated November 2006, PER_CC0004260.

⁹¹¹ Transcript, Hearing on Counterclaims, Day 6, pp 1509-1511 (Testimony of Wilfrido Saltos): "Q: Now, did Perenco, by the way, undertake a similar type of audit or assessment when it took over the works or the oil field operations in or around 2002? A. Yes, an assessment was conducted also. Q: And to be clear, you're not referring to the biannual audit that was submitted or conducted on behalf of Perenco for the purposes of the – of its regulatory requirements. You're talking about an internal Perenco assessment audit; is that correct? A. No. The biannual audit was not internal in nature. It was a compliance audit, and this was done under the environmental regulations and because it was requested of us by DINAPA. Q. Okay. But set aside the biannual audit for a moment. Perenco also undertook an internal audit when it took over the works in or around 2002; correct? A. Yes. That was the usual practice of Perenco up to McGee [sic] and also Oryx."

⁹¹² Transcript, Hearing on Counterclaims, Day 6, pp 1590-1591 (Testimony of Alex Martínez).

they may be indemnified for any liability for contamination which is attributable to their predecessor.⁹¹³

382. This sort of appraisal was performed by Oryx when it took over operations in the Coca-Payamino Field in 1994. The introduction to its May 1994 Environmental Assessment stated in this regard that, “[t]he objective of this assessment was to determine the current environmental status of all sites and facilities to support the take over of operations by Oryx on February 12, 1994.”⁹¹⁴ The 141-page document contained appendices which included a file of the correspondence between Oryx and *Petroproducción* and the daily production reports that the latter sent to Oryx, a database compiled from site summary sheets and site status tables, and a copy of the completed inspection checklists.⁹¹⁵ Although in some respects the report was quite comprehensive, regrettably for the purposes of the present proceeding, the consultants did not perform sampling. The report notes in this regard:

Based on the visual inspection of the sites and the spills identified the level of contamination is deemed to be minimal. However, as this study did not include sampling and analysis, no confirmation of contamination levels can be made.⁹¹⁶

383. One other fact emerges from the report. It noted the absence of an incident reporting system on *Petroproducción*'s part:

There is presently no reporting or written procedures within PetroProducción [sic] for environmental pollution or spill incident reporting. An incident reporting system should be put in place as soon as possible.⁹¹⁷

384. Thus, the 1994 report is not of much assistance other than it shows how Oryx sought to evaluate what it was taking on, that at the time of its entry into the field, the level of contamination was deemed to be minimal, and *Petroproducción*'s environmental monitoring practices were considered to be rudimentary.

385. There are other such studies on the record. For example, when Oryx was negotiating to resume the operatorship of the Coca-Payamino Field (it evidently had been operated by *Petroproducción* for some eighteen months), a Mr. Patrick Grizzle (who appears to have been an Oryx employee⁹¹⁸) conducted an inspection from 12 to 14 January 1998. Mr. Grizzle's view was that environmental conditions had deteriorated in the period during which the field was being operated by *Petroproducción* and he was critical of its operatorship. Oryx had operated the field

⁹¹³ *Ibid.*

⁹¹⁴ Exhibit E-261, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated May 1994, p 8 in the document.

⁹¹⁵ Exhibit E-261, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated May 1994, pp 9-10 in the document.

⁹¹⁶ Exhibit E-261, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated May 1994, p 4. See also, CE-CC-21, Environmental Audit of *Petroproducción*'s Operation of the Coca-Payamino Field, January 1999, PER_CC0001020 (“Photos of well sites and facilities are included in Appendix B. Note that no sampling of soils, surface or groundwater was conducted during the audit and that the recommendations are based on visual observations.”).

⁹¹⁷ Exhibit E-261, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated May 1994, p 6.

⁹¹⁸ Claimant's Counter-Memorial, paragraph 442.

from 1995 to 1997 and Mr. Grizzle recorded what he viewed as backsliding from many of Oryx's better practices. He appears to have reached this conclusion entirely on visual inspections (many photographs are attached to the report). Once again, according to the report, no sampling of soils, surface water or groundwater were taken.⁹¹⁹

386. The question naturally arises as to what Perenco did when it succeeded Kerr-McGee. Mr. Saltos was questioned about this and his exchange with counsel went as follows:

Q. Now, in 1994, Oryx assumed operations for the Coca-Payamino Field; correct?

A. Yes. Within the context of the Unified Operation Agreement.

Q. Okay, sir. And if you could look to Tab 15, this is an environmental assessment of the Coca-Payamino Field; correct?

A. Yes.

Q. Which was undertaken by--or conducted by or on behalf of Oryx after it took over this field; correct?

A. Can you repeat, please.

Q. And this environmental assessment was undertaken on behalf of Oryx in February 1994, as it was taking over the Coca-Payamino Field; correct?

A. Yes. Specifically here, it says May 1994. That is to say, after they took over the operations area.⁹²⁰

387. Mr. Saltos was asked whether the same sort of exercise was conducted by Perenco:

A. Yes, an assessment was conducted also.

Q. And to be clear, you're not referring to the biannual audit that was submitted or conducted on behalf of Perenco for the purposes of the--of its regulatory requirements. You're talking about an internal Perenco assessment audit; is that correct?

A. No. The biannual audit was not internal in nature. It was a compliance audit, and this was done under the environmental regulations and because it was requested of us by DINAPA.

⁹¹⁹ Exhibit CE-CC-21, Environmental Audit of Petroproducción's Operation of the Coca-Payamino Field, January 1999, PER_CC0001020 ("Note that no sampling of soils, surface or groundwater was conducted during the audit and that the recommendations are based on visual observations.").

⁹²⁰ Transcript, Hearing on Counterclaims, Day 6, pp 1507-1508 (Testimony of Wilfrido Saltos).

Q. Okay. But set aside the biannual audit for a moment. Perenco also undertook an internal audit when it took over the works in or around 2002; correct?

A. Yes. That was the usual practice of Perenco up to McGee [sic] and also Oryx.

Q. (Overlapping translation)—to undertake internal assessments or audits when they took over the works--responsibility for the works; correct?

A. Yes. When there was a change in the operatorship or--also, well, yearly to assess the conditions of the environmental management in the Blocks.”⁹²¹

388. At the conclusion of the hearing, the Tribunal requested Perenco to conduct a search for the evaluation that Mr. Saltos recalled having been conducted. Counsel for Perenco subsequently advised that: “Regarding the Tribunal’s request for a 2002 study ‘done of the state of the Blocks’ at the time of Perenco’s acquisition thereof ... no written report was ever prepared of the inspection made at that time.”⁹²²

389. The Tribunal takes from this response that Perenco’s position is that an inspection was conducted, but unlike Oryx/Kerr-McGee and Burlington, Perenco did not have it reduced to writing. The Tribunal finds this to be surprising because it seems obvious that a prudent operator would conduct a reasonably comprehensive written study of the condition of the blocks that it was taking over.⁹²³ Thus, a contemporaneous written appraisal of the Blocks’ conditions in 2002 from Perenco’s point of view – the party who presumably would be most interested in ensuring that it was not taking on the possibility of being held liable for the acts of its predecessor – was not prepared.

390. The absence of such a study assumes further significance when one considers that although a third party audit of both blocks was performed in 2002 (evidently initiated when Kerr-McGee was the operator but concluded at around the time that Perenco acquired its interests), Perenco inexplicably did not have the 2004 audits performed as required by the Ecuadorian regime. The absence of a study at the time of acquisition combined with the failure to perform the 2004 audit after it assumed control of the Blocks suggests a less than complete concern about ascertaining the environmental conditions.

391. Reasoning that the parties to the Purchase and Sale Agreement (PSA) would likely have allocated risks between them with respect to environmental liabilities, the Tribunal requested a copy of Perenco’s Purchase and Sale Agreement with Kerr-McGee. This was produced by

⁹²¹ Transcript, Hearing on Counterclaims, Day 6, pp 1526-1527 (Testimony of Wilfrido Saltos).

⁹²² Letter dated 6 November 2013 from Debevoise & Plimpton to the Tribunal’s Secretary.

⁹²³ The Report prepared for ConocoPhillips was 191 pages in length (Exhibit CE-CC-126, HSE & SD Assessment and Other Technical Services, Assets in Ecuador, Report prepared by ERM for Conoco-Phillips, dated November 2006); Mr. Grizzle’s January 1999 report on the Coca-Payomino Field was 123 pages long (Exhibit CE-CC-21, Environmental Audit of Petroproducción’s Operation of the Coca-Payamino Field, January 1999) and Oryx’s 1994 report on the Coca-Payomino Field was 141 pages long (Exhibit E-261, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated May 1994).

Perenco after the hearing. Section 9 of the agreement indicates that Perenco had recourse against Kerr-McGee for any damage that occurred as a result of its operations prior to 13 December 2001 by means of an indemnification action for monetary loss.

392. The Kerr-McGee/Perenco Purchase and Sale Agreement PSA provides an indication of the Blocks' condition at the time of Perenco's acquisition because the vendor represented and warranted that it had complied with all applicable Ecuadorian Laws relating to the environment, with the exception of certain matters listed in two schedules to the Contracts.

393. The Tribunal finds it helpful to quote the relevant provision of the PSA in full:

Section 3.9 Environmental Laws. KMEEC [Kerr-McGee] has complied with, and, to KMEEC's knowledge (after making an investigation of Seller's records and an inquiry to KMEEC's personnel), operations related to the Assets have been in compliance with, all applicable Ecuadorian Laws relating to the environment, including without limitation, Ecuadorian Laws relating to (a) the control of any potential pollutant, or protection of the air, water or land, (b) solid, gaseous or liquid waste generation, handling, treatment, storage, disposal, transportation or remediation, (c) exposure to hazardous or toxic substances, and (d) protection of wildlife or indigenous people or historic resources ("Environmental Laws"). Except as set forth in Schedule 3.9(a), to KMEEC's knowledge (after making an investigation of KMEEC's records and an inquiry to KMEEC's personnel), all hazardous materials generated from the use, construction or operation of the Assets have been handled and disposed of in accordance with applicable Environmental Laws. To KMEEC's knowledge (after making an investigation of KMEEC's records and an inquiry to KMEEC's personnel), there has been no contamination of, or releases into, groundwater, surface water, or soil on the Contract Areas resulting from activities related to the Assets, which require remediation under applicable Environmental Laws (or would require remediation, were all facts known to applicable Governmental Authorities). Schedule 3.9(b) sets forth a list provided by KMEEC of all wells that have been drilled on the Contract Areas and the current status of each such well. To KMEEC's knowledge (after making an investigation of KMEEC's records and an inquiry to KMEEC's personnel), KMEEC is not aware of any wells on the Contract Areas where any different status of the wells on the Contract Areas, except as listed on Schedule 3.9(b). To KMEEC's knowledge (after making an investigation of KMEEC's records and an inquiry to KMEEC's personnel), all wells identified on Schedule 3.9(b) as having been abandoned have been properly plugged and abandoned in accordance with applicable Ecuadorian Laws.⁹²⁴

394. Clause 3.9 thus records Kerr-McGee's representation that it had complied with all applicable Ecuadorian environmental laws and that there were no exceedances *except* for those listed in Schedule 3.9(a). Reference to that schedule in turn shows the following steps that still

⁹²⁴ Exhibit CE-CC 414, Purchase and Sale Agreement between Kerr McGee and Perenco regarding Blocks 7 and 21, December 13, 2001, p 17 in document [Emphasis added.].

had to be taken in order for Block 21 to be brought into compliance. Once again, the Tribunal quotes the schedule in full:

SCHEDULE 3.9(a)
ENVIRONMENTAL MATTERS

1. Letter, referenced DINAPA-CSA-160-2001-20001697, dated September 4, 2001 from DINAPA (Dirección Nacional de Protección Ambiental) to Operator regarding an environmental inspection completed by DINAPA of Block 21 and setting forth the following requirements:

- Carry out maintenance of the drainage system around existing wells in the Yuralpa Field;
- Recondition the site for classification of solid waste;
- Relocate scrap existing in Operator's temporary camp;
- Recondition the grease trap existing at the end of the diesel tank that supplies diesel to the power generator;
- Remove soil contaminated with lubricant oil in the generator area;
- Add the existing incinerator to the air monitoring plan;
- Provide DINAPA with black water analyses of gray and black waters being discharged at the Operator's temporary camp;
- Provide DINAPA with blackwater analyses of gray and black waters being injected underground by the seismic contractor and the stratigraphic profile of the respective wells; and
- Conduct maintenance of existing slopes of roads that connect with the platforms in order to avoid landslides within the field.⁹²⁵

395. According to the vendor and evidently after an inspection by DINAPA, these were the issues of non- or further compliance that needed to be addressed.

396. Schedule 3.9(a) assumes some importance for the current proceeding. In the Tribunal's view, it has two consequences: First, Perenco cannot be held liable for exceedances or other environmental compliance measures listed in the Schedule since, by definition, they preceded its operatorship. Second (and conversely), if IEMS and/or GSI have found contamination in sites not listed in Schedule 3.9(a), it might well be that such contamination occurred after Perenco took possession.

397. In the next phase of this proceeding, it will be helpful to examine DINAPA-CSA-160-2001-20001697 if a copy of that letter can be located, because it sets out the authority's view of what needed to be done at the time in order to bring the Operator into compliance with its legal obligations. The Tribunal will call upon both Parties to conduct a diligent search of their respective files to determine whether they have in their possession any other such evaluations of

⁹²⁵ Exhibit CE-CC 414, Purchase and Sale Agreement between Kerr McGee and Perenco regarding Blocks 7 and 21, December 13, 2001, p 48 of PDF.

the Blocks, whether performed by themselves or by another party such as Oryx/Kerr-McGee at around the time of Perenco's arrival at the scene.

398. For present purposes, while the Tribunal considers that Schedule 3.9(a) provides a helpful contemporaneous assessment of the Blocks, it cannot be considered to be a definitive and exhaustive analysis of their environmental condition. There might have been contamination of which Kerr-McGee was unaware or which it might have failed to disclose.⁹²⁶ There is no indication that Perenco challenged Kerr-McGee's list of noncompliant issues by informing it of contamination or other regulatory problems which had not been disclosed to it under Schedule 3.9(a) nor is there any evidence of Perenco's having ever complained to Kerr McGee that it had made anything other than an accurate disclosure.⁹²⁷ Schedule 3.9 (a) thus provides a starting point for distinguishing between any contamination that might have occurred prior to Perenco's acquisition of its interests and any contamination which occurred thereafter.

399. Before leaving the PSA, the Tribunal notes that Section 3.9 referred to a second schedule, Schedule 3.9(b), which was a list of all wells in the Contract Area and a description of their status. This schedule was not included in Perenco's redacted version of the Purchase and Sale Agreement and should be produced in the next phase of this proceeding because it might shed additional light on the scope of Perenco's duty to remediate.

400. This takes the Tribunal to the third source of guidance. As Mr. Saltos noted in the testimony quoted above, a distinction is to be made between Perenco's evaluation of the Blocks for the purposes of acquiring its interests, and its statutory duty, as operator, to have an independent third party conduct a biennial audit.

401. Ecuador has characterised Perenco's position as being that "because the audits that it conducted didn't show evidence of contamination, the Tribunal should be convinced that the Blocks are, in fact, clean", a position, that counsel for Ecuador described as "nonsense", but to which he added:

"... I should like to point out that this position is contradictory with Perenco's allegations that all of the environmental harm was already there when it began operations. In fact, if that was the case, then the pollution should obviously have surfaced at the start of Perenco's operations, and Perenco should have made the necessary reservations to make sure that it would not be made liable for the harm."⁹²⁸

⁹²⁶ The Grizzle report of January 1999 noted above shows that there were spills in the Coca-Payamino Field well before Perenco arrived on the scene: see Exhibit CE-CC-21, Environmental Audit of Petroproducción's Operation of the Coca-Payamino Field, January 1999, PER_CC0001020-PER_CC0001022.

⁹²⁷ An example of this occurring in the case of Oryx can be seen at Exhibit CE-CC-9 (Letter of March 9, 1992 from Luis Cobos (Oryx) to Petroproducción), where on 9 March 1992, an Oryx Operations Manager wrote to the Senior Engineer of *Petroproducción* informing him that when clearing access to the Payamino-8 well, Oryx found a spill of crude oil in an area of approximately 50 x 100 metres which seemed to have been caused in the past by a defect in the test pit wall at the Payamino 2 well. The letter requested *Petroproducción* "as the operator of the Unified Coca-Payamino Field" to take "the necessary measures and actions to resolve this situation as quickly as possible." (PER_CC-0000304).

⁹²⁸ Transcript, Hearing on Counterclaims, Day 1, pp 75-76 (Opening Statement of Eduardo Silva Romero).

402. There is a logic to Ecuador's position. The 2002 environmental audits for Blocks 7 and 21 showed little in the way of contamination.⁹²⁹ A review of the Block 7 audit shows that in general terms, the Blocks did not exhibit major nonconformities. Of 14 groundwater samples noted at Table 4-7 of the Audit, only one (at Payamino Camp) showed an exceedance above Table 4(a) of RAOHE.⁹³⁰ There were certain other nonconformities in other areas. For example, on infrastructure, the Audit noted:

IV.8.1.1 Infrastructure

- Nonconformity with drainage systems is minor, given that there is a partial and inefficient system available.
- Major nonconformity is caused by poor functionality of concrete areas of retention near the drill hole in all platforms.
- Protection structure (buckets) show conformity in most stations and platforms, except for Payamino 2, Oso 1, Lobo 3 and 4 which present major nonconformity de [sic] to their absence or poor condition. (See photographs 18 through 22 under Infrastructure and Drainage, Annex 6.)⁹³¹

403. In terms of waste management, in general there was "conformity with environment management of solid and liquid waste in most Fields", but there was a "major nonconformity in Oso Field, Oso 1 platform because there is not an appropriate disposal of solid waste, let alone of liquid waste (black and gray waters) which are directly discharged to the neighboring estuary (see Photographs 1, 6 to 12, Waste Management, Annex 6.)."⁹³² The evaluation matrix at the end of the Block 7 Audit listed major non-conformities only for "retention" in the "Payamino Sector" and otherwise the Block was described as "in conformity" with applicable regulations with a few "low nonconformities" listed in the matrix.

404. As for Block 21, as Ecuador has correctly noted, the 2002 audit "did not record a single site as being contaminated."⁹³³ Perenco did not take issue with this assertion in its Reply Post-Hearing Brief.

(13) Conclusion on the State of the Blocks at the Time of Their Acquisition

405. The Tribunal considers that the record evidence indicates some problems with the Coca-Payamino Field and the Oso 1 platform which predated Perenco's operatorship⁹³⁴, but otherwise, the PSA's disclosures and the 2002 Audit do not suggest major environmental problems.

⁹²⁹ Exhibits E-266, *Auditoría Ambiental Bloque 7 – 2002, Perenco Ecuador Limited*, December 2002; E-267, "Auditoría Ambiental del Bloque 21," prepared by *Eficiencia Energética y Ambiental Eficacitas Consultora Cía.* for Perenco, dated December 2002.

⁹³⁰ Exhibit E-266, *Auditoría Ambiental Bloque 7 – 2002, Perenco Ecuador Limited*, December 2002, pp 58-59.

⁹³¹ Exhibit E-266, *Auditoría Ambiental Bloque 7 – 2002, Perenco Ecuador Limited*, December 2002, p 79. [Emphasis added.]

⁹³² *Ibid.*

⁹³³ Ecuador's Post-Hearing Brief, paragraph 45.

⁹³⁴ See Exhibit CE-CC-51, Letter of January 28, 2003 from Perenco to DINAPA, attaching the Remediation Program for Block 7, including Coca-Payamino field, PER_CC0002831. It refers to a letter dated 28 January 2003 (i.e., just after Perenco commenced operations) which referred to a DINAPA letter of 22 January 2003 requesting the submission of a remediation programme for contaminated areas in Block 7, including the Coca-Payomina Field. Perenco's letter noted that the "material requiring remediation is that resulting from recollecting hydrocarbon-contaminated soils from several Block 7 sites including the Coca-Payomina field."

(14) Observations on Perenco’s Environmental Management Practices in Blocks 7 and 21

406. The Tribunal considers it necessary to set out some observations on the way in which Perenco conducted itself in relation to these Blocks under Ecuadorian environmental laws. Perenco has held itself out as having been a “responsible manager that focused on, preserved, and even improved the environmental and infrastructural integrity of the Blocks.”⁹³⁵ On the basis of certain contemporaneous documents, some of Perenco’s own making, as well as witness testimony, the Tribunal is not convinced of this assertion. For example, a “Health, Safety, Environment and Sustainable Development Assessment” performed by ConocoPhillips in October 2006 (in relation to its acquisition of Burlington), noted that Perenco “does not have an HSE [Health, Safety Environment] management system in place” although it was “currently in the process of developing one.”⁹³⁶ This observation was made *four years* after Perenco started operating the Blocks.

407. Given the Tribunal’s view of Perenco’s conduct, as discussed further below, it has decided not to dispose of this claim on a simple burden of proof approach.

408. The Tribunal also accepts Ecuador’s submission that it might be difficult to have an accurate picture of the environmental condition of oil blocks situated in a rapidly changing environment such as the Amazonian rainforest. The combined effect of the hot, humid climate and rapid growth of vegetation of the Amazonian rainforest zone is of such a nature as to quickly obscure spills. Indeed, the point was made by Perenco’s Mr. Saltos, who observed:

In one month, a whole area could be revegetated, even though the area was deforested. There is so much rain, so much humidity, that, well, plants proliferate. We've had many cases, and oftentimes this has happened, that areas that were impaired by a spill, well, you go there the next month, and there are no vestiges of it [sic] this spill. You can be walking over this spill and not realize there was a spill.⁹³⁷

409. This is the view of a representative of the operator who – unlike the environmental authorities – was closer to the day-to-day operations in the oilfield and therefore comparatively more knowledgeable as to the occurrence and extent of spills and other forms of contamination. The Tribunal agrees with Ecuador that the fact that rapid growth of vegetation might obscure a visual inspection of contaminants, does not mean that they disappear for remediation purposes.⁹³⁸ Hence, while as GSI emphasised, visual inspections are an important part of conducting a thorough assessment, they are hardly adequate to the task of ascertaining the extent of contamination and the Tribunal is not content to rely upon an expert’s visual evaluation.

410. Perenco failed in its duty to conduct the 2004 audit, with the result that there was a gap in environmental monitoring from 2002 to 2006. The 2006 audits showed an increase in non-

⁹³⁵ Claimant’s Counter-Memorial, paragraphs 2, 4-6; Rejoinder, paragraphs 2, 289-297.

⁹³⁶ Exhibit CE-CC-126, HSE & SD Assessment and Other Technical Services, Assets in Ecuador, Report prepared by ERM for Conoco-Phillips, dated November 2006, PER_CC0004420.

⁹³⁷ Transcript, Hearing on Counterclaims, Day 6, p 1514 (Testimony of Wilfrido Saltos) [Emphasis added.].

⁹³⁸ Ecuador’s Post-Hearing Submission, paragraph 11. Ecuador argues further that “a significant number of the samples showing exceedances were found at depths of one meter or more. Obviously, contamination at the subsurface depths [is] not readily apparent.”

conformities, which counsel for Ecuador characterised as “a fairly bleak picture of Perenco’s first four years of operations contrary to the impression Perenco has sought to convey in this arbitration.”⁹³⁹ Ecuador asserted that the 2006 audits show that, contrary to Perenco’s submission, the increase in incidence of contamination occurred after the year 2000.⁹⁴⁰ Perenco took exception to this characterisation, responding that: “...the 2006 audit revealed no major problems and was approved.”⁹⁴¹

411. The Tribunal notes that RPS’s third expert report contains a comprehensive summary of the 2006 and 2008 audits. The number of non-conformities, including major non-conformities, is striking and tends to weaken Perenco’s claim of strong environmental stewardship. The Tribunal considers it helpful to summarise RPS’s findings (in a somewhat summary fashion) because they are quite thorough.

a) Failure to Conduct Biennial Environmental Audits⁹⁴²

412. It has already been noted that a biennial environmental audit was not conducted in either Block 7 (including CPUF) or Block 21 in 2004. This was recorded in the 2006 audits.

413. Excerpts of Ecuambiente’s November 2006 environmental audit findings noted the lack of 2004 biennial audits:

2006 Block 7 Audit. “Environmental Audit of Block 7,” prepared by Ecuambiente Consulting Group (November 2006) for Perenco Ecuador, Limited: Ecuambiente stated that the last environmental audit was in 2002 (Finding 47 – Nonconformance: No biennial audit in 2004 for Block 7 activities.). The auditor compared findings from the November 2006 audit with the 2002 audit and listed six areas of repeated noncompliance, two of which included management of drainage and contaminated soil management.

2006 Block 21 Audit. “Environmental Audit of Block 21” prepared by Ecuambiente Consulting Group (January 2007 and 2007a) for Perenco Ecuador Limited: Finding No. 42 – Nonconformance: Biennial audit was not conducted in 2004 for Block 21.

⁹³⁹ Transcript, Hearing on Counterclaims, Day 1, pp 124-126 (Opening Statement of Philip Dunham).

⁹⁴⁰ Transcript, Hearing on Counterclaims, Day 1, pp 122-123 (Opening Statement of Philip Dunham). This position is taken in the alternative, Ecuador’s primarily proceeding on the basis that the audits commissioned by the Consortium in 2000, 2006 and 2008 were inadequate because of the small number of samples examined: Transcript, Hearing on Counterclaims, Day 1, pp 123-124 (Opening Statement of Philip Dunham) (“...if you add up the totality of the soil samples taken for auditing purposes between 2002 and 2008, the total amounts to 29 soil samples only.”). See also, Transcript, Hearing on Counterclaims, Day 1, p 126 (Opening Statement of Philip Dunham) “...out of a total of 29 soil and pit leachate samples taken for the 2006 audit—audits, one finds nine nonconforming results. This is a significant failure rate of some 30 percent.” Perenco relies on, amongst other things, the 2008 audits which it submits revealed general compliance with only minor regulatory deviations. Ecuador challenges reliance on this audit because it was rejected by Ecuadorian Ministry of Environment as not representative of the condition of the Blocks, and because it is significant that Mr. Puente (former employee who worked on “community relations within Block 7”) who provided evidence of the limited scope of the audit and that it avoided some contaminated areas) was not called to testify at the hearing in The Hague. (Transcript, Hearing on Counterclaims, Day 1, pp 128-129).

⁹⁴¹ Perenco’s Reply Post-Hearing Brief paragraph 26.

⁹⁴² RPS ER III, section 6.1.

b) Lack of Environmental Management Plan (*Plan de Manejo Ambiental*)⁹⁴³

414. RPS described a “vital component” of the audit process as evaluating compliance/conformance not only with applicable environmental regulations but also with the (facility’s or site’s) Environmental Management Plan. An Environmental Management Plan is used in tandem with an Environmental Impact Study and Monitoring Plan to control and mitigate impacts that could have a deleterious effect on the environment. RAOHE, Article 41, Section 7A describes the components of the Environmental Management Plan. RPS noted that GSI acknowledged the importance of the Environmental Management Plan in their first expert report.⁹⁴⁴

415. The auditor, Ecuambiente, noted the lack of an Environmental Management Plan for Block 7 in 2006. The Consortium sought to minimise the significance of this in a letter to the Undersecretary of Environmental Protection (SPA) within the Ministry of Mines and Petroleum. The SPA responded stating that this was a serious breach of RAOHE.

2006 Block 7 Audit. Finding 30 – *Nonconformance*: No Management Plan (*Plan de Manejo*) establishing control criteria for development and operations phase in Block 7. No updated, documented procedures. Obsolete procedures are maintained (Oryx Manuals, HSE manual dated November 1997, procedures in English).⁹⁴⁵

c) Lack of Environmental Licence

416. The Environmental Management Law (*Ley de Gestión Ambiental*), Article 20 (1999) states, “For the initiation of all activities that pose an environmental risk, one must have the license granted by the corresponding Ministry.” The requirement for Environmental Licences is stipulated in TULAS Book VI Articles 3, 18, and 25. In the 2008 environmental audits for Blocks 7 and 21, the following was noted::

2008 Block 7 Audit. Observation 6: Coca-Payamino, Jaguar, Mono, and Gacela fields lack environmental licenses in accordance with the legal requirement.

2008 Block 21 Audit. Consortium correspondence (*Oficio*: PER-1350-07) dated 17 December 2007 to the Subsecretary of Environmental Protection (SPA) requesting a prompt response from the government because the Consortium needed to submit paperwork in order to obtain Environmental Licenses. (Abrus 2008, page 264 of 510).

⁹⁴³ RPS ER III, section 6.2.1.

⁹⁴⁴ GSI ER I, Section 5.3.7, paragraphs 205 and 206, pp 82-83.

⁹⁴⁵ See also, correspondence between General Manager of the Consortium and SPA dated 19 September 2007 (Oficio No. 645-SPA-DINAPA-CDS): “With respect to your affirmation that the inexistence of an environmental management Plan for Campo Coca Payamino and Block 7 consists in a slight noncompliance of management plans and applicable laws according to the applicable scheme of minor non-conformances, I inform you that this Department considers the finding a serious breach of the Environmental Regulation for Petroleum Operations in Ecuador and must be categorized as a Major Nonconformance.” (As quoted at RPS ER III, p 88).

d) Outdated Environmental Impact Study⁹⁴⁶

417. The audit noted that when requested to produce an Environmental Impact Study for the CPUF, the Consortium relied on an outdated EIS that was prepared by another operator some 14 years earlier:

An excerpt from one of the Consortium’s internal weekly reports, Perenco Ecuador Limited Weekly Report, Period Covering: April 7 through 13, 2007, Section 2 Q.H.S.E. (Perenco Ecuador Limited 2007 - PERPROD0007596, page 2 of 6) follows: “DINAPA made a petition with penalty regarding the non-submission of EIS Coca-Payamino Field. Perenco responded with the copy of the EIS presented in year 1993 and submitted a communication regarding the no application (sic) of the penalty.

e) Irregularities in Management of Drill Cuttings and Mud Pits⁹⁴⁷

418. RPS noted that the audits found irregularities in mud pit management in Block 7 and Block 21 in 2006 and in 2008:

2006 Block 7 Audit: Section 4.4.5 “Table 4-15 Monitoring Results of Drill Cuttings in Pits in Block 7” (Ecuambiente 2006) contains two tables:-

1. Table 4-15 Pits with Impermeable Base (page 51): It compared the results of a sampling event conducted during the audit at Coca 18-19 with RAOHE Table 7b (i.e., pit with impermeable base or liner) and did not show exceedances in the analytical results.
2. Table 4-15 Pits Without Impermeable Base (page 52): It showed exceedances in leachate concentrations at three sites (Oso 3-RLP, Lobo 3 Taladro and Jaguar 9)

Parameter	Maximum Permissible Limits RAOHE Table 7a (i.e., Pit <i>Without</i> Impermeable Base or Liner)	Audit Sample Results		
		Oso 3- RLP	Lobo 3 Taladro	Jaguar 9
pH	6 - 9	5.52	11.98	5.4
Electrical Conductivity (µS/cm)	4000		4320	

2008 Block 7 Audit: Closed mud pit does not conform with grade (accumulation of water) (Observation 15).

2006 Block 21 Audit: Monitoring of soil quality in drilling mud pits was not performed in a timely manner (6 of 16 pits without complete monitoring). Monitoring that was complete (at time of audit) was within regulatory limits (Finding 12). Areas where drill cuttings and drilling mud are treated lack appropriate surface drainage systems (Finding 19). Platform soil where mud treatment pits are located is not reconformed [sic] (presumably not regraded) to similar conditions as the rest of the platform (Finding 20). Use of area for Perenco activities [auxiliary covering [sic] (presumably capping or closure) of drilling mud and drill cuttings] without authorization (Finding 28). Lack of revegetation/reforestation of areas used for drilling muds (Finding 48).

⁹⁴⁶ RPS ER III, section 6.2.3.

⁹⁴⁷ RPS ER III, section 6.3

2008 Block 21 Audit: As of 31 October, there is no impact evaluation or management plan for mud pits. This will be a nonconformance in the audit if it is not presented before the indicated date (Abrus 2008, page 7-2, pdf page 153 of 510, Observation No. 2).

f) Irregularities in Wastewater Treatment and Impact to Receiving Bodies⁹⁴⁸

419. The audits noted that RAOHE Table 4 requires liquid discharges to comply with the maximum permissible limits at two control points:

1. RAOHE Annex 2, Table 4a: Wastewater discharge control point; and
2. RAOHE Annex 2, Table 4b: Receiving body (e.g., creek) immission point. The term immission point is the point the discharge enters the creek or receiving body.

420. Examples of inadequately treated wastewater were identified during the environmental audits:⁹⁴⁹

In 2002, untreated waters from grease and oil traps were discharged directly to a seasonal creek. The auditor defined “grey waters” (*aguas grises*) as wastewaters conveyed to grease and oil traps and discharged directly to the soil.⁹⁵⁰

2002 audit: The drainage systems (ditches, secondary containment) are inefficient and do not comply with what is stipulated in the environmental impact study and RAOHE. Major nonconformance in Oso 1 platform (“Adequate disposal of solid waste does not exist and even worse is liquid waste (sewage and grey waters),” which is directly discharged to the adjacent *estero* (i.e., seasonal creek).

The **2006 Block 7 audit** compared the analytical results of samples collected during the audit with the regulatory limits established in RAOHE, Annex 2 Table 4a. It showed exceedances at the process wastewater discharge control point (Table 4a) at three sites:

Coca Payamino Mechanical API

Parameter	Maximum Permissible Limits		Audit Sample Results
	RAOHE Table 4a	TULAS, Book VI, Annex 1, Table 12	
Barium (mg/L)	< 5	< 2	3.047
Total Solids (mg/L)	< 1700	< 1600	4396
Chemical Oxygen Demand (mg/L)	< 120	< 250	750

⁹⁴⁸ RPS ER III, section 6.4.
⁹⁴⁹ RPS ER III, section 6.4.1.
⁹⁵⁰ RPS ER III, section 6.4.1.

Gacela CPF API

Parameter	Maximum Permissible Limits		Audit Sample Results
	RAOHE Table 4a	TULAS, Book VI, Annex 1, Table 12	
Total Solids (mg/L)	< 1700	< 1600	19140

Lobo 7

Parameter	Maximum Permissible Limits		Audit Sample Results
	RAOHE Table 4a	TULAS, Book VI, Annex 1, Table 12	
Total Solids (mg/L)	< 1700	< 1600	5028
Electrical Conductivity (μ S/cm)	< 2500	Not Listed	6840

The **2006 Block 7 audit** also noted that “Perenco’s activities” may result in the “possibility of impacting groundwater by injection of saline waters and sanitary wastewater (i.e., sewage) in old injection wells that do not have environmental studies, in accordance with RAOHE.” It recommended that “Perenco must establish geologic studies that ensure injection of formation waters and sewage in old wells (Payamino 3, Punino, Jaguar CPF, Mono 12) do not provoke environmental risk.”

The **2006 Block 21 audit** observed inadequate “grease traps”, identified the nonconformity that natural drainage was not respected when constructing a “grease trap” over an *estero* at control point 2, and observed noncompliance of maximum permissible limit for the parameter, barium, in internal monitoring of API discharge in March 2006 (subsequent monitoring found that the condition had been corrected).

421. RPS cited examples where the Consortium’s auditors noted that the water quality of receiving bodies, such as creeks, was negatively affected by inadequately treated wastewater and/or by polluted storm water runoff.⁹⁵¹ The concentrations exceeded the maximum permissible limits in RAOHE, Annex 2, Table 4b.

2006 Block 7 Audit**Coca CPF**

Parameter	Maximum Permissible Limits		Audit Sample Results
	RAOHE Table 4b	TULAS, Book VI, Annex 1, Table 3	
TPH (mg/kg)	< 0.5	< 0.5	1

⁹⁵¹ RPS ER III, section 6.4.2.

Coca 7

Parameter	Maximum Permissible Limits		Audit Sample Results
	RAOHE Table 4b	TULAS, Book VI, Annex 1, Table 3	
Electrical Conductivity ($\mu\text{S}/\text{cm}$)	< 170	Not Listed	442

Payamino 15

Parameter	Maximum Permissible Limits		Audit Sample Results
	RAOHE Table 4b	TULAS, Book VI, Annex 1, Table 3	
Chemical Oxygen Demand (mg/L)	< 30	Not Listed	50

g) Audit Findings – Contaminated Soils⁹⁵²

422. RPS noted that in 2002, the Consortium’s auditor, *Efficácitas*, concluded that improper treatment of contaminated soils had a direct impact on the environment.

2002 Block 7 Audit: “The management and treatment of contaminated soils is partial and produces direct impacts.”

423. Soil samples collected during the 2006 audit by Ecuambiente showed concentrations of cadmium and lead above the maximum permissible limits in the regulations.

2006 Block 7 Audit:

Parameter	Maximum Permissible Limits		Audit Sample Results	
	RAOHE Table 6	TULAS, Book VI, Annex 2, Table 2	Coca 13	Payamino Sanitary Landfill
Cadmium (mg/kg)	< 2	< 0.5	0.51	
Lead (mg/kg)	< 100	< 25		33.61

h) Irregular Waste Management and Chemical Management⁹⁵³

2002 Block 7 Audit: The management of the Payamino Sanitary Landfill only partially complied with what is stipulated in RAOHE and the EIA (i.e., environmental impact study). It identified a major non conformance in the inadequacy of the disposal of contaminated soils within the Landfill, and a minor nonconformance in the storage of chemical containers which were exposed to inclement weather.

2006 Block 7 Audit: The auditor noted that hazardous waste was stored directly on the soil (finding 37). It cites Photo PA.45, which was not included in Annex B of the 2006

⁹⁵² RPS ER III, section 6.5.1.

⁹⁵³ RPS ER III, section 6.6

report provided for review. In general, storage of hazardous waste directly on soil over multiple years and exposed to inclement weather will exacerbate contamination.

2008 Block 7 Audit: The auditor identified a minor nonconformance in that soil disposed in the Landfill lacked containment to prevent migration of hydrocarbons (finding 11).

2006 Block 21 Audit: Lack of secondary containment or lack of retention valve for chemical and fuel tank or equipment (finding 10). A nonconformity in hazardous waste (batteries, chemical product containers) being given to the organization, La Selva, who is not permitted to treat this type of waste (finding 31). Auditor identified that chemical products were found in storm water drainage and outside of drainage trench (finding 36), and chemical products not protected from rain (finding 38).

2008 Block 21 Audit: Chemical storage containment for Pad A and CPF have openings and plants growing in them. The containment lacks integrity in the event of a spill (finding 2).

424. In sum, the audits did not, in the Tribunal's view, resoundingly endorse Perenco's operatorship.

425. In its reply expert report, in response to RPS's summary of the audits' findings, GSI sought to downplay the audits' significance. It asserted firstly that, "environmental audits are not intended to prove that the operations are flawless, but, rather, serve to facilitate the continuous improvement of the operations with regard to environmental, health, and safety concerns"⁹⁵⁴, the implication that the process of complying with environmental regulations is an on-going work in progress.

426. GSI then devoted three paragraphs to the audits, which the Tribunal quotes in full:

190. The biennial audits completed for the Consortium operations did not identify significant impacts to soil, and minor issues of this nature were subsequently resolved. In addition, none of the biennial audits reported groundwater impacts. In sum, these audit findings do not support the current claims by IEMS of extensive damage to soil and groundwater.

191. The biennial audits do identify other issues that are unrelated to soil or groundwater impacts. Many of the issues listed by RPS are administrative in nature, such as the absence of a required document or license. In addition, RPS discusses "irregularities" in the management of drill cuttings and mud pits, which generally reflect minor excursions of monitoring parameters such as pH and electrical conductance, or failure to perform testing within a specific timeframe. However, none of the audit findings identified by RPS are related to any specific claim of environmental damage now alleged by Ecuador.

192. RPS also discusses soil impacts within the Payamino field, particularly at the locations of Payamino 02 y 08 and Payamino CPF. These sites have been thoroughly investigated by IEMS and GSI, and our findings regarding environmental impacts and related remediation costs

⁹⁵⁴ GSI ER II, paragraph 188.

are discussed in detail in this report and our prior report. As discussed in Section 5 of this report, the soil impacts delineated at these and other sites are principally related to operations prior to 1990, and are therefore unrelated to Consortium operations after 2002.⁹⁵⁵

427. The Tribunal considers that this does not adequately respond to the list of non-conformities found by the audits and summarised by RPS. Contrary to the description of many of the issues as being “administrative in nature”, as the list of non-conformities shows, in addition to irregularities in treating and confining contaminated soils, wastewater treatment, monitoring and ensuring proper grading for mud pits and the like, there were basic failings such as: (i) failing to even conduct an audit in 2004; (ii) not having the Environmental Management Plan required by RAOHE for the Payamino Camp and Block 7 at all and instead relying on Oryx’s outdated November 1997 plan;⁹⁵⁶ (iii) using an Environmental Impact Study for the Coca-Payamino Field that was prepared by Oryx years before;⁹⁵⁷ (iv) not having the Environmental Licences required by the Environmental Management Law and TULAS Book VI Articles 3, 18, and 25 for certain fields in the Blocks.

428. As for GSI’s attempt to minimise the contamination issues identified in the audits and its contention that the “biennial audits do identify other issues that are unrelated to soil or groundwater impacts”, this takes the Tribunal to a third and related point in connection to the biennial audits. The Tribunal is not convinced that the issues identified were “minor.” The entire system relies upon compliance with licencing obligations, full and timely reporting, and the retention of independent auditors in order to conduct thorough audits. The system assumes that the operator will work with the auditing company in good faith to objectively report the environmental condition of the Blocks in their entirety.

429. In this respect, the Tribunal was struck by the evidence of one witness who provided a written statement for Ecuador, but who was not called for cross-examination by Perenco. Mr. Marco Puente was a former Perenco employee responsible for Community Relations in the northern section of Block 7 where the Coca-Payamino, Gacela and Lobo fields are located.⁹⁵⁸ Mr. Puente testified as to certain commitments made by Perenco to the local communities, which are not relevant for present purposes, but more importantly, he testified that:

As Block 7 Community Relations liaison, I intervened as a negotiator or intermediary with the operator whenever complaints against Perenco

⁹⁵⁵ GSI ER II, paragraphs 190-192.

⁹⁵⁶ GSI in its first expert report noted, at paragraph 19, that an Environmental Impact Study (EIS), an Environmental Management Plan (EMP), and a Monitoring Plan is required for every oilfield development project: “As specified under the Ecuador [RAOHE] regulation, effective since February 2001, for every oilfield development project, an Environmental Impact Study (EIS), an Environmental Management Plan (EMP), and a Monitoring Plan are required to assess the potential risks posed to the environment and design and implement measures to mitigate such risks. In practical terms, environmental management for the oilfield industry entails minimizing the footprint of the oilfield facilities; controlling and containing the materials used and generated during drilling and production operations (mud/ cuttings, crude oil, produced water); and implementing effective response actions if and when spills of these materials do occur. Specific considerations regarding the use of earthen pits, oil spill prevention and response, and the use of gas flares, which are relevant to certain allegations made by IEMS or the Republic of Ecuador in this case, are addressed in further detail below.”

⁹⁵⁷ As RPS noted in its third expert report, at paragraph 6.2.3.

⁹⁵⁸ Witness Statement of Marco Puente, paragraph 4.

arose from the residents. Most complaints were related to damages to the natural environment (whether spills of crude or water formations, overflow of sludge ponds, etc.) or damages caused to local populations (for example, we received complaints about noise in those areas with homes close to the platforms as well as complaints regarding damages to crops). The Coca, Gacela and Payamino fields were the most problematic in this regard.⁹⁵⁹

430. When such incidents occurred, he testified, Perenco would negotiate agreements with the affected local inhabitants. However:

While in many cases, agreements were reached, the communities complained to Perenco that an adequate and full environmental remediation was not made. The communities often complained that the cleaning of contaminated areas was highly superficial and did not completely eliminate the contamination. I recall, for example, that we received a complaint in 2008 regarding the spill of water formation (very corrosive water produced alongside with crude oil) in a swamp near the Lobo 3 well. We reached an agreement with about 7 owners of affected areas but not any remediation of the contaminated water was made. In another case, an oil spill occurred from Payamino 1 into River Añango and the river was never cleaned because Perenco declared that the material falling into the river consisted of leaching debris from the coffee fields, even though the Community Relations liaison was present when the spill occurred and confirmed that such spill consisted of crude indeed.⁹⁶⁰

431. Mr. Puente also testified as to how the 2008 biennial audit for Block 7, which took place when he was in the Block, was conducted. As the Community Relations liaison, his role “was to contact the communities where the auditors should go to collect samples, to inform them of what was to occur and request permission for the auditors to enter areas of their property.” He testified further:

As I recall, the Block 7 audit did not last for more than a week and very few people, from a private Ecuadorian consultant hired by Perenco, intervened. Given the great extension of Block 7 and the few mobilized personnel, the scope of the audit was very limited. The auditors were only able to review certain sites where Perenco employees had expressly taken them and which had been previously cleaned, to verify, in particular, the fulfillment of a previous audit conducted in 2006. In addition, auditors arrived with very simple equipment which only allowed them to take samples at a depth of between 50 and 60 cm. This depth is insufficient to detect all the possible contamination by hydrocarbons. I do not recall that they were taken to sites where highly contaminated areas had been detected.⁹⁶¹

⁹⁵⁹ Witness Statement of Marco Puente, paragraph 14.

⁹⁶⁰ Witness Statement of Marco Puente, paragraph 17 [Emphasis added.].

⁹⁶¹ Witness statement of Marco Puente, paragraph 19 [Emphasis added.].

432. The Tribunal notes that Mr. Puente's testimony is consistent with IEMS' critique of the 2008 Block 7 audit. IEMS noted that only 12 sites were sampled by the auditors and only 1 sample was taken at each site, except for Coca CPF, where 2 samples were taken.⁹⁶² IEMS asserted further that the sampling evidently did not take place at different depths, but rather close to the ground surface.⁹⁶³ In such circumstances, it is unsurprising that GSI asserted that the audits "did not identify significant impacts to soil, and minor issues of this nature were subsequently resolved."⁹⁶⁴

433. Mr. Puente's testimony was not directly challenged by Perenco and it is troubling. If it is to be credited – and there is no reason to doubt it – the 2008 audit must be viewed with skepticism.

434. This takes the Tribunal to a consideration of Perenco's attitude as operator. In addition to Mr. Puente's testimony, the Tribunal was directed to certain documents that portray a disquieting approach to dealing with incidents of contamination.

435. The first document which has given the Tribunal pause is a memorandum of May 2010 prepared by Perenco regarding the characterisation of the environmental issues in Payamino 2-8. It concerned an area of soil saturated with crude oil to an average depth of 80 cm and covering approximately half a hectare. The document acknowledged that this was "contamination caused by crude oil for which it is not been possible to establish the exact date of occurrence" but which Perenco assumed occurred prior to its operations ("assuming that it must have occurred during the time of the operations of the State Oil Company Petroproducción (1997-2000)").⁹⁶⁵ The

⁹⁶² Annex P to IEMS ER II at pp 2-3: "In relation to the quantity of samples, the auditors of Perenco collected only 13 samples to evaluate the operations in an area of 2,033,000,000 square meters. This means that each sample represented an area of approximately 156,000,000 square meters. Even if it is true that, through the use of some criteria, the studied areas should be reduced and focused exclusively on those areas with potential contamination, such criteria are not explained in the report examined. Moreover, the fact that 13 samples were taken in an area with operations presenting a high risk of impact to soil in 62 sites, and with a large number of complaints presented by the residents of the areas, is, obviously, an insufficient process. In addition, the criteria that were used for the location of soil samples are not explained. Therefore, it is not clear if these samples were aimed at detecting contamination."

⁹⁶³ Annex P to IEMS ER II at p 3: "In regards to the quality of the samples, the 13 soil samples were taken by the auditors of Perenco in a superficial manner. This is so, notwithstanding the fact that these complaints from residents of the area near the contaminated soil which is buried and covered with layers of non-contaminated soil, according to the information obtained by IEMS. Therefore, the sampling process should have included samples at different depths. For this reason, IEMS investigation has included, precisely, samples at different depths (up to depths superior to 5 meters). As the auditors of Perenco collected the samples from the surface, they did not detect the contamination covered with layers of non-contaminated soil, as they only studied the layer of clean soil. This situation does not demonstrate an intention to evaluate these areas claimed as contaminated by the residents of the communities within Block 7."

In this respect, the auditor's shallow soil sampling echoes GSI's sampling techniques in the present arbitration; RPS noted that while IEMS collected samples at up to depths of 5.5 metres, GSI limited their investigation of surface soils to 0.3 metres below ground surface. RPS ER III, p 8, "The results for the risk characterization samples are not expected to be representative of the concentrations of chemicals in contaminated soils, and do not correctly represent the potential for exposure, since only 1) surface soils 0 to 0.3 meters below ground surface were collected, while RBCA [Risk-Based Corrective Action] protocol for surface soils is 0 to 1.0 meters below ground surface..." and p 50, where the point is repeated.

⁹⁶⁴ GSI ER II, paragraph 190.

⁹⁶⁵ Exhibit E-170, Memorandum prepared by Perenco on the characterization of the environmental issues in Payamino 2-8 (*Caracterización de Pendientes Ambientales Payamino 2-8*) dated May 2010, p 1.

contamination was discovered by the owner of the lands, Mr. Daniel Jungal, when he was hunting.⁹⁶⁶

436. The memorandum recounted the fact that the “knowledge of the existence of this issue is limited to the following people and organizations”:

PERENCO-QUITO: we know the true extent of the problem

DANIEL JUNGAL - Owner: knows exactly the extent and impacts of the problem, as well as the consequences and effects of its spreading out

PETROAMAZONAS-MANAGEMENT QSHE-DEPARTMENT
BLOCK 7: only knows of the existence of ‘contamination behind the Payamino 2-8 platform’ but does not know the exact location nor of its extent

OMBUDSMAN – DIOCLES ZAMBRANA: knows the exact location of the problem, but not its true extent

VENCEDORES – ZIGIFREDO CEVALLOS: knows that the environmental damage exists and that it is near Payamino 2-8 but not the exact place nor extent.⁹⁶⁷

437. The memorandum noted further that Mr. Jungal had “orally offered not to allow claimants or judicial officers to access his land, *at least where we consider that it is not in our interest that it be visited.*”⁹⁶⁸ Even accounting for the fact that at the time of its writing Perenco and Ecuador were locked in the current adversarial process, this is a disquieting statement.

438. The memorandum then set out “possible solutions” to the problem including, “conventional remediation” of the location, “confine the problem and justify leaving the area as it is”, “dismiss the issue” (which it was noted could lead to a lawsuit and “multimillion dollars compensation” as well as lead the State to “force us to remedy the site under their conditions” in a situation where “the cost will reach amounts very difficult to estimate now” and “the reputational cost to Perenco will also be very high”).⁹⁶⁹

439. The final passage of the Memorandum which is relevant for present purposes noted:

“The State will probably assume that we are hiding many more [environmental] damages and will scrutinize the operations area in search for more damages and it will probably find them.”⁹⁷⁰

⁹⁶⁶ Exhibit E-170, Memorandum prepared by Perenco on the characterization of the environmental issues in Payamino 2-8 (*Caracterización de Pendientes Ambientales Payamino 2-8*) dated May 2010, p 1.

⁹⁶⁷ Exhibit E-170, Memorandum prepared by Perenco on the characterization of the environmental issues in Payamino 2-8 (*Caracterización de Pendientes Ambientales Payamino 2-8*) dated May 2010, p 2.

⁹⁶⁸ Exhibit E-170, Memorandum prepared by Perenco on the characterization of the environmental issues in Payamino 2-8 (*Caracterización de Pendientes Ambientales Payamino 2-8*) dated May 2010, p 2 [Emphasis added.].

⁹⁶⁹ Exhibit E-170, Memorandum prepared by Perenco on the characterization of the environmental issues in Payamino 2-8 (*Caracterización de Pendientes Ambientales Payamino 2-8*) dated May 2010, pp 2-4.

⁹⁷⁰ Exhibit E-170, Memorandum prepared by Perenco on the characterization of the environmental issues in Payamino 2-8 (*Caracterización de Pendientes Ambientales Payamino 2-8*) dated May 2010, p 4 [Emphasis added.].

440. Perenco settled with Mr. Jungal without admitting liability. Only after it was notified on 22 May 2010 by a Civil Judge from Pinchincha that there would be a judicial inspection on 11 June 2010 did it inform the Minister of Environment of the contamination by letter of the same date. In the letter, it attributed the damage to a prior operator and disclaimed any responsibility for any of the damages and remedial costs arising from the event.⁹⁷¹

441. Prior to informing the Ministry of the contamination, however, Perenco retained a laboratory to take samples with a view to determining when the spill occurred. As Ecuador noted in its Counter-Memorial on Liability and the Counterclaims:

Perenco sent several samples, taken by its own employee, Mr. Wilfrido Saltos, to be analyzed by a laboratory named Grüntech.⁹⁷² On 2 June 2010, this laboratory concluded that the sample received was highly contaminated with hydrocarbons and estimated that the contamination occurred 4 to 7 years earlier, *i.e.*, during the time Perenco was acting as operator.⁹⁷³

442. The laboratory's finding, which it noted was not conclusive, was inconsistent with Perenco's contention that the contamination predated its involvement in the Blocks. When writing to the Ministry eight days later, however, and without adverting to Grüntech's findings, Perenco maintained its position that someone else was responsible for this major spill without disclosing the possibility that Perenco itself might be:⁹⁷⁴

⁹⁷¹ Exhibit E-161, Letter from Perenco to the Minister of Environment dated 11 June 2010. The confidential settlement agreement was concluded between Perenco and Mr. Jungal and Ms. Nancy Cecelia Cardenas Hernandez on 11 May 2010 (Exhibit CE-CC-235, Settlement Agreement with Jose Daniel Jungal, May 11, 2010 (*Confidential*), PER_CC007439). The settlement agreement records the statement that: "An inspection was done by a company expert, and everything indicates that the most important impacts occurred more than 10 years ago, that is to say, they occurred when Perenco was not the operator." A further recital recorded that Perenco "as an act of good faith agrees to enter into this agreement in order to end all controversies that have arisen between the Parties to cover all of these years." There were prior complaints made by Mr Jungal. Annex E to IEMS ER II, contains minutes of a meeting held on 15 September 2005 between the Ombudsman Office of Orellana and Mr. Jungal and Dr. Gabriella Rumazo representing Perenco along with Engineer David Trujullo. Exhibit E-269 ("*Informe de inspección N° 07-07, H. Consejo Provincial de Orellana – Departamento del Ambiente,*" dated 10 April 2007) is a report of an inspection of Mr. Jungal's farm conducted by the Orellana Department of the Environment on 10 April 2007.

⁹⁷² Exhibits E-171, Grüntech's Analysis Report dated 2 June 2010; E-161, Letter from Perenco to the Minister of Environment dated 11 June 2010

⁹⁷³ Ecuador's Counter-Memorial, paragraph 745.

⁹⁷⁴ There is conflicting evidence on this point. Exhibit E-269 is a report of an inspection of Mr. Jungal's farm conducted by the Orellana Department of the Environment on 10 April 2007. Among other areas, the inspection looked at the Payamino 4, 2-8, 20-24-14, 18 and 22 platforms. It found, "On the #02-08 platform (point 4) and to the side of it, a large area of approximately 20,000 m² was found containing crude oil residues in large quantities." During his cross-examination, Mr. Saltos stated that he was unaware of this inspection report until it was entered into the record of the arbitration. Transcript, Hearing on Counterclaims, Day 6, pp 1517-1518 (Testimony of Wilfrido Saltos). The transcript then records the following exchange between counsel and Mr. Saltos:

Q. But according to this inspection, sir, in April 2007, crude could still be found on the platform itself; correct?

A. Well, in the platform itself, there must have been--or there could have been crude oil because this is an operational platform and occasionally there are some sprays--there is some spraying or there is the spreading of hydrocarbons or diesel. So, certainly there must have been some on the platform.

“In effect, the spill seems to have been caused by prior events not solely to the [sic] presence of Perenco and Kerr McGee in Block 7 and the Coca Payamino field, but also to the execution of the Participation Contract for the Exploration and Exploitation of Hydrocarbons in Block 7 of the Amazon Region and the Unified Coca-Payamino Field (“Block 7 Contract”). CEPE – The Ecuadorian State Oil Corporation (which years later was replaced by Petroecuador and recently by EP PETROECUADOR) drilled Payamino well number 2 in 1987; and Oryx Ecuador Energy Company drilled Payamino well number 8 in 1992.

These facts strongly suggest that the alleged environmental incident, if existed, occurred prior to Perenco or its predecessors having any kind of control over the Payamino 2 and 8 wells. Consequently, Perenco is not responsible for any of the damages or remedial costs arising from any leakage from the Coca-Payamino field.”⁹⁷⁵

443. Another document exhibits the same attitude. In an email of 19 December 2008 to the Block 7 HES Supervisor, Mr. Saltos referred to an upcoming inspection of the Block 7 Jaguar Field in the following terms:

“Please, closely read the initial soap opera documents listed below and apply immediate corrective action so that, when the inspection date comes, we will not have to regret unfavorable reports. We must especially update:

Discharge of served waters from a plant ... We have to clean the banks of the canal, about 100 meters below the discharge, clean the grease trap, confirm parameters; we have to take into account that we already have NC + [i.e., a major non-conformity⁹⁷⁶] included in the 2008 audit, precisely due to this finding, and that Dinapah [sic] has sentenced us with an ADMINISTRATIVE RECORD and FINE which we have yet to know who will pay (?) or who we will impose it on (?).”

...

Q. Well, sir, this delegation goes to the platform in April 2007 and finds both on the platform and to the side of it some 20,000 cubic meters—square meters, sorry, of contamination, and you were not aware, Perenco was not aware, had not observed this contamination. That is your testimony, sir; correct?

A. That's correct. This Report that was drafted there was not made aware to me, and I wasn't aware of it. And in addition to that, we are not aware of the conditions under which the samples were taken or what samples were taken. We don't know.

Transcript, Hearing on Counterclaims, Day 6, pp 1519-1520 (Testimony of Wilfrido Saltos).

After receiving the results of the Grüntech report, in October 2010, Perenco retained Walsh Environmental Scientists and Engineers to conduct an evaluation of the Jungal swamp. It issued a report concurring with Perenco's belief that a preceding operator was responsible. Exhibit E-163, *Informe Técnico: Caracterización del Pasivo Ambiental Adyacente a la Plataforma Payamino 2-8 – Campo Unificado Coca-Payamino*, dated October 2010. Ecuador alleged that the Walsh report was intended to find another operator responsible in the hopes of avoiding liability.

⁹⁷⁵ Exhibit E-161, Letter from Perenco to the Minister of Environment dated 11 June 2010.

⁹⁷⁶ At the hearing, Mr. Saltos acknowledged that the term “NC +” in the 2008 Audit referred to a major non-compliance: see Transcript, Hearing on Counterclaims, Day 5, pp 1491-1492 (Testimony of Wilfrido Saltos).

The site destined to treatment of contaminated soil... we must review that the containment ditches and grease traps are operating well (if not, we have to construct them immediately).

...

It is necessary that we verify, and ensure compliance with the recommended works since, due to the distance, this will surely be assigned to the coordinators of south, which, to me, has a "reserved prognosis", until the contrary is demonstrated.

I especially recommend not creating too much attention around these works (military?), so that there is no resistance, and so that it cannot be documented, (be careful with pictures) that we are doing this, because the referenced inspection is approaching; it will be very appropriate for us to do this on holidays and without using Manguilla workers."⁹⁷⁷

444. When cross-examined, Mr. Saltos downplayed any suggestion that he was trying to mislead the authorities or avoid having the problem documented, and sought to put his views in a better light as follows: "We have a word that has to do with the wheeling and dealing, and the things that may cause more problems than the ones with that we want to solve."⁹⁷⁸

So that's why I say 'military' in between parentheses because we had a group of military personnel that gave us some physical security and protection, and they were there on the field. But their role is--they don't have much to do during the day. So as soon as they saw that someone was moving or doing some sort of activity, they took pictures and they sent the pictures to their supervisors. So the pictures and the reports made their way to the authorities of the company, and even outside the company, and they caused unnecessary problems and sometimes serious problems that were unfounded. So I wanted to avoid that so that the military were not in the area. That's what I was referring to."⁹⁷⁹

445. The Tribunal is not satisfied that this testimony cleared up the document's infelicities.

446. It might be that these documents are not representative of Perenco's general approach to the stewardship of the Blocks.⁹⁸⁰ But combined with Mr. Puente's unchallenged testimony that the 2008 Block 7 audit was organised to focus on areas that were previously cleaned up – the same thing that Mr. Saltos was urging the Block 7 HES Supervisor to do before the inspection took place – and the limited sampling performed in the 2008 audit of Block 7, the documentary evidence casts doubt on Perenco's claim that "whenever an incident occurred that affected the environment, the Consortium promptly notified the State, performed all required repairs, remediation and cleanup and obtained the State's approval of the remediation."⁹⁸¹ It also underscores the Tribunal's belief that with operations in a rainforest environment and the self-

⁹⁷⁷ See Annex 61 to 2nd Witness Statement of Manuel Solís; as discussed at Transcript, Hearing on Counterclaims, Day 5, pp 1489-1499 (Testimony of Wilfrido Saltos) [Emphasis added.]

⁹⁷⁸ Transcript, Hearing on Counterclaims, Day 5, p 1498 (Testimony of Wilfrido Saltos).

⁹⁷⁹ Transcript, Hearing on Counterclaims, Day 5, pp 1498-1499 (Testimony of Wilfrido Saltos).

⁹⁸⁰ There are a number of documents on the record that show the timely reporting of spills to the authorities.

⁹⁸¹ Claimant's Counter-Memorial, paragraphs 120, 133-139.

reporting nature of the regulatory regime, the environmental regime is only as good as the information that is discoverable, reported and acted on.

(15) Conclusion on Perenco's Environmental Management Practices in Blocks 7 and 21

447. In sum, the Tribunal considers that Perenco's claims of strong environmental law compliance are not made out. While the Tribunal is not prepared to find that Perenco consistently sought to conceal instances of contamination, there is some evidence that it was less than forthcoming in some instances. The 2010 memorandum's comment on the Payamino 2-8 contamination that the "State will probably assume that we are hiding many more [environmental] damages and will scrutinize the operations area in search for more damages and it will probably find them" is very troubling. This evidence, combined with the company's failure to document the environmental condition of the two Blocks at the time of the acquisition of its interests, its failure to conduct the statutorily required audits in 2004, its use of outdated environmental documents during the course of the operations, its failure to obtain necessary licenses, the increase in the incidence of nonconformities detected in the 2006 and 2008 audits, and Mr. Puente's unchallenged testimony as to the approach taken in the 2008 Block 7 audit do not paint a picture of a responsible environmental steward.

448. With these observations in mind, the Tribunal now turns to the expert evidence on the environmental condition of the two Blocks.

C. Modelling versus Delineation

449. Turning to the modelling versus delineation method of mapping the extent of the contamination, this can be determined summarily. Although the evidence relating to modelling versus delineation took up a substantial amount of time at the hearing, the Tribunal believes it can express its views simply without going into great detail about this evidence.⁹⁸²

450. The Tribunal has no hesitation in coming down squarely in favour of delineation. The reasons are manifold, but the principal ones are the following.

451. First, the Tribunal was convinced that the maps resulting from the use of the ArcGIS software which sought to model the extent of the contamination in the two Blocks did not adequately reflect their topography. The "spilled coffee on the crumpled paper" demonstrative exhibit employed by IEMS' Mr. Chaves during the course of direct examination did not convince the Tribunal that the model sufficiently accounted for topography and therefore was more accurate than delineation measurements taken around areas of the Blocks which showed regulatory exceedances.

452. Second, although the Tribunal has no reason to doubt IEMS' environmental credentials in general and considers the witnesses to be serious professionals, it found that its representatives' attempts to explain how they had employed the software program and their responses to questions posed during cross-examination did not exhibit either a sufficient degree of precision and clarity or show an adequate use of the software's internal validation methods to be able to

⁹⁸² The Parties' contentions in respect of this particular issue are set out in detail at paragraphs 197 to 283 of this Decision and it is unnecessary of the Tribunal to repeat the points in order to explain its reasoning.

engender the Tribunal's confidence in the mapping exercise, particularly given the very large areas of purported contamination that were generated by the software's use.⁹⁸³

453. By contrast, the Tribunal considered that Dr. Rouhani persuasively demonstrated that the Arc-GIS software modelling conducted by IEMS was not performed to a sufficient standard of reliability. For example, Mr. Chaves and Dr. Rouhani agreed that ArcGIS contained a means of testing results known as "cross-validation."⁹⁸⁴ On cross-examination, Mr. Chaves testified that he ran a cross-validation analysis for only one map out of the hundreds that he created.⁹⁸⁵ It was then shown that the error demonstrated in this cross-validation was substantial.⁹⁸⁶

454. Third, Dr. Rouhani described delineation as the "standard conventional approach" when seeking to characterise and quantify contamination.⁹⁸⁷ In this respect, Ecuador's other environmental experts, RPS, also acknowledged on cross-examination that "delineation is a standard approach to defining the edges of contamination" and that they did not fault GSI for using that method.⁹⁸⁸

455. Fourth, the Tribunal notes GSI's evidence that in some areas that had been represented as contaminated in IEMS' map, GSI had found clean delineation samples and indeed IEMS itself found clean samples, yet the model had predicted contamination.⁹⁸⁹

(1) Conclusion on Modelling versus Delineation

456. In sum, the general use of delineation in the industry when seeking to determine the existence and extent of contamination, the difficulty exhibited by IEMS when seeking to explain what they had done in the modelling exercise, Dr. Rouhani's contrasting testimony which was clear and convincing, considered together with the demonstrative exhibits employed by the Parties, has created such strong doubt in the Tribunal's mind that it is compelled to reject the mapping exercise in its entirety. Given its view as to the frailties of IEMS' mapping exercise, the Tribunal considers that delineation of contaminated sites is the appropriate means of ascertaining the volume of soil that requires remediation.

D. The Tribunal's Findings on the Regulatory Standards That Should be Applied

457. Given that it now has before it a "regulatory exceedances case" as opposed to a "background values case", the Tribunal turns to the question of which regulatory standards apply.

458. The principal issues, as the Tribunal sees them, are the following: (i) whether RAOHE Annex 2, Table 6 represents the comprehensive list of contaminants when testing for

⁹⁸³ See Transcript, Hearing on Counterclaims, Day 4, pp 1121-1128 (Testimony of IEMS); Transcript, Hearing on Counterclaims, Day 5, pp 1197-1269 (Testimony of IEMS).

⁹⁸⁴ Transcript, Hearing on Counterclaims, Day 5, pp 1217-1223 (Testimony of IEMS); Transcript, Hearing on Counterclaims, Day 7, pp 2016-2022 (Testimony of Sharhokh Rouhani).

⁹⁸⁵ Transcript, Hearing on Counterclaims, Day 5, pp 1218-1222 (Testimony of IEMS). Claimant's Reply Post-Hearing Brief, paragraph 43. It appears that Mr. Chaves ran one cross-validation on Coca 8, Layer A, barium. Transcript, Hearing on Counterclaims, Day 5, pp 1219 (Testimony of IEMS).

⁹⁸⁶ Transcript, Hearing on Counterclaims, Day 5, pp 1225-1230 (Testimony of IEMS).

⁹⁸⁷ Transcript, Hearing on Counterclaims, Day 7, p 1958 (Testimony of Shahrokh Rouhani).

⁹⁸⁸ Transcript, Hearing on Counterclaims, Day 5, pp 1395-1396 (Testimony of RPS).

⁹⁸⁹ Perenco's Closing Statement Slide 145; Perenco's Post-Hearing Brief, paragraph 78.

environmental damage as a result of hydrocarbon operations or whether TULAS Tables 2 or 3 provide additional remediation criteria that should be applied; (ii) whether the regulatory criteria in Ecuador requires the use of “indicator parameters” when testing for contamination of the environment by hydrocarbon activities; (iii) which land-use classification should be applied under Ecuador’s regulatory criteria; (iv) whether Table 7(a) or Table 7(b) of RAOHE applies to the testing of the mud pits in the two Blocks; and (v) in relation to groundwater testing, whether Ecuadorian regulatory criteria for groundwater testing admit of filtration in collecting samples.

459. Each will be addressed in turn.

(1) Whether RAOHE Annex 2, Table 6 represents the comprehensive list of contaminants when testing for environmental damage as a result of hydrocarbon operations or whether TULAS Tables 2 or 3 provide additional remediation criteria that should be applied

460. The Parties and their experts diverged on whether the proper regulatory criteria to be applied were confined to the contaminants listed in Table 6, Annex 2, of RAOHE or whether they also included the contaminants listed in Tables 2 or 3 of Annex 2, Book VI of TULAS.⁹⁹⁰

461. Perenco and GSI proceeded on the basis that Table 6, Annex 2, of RAOHE provided the sum total of what should be tested for in the case of remediation of soil contamination resulting from hydrocarbon operations. Ecuador and IEMS, in formulating the alternative regulatory case, disagreed. In preparing its alternative case, IEMS measured its sampling results against the standards stipulated by RAOHE and, it submitted, where applicable, TULAS Table 2. In its first expert report, IEMS identified the parameters it had tested for as TPH, polycyclic aromatic hydrocarbons, nickel, cadmium, lead, barium and vanadium.⁹⁹¹ Barium and vanadium are not elements regulated by RAOHE Table 6, but they are listed in Tables 2 and 3, Annex 2 of Book VI of TULAS.⁹⁹²

462. By the time of its second expert report, IEMS added chromium, potential hydrogen (pH) and electrical conductivity to its list of elements.⁹⁹³ These elements are similarly governed only by Tables 2 and 3, Annex 2 of Book VI of TULAS. In its third expert report, IEMS excluded polycyclic aromatic hydrocarbons and chromium because it stated they had not been identified in their field sampling at “concentrations greater than the regulatory reference criteria.”⁹⁹⁴ Thus, in addition to the RAOHE, Table 6 elements, IEMS continued to apply Table 2, Annex 2 of Book VI of TULAS to two remaining elements: barium and vanadium.⁹⁹⁵

463. Ecuador contended that Ecuadorian law requires TULAS to be applied to the analysis of soil (and groundwater) remediation.⁹⁹⁶ In its view, TULAS addressed chemical indicators and

⁹⁹⁰ See above at paragraphs 86 to 107, 217 to 312.

⁹⁹¹ IEMS ER I, pp 20-24, 26.

⁹⁹² IEMS ER I, pp 21-27; 48-61.

⁹⁹³ IEMS ER II, pp 42-48.

⁹⁹⁴ IEMS ER III, p 12.

⁹⁹⁵ IEMS III, p 44.

⁹⁹⁶ Exhibit EL-146, TULAS; Supplemental Memorial, paragraph 164 and footnote 27. See above at paragraphs 97-107.

heavy metals associated with hydrocarbon operations that are not considered in RAOHE, namely electrical conductivity, pH, barium and vanadium.⁹⁹⁷

464. Perenco's response was that TULAS was intended to generally govern activities that may cause an impact on the environment, but that the legal regime in Ecuador operated such that as regards activities that were more likely to require environmental authorisations and had a greater potential of impact on the environment, specific regulation is promulgated in accordance with the technical standards established in TULAS. This was the case with hydrocarbon operations. Moreover, it was Table 3, not Table 2, of Annex 2 of Book VI of TULAS that stood to provide any additional contaminant criteria for the identification and remediation of contaminated soil.⁹⁹⁸

465. The Tribunal begins with a consideration of TULAS's objective, as articulated in the opening section to Annex 2 (which contains Tables 2 and 3). Its purpose is to provide general technical standards, as authorised by two other instruments of general application: the Environmental Management Act and the Regulations to the Environmental Management Act for the Prevention and Control of Environmental Pollution. These standards are to be used to "determine or set" the "rules of general application for different soil uses" across a range of industries and activities.⁹⁹⁹ Its reach insofar as the industries and activities it governs is concerned is limited only by whether they require environmental authorisations in connection with their activities. The technical standards are intended for use by the State and its agencies in its administration of powers or actions to "preserve, conserve or recover the quality of soil resources."¹⁰⁰⁰ In other words, in administering the rules that govern areas of industry or activity that affect the environment, the onus is on the competent authority to ensure that it acts consistently with TULAS.

466. In the Tribunal's view, it is Table 3, rather than Table 2, of Annex 2 of Book VI of TULAS that addresses the identification and remediation of contaminated soil. As noted above, Table 3 accepts that there is an activity that may affect the environment and reflects the balance that has been struck by the regulator between activity and a tolerable impact on the environment.

⁹⁹⁷ *Ibid.*

⁹⁹⁸ See above at paragraph 73.

⁹⁹⁹ (Original) "**O INTRODUCCION** La presente norma técnica ambiental es dictada bajo el amparo de la Ley de Gestión Ambiental y del Reglamento a la Ley de Gestión Ambiental para la Prevención y Control de la Contaminación Ambiental y se somete a las disposiciones de éstos, es de aplicación obligatoria y rige en todo el territorio nacional. La presente norma técnica determina o establece: a) Normas de aplicación general para suelos de distintos usos. b) Criterios de calidad de un suelo. c) Criterios de remediación para suelos contaminados. d) Normas técnicas para evaluación de la capacidad agrológica del suelo." (Exhibit EL-146, TULAS, p 341 [Bolding in original.]

¹⁰⁰⁰ Exhibit EL-146, TULAS, Article 1. (Unofficial translation) (translation resubmitted on 10-18-2013) "**1 OBJECTIVE** The objective of the is the Prevention and Control of Environmental Contamination, with respect to soil resources. The principal objective of this standard is to preserve or conserve the quality of soil resources in order to safeguard and preserve the integrity of persons and ecosystems and their interrelationships and of the environment in general. Actions intended to preserve, conserve or recover the quality of soil resources must be carried out under the terms of this Environmental Technical Standard." (Original) "**1 OBJETO** La norma tiene como objetivo la Prevención y Control de la Contaminación Ambiental, en lo relativo al recurso suelo. El objetivo principal de la presente norma es preservar o conservar la calidad del recurso suelo paragraph salvaguardar y preservar la integridad de las personas, de los ecosistemas y sus interrelaciones y del ambiente en general. Las acciones tendientes a preservar, conservar o recuperar la calidad del recurso suelo deberán realizarse en los términos de la presente Norma Técnica Ambiental."

Notably, unlike Table 2, Table 3 offers separate criteria according to four different land-use classifications: agricultural, residential, commercial and industrial.

467. By contrast, Table 2, entitled “Soil Quality Standards”, sets out non-site specific standards for the *background* values of 36 different elements that may be present in soil. Article 4.2.1 explains that Table 2 sets out background values or analytical detection limits that reflect the “natural geological variations of *undeveloped or areas free of the influence of generalized industrial or urban activities.*”¹⁰⁰¹ The definition of “[b]aseline (background)” in TULAS (Article 2.38) refers to “conditions which prevailed in the absence of anthropogenic activities, only natural processes in activity.”¹⁰⁰² Table 3 is titled “Soil Remediation or Restoration Criteria” and its opening paragraph defines it as “[t]he Remediation or Restoration criteria are established in accordance with the use of soil”, said to comprise the “maximum contaminant concentration levels for of soil in the process of remediation or restoration.”¹⁰⁰³

468. The Tribunal considers that there has been a conscious and intentional demarcation between baseline values and contamination limits in Tables 2 and 3 of Annex 2 of Book VI of TULAS. It would be counterintuitive to ignore the fact that Table 3 expressly describes itself as stipulating the criteria for the remediation and restoration of soil and to proceed on the basis that while Table 2 is used to identify whether a site should be remediated, Table 3 provides the limits that should be observed by the party remediating the site such that the remediation should bring the concentration of contaminants to below those limits. Moreover, similar to RAOHE, Table 6, Table 3 offers criteria which are specific to land-uses such that, for example, in the case of land that is put to residential use, its limits of permitted disturbances are lower than those stipulated for industrial land.¹⁰⁰⁴

469. With this in mind, the Tribunal turns to consider the issue of the relationship between Table 6, Annex 2 of RAOHE and Table 3 of Annex 2, Book VI of TULAS.

470. The Tribunal is conscious of the imperative in Ecuadorian constitutional law to proceed in a manner most protective of the environment, and considers that to exclude TULAS’s treatment of soil contamination and remediation entirely would undermine this goal and it would contradict the objective and purpose of Annex 2 of Book VI of TULAS. Moreover, it notes that

¹⁰⁰¹ Exhibit EL-146, TULAS, pp 361-262 (unofficial translation) [Bolding in original, emphasis added in italics.] (translation resubmitted on 10-18-2013); (Original) “**4.2.1 Criterios de Calidad del Suelo** Los criterios de calidad, son valores de fondo aproximados o límites analíticos de detección para un contaminante en el suelo. Para los propósitos de esta Norma, los valores de fondo se refieren a los niveles ambientales representativos para un contaminante en el suelo. Los valores pueden reflejar las variaciones geológicas naturales de áreas no desarrolladas o libres de la influencia de actividades industriales o urbanas generalizadas. Los criterios de calidad de un suelo se presentan a continuación.”

¹⁰⁰² See above at paragraphs 103-105, footnote 199.

¹⁰⁰³ Exhibit EL-146, TULAS, Article 4.2.2 (Unofficial translation) (translation resubmitted on 10-18-2013) “The Remediation or Restoration criteria are established in accordance with the use of the soil (agricultural, commercial, residential, and industrial), and are provided in Table 3. The purpose of the criteria is to establish the maximum contaminant concentration levels for soil in the process of remediation or restoration.” (Original) “**4.2.2 Criterios de Remediación o Restauración del Suelo** Los criterios de Remediación o Restauración se establecen de acuerdo al uso que del suelo (agrícola, comercial, residencial e industrial), y son presentados en la Tabla 3. Tienen el propósito de establecer los niveles máximos de concentración de contaminantes de un suelo en proceso de remediación o restauración.”

¹⁰⁰⁴ Exhibit EL-146, TULAS, pp 363-366 (unofficial translation).

IEMS and Ecuador's approach in this arbitration has not been to advocate testing for every single contaminant listed in Table 3, but rather to home in on barium and vanadium in addition to the contaminants in RAOHE, Annex 2, Table 6, because they are elements that they contend can be found in the by-products of the hydrocarbon exploitation process.¹⁰⁰⁵ Perenco, for its part, has in its experts' selection of "indicator parameters" included barium as an indicator of the effect of hydrocarbon operations in soil.¹⁰⁰⁶ Barium, as noted before, is not a parameter that is addressed in RAOHE, Annex 2, Table 6. That would suggest that Perenco accepts that there may be a need to look outside of RAOHE, Annex 2, Table 6, for permissible values.

471. The Tribunal considers that this is a reasonable approach to adopt and further notes that TULAS was included in the 2002 and 2008 audits of Blocks 7 and 21, though not consistently with regard to the analysis of soil contamination.¹⁰⁰⁷ It finds it pertinent, in particular, to note a conclusion in the 2008 audit of Block 7 conducted by *Ecuambiente* that TULAS had "not been taken into account in PERENCO's environmental management. While the RAOHE does describe applicable criteria for the hydrocarbon industry, it does not contain all of the requirements PERENCO must observe."¹⁰⁰⁸

472. The Tribunal makes this finding of TULAS's applicability to certain substances that might be associated with oilfield contamination mindful that an examination of the environmental audits and assessments performed from 1999 to 2010 seems to show inconsistent treatment of choice of regulatory criteria. RAOHE Table 6 is a constant for soil contamination, but otherwise with respect to whether Table 2, Table 3 or Table 5 of Annex 2, Book VI of TULAS should be applied, it is difficult to pinpoint a consistent practice. For example, the May 2010 assessment done by ENTRIX, as commissioned by Petramazonas, refers to Table 3 of TULAS for water quality (when the table is entitled soil remediation).¹⁰⁰⁹ In principle, the Tribunal considers it appropriate to consult TULAS where RAOHE is silent.

(1.1) Conclusion on whether RAOHE Annex 2, Table 6 represents the comprehensive list of contaminants or whether TULAS Tables 2 or 3 provide additional remediation criteria that should be applied

473. In the Tribunal's view, Table 6, Annex 2 of RAOHE applies to the identification and remediation of contaminated soil, but to the extent that it is silent, for example, on two soil contaminants, barium and vanadium, at issue in this case, TULAS Book VI, Annex 2, Table 3, applies. Accordingly, the Tribunal concludes that it is permissible to look at TULAS, Book VI, Annex 2, Table 3 for those substances that may be generated in hydrocarbon operations that are not addressed in RAOHE, Annex 2, Table 6.

¹⁰⁰⁵ See above at paragraphs 97, 105, 195-196 cf. 229; Supplemental Memorial, paragraph 167; IEMS ER I, pp 23-24.

¹⁰⁰⁶ See above at paragraphs 241-243, 258, 305

¹⁰⁰⁷ See, for e.g., Exhibits E-144, 2008 Block 7 Audit, pp 39, 46; E-145, 2008 Block 21 Audit, p 4-8, Table 5-11.

¹⁰⁰⁸ Exhibit E-144, 2008 Block 7 Audit, p 77.

¹⁰⁰⁹ Exhibit CE-CC-241, Ex-post Environmental Impact Study and Environmental Management Plan for Coca Complex, Block 7, June 2010.

(2) The use of “indicator parameters”

474. Another area in which the experts diverged on how to apply the regulatory criteria was with respect to GSI’s use of “indicator parameters” to screen its sampling results and, in its submission, isolate results that depicted contaminants associated with hydrocarbon operations as opposed to those that more likely resulted from other activities in the Blocks or in their vicinity.

475. One of the first steps in GSI’s investigation was to combine its sampling results and those collected by IEMS in its first two expert reports in this arbitration. In reviewing IEMS’ sampling results, and based on its view of what sort of pollutants might be generated in the Blocks, GSI employed what it termed were the “primary indicators of oilfield materials”; namely, TPH,¹⁰¹⁰ barium, electrical conductance or chloride.¹⁰¹¹ It excluded samples that did not exhibit at least one of these ‘primary indicators’: “[t]he presence of other chemicals in the soil, in the absence of a primary indicator (e.g., nickel in the absence of elevated barium or TPH), *cannot be caused by an oilfield material* and was therefore not retained for further investigation.”¹⁰¹² GSI submitted that this was tied to the three primary sources of potential environmental effects produced in the process of extracting oil: use and disposal of drilling mud (barium), extraction of crude oil (TPH), and production of formation water (soil electrical conductance).¹⁰¹³ As a result, it concluded that 91% of the 1243 soil samples collected by IEMS did not evidence “soil impact by oilfield materials.”¹⁰¹⁴

476. IEMS responded that this approach was contrary to Ecuadorian regulations and rendered meaningless key elements of RAOHE Table 6 and TULAS (irrespective of whether Table 2 or Table 3 applied). RPS concurred, contending that GSI’s approach resulted in excluding all heavy metal contamination found in Blocks 7 and 21, rendering Ecuadorian regulations which specifically identified and regulated heavy metals “wholly pointless.”¹⁰¹⁵

477. Ecuador’s experts further submitted that GSI’s position was contradicted by Perenco’s own prior practice, as evidenced in an ‘Environmental Protection Guide’ it had developed during the course of its operatorship in which it listed a total of 16 indicators that should be monitored. This list included TPH, barium, cadmium, chromium, lead, and polycyclic aromatic hydrocarbons, and was not conditioned on whether they presented themselves in association with hydrocarbon, barium or any other indicator substance.¹⁰¹⁶

478. RPS was particularly critical of GSI’s decision to use indicator parameters, which RPS considered unduly narrowed the scope of GSI’s investigation. RPS noted that while GSI had

¹⁰¹⁰ TPH or Total Petroleum Hydrocarbons refers to hydrocarbon compounds derived from petroleum. It can be used to detect the presence of test crude, which is crude used to determine the well’s production capacity and the quality of the oil at the start of the drilling process of a well. GSI ER I, paragraphs 36, 225; Claimant’s Counter-Memorial, paragraph 76.

¹⁰¹¹ GSI ER I, section 2.4.3, paragraphs 36-38. It defined indicator parameters as “chemicals or groups of chemicals that are present at significant concentrations in the source material and are readily detectable by field or laboratory analysis.”; see Claimant’s Counter-Memorial, paragraph 60.

¹⁰¹² GSI ER I, paragraph 181(1) [Emphasis added]; Reply, paragraph 73.

¹⁰¹³ GSI ER I, paragraphs 16, 34, 36, 225; Claimant’s Counter-Memorial, paragraphs 60-76.

¹⁰¹⁴ GSI ER I, paragraph 181(1) [Emphasis added].

¹⁰¹⁵ Reply, paragraph 74; RPS ER III, section 3.2.

¹⁰¹⁶ IEMS ER III, section 3.1, p 14 referring to Attachment 3 to the report; Reply, paragraph 77.

stated that its objective was to “provide an objective evaluation of the work conducted by IEMS and, at the same time, achieve a comprehensive assessment of current environmental conditions for each of the 74 oilfield facilities investigated by IEMS in the CPUF, Block 7 and Block 21”¹⁰¹⁷, it conducted visual site inspections at only 58 of the 74 oilfield facilities investigated by IEMS and then actually investigated only 24 of the 74 facilities with the collection and analysis of soil and/or groundwater samples.

479. When it came to analysing the majority of such samples, GSI used the short list of indicator parameters. This, in RPS’s view, “severely limits their ability to understand the full nature of impacts from historical oilfield operations and can accordingly lead to certain contaminants not being detected contrary to GSI’s stated objective of achieving a comprehensive assessment of the environmental conditions” in the Blocks.¹⁰¹⁸

480. RPS devoted four pages of its report to a discussion of indicator parameters’ potential for generating a misleading picture of the Blocks’ environmental conditions. In its view, GSI performed a subset of soil sampling which it described as “risk characterization” samples, the stated objective in using such samples being “to provide a more comprehensive evaluation of the potential risks posed to human health.”¹⁰¹⁹ Whereas 333 “confirmation and delineation” soil samples were tested only for the following analytes: Gasoline Range Organics, Diesel Range Organics, Oil Range Organics, Barium, Cadmium, Chromium, Lead, and Nickel, only 57 “risk characterization” soil samples were tested for the foregoing and an additional 49 other potential contaminants.¹⁰²⁰

481. GSI defended its use of indicator parameters as follows:

The validity of the “primary indicator approach” is illustrated by the fact that, among the 3,561 soil samples collected and analyzed by GSI, Walsh, and IEMS, only 39 soil samples (1%) exceeded a regulatory criterion for a non-indicator parameter (i.e., cadmium, chromium, lead, vanadium, and nickel) outside of an area otherwise designated for remediation of primary indicators (i.e., barium or TPH) and outside the paved platform area. Of the total 249 soil samples exceeding an applicable regulatory criterion outside the paved platform area, the primary indicator compounds (210 samples) represent 84% of the total exceedances, while the non-indicator compounds (39 samples) represent only 16% of the total exceedances. Consequently, for these oilfield sites, the primary indicators are clearly effective for *identification* of impacts, while the other nonindicator chemicals generally serve as additional criteria to be applied for *remediation* within the impacted areas.¹⁰²¹

482. GSI’s defence has not assuaged the Tribunal’s doubts about its use of indicator parameters. The Tribunal was particularly struck by RPS’s assertion that less than 15% of GSI’s soil samples were analysed for the full set of individual contaminants that are associated with the

¹⁰¹⁷ RPS ER III, p 2 quoting from GSI ER I, p 1.

¹⁰¹⁸ RPS ER III, p 5.

¹⁰¹⁹ GSI ER I, pp 70-72, 107-108.

¹⁰²⁰ RPS prepared a comparative table on this point at pp 16-17 of its third expert report [Emphasis added.].

¹⁰²¹ GSI ER II, paragraph 45 d) [Italics in original.].

impact of oil field operations on the environment.¹⁰²² Given the narrowness of the samples' testing, RPS concluded that GSI's conclusion that, "at no location do environmental conditions pose a risk to human health, nor are their impacts to groundwater resources at any investigated site" could not be reasonably made: "GSI's reliance upon indicator parameters that exclude chemical compounds harmful to human health for the majority of the soil samples it collected (greater than 85%) prevents them from being able to support their claim of no risk to human health."¹⁰²³

483. The Tribunal is not persuaded that using indicator parameters was the correct way to proceed. Neither RAOHE nor TULAS refer to soil sampling and analysis that screens its results based on whether it presents a particular permutation or combination of elements. RAOHE, Annex 2, Table 6, which in Perenco's own submission is the regulation specific to the testing for soil contamination that occurs as a result of and in the process of exploiting hydrocarbons, reflects a prior determination by the Ecuadorian authorities of the kinds of elements in the soil that should be tested for as likely to be attributable to hydrocarbon activities. It is an act of regulatory power and discretion that would be undermined by restricting sample testing to "indicator parameters." The Tribunal is also mindful of RPS's examples, such as an area near Payamino 1, which GSI had identified as exhibiting "oil residue associated with a former produced water surface impoundment" but which it then excluded on the basis that samples from the site did not indicate any environmental harm based on electrical conductance (one of its "indicator parameters").¹⁰²⁴

484. Finally, the Tribunal agrees with IEMS and RPS that GSI's use of "indicator parameters" is inconsistent with Perenco's own environmental audits, assessments and reports in relation to Blocks 7 and 21. The 2002 audit that was carried out relatively soon after Perenco took over the Blocks does not refer to "indicator parameters"; it tested for the full list of contaminants in RAOHE, Annex 2, Table 6.¹⁰²⁵ Similarly, in the 2008 audit, on which Perenco placed considerable emphasis in these proceedings, the samples were tested against each parameter in RAOHE, Annex 2, Table 6.¹⁰²⁶

(2.1) Conclusion on the use of indicator parameters

485. In sum, the Tribunal finds that Ecuadorian regulation does not dictate the use of "indicator parameters" and using such parameters has the potential to unduly narrow the sampling tests with the likely result being that fewer instances of contamination are yielded. The Tribunal is also mindful of Ecuador's view that it does not have a sufficient level of confidence as to a comprehensive list of what chemicals were used by Perenco throughout its

¹⁰²² RPS ER III, p16.

¹⁰²³ RPS ER III, p 18.

¹⁰²⁴ Reply, section 2.1.2.2; RPS ER III, section 3.2.

¹⁰²⁵ See exhibits E-266, "*Auditoría Ambiental Bloque 7 – 2002, Perenco Ecuador Limited*," dated December 2002 and E-267, "*Auditoría Ambiental del Bloque 21*," prepared by Eficiencia Energética y Ambiental Eficacitas Consultora Cía. Ltd. for Perenco, dated December 2002.

¹⁰²⁶ Exhibits E-144/CE-CC-182, 2008 Block 7 Audit, PER_CC0006095; E-145/CE-CC_183, 2008 Block 21 Audit, PER_CC0006134.

operatorship.¹⁰²⁷ If that is the case, the argument for dismissing the use of “indicator parameters” is perforce stronger.

(3) Land-use classification

486. Another major point of difference between the Parties, once that the “background values” case is put to one side and the focus is on the regulatory regime, concerns the choice of land-use classifications applicable to different locations within the Blocks. Ecuador asserted that more than 50% of what it considers to be the contaminated area falls within the Amazonian rainforest and therefore in its view qualifies under the sensitive ecosystem land-use criterion.¹⁰²⁸ Perenco disagrees.¹⁰²⁹

487. Ecuador submitted that amongst its different land-use criteria, it was the “sensitive ecosystems” criteria that should be applied to the Blocks in light of their location in the Ecuadorian Amazon and the 2008 Constitution’s emphasis on full restoration and protection of the environment.¹⁰³⁰ Moreover, it submitted that Table 6 of RAOHE referred to “posterior use” which, in its view, was meant to facilitate site re-use and should be interpreted to refer to the future land use to which the site will reasonably be put.¹⁰³¹

488. IEMS criticised GSI’s approach because, in its view, it should have applied the stricter standards prescribed by RAOHE for a “sensitive ecosystem” rather than the more relaxed industrial and agricultural area standards.¹⁰³² It contended that while the Blocks were not a designated protected area under Ecuadorian law, its ecological studies confirmed that most areas displayed characteristics “similar to those of a National Natural Area.”¹⁰³³

489. GSI, for its part, asserted that IEMS had mischaracterised the applicable land-use criteria and as a result this had invalidated two-thirds of its samples, accounting for over US\$ 885 million of its US\$ 2.4 billion claim.¹⁰³⁴ GSI applied sensitive ecosystems criteria to “the small amount of land that f[ell] within a designated protected area”, correlating to 89 of IEMS’ 1243 sampling locations.¹⁰³⁵ It otherwise applied agricultural or industrial land-use criteria in its analysis.¹⁰³⁶

¹⁰²⁷ Ecuador noted in its Post-Hearing Brief, paragraph 66, that: “Perenco further failed to provide evidence that the presence of such contaminants did not result from oilfield operations and refused to disclose the list of chemicals it used in these operations [Procedural Order No. 4, Request 9].” Perenco did not reply to this particular allegation in its Reply Post-Hearing Brief.

¹⁰²⁸ Ecuador’s Post-Hearing Submission, paragraph 36; see above at paragraphs 221, 278-279.

¹⁰²⁹ See above at paragraphs 214, 215, 247-252.

¹⁰³⁰ Reply, paragraphs 294-303; Claimant’s Counter-Memorial, paragraphs 15-17; IEMS ER III, p 45; Exhibit EL-147, RAOHE, p 7 of PDF; see also Transcript, Hearing on Counterclaims, Day 1, pp 70-72 (Opening Statement of Eduardo Silva Romero).

¹⁰³¹ IEMS ER III, pp 41-48; Reply, paragraphs 294-303; see above at paragraphs 248-249.

¹⁰³² IEMS ER III, pp 41-48.

¹⁰³³ IEMS ER III, p 41, see also, pp 41-47.

¹⁰³⁴ Claimant’s Counter-Memorial, paragraphs 15-17, 277-282; GSI ER I, paragraph 11(7). GSI submitted that IEMS’ failure to apply the correct regulatory criteria resulted in the incorrect categorisation of 568 samples as contaminated: GSI ER I, paragraph 11(7), Exhibit 3.

¹⁰³⁵ Claimant’s Counter-Memorial, paragraph 288, footnote 352; GSI ER I, Appendix F.5.

¹⁰³⁶ Claimant’s Counter-Memorial, paragraphs 279, 283, section III.B.2(c). Perenco submitted that the majority of its operations in Blocks 7 and 21 would result in the classification of the land-use as industrial (Claimant’s

490. In the Tribunal's view, a number of factors bear upon this issue. First, the 2008 Constitution's imperative in favour of the protection of the environment should, in any case of doubt, militate in favour of applying the most stringent land-use designation. But this does not mean that an area that has clearly become an industrial or agricultural area and is reasonably expected to remain as such for the foreseeable future should be re-designated as a sensitive ecosystem, particularly where oilfield operations continue to be conducted. The Tribunal recognises that the posterior use of the land is the central concern, but there is the practical consideration that the Blocks are expected to be operated for many years to come and that it would be unjust to require Perenco to bear the cost of restoration for land and platforms that are now being used by Petroamazonas and are still distant from any "posterior use."

491. Second, and related to the first point, the Tribunal considers that the treatment of this issue should be guided by the Ecuadorian authorities' practice in relation to the Blocks. The evidence shows that the authorities accepted the application of industrial land-use criteria in certain parts of Blocks 7 and 21, in particular, in the January 2003 Remediation Plan relating to the Payamino Sanitary Landfill, Payamino 22, Payamino CPF, Coca CPF and Jaguar CPF as approved by the Ministry,¹⁰³⁷ the report of a clean-up of a spill at Payamino 19 in June 2009,¹⁰³⁸ the Consortium's EIS for the construction of the Oso A and Oso B platforms and the Yuralpa Norte platform in April and October 2006,¹⁰³⁹ and, most significantly, in the environmental impact studies commissioned by Ecuador in 2010.¹⁰⁴⁰

492. Ecuadorian authorities similarly accepted the application of agricultural land-use criteria in areas surrounding platforms in Blocks 7 and 21 such as in the Ministry-approved remediation plan for the May 2007 spill from the Oso 2 flow line,¹⁰⁴¹ the January 2008 Ministry-approved remediation plan for a spill in the Gacela-Payamino flow line in October 2007,¹⁰⁴² and in the

Counter-Memorial, paragraph 289). Examples of practice of Ecuadorian authorities applying industrial criteria at paragraphs 292-297 of its Counter-Memorial. See also, 1st Witness Statement of Wilfrido Saltos, paragraphs 57-68.

¹⁰³⁷ Exhibits CE-CC-51, Letter of January 28, 2003 from Perenco to DINAPA, attaching the Remediation Program for Block 7, including Coca-Payamino field; CE-CC-54, Letter of April 22, 2003 from Perenco to DINAPA, p 1; see Claimant's Counter-Memorial, paragraph 292.

¹⁰³⁸ Claimant's Counter-Memorial, paragraph 293, referring to Exhibit CE-CC-86, Sandblasting, Painting, and Mechanical Repairs to Gacela Station Tank (101-Tk).

¹⁰³⁹ Exhibits CE-CC-110, Environmental Impact Study for the Construction of Platforms Oso A and Oso B, Access Road, and Drilling and Production Activities in Block 7, April 2006; CE-CC-122, Environmental Impact Study and Environmental Management Plan for the Construction of the Yuralpa Norte Platform, Access Road, and Drilling and Production Activities, October 2006; Claimant's Counter-Memorial, paragraph 294.

¹⁰⁴⁰ Exhibits CE-CC-241, Expost Environmental Impact Study and Environmental Management Plan for Coca Complex, Block 7, June 2010, section 3, p 17 (EIS contracted by Petroamazonas for Coca, Payamino and Gacela Fields); CE-CC-242, Expost Environmental Impact Study and Environmental Management Plan for Mono Complex, Block 7, June 2010, section 3.1.6.2 (pp 15-17) (EIS contracted by Petroamazonas for Mono and Jaguar fields); CE-CC-236, Expost Environmental Impact Study and Environmental Management Plan for the Oso Complex in Block 7 and the Drilling of Three Additional Wells in Oso A, June 2010, section 3.1.6.3 (EIS contracted by Petroamazonas for Oso Field).

¹⁰⁴¹ Exhibits CE-CC-116, Letter of June 4, 2006 from the Consortium to DINAPA; CE-CC-153, Letter of January 11, 2008 from the Consortium to DINAPA; CE-CC-138, Letter of August 14, 2007 from Ministry of Mines and Petroleum to the Consortium; CE-CC-197, Letter of February 11, 2009 from the Undersecretariat of Environmental Protection to the Consortium.

¹⁰⁴² Exhibits CE-CC-140, Letter of October 8, 2007 from the Consortium to DINAPA; CE-CC-151, Letter of January 10, 2008 from the Consortium to Undersecretariat of Environmental Protection; CE-CC-203, Letter of February 25, 2009 from the Consortium to DINAPA.

environmental impact studies commissioned by Ecuador in 2010.¹⁰⁴³ In the present proceeding, IEMS itself accepted that the areas surrounding Coca 6, Coca 8, Lobo 3, Lobo 1, Oso 9, Mono CPF, and Payamino CPF were primarily used for agricultural purposes.¹⁰⁴⁴

493. This is not to say that, once selected, the land-use criteria are irrevocable and the decision cannot be changed. However, there is significant probative value to be derived from the authorities' acceptance of a particular land-use criterion with respect to the same area for the purpose of measuring soil remediation.

494. It is also clear to the Tribunal that the sensitive ecosystem designation is not limited to designated protected zones. RAOHE makes clear that the designation applies in areas "*such as* the National Heritage of Natural Areas¹⁰⁴⁵ *and others* identified in the corresponding Environmental Study."¹⁰⁴⁶ GSI's initial approach was to restrict the use of the sensitive ecosystem criterion to those areas alone.¹⁰⁴⁷ The Tribunal notes that GSI itself accepted that the "sensitive ecosystems criteria" might apply to a number of sites in the Blocks which intersected with State-designated sensitive ecosystem areas: Payamino CPF, Payamino 1, Payamino 2-8, Payamino 19, Waponi-Ocatoe and Nemoca.¹⁰⁴⁸

(3.1) Conclusion on land-use criteria

495. The Tribunal concludes that that in view of the 2008 Constitution's imperative in favour of the protection of the environment, in any case of doubt where a site could be considered to fall under either of two designations, the more stringent land-use designation should be applied. In the Tribunal's view, where a posterior land use has not been designated, Article 395.4 of the 2008 Constitution's focus on full restoration should guide in determining the appropriate land use and it should be in favour of the most environmentally-protective designation that is reasonable in the circumstances of the particular case. At the same time, the prior determinations of the Ecuadorian authorities have significant probative value.

496. For present purposes, the Tribunal reserves its position on the posterior land use question with respect to any oil well or drilling platform (or other installation) that was retired during Perenco's operatorship. This is discussed in further detail below.

(4) The approach to the testing and evaluation of mud pits

497. The investigation of mud pits was fraught with a number of divisive issues. The first issue was whether to exclude soil samples that were taken from *inside* closed mud pits when measuring soil contamination in the Blocks. The second issue, which bears some relation to the first, is whether the leachate testing method should be used and, in that connection, whether the

¹⁰⁴³ Exhibits CE-CC-241, Expost Environmental Impact Study and Environmental Management Plan for Coca Complex, Block 7, June 2010, section 3, pp 79-81; CE-CC-242, Expost Environmental Impact Study and Environmental Management Plan for Mono Complex, Block 7, June 2010, section 3, pp 51, 175.

¹⁰⁴⁴ IEMS ER II, Annex H, pp 7, 56, 60, 78; Claimant's Counter-Memorial, paragraphs 300-311.

¹⁰⁴⁵ Heritage of State Natural Areas (*Patrimonio de Áreas Naturales del Estado*): Claimant's Counter-Memorial, paragraph 283, section III.B.2(c).

¹⁰⁴⁶ Exhibit EL-147, RAOHE, p 57 [Emphasis added.]. Table 6, Annex 2 of RAOHE, is depicted above at Chart 1.

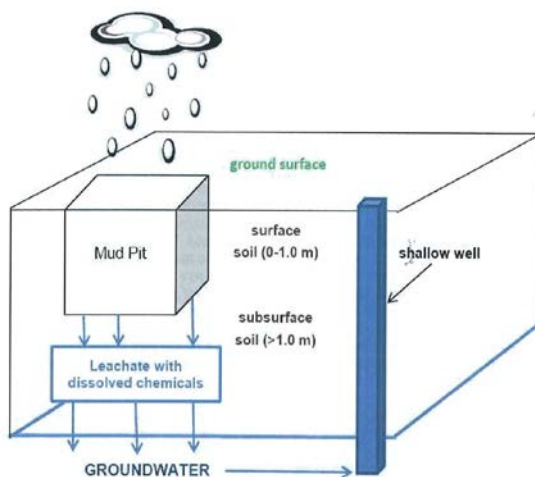
¹⁰⁴⁷ Claimant's Counter-Memorial, paragraphs 278-279; 1st Witness Statement of Wilfrido Saltos, paragraphs 75-77.

¹⁰⁴⁸ *Ibid.*

appropriate regulatory criteria to be applied are found in Table 7 of Annex 2 of RAOHE (GSI's approach) which governs leachates, rather than Table 6 of Annex 2 of RAOHE (IEMS' approach) which governs soil contamination generally. The third issue is the approach to determining whether Table 7(a), which provides the regulatory limits for pits that are not *bottom sealed*, or Table 7(b), which provides more generous regulatory limits for *sealed* pits, is more properly applied in a specific instance.¹⁰⁴⁹

498. The issue is an important one because mud pits can constitute an important transport mechanism for groundwater contamination.¹⁰⁵⁰ In its expert report, RPS included a schematic drawing that illustrates the potential problem.

Figure 4-4: Transport Mechanism, Leaching and Groundwater Transport



¹⁰⁴⁹ Generally, see above at paragraphs 90, 255-257, 274-277.

¹⁰⁵⁰ RPS in its third expert report criticised GSI for what it considered to be a generally inadequate treatment of exposure pathways of contaminants. In specific regard to mud pits, RPS noted: "Indications that migration of chemicals of concern from primary sources (e.g., mud pits) to surface soil, subsurface soil, groundwater and surface water at the CPUF, Block 7, and Block 21 sites are of concern include 1) historical spills, 2) TCLP Test Results obtained by GSI indicating the potential for migration of chemicals from closed mud pits, 3) detection of TPH and inorganic chemicals in groundwater adjacent to mud pits and other waste management units, and 4) reported contamination of water supplies in these areas (IEMS Expert Report). There are examples where primary sources and contamination (secondary sources) are located adjacent to drainage areas, creeks, streams, swamps and other surface waters, with the potential for migration of chemicals to surface water and sediments and to adjacent land." RPS ER III, p 63. To this, GSI responded, in its second expert report, paragraph 155, that: "We do not agree that a more extensive list of chemical analyses or a more complex analysis of potential future exposure pathways is necessary to determine whether current site conditions pose an unsafe risk to human health or livestock. IEMS and RPS have presented their criticisms of the GSI risk assessment, but they have not conducted their own risk assessment nor have they found that current conditions at the oilfield facilities actually pose an unsafe risk." The Tribunal did not find this persuasive. RPS was retained to review and critique GSI's analysis and it was GSI that described its exposure pathways analysis in its first report (pp 4, 107-108, Appendix E) and concluded that soil exposure was the only such pathway. IEMS' report was predicated upon a different mode of mapping contamination and it appears to the Tribunal that this reduced the perceived need to develop an exposure pathways analysis.

499. The Tribunal considers that it must follow the practice in Ecuador on this important issue. It notes that the disposal of drilling muds and cuttings in Ecuador has both before and since the 2008 Constitution been effected through the construction of *in situ* mud pits. It has not been directed to any evidence showing that at the end of operations of a particular platform, the operator has been required to dig up and either completely remediate the desiccated mud and cuttings *in situ* or remove that material for off-site remediation or storage. This is not what the Ecuadorian authorities have required.

500. Although it recognises that Ecuador's primary case was premised principally on the full restoration objective, the Tribunal considers that drilling muds and cuttings are properly disposed of under the current regime if: (i) they are placed in properly constructed and graded pits as required by law; (ii) the operator properly treated the contents of the pits so as to ensure that it did not deposit muds and cuttings that contained analytes in quantities in excess of the applicable regulations; (iii) the pits have been properly covered and closed; and (iv) soil sampling at places around the pits shows no sign of leaching.¹⁰⁵¹

501. One of the problems faced in this particular aspect of the counterclaim concerns the uncertainty of the information surrounding the pits' construction. During the documents production phase, Perenco was requested to produce documents pertaining to the design and construction of mud pits.¹⁰⁵² In its response, Perenco stated that it: "...does not have a specific written policy for the construction, cleaning, monitoring, testing, and closing of pits."¹⁰⁵³ It did however advert to Mr. Saltos' testimony that the company used liners as well as to interview notes in an annex to IEMS' third expert report in which certain former employees discussed the laying down of liners before depositing drilling muds therein.¹⁰⁵⁴ However, reference to the notes shows that the evidence on the point was mixed and not fully supportive of Perenco's position because one former employee stated that undue care was taken in depositing drilling muds such that the liners cracked under the high temperatures.¹⁰⁵⁵

502. The Schedule of Closed Mud Pits attached as Appendix A to the Claimant's Post-Hearing Brief on Counterclaims, which was prepared with both Parties' involvement and for which the Tribunal is grateful, regrettably shows that there are substantial disagreements as to whether many pits were lined or unlined. The 'Master List' records disagreement in at least 26 of 79 cases; the 'Pits Constructed by Perenco' list shows an even higher percentage of disagreement (14 of 18). The 'Pits Constructed by Prior Operators' shows 12 disagreements (of 63 entries) and many (36) unknowns.

¹⁰⁵¹ In its third expert report, RPS critically reviewed GSI's mud pits sampling at p 39. It also observed at p 44 that: "... about 50% of the samples [taken by GSI] were collected from cover soils on top of closed mud pits. These cover soils are expected to be clean and analytical results do not represent potential concentrations in contaminated media."

¹⁰⁵² Request #12 stated: "Concerning the mud pits: (i) construction design plans for all the pits installed by or on behalf of the Consortium; (ii) the Consortium's procedures for building, cleaning, monitoring, testing and closing pits; ... Procedural Order No. 4, 9 January 2013.

¹⁰⁵³ Perenco's response to Request #12, 18 January 2013.

¹⁰⁵⁴ Mr. Saltos testified that Perenco regularly used synthetic liners. (Quoted at Rejoinder, paragraph 138.) The Rejoinder, at footnote 191, refers to the IEMS ER III, Attachment 17 (recording interviews with former Consortium employees, several of whom specifically note the Consortium's use of liners).

¹⁰⁵⁵ As discussed in IEMS 3rd Report page 28 (referring to Attachment 17).

503. There also appears to be a disagreement on whether a pit which might have been built in clay soil is to be considered to be “sealed”; GSI’s Mr. Connor believed so, while IEMS did not. The Tribunal is not prepared to equate what have been assumed to be impermeable clay-based pits with those that have been lined within an impermeable synthetic barrier. This would first require the Tribunal to assume that the bottom of an unlined pit was in fact clay. IEMS adduced evidence that this was not necessarily the case; in some instances sandy soil is located near the pits.¹⁰⁵⁶ During cross-examination, Mr. Connor admitted that, for example, when looking at a Coca 8 pit, GSI did not do any geotechnical testing and assumed that the bottom of the pit was lined with clay.¹⁰⁵⁷

504. In addition, GSI appears to have assumed that the contents of all pits were cuttings and water-based muds and that the only key substance of possible concern was barium sulfate.¹⁰⁵⁸ This does not appear to have always been the case because there appear to be some pits that contained oil-based muds.¹⁰⁵⁹ Moreover, the evidence suggests that there are other substances associated with water-based drilling muds and these were not checked by GSI. During cross-examination, Mr. Connor was shown a 4 October 2006 inspection report prepared by the Orellana Department of the Environment which recorded the results of an inspection made after the complaint of a local landowner, Mr. Alberto Tanguila. The report noted that:

¹⁰⁵⁶ See Ecuador’s Closing Presentation, Slides 111, 112 and 113.

¹⁰⁵⁷ Mr. Connor was cross examined on this point:

“Q. Mr. Connor, have you assumed that all the pits in Blocks 7 and 21 are properly lined? Yes or no?

A. I believe that all the pits in Blocks 7 and 21 have some form of liner, whether it be natural soils or synthetic, and that would be consistent with the lithology of that region. So, in that regard, I’ve assumed that they do have either earthen or synthetic liners...”

He was then asked:

“Q. Now, did you perform any geotechnical studies or tests to actually confirm whether, beneath those pits, you have clay soil? Yes or no?

A. On the specific locations of the pits, I did not conduct a geotechnical test beneath that pit. I did not.”

(See Transcript, Hearing on Counterclaims, Day 6, pp 1786-1787 (Testimony of GSI).)

¹⁰⁵⁸ RPS disagreed with this in its third expert report, p 43: “Although barium sulfate *‘is the major component of drilling muds used for drilling oil and gas wells’* (GSI Expert Report, Section E.3.2, page E-14 [Emphasis of RPS]), barium sulfate is not the only component of drilling mud and the presence of additional constituents was not discussed by GSI. Water-based muds contain a number of additives that improve the properties of the mud. For example asphaltene (also called gilsonite) is listed as a primary additive in drilling muds in Perenco documents and is considered to be toxic (Entrix 2003, Tabla 3-4, pages 238 and 247; Entrix 2003, Tabla 4.1-2 pg. 4-4; Abrus 2005, Table 4-5, pages 4-13; and Martrex 2009). Asphaltene is a mixture, consisting primarily of high molecular weight hydrocarbons, sulfur, and trace amounts of vanadium and nickel. In addition to barium, other metals that are commonly found in water-based drilling mud are arsenic, chromium, cadmium, copper, mercury, lead, nickel, vanadium, and zinc; and caustic is added for pH control (Neff 2005, page 12). GSI did not adequately discuss the chemicals that could be present in drilling mud at the oilfield sites. The initial investigations of contamination should not be limited to barium sulfate and TPH and should at a minimum include the constituents listed on GSI Table E.1.”

¹⁰⁵⁹ As Ecuador noted in its Post-Hearing Brief, paragraph 86: “GSI’s testing of pits was limited to taking leachate samples at 7 sites, none of which included pits known to contain oil-based mud [GSI 1st, Table D.12.A]. But GSI only tested the samples for Table 7B of RAOHE, i.e., the most permissive criteria for lined pits. Had GSI compared its results against Table 7A (for unlined pits), it would have concluded that three out of seven locations (i.e., 43%) failed the test. Given the available evidence, including Perenco’s own prior practice (e.g., at Jaguar 9 and Coca 19 [IEMS 3rd, Attachment 11 and GSI 2nd, Appendix B.3.1]), GSI should have applied Table 7A of RAOHE.”

In one of the sides of the Coca #8 platform, there is a closed pits [sic] from where crude oil is coming out to the surface, (10:15h) a sample of superficial soil 0 to 20 cm was taken. (Coor.: X 027-0617 –Y: 995-5102) ... Finally, when the drilling was finished, the tillable layer was moved from a nearby large extension of agricultural soil, in order to close the pits that were filled with oil in the pits that contain water were left open and filled with water. With time, oil has started to come out in the slopes near the platforms. Before the drilling, the slopes had clear water and the soil was hard rock, but now has been turned into swamps that cannot be used. Since at that time, it wasn't know (sic) that oil could cause illnesses, we weren't worried, but we now see that things are different and that we can't even find animals for hunting.¹⁰⁶⁰

505. It may be that this particular pit was closed prior to Perenco's assuming its operatorship and therefore Perenco bears no responsibility for it under the then-applicable fault-based regime. The Tribunal refers to the document simply to underscore the point that the evidence appears to indicate that some of the mud pits in Blocks 7 and 21 contain more than water-based drilling muds and cuttings. This point was explored with Mr. Connor during his cross-examination:

Q. Okay. Now, if you go to--if you stay on the first page, do you see that this is an Inspection Report; correct?

A. Yes, it is.

Q. Dated 4 October 2006; correct?

A. Yes.

Q. And so--I mean, we can understand that this is the same complaint that IEMS was referring to when it identified the REC relating to Coca 8; right?

A. It's part of "Consejo Provincial de Orellana."

Q. And it's dated 4 October 2006, which—

A. Is that the same--I don't recall--oh, yes, that was date that was in the other one. Yes. I would presume it's the same.

Q. Okay. Now, if you look at the last paragraph--or second-to-the-last paragraph, it says that "On 21 September 2006 at 10:00 a.m., people"—and you have the people who attended are identified earlier went to Coca 8, and you see at the platform of Coca 8 there is a closed pit from where crude oil is coming out of the surface, 10:15 a.m. Now, we agree, just so that there is no confusion, Coca 8--the only closed pits in Coca 8 were to the south of the platform; correct?

¹⁰⁶⁰ Annex E to IEMS ER II, Inspecting Report No. 06-037, Provincial Council of Orellana, Environment Department [Emphasis added].

A. That's correct.

Q. Okay. So we're talking about a southern pit here. So as of 21 September 2006, there is an inspection reporting that crude oil is coming out to the surface of a closed pit on Coca 8; correct?

A. That's right. That's what it says here, yes.

Q. And now when you turn the page ...--will get to a page where we have a table with lab results. So, I'd like you to first look at the paragraph immediately above that table. And I will try my best for the translation. It says, "Finally, when the drilling was finished, the clean layer was moved from a nearby large extension of agricultural soil in order to close the pits that were filled with oil, and the pits that contained water were left open and filled with water. With time, oil has started to come out in the slopes near the platforms. Before the drilling, the slopes had clear water and the soil was hard rock, but has now been turned into swamps that cannot be used."

A. I see that.

Q. Okay. So, all of this is after the drilling was done and the pits were closed; correct?

A. This record that's been put here by an inspector is after the pits have been closed.

Q. So, there's at least an indication here that, gee, maybe the pit is actually leaking; correct?

A. That's what the person says. It's not--I don't think that's consistent with the true conditions of that pit.

Q. Okay. We're going to see that. Now, as part of your First Expert Report, you eliminated several RECs that were identified by IEMS, including all of those relating to pits because you considered that pits were "accepted and appropriate practices for operations." Correct?

A. Yes, that's because they are.¹⁰⁶¹

506. Having made these observations about general questions arising out of the mud pits, the Tribunal turns to the applicable standards.

507. Pits without bottom sealing are governed by RAOHE Table 7(a), while sealed pits are governed by the less stringent RAHOE Table 7(b). The limits of permissible contents differ. For ease of reference, the Tribunal sets out an image of the translated Table 7, Annex 2, of RAOHE as provided by Ecuador:

¹⁰⁶¹ Transcript, Hearing on Counterclaims, Day 6, pp 1772-1775 (Testimony of GSI).

RAOHE, Annex 2, Table 7¹⁰⁶²

a) WITHOUT impermeabilization of the base			
Parameter	Expressed in	Unit	Permissible limit value
Hydrogen potential	pH	---	6<pH<9
Electrical conductivity	CE	μS/cm	4,000
Total hydrocarbons	TPH	mg/l	<1
Polycyclic aromatic hydrocarbons (PAHs)	C	mg/l	<0.003
Cadmium	Cd	mg/l	<0.05
Total chromium	Cr	mg/l	<1.0
Vanadium	V	mg/l	<0.2
Barium	Ba	mg/l	<5
b) WITH impermeabilization of the base			
Parameter	Expressed in	Unit	Permissible limit value
Hydrogen potential	pH	---	4<pH<12
Electrical conductivity	CE	μS/cm	8,000
Total hydrocarbons	TPH	mg/l	<50
Polycyclic aromatic hydrocarbons (PAHs)	C	mg/l	<0.005
Cadmium	Cd	mg/l	<0.5
Total chromium	Cr	mg/l	<10.0
Vanadium	V	mg/l	<2
Barium	Ba	mg/l	<10

508. GSI excluded from its investigation samples taken by IEMS from within closed pits for the purpose of determining the existence of soil contamination because their closure was “specifically authorized and required under applicable Ecuador regulations (*Acuerdo* 621, Decree 2982, and RAOHE Decree 1215) and the government-approved Environmental Management Plans (EMPs) for oilfield operations in the Consortium area.”¹⁰⁶³ In its view, IEMS

¹⁰⁶² Exhibit EL-147, RAOHE, p 58 (partial translation resubmitted on 10-18-2013).

¹⁰⁶³ GSI ER I, paragraph 181(1); Reply, paragraph 73

treated these samples, and by extension the contents of closed pits, which are areas specially construed to hold the by-products of the drilling process, as if they were regular soil.¹⁰⁶⁴ According to Perenco, this represented 22% of the 22,629 samples IEMS collected in its first sampling campaign.¹⁰⁶⁵

509. An examination of Tables 6 and 7 of Annex 2 of RAOHE suggests that there was a deliberate decision by the regulator to separate the treatment of “leachates for the final storage of surface drilling muds and rubbles” from the treatment more generally of soil that may have been affected during the course of the hydrocarbon production process. As noted above, a mud-pit is a specific containment method for these by-products of the drilling process, which tend to take the form of a combination of drilling muds and formation water which is dried and treated (using substances such as aluminium sulfate and calcium hydroxide), mixed with solids, and then compacted and stored in the pits. In this light, it is understandable that RAOHE should treat the one separately from the other, and would contemplate contaminant levels greater than that applied more generally to soil which is not as directly affected by the hydrocarbon production process as a mud pit.

510. The significance of the difference in treatment is confirmed, for example, by the fact that drilling muds commonly contain heavy metals such as barium, which is addressed in Table 7, Annex 2, of RAOHE along with chromium and vanadium, but is not identified as a contaminant of concern in Table 6, Annex 2, of RAOHE. The Tribunal notes that Table 7 of RAOHE in fact addresses a number of elements that are not addressed in Table 6 of RAOHE: hydrogen, electrical conductivity, total chromium, vanadium and barium, and in this way it is more comprehensive in addressing the kinds of chemicals that might be produced in the by-products of the drilling process and stored in a mud pit.

511. Moreover, RAOHE Table 6 sets out concentrations in mg/kg, compared to Table 7, which provides concentration limits in mg/l.¹⁰⁶⁶ Again, this reflects the concern with mud pits, which is not with contaminants in the material contained within the pit because that is a given at some concentration, but rather with the potential for their contents to leach such contaminants into surrounding soil and underground water sources in concentrations that pose a threat to the environment.¹⁰⁶⁷ This explains the choice to provide a higher set of permitted substances for sealed pits in Table 7(b) as opposed to that for unsealed pits. The latter pose a greater risk for discharges of substances that contain contaminants at environmentally damaging concentrations.

512. The Tribunal has considered and takes into account the evidence of the use of the Table 7 criteria in the investigation of the mud pits in Blocks 7 and 21, whether initiated by the operator and not objected to by the Ecuadorian authorities when brought to their attention, or by IEMS in its report in the *City Oriente* proceedings. The 2002 pit closure report for pits in Payamino 24 describes leachates analysis of samples having regard to Table 7 of RAOHE.¹⁰⁶⁸ They confirmed that the fluid inside the pits complied with the permissible limits for barium, chromium,

¹⁰⁶⁴ Claimant’s Counter-Memorial, paragraphs 18, 313-333; relying on GSI ER I, paragraphs 108-110; Rejoinder, paragraphs 98, 128-140

¹⁰⁶⁵ Claimant’s Counter-Memorial, paragraphs 18, 316; GSI ER I, section 3.7, Appendix F.4, Appendix D, Table D.3.

¹⁰⁶⁶ See above at paragraph 90.

¹⁰⁶⁷ Claimant’s Counter-Memorial, paragraph 324.

¹⁰⁶⁸ Exhibit CE-CC-40, Final Report on Closure Work for the Payamino 24 Mud Pits, February 2002, pp 20-21.

cadmium, vanadium and TPH set forth in Table 7.¹⁰⁶⁹ The 2006 and 2008 environmental audits applied Table 7 of RAOHE.¹⁰⁷⁰ The 2003 environmental report on specific sites in Block 21 (such as Yuralpa Centro 1 pit) applied Table 7 of RAOHE.¹⁰⁷¹

513. In this regard, the Tribunal notes that some of the evidence of the application of Table 7 of RAOHE to pits in the Blocks is in the form of pit closure reports produced by the operator. As noted above, one of Ecuador's objections to the applicability of Table 7, Annex 2, of RAOHE was its submission that Table 7 applied strictly to the sealing of a pit and to investigate whether it has been properly sealed (hence, the periodic sampling seven days, three months, and six months after storage). It was limited to a specific context and period of time.

514. In sum, the Tribunal finds that Ecuador has not made this aspect of its case out. Two factors militate in favour of the finding that Table 7 remains the applicable regulatory criteria to testing the environmental compliance of mud pits. The first is that there is no indication in Table 7 that at the six-month mark, some other set of regulatory criteria supersedes Table 7. A review of the sections and other annexes of RAOHE similarly does not offer a clear and suitable alternative. Ecuador's position is that this would be RAOHE, Annex 2, Table 6.¹⁰⁷² However, as set out above, the nature of the contaminants that may 'leach' from the material compacted and stored in mud pits has been addressed in Table 7, and it does not appear that the same can be said for Table 6. In this sense, Table 7 presents the regulatory standard that is more specifically aimed at the protection of the environment in the case of mud pits.

515. The second point is that Table 7 requires periodic sampling precisely because the effect of 'leaching' presents itself over time and it is concerned with catching the development and accumulation of seeping substances. To turn the six-month mark into a six-month cut-off would seem to undercut this imperative. In the absence of a regulatory prescription to apply a different set of criteria after six months, the Tribunal is of the view that it accords with the purpose of Table 7 to continue to apply it to determine the regulatory compliance of the mud pits in the Blocks.

516. As regards the question of the appropriate testing method, the Tribunal considers that this is addressed in the title and opening paragraphs of RAOHE Table 7. The title refers to permissible limits for leachates for the "final disposal of drilling muds and cuttings on the surface".¹⁰⁷³ It does not state that it prescribes the permissible limits for the content of the storage of surface drilling muds and rubbles. Its opening paragraph states that "[t]he sampling shall be performed so as to obtain representative composite samples as a function of total volume disposed of at the respective site."¹⁰⁷⁴ Thus, any "leachate testing" should take into account this directive in the regulation and ensure it is representative of the bounds and underlying surface area of the pit, that is, the area from which leaching may occur.

¹⁰⁶⁹ *Ibid.*

¹⁰⁷⁰ See, for e.g., exhibit CE-CC-182/E-144, 2008 Block 7 Audit, pp 67-68.

¹⁰⁷¹ Exhibit CE-CC-213, Compilation of the Consortium's annual environmental reports for Blocks 7 and 21, pp 51, 61.

¹⁰⁷² IEMS ER III, p 27; see also, Ecuador's Counter-Memorial, paragraph 305 cf. Claimant's Counter-Memorial, paragraphs 318-321, Section II.A.2(a).

¹⁰⁷³ Exhibit EL-147, RAOHE, Table 7 (partial translation resubmitted on 10-18-2013).

¹⁰⁷⁴ *Ibid.*

517. Thus, the Tribunal finds that the appropriate regulatory criteria and leachate testing methodology that should be applied to the testing of mud pits is contained in Table 7, Annex 2, of RAOHE.

518. As to the mechanics of sampling for leachates, the Tribunal notes that one of IEMS' objections to GSI's approach to testing was its allegedly 'convenient' delineation of the size and bounds of the pits in order to avoid finding contamination. IEMS alleged that GSI presented the pits as being larger than they actually are so as to give the impression they were not leaking.¹⁰⁷⁵ The logic was that leachates were unlikely be detected around the pit if one sampled soil well away from the pit's actual perimeter. This is not something that the Tribunal is in a position to decide at present, but if GSI's sampling did not occur at a sufficiently close proximity to the pits, that would undermine the validity of its findings.

519. For its part, GSI challenged IEMS for treating closed mud pits, and in particular their contents, as subject to the criteria and the testing methodology applicable in RAOHE, Annex 2, Table 6, rather than that which applies to the testing of leachates in RAOHE, Annex 2, Table 7.¹⁰⁷⁶ As already noted, Ecuador submitted that Table 7 was intended to apply only in the immediate aftermath of sealing the contents of a pit.¹⁰⁷⁷ Perenco responded to this assertion that there was nothing in Table 7 or otherwise in RAOHE that supports such a reading of the approach under Ecuadorian law.

520. The Tribunal has already disposed of Ecuador's view that soil samples taken from *within* mud pits should be treated as if they were taken from soil from the Blocks' general terrain that may or may have been affected by hydrocarbon operations. However, the Tribunal does not see anything wrong with testing the contents of mud pits to see if the operator deposited substances that should not have been deposited in them. The contents of such pits will by definition differ from the surrounding environment. So long as they do not contain substances that should not have been deposited in the first place, they are properly constructed, and their contents meet the relevant Ecuadorian standard, mud pits are deemed to be an acceptable by-product of oilfield operations in Ecuador.

521. Turning to the third and last issue in relation to the investigation of mud pits, as noted above, Table 7 distinguishes between the criteria that should apply to sealed and unsealed pits. This refers to whether the bottom of the pit is 'sealed', a term that is used in Tables 7(a) and 7(b). In Perenco's view, Table 7(b) applied to the pits constructed by it in Blocks 7 and 21.¹⁰⁷⁸ In Ecuador's view, IEMS' evidence demonstrates that there is "no evidence of intact permeable liners beneath [the] pits" in Blocks 7 and 21.¹⁰⁷⁹

522. There is some evidence that the bottoms of some of the pits were not lined or their liners had seriously deteriorated.¹⁰⁸⁰ RPS submitted that four of the seven pits that GSI tested should

¹⁰⁷⁵ Reply, paragraphs 94-95; IEMS ER III, section 3.2.4.

¹⁰⁷⁶ Claimant's Counter-Memorial, paragraphs 318-321, Section II.A.2(a).

¹⁰⁷⁷ IEMS ER III, p 27; see also, Ecuador's Counter-Memorial, paragraph 305.

¹⁰⁷⁸ Rejoinder, paragraphs 138-140; 1st Witness Statement of Wilfrido Saltos, paragraph 185.

¹⁰⁷⁹ Reply, paragraphs 92-93; RPS ER II, section 5, pp 81-83; IEMS ER III, section 3.2.2.

¹⁰⁸⁰ Ecuador noted in its Post-Hearing Brief (paragraph 92): "The statements from Perenco's former field employees in relation to pits are telling. For example, when asked whether pits could be leaking, Perenco's Block 7 Maintenance Supervisor and Superintendent (Marco Ramirez) explained that "[t]he lyner (*sic*) lacked maintenance. Cracked by the high temperatures of formation water and [was] damaged by the chemical products [...]. The lyner

more properly be subjected to Table 7(a) limits and it raised instances where the operator applied Table 7(a) limits of its own volition rather than Table 7(b) in pit closure procedures, such as in Jaguar 9 in November 2000 and in Coca 19 in October 2004 (when Perenco was operator).¹⁰⁸¹ RPS also noted that the TCLP analyses of materials buried at certain closed pits that GSI tested “show concentrations of barium above the applicable standards for pit closure at three of the seven pits investigated [by GSI]. A fourth pit also fails to meet the applicable closure criteria based on a soil pH that is out of the allowable range.”¹⁰⁸²

523. On the Tribunal’s instruction, in their post-hearing briefs the Parties attached tables they had prepared summarising the evidence of their respective experts on each pit and their observations on whether Table 7(a) or Table 7(b) should more appropriately be applied in specific instances.¹⁰⁸³ It notes pit closure reports on the record which present examples of Perenco’s use of Table 7(a) with regard to specific pits: Oso 4-5 in November 2004, Coca 19 in October 2004 and one pit in Jaguar 9 in the 2008 audit.¹⁰⁸⁴ There are similarly instances where it applied Table 7(b): Cónдор Norte 1 in November 2005, two pits in Yuralpa Pad A closed in June 2003 and May 2004.¹⁰⁸⁵ The Tribunal notes Perenco’s submission that where Table 7(a) was applied it does not necessarily denote that the pit was unlined because “Table 7A was at times used out of an abundance of caution even in cases of pits that were very clearly lined.”¹⁰⁸⁶

524. Be that as it may, the Tribunal agrees with RPS that GSI’s use of Table 7(b) is inconsistent with the Consortium’s own practice of applying Table 7(a) in some instances. RPS submitted that if GSI had applied Table 7(a) limits, it would have concluded that 4 of the 7 pits that GSI had tested should be remediated.¹⁰⁸⁷

525. The Tribunal considers that there is a need to proceed cautiously with respect to the approach that should be adopted in order to determine whether Table 7(a) or 7(b) should apply in the analysis of leachate samples. It considers that because of the risk that an unlined pit or a pit whose lining has deteriorated over time poses to the environment, where there is any doubt as to whether a pit is sealed, or where there may have been a deterioration of the lining, the more environmentally protective standard in Table 7(a) should be used.

(4.1) Conclusion on the Mud Pits Issues

526. In light of the above, the Tribunal’s conclusions on the mud-pit issues are as follows:

crystalizes [sic] and leaks. The pits never received maintenance [...]” [IEMS 3rd, Attachment 17]. Similarly, Perenco’s Roads and Platforms Construction Supervisor (César Andrade) explained that prior to construction of pits “[g]eological and hydrological studies were not performed” [IEMS 3rd, Attachment 17]. Both reported that they know of people affected by leaks in pits at Coca 4, Payamino 1, Oso A, and Gacela 2. GSI had this information and yet did not sample any of the pits at these locations.”

¹⁰⁸¹ Reply, paragraphs 92-93; RPS ER III, section 5, pp 81-83; IEMS ER III, section 3.2.2.

¹⁰⁸² RPS ER III, p 83.

¹⁰⁸³ Annex 1 to Ecuador’s Post-Hearing Brief and Appendix A to Perenco’s Reply Post-Hearing Brief.

¹⁰⁸⁴ Exhibits E-371, Pit closure report for Oso 4-5; E-271, “*Reporte de taponamiento de piscinas de Coca 19,*” dated October 2004.

¹⁰⁸⁵ Exhibits E-366, Pit closure report and pit diagram for Condor Norte, PERPROD0029388; E-375, Pit closure report for Yuralpa Centro 1 and 2; E-300, “*Taponamiento de piscinas de perforación – Yuralpa Centro 2 y Yuralpa Centro 1, Informe de trabajo por administración directa,*” dated April – May 2004.

¹⁰⁸⁶ See Appendix A to Perenco’s Reply Post-Hearing Brief, item no. 12, (Perenco’s comments).

¹⁰⁸⁷ RPS ER III, section 5, pp 82-83.

- (a) Table 7 of Annex 2 of RAOHE provides the applicable technical standard.
- (b) Perenco has no obligation to dig up and remediate properly constructed and confined mud pits whose contents do not exceed the applicable regulatory standard.
- (c) At the same time, it was not improper for IEMS to sample the contents of closed mud pits to determine whether or not they exceeded the permissible tolerances contained in Table 7 of Annex 2 of RAOHE or contained substances that should not have been deposited in the first place.¹⁰⁸⁸
- (d) Drilling muds and cuttings are properly disposed of under the current regime if: (i) they are placed in proper pits as required by law; (ii) the operator properly treated the contents of the pits so as to ensure that it did not deposit muds and cuttings that contained analytes in quantities in excess of the applicable regulations or other substances that should not have been deposited therein; (iii) the pits have been properly covered and closed; (iv) such pits are constructed with proper berms and at grade; and (v) that soil sampling at places around the pits shows no sign of leaching.
- (e) As to whether regard should be had to Table 7(a) or 7(b), if a pit has an impermeable liner, Table 7(b) applies. Conversely, if there is no impermeable liner, Table 7(a) applies. The Appendix A to Claimant's Reply Post-Hearing Brief on Counterclaims, Schedule of Closed Pits in Blocks 7 and 21 as of 2009, shows that the Parties continue to have substantial disagreements as to whether or not certain pits have been closed with impermeable liners. This will be the subject of further investigation (as to which see below). In any case of doubt, the more environmentally protective standard set out in Table 7(a) shall be applied.

(5) Groundwater remediation

527. The Parties and their experts were also deeply divided on the matter of testing groundwater contamination, disagreeing on the applicable regulatory criteria and the proper testing methods.

528. In addition, the groundwater issue became subsumed in a dispute over certain evidence beginning with Perenco's filing with its Rejoinder a statement from Mr. Gilberto Martínez, a former employee of IEMS who left the company on poor terms.

529. After he left IEMS' employ on 6 September 2011, Mr. Martínez contacted the Claimant's counsel and volunteered to assist Perenco.¹⁰⁸⁹ His witness statement spurred considerable correspondence and the filing of further evidence leading up the oral hearing.

¹⁰⁸⁸ It has already been determined that it is not relevant to the disposition of this claim to test the content of mud pits against background values (see above at paragraphs 292-323).

¹⁰⁸⁹ Transcript, Hearing on Counterclaims, Day 7, pp 2044-2045 (Testimony of Gilberto Martínez). Mr. Martínez initially stated that he submitted his resumé to Debevoise & Plimpton "when I had just left the company, IEMS." He then amended his answer. "Q. But, sir, you have just told me that you submitted that CV to Debevoise as soon as you left IEMS; isn't that the case? A. Well, it wasn't the following day. It was a few months after that." Transcript, Hearing on Counterclaims, Day 7, p 2046 (Testimony of Gilberto Martínez).

530. Mr. Martínez testified that he worked on the Ecuador project starting with a visit from 25 October to 26 November 2010. He led one of IEMS' sampling brigades which collected soil, surface water and groundwater samples.¹⁰⁹⁰ He also interviewed local inhabitants about any environmental problems, met with Environment Ministry officials who informed IEMS about potential contamination, and directed his brigade to sample in locations where they thought they might find environmental harm.¹⁰⁹¹ Mr. Martínez testified that when he arrived in the oilfields, he "immediately noticed that the fields were in good shape" and "in comparison to other fields that I have visited, Blocks 7 and 21 looked clean and healthy to me."¹⁰⁹²

531. Mr. Martínez visited Ecuador again, this time from 1 to 22 August 2011 to resample certain areas based on the first field campaign's results. He asserted that he was demoted for the second visit because he had told his supervisors that he disagreed with the way in which samples were being taken. Rather than running a brigade, his role was to take data on the physical characteristics of the soil, i.e., colour, smell, texture, grain size, moisture and presence of hydrocarbon per sample and depth.¹⁰⁹³

532. He described IEMS' work as "being conducted in a rushed and chaotic way" and beyond IEMS' capacity. He said that he became increasingly concerned about the company's motives and alleged that management seemed to be making obtaining favourable results more important than maintaining integrity and professionalism. He claimed that IEMS' Mr. Rubén Villanueva said that they would be rewarded with a trip to the Galápagos Islands and to good restaurants in Quito "for our good work, provided we reach the goal" of finding pollution. In Coca, at an IEMS-only meeting, Mr. Villanueva was alleged to have called José Francisco Alfaro, Eric Torres and Gilberto Martínez and to have told them that "IEMS had to continue receiving this type of assignment from Ecuador" and further that "the main objective of the Blocks 7 and 21 project was to find – at all costs – hydrocarbons in the soil, surface water and groundwater."¹⁰⁹⁴

533. Mr. Martínez said that they were instructed to take samples from mud pits and to treat the area as if it was normal soil, which "seemed absurd" to him.¹⁰⁹⁵ He added that IEMS "did not use proper equipment or procedures for sampling groundwater" and that groundwater monitoring wells were installed using a hand-threaded pipe rather than a machine-threaded pipe which would have prevented the clogging of filters. He said that his recommendation to use machine-threaded pipes was ignored. He added that because of the defective way in which the monitoring wells were put together, they did not capture any groundwater and came out dry and this led to the "rather astonishing practice", which he said one of his colleagues told him about, whereby IEMS employees poured river water into the pipes to take the sample. He said that he saw this with his own eyes during his second visit and considered this to be a "scandalous breach of the sampling protocol" which he reported to Mr. Alfaro who, he said, told him that if he wanted to keep his job he should not ask questions or make such comments.¹⁰⁹⁶

¹⁰⁹⁰ Witness Statement of Gilberto Martínez, paragraph 10.

¹⁰⁹¹ Witness Statement of Gilberto Martínez, paragraph 11.

¹⁰⁹² Witness Statement of Gilberto Martínez, paragraph 18.

¹⁰⁹³ Witness Statement of Gilberto Martínez, paragraph 13.

¹⁰⁹⁴ Witness Statement of Gilberto Martínez, paragraph 21.

¹⁰⁹⁵ Witness Statement of Gilberto Martínez, paragraph 23.

¹⁰⁹⁶ Witness Statement of Gilberto Martínez, paragraphs 21-27.

534. Mr. Martínez also described IEMS' failure to take the necessary steps to adequately define areas of contamination and its errors in analysing laboratory results. He said that he proposed that they follow ASTM protocols for sampling in order to be impartial and to avoid any possible problems for the company or future complaints about its integrity, but that Mr. Villanueva explained "that the purpose of the project was to find contamination so that the operator would lose its case against Ecuador." He recounted Mr. Villanueva's saying that "that was why IEMS was hired and why I should not ask questions."¹⁰⁹⁷

535. These were serious allegations and called for a response. Ecuador was granted leave to file responsive evidence. IEMS therefore filed a "Supplemental Expert Report" (which also responded to Dr. Rouhani's report also filed with the Rejoinder). The Report described Mr. Martínez's account of his work with the company as "for the most part fictitious", described him as an "unreliable employee" who "engaged in unacceptable conduct" which led to his dismissal.¹⁰⁹⁸ It cited an 8 August 2011 email of complaint from Mr. Villanueva. Mr. Martínez was said to have habitually arrived late at work, "often in an unsuitable state" and to have slept on the job whilst in Ecuador.¹⁰⁹⁹ IEMS added that whilst the second sampling campaign was underway in August 2011 it was decided to terminate his employment. He was so informed upon his return to Mexico. He refused to accept the sum fixed by the company for a justified termination. A settlement was concluded on 6 September 2011.¹¹⁰⁰ IEMS asserted that his account of his leaving the company was "wholly fabricated."¹¹⁰¹

536. According to IEMS, Mr. Martínez never mentioned any of the preoccupations contained in his witness statement and any claims to the contrary were false. IEMS denied that its instructions were to find evidence of contamination at all costs. The alleged promise of a trip to the Galápagos Islands if contamination was found was a "particularly absurd fabrication."¹¹⁰² The allegations concerning the use of certain equipment were incorrect. In particular, the allegation that water was poured into the monitoring wells to pass it off as groundwater samples was "mendacious" and was never approved.¹¹⁰³ The problem of dry wells was solved not by pouring water into the wells, but rather by "digging deeper, as shown by the email correspondence with Gilberto Martínez himself."¹¹⁰⁴

¹⁰⁹⁷ Witness Statement of Gilberto Martínez, paragraphs 59-61.

¹⁰⁹⁸ IEMS ER IV, p 6.

¹⁰⁹⁹ *Ibid.*

¹¹⁰⁰ IEMS ER IV, p 6.

¹¹⁰¹ IEMS ER IV, p 6.

¹¹⁰² IEMS ER IV, p 7.

¹¹⁰³ IEMS ER IV, p 7. This last point was said to have been corroborated by Mr. Mauricio Naranjo, a local professional who coordinated a group of local experts, some of whom participated in groundwater sampling. IEMS filed in this regard an email from Mr. Naranjo, the Ecuadorian contractor who assisted IEMS in the groundwater sampling campaign, to Mr. Alfaro, who said that with respect to: "...the water samples from the monitoring wells, I must tell you that neither the workers nor my personnel have mentioned that samples were taken from the river. However, they have been monitoring wells that were placed near the watercourses and in the flood zones, which were lost because it was impossible to sample them, making it necessary to drill more wells, and in some cases the well was lost." Exhibit E-354, Email dated 9 August 2013 from Mauricio Fernando Naranjo Viscarra to José Francisco Alfaro.

¹¹⁰⁴ IEMS ER IV, pp 7-8 (IEMS attached email correspondence between Mr. Martínez and his superiors during the August 2011 campaign showing that this was a topic of discussion between them.).

537. IEMS questioned how Mr. Martínez would be in a position to be able to “immediately” determine whether an oilfield was “in good shape” or whether it looked “clean and healthy” because the verification and characterisation of contamination “cannot be done without a careful process of sampling and laboratory analysis.”¹¹⁰⁵ His experience was “at best, extremely limited”; he had joined the company from university and “he had never worked on an oilfield before. In all probability, the first time he ever visited one was in Ecuador.”¹¹⁰⁶

538. Finally, IEMS considered it strange to be criticised for employing the background values criteria when the instruction to do so came from counsel. In any case, Mr. Martínez had already left IEMS before its second expert report (in which background values were applied) was presented. IEMS also recalled that Mr. Martínez had specifically suggested applying the “sensitive ecosystem” criteria since most of the area belonged to the Amazonian forest.¹¹⁰⁷

539. The more serious issue from the Tribunal’s perspective stemmed from the fact that IEMS’ response to Mr. Martínez’s statement also included the filing of documents which Perenco’s experts assert were manipulated.

540. The first such document was a Confidentiality Agreement which was said to have been found in IEMS’ employment records. This prompted an assertion by Perenco that the document was a forgery.¹¹⁰⁸ Mr. Martínez denied ever signing the document and asserted that his signature was cut and pasted from his actual employment contract.¹¹⁰⁹ His evidence that his signature had been cut and pasted on the Confidentiality Agreement was supported by the expert report of Mr. Joseph Parker.¹¹¹⁰

541. IEMS responded with a witness statement from its Material and Human Resources Administrator, Ms. Laura Díaz de la Garza, who explained what she had done both when Mr. Martínez had been hired and when she was asked to gather information pertaining to his employment at IEMS in order to respond to his witness statement. She said that she sent copies of the confidentiality agreement and code of ethics that comprised Exhibit E-355.¹¹¹¹ She noted further:

I understand that two electronic files containing Gilberto Martínez’s confidentiality agreement, one dating from July 2008, and the second one from July 2009, were found in the draft confidentiality agreement folder, among the electronic files kept by IEMS. These Word documents show that Gilberto Martínez’s signature is indeed electronic. I understand that these documents have been analyzed by an IT expert in order to verify their date. It is usual for IEMS engineers and technical personnel to use electronic signatures in the reports sent to clients or various authorities throughout the Republic, which is why it is possible that Mr. Martínez proceeded this way when signing his confidentiality agreement.

¹¹⁰⁵ IEMS ER IV, p 8.

¹¹⁰⁶ *Ibid.*

¹¹⁰⁷ IEMS ER IV, p 8.

¹¹⁰⁸ A letter from Debevoise & Plimpton LLP dated 26 August 2013 questioned the authenticity of the confidentiality agreement.

¹¹⁰⁹ See letter from Debevoise & Plimpton LLP dated 26 August 2013, p 2.

¹¹¹⁰ Letter of Joseph Parker and Attachments dated 26 August 2013.

¹¹¹¹ Witness Statement of Laura Díaz de la Garza, paragraph 15.

Unfortunately, I do not keep [sic] emails from 2008 or 2009 in order to confirm this last statement.¹¹¹²

542. The expert to whom Ms. Díaz referred was Dr. Jean-Louis Courteaud, an expert retained by Ecuador to respond to the document modification allegations. Dr. Courteaud examined the two Word documents and concluded that there was no inconsistency in the metadata of the Word documents.¹¹¹³

543. This did not resolve the problems associated with the electronic documents that IEMS had produced. Perenco was given access to the electronic files and shortly thereafter filed an expert report from Mr. Rich Hoffman on the meta-data associated with the signature on the documents to support the view that those documents had been manipulated as well.¹¹¹⁴ Mr. Hoffman observed that although Dr. Courteaud had looked at the metadata associated with the Word documents, he had not looked at the separate metadata associated with the embedded JPG files. “That metadata shows the creation date and the software used to make or modify the image. In this case some of the potentially relevant metadata is: Adobe Photoshop elements 8.0 Windows 2013:08:27 10:55:36 CST.”¹¹¹⁵ This led him to opine that “...the images of the signatures appearing in the two documents were created very recently, on August 27, 2013. That is just one day before Mr. Courteaud, according to his letter, accessed these documents.”¹¹¹⁶ Mr. Hoffman noted further that “the signatures were created in Adobe Photoshop Elements 8.0. That version of the software was released on September 23, 2009 – which was 14 months after the first document’s ‘date last saved’ that appears in the document metadata.” Documents that were genuinely “last saved” in 2008 and 2009 “cannot include images that were created on software that did not exist at that time, much less images that were in fact created over four years later in August 2013 according to the image metadata of the JPG files.”¹¹¹⁷ He concluded that the ‘last saved’ dates that appeared in the metadata that Mr. Courteaud examined were “false.”¹¹¹⁸

544. At the oral hearing, Dr. Courteaud made a short presentation, but due to Ecuador’s failure to submit additional expert evidence by 4 September 2013 as contemplated in its correspondence with the Tribunal, as well as Perenco’s objection to Dr. Courteaud’s introducing new evidence responsive to Mr. Hoffman’s report based on tests performed on a disc that was delivered to him prior to the hearing but not disclosed to Perenco, the Tribunal ruled that he could address Mr. Hoffman’s expert report but could not introduce any new evidence based on more recent studies of the data.¹¹¹⁹

545. Dr. Courteaud did not take issue with much of Mr. Hoffman’s opinion, but he described his view as being “more nuanced” as regards the conclusions and the analysis. In view of the

¹¹¹² Witness Statement of Laura Díaz de la Garza, paragraph 18.

¹¹¹³ Expert Report of Dr. Jean-Louis Courteaud, p 5.

¹¹¹⁴ Expert Report of Mr. Rich Hoffman, p 2.

¹¹¹⁵ Expert Report of Mr. Rich Hoffman, pp 3-4.

¹¹¹⁶ *Ibid.*

¹¹¹⁷ Expert Report of Mr. Rich Hoffman, p 4.

¹¹¹⁸ *Ibid.*

¹¹¹⁹ Transcript, Hearing on Counterclaims, Day 3, p 839 (Statement of President of Tribunal): “I wish to make clear to Mr. Courteaud that he can comment only on Mr. Hoffman's Report or to provide comments on his own Report, but he is to proceed as he never saw the disc which was delivered to him on 3rd of September. He cannot rely on any data because this disc and the data there were not provided to Perenco and the Expert retained by Perenco. So, this data are for the moment unverifiable to Perenco, and Perenco's Experts in particular.”

Tribunal's ruling, he did not elaborate upon the point.¹¹²⁰ The Tribunal was thus left with a hint of an explanation from Ecuador's expert, but no further explication due to its ruling as to the propriety of adducing new expert evidence on direct examination. There is little more to be said on this particular point.

546. At the hearing, Ms. Díaz denied any involvement in manipulating the documents or knowing who might have done so.¹¹²¹ Her testimony did not rule out the possibility that someone else did alter the electronic files.¹¹²² When the IEMS experts testified, each denied having instructed anyone to alter the documents or otherwise having anything to do with such an act.¹¹²³ Neither they, nor Dr. Courteaud, shed any light on the events leading up to the documents' use in this arbitration.

547. The Tribunal's view is that the weight of the evidence shows that someone at IEMS cut and pasted the signature on to the Confidentiality Agreement. If this is what was done, it was unacceptable.

548. The question is what to do about it. It is clear that Ecuador's counsel had no involvement in this and were taken by surprise. They have conducted this proceeding in good faith and in a professional manner and no imputation of wrongdoing can be made against them for having received documents and submitted them as evidence. The Tribunal is reluctant to find that the IEMS witnesses who appeared before it and denied any knowledge of the handling of the electronic files were untruthful. They too seemed confused by this turn of events. But the Tribunal must record its view that the evidence strongly points in the direction of misconduct by a person or persons affiliated with IEMS.

549. The question is whether this taints the whole of IEMS' evidence. The Tribunal considers that it does not. IEMS has made some important points and it would be unfair to Ecuador to dismiss the totality of expert evidence prepared over the course of three years on the basis of what appears to be an unethical act of perhaps a single individual.

550. The Tribunal was invited to find that the evidence as a whole corroborates Mr. Martínez's testimony. The Tribunal does not agree. It found him to be a non-responsive witness who clearly bears a strong animus towards his former employer. He provided details as to the number of times that he met with counsel and the amount he estimated that he was paid by Perenco to appear as a witness only when pressed by the Tribunal's President and even then he was vague. These aspects of the witness' demeanour, his seeking out Perenco's counsel to provide evidence against his former employer soon after arriving at a settlement with it, and the animus between him and IEMS leads the Tribunal to treat his evidence with caution.

¹¹²⁰ Transcript, Hearing on Counterclaims, Day 3, pp 863-864 (Testimony of Jean-Louis Courteaud).

¹¹²¹ Transcript, Hearing on Counterclaims, Day 3, pp 872-875, 877-885 (Testimony of Laura Díaz de la Garza).

¹¹²² Perenco's Post-Hearing Brief described its view of the situation as follows (at paragraph 92): "Perenco confronted Ms. Laura Díaz with the direct question of whether she put the electronic signature on the Word documents. She timidly answered, "[i]t wasn't me." Counsel to Perenco asked Ms. Díaz whether there was 'anybody else who knew about the forgery allegation that first arose on August 26, knew that a metadata expert would be hired and provided with data on August 28, and had access to the computer system' besides Mr. Alfaro and Mr. Villanueva, and she conceded: 'No one else, based on my knowledge.'"

¹¹²³ Counsel properly put the allegations directly to the witnesses; the Transcript, Hearing on Counterclaims, Day 5, pp 1269-1278 (Testimony of IEMS), records their exchanges. Both witnesses denied having any involvement in manipulating the documents or knowing how they might have been altered.

551. Of particular note, while he claimed that Mr. Villanueva told him and two other colleagues that “the main objective of the Blocks 7 and 21 project was to find – at all costs – hydrocarbons in the soil, surface water and groundwater”, and that he raised his concerns first in mid-November 2010 and then while the August 2011 sampling campaign was underway, the contemporaneous email exchanges during the midst of the latter campaign do not corroborate this. Exhibits E-347 to E-351 contain no evidence of reservations on Mr. Martínez’s part as to the conduct of the campaign. To the contrary, he was seeking to explain why his team had been so slow in drilling wells. There is an email from Mr. Villanueva expressing his unhappiness with the lack of progress, but nothing in it suggests that he was driving the team to act unprofessionally. Rather, it supports IEMS’ present account of its disillusionment with Mr. Martínez’s work. In an 8 August 2012 email to Mr. Martínez, Mr. Villanueva noted:

“I have just learned that we have not done any wells, and this did not make me at all happy. According to what I had discussed with you, this was one of your priorities, I suggest that you establish the leadership that I expect from someone with your experience, and support the team in order to perform the work...”

552. Mr. Martínez replied four days later:

“I thank you for your trust and the expectations placed on me, and please know that what has been asked of me has been carried out, within my status of engineer, but not of project director. However, for the success of this great project (which is one of the most important as you have let me know earlier), you have 100% of my commitment as a professional and as a person, and that is how it has been since my arrival, as my sampling team is most energetic, and has done the furthest and heaviest platforms, without diminishing the good work of all my colleagues who have fought on a daily basis in order for everything to come out well for the benefit of our company.”¹¹²⁴

553. The respectful and complimentary tone and content of this statement, invoking “100%” of Mr. Martínez’s “commitment as a professional and as a person” was made nine months after the first campaign (during which time, he testified, he first expressed reservations to his superiors) and two-thirds through the second campaign. Mr. Martínez now says both campaigns were marred by intentionally misleading sampling and analyses. But his email to Mr. Villanueva, written when his time with IEMS was soon to come to an end, stands at odds with Mr. Martínez’s subsequent account of what Mr. Villanueva had allegedly instructed him to.

554. In sum, the Tribunal is not persuaded by Mr. Martínez’s allegations that IEMS deliberately falsified various findings in its soil and groundwater sampling campaigns.

555. No more need be said of this part of the proceeding other than to record the Tribunal’s view that it was not a “side show” in the hopeful words of Ecuador’s counsel.¹¹²⁵ International

¹¹²⁴ Exhibit E-349; Emails dated 8 August 2011 from Rubén Villanueva to Gilberto Martínez and reply from the same on 12 August 2011 [Emphasis added.]

¹¹²⁵ Ecuador’s Post-Hearing Brief, paragraph 17; Ecuador’s Reply Post-Hearing Brief, paragraph 5.

arbitration cannot operate effectively without all parties acting in good faith; the duty is owed by each disputing party to the other and by each party to the Tribunal.¹¹²⁶

556. Leaving the Martínez matter to one side, the Tribunal turns to the other differences between the Parties on the important issue of alleged groundwater contamination. IEMS collected groundwater samples from 18 sites in the Blocks.¹¹²⁷ It reported that all of the samples collected from these sites exhibited contamination by heavy metals (such as zinc, barium, copper, chrome, nickel) in concentrations that exceeded the regulatory limits. It compared its results to values in Table 5, Annex 1, Book VI of TULAS.¹¹²⁸ Ecuador submitted that TULAS obliged the operator to remedy the underground water source (and not just the groundwater in the immediate vicinity or its run-off) as well as the correspondingly affected soil if contaminants were found in concentrations above the thresholds in Table 5.¹¹²⁹

557. GSI criticised IEMS' sampling methods, asserting that they invalidated its findings.¹¹³⁰ In GSI's view, IEMS' monitoring wells did not conform to industry standards and IEMS failed to properly filter its groundwater samples, and as a result it produced values that were "scientifically impossible."¹¹³¹ This included the addition of nitric acid preservative to the samples in order to stabilise the dissolved metal concentrations prior to testing, which GSI submitted exponentially elevated the metal concentrations.¹¹³² GSI also criticised IEMS for evaluating its samples under Table 5, Annex 1, Book VI of TULAS when it should have employed Annex 5 of RAOHE. As for its own samples, GSI submitted that they had been taken with proper equipment, using the correct filtration method, and the results showed that they were fully compliant with applicable regulatory limits.¹¹³³

558. The Tribunal has found the whole question of filtering to be problematic. On the question of the applicable technical standards, reference to RAOHE, Article 86, shows that it applies to the following specific matters:¹¹³⁴

ART. 86. - Parameters. – For liquid discharges, atmospheric emissions and disposal of solid waste to the environment, the subjects of control and their operators and related parties in the implementation of their operations shall comply with the permissible limits specified in Annexes Nos. 1, 2 and 3 to this Regulation, which constitute the minimum program for internal environmental monitoring and shall be reported to the Undersecretariat of Environmental Protection with the frequency established in Article 12 of this Regulation. Should a permissible limit

¹¹²⁶ *Methanex Corporation v. United States of America*, UNCITRAL, Final Award, 3 August 2005, Part II, Chapter 1, paragraph 54; *Libananco Holdings Co. Limited v. Republic of Turkey*, ICSID Case No. ARB/06/8, Decision on Preliminary Issues, 23 June 2008, paragraph 78.

¹¹²⁷ IEMS ER I, pp 62-63; 72-73; Counter-Memorial, paragraphs 872-874; IEMS II, p 180; Supplemental Memorial, paragraphs 176, 288-289. IEMS at the time of its second report in April 2012 identified a further 52 sites it intended to investigate for possible groundwater contamination (IEMS II, p 181).

¹¹²⁸ IEMS ER II, p 153.

¹¹²⁹ Counter-Memorial, paragraph 805; Supplemental Memorial, paragraph 169.

¹¹³⁰ GSI ER I, paragraph 9

¹¹³¹ GSI ER I, paragraphs 79, 83, 84, 226-228; Claimant's Counter-Memorial, paragraphs 18, 334-340.

¹¹³² Claimant's Counter-Memorial, paragraphs 337-339; GSI ER I, paragraph 230; Rejoinder, paragraph 145.

¹¹³³ GSI ER I, paragraphs 86, 182 and 229 (suggests that it could not gain access to 3 of the 18 sites examined by IEMS); Claimant's Counter-Memorial, paragraph 339.

¹¹³⁴ Exhibit EL-147, RAOHE (translation resubmitted on 10-18-2013).

established in the annexes is exceeded, this must be reported immediately to the Undersecretariat of Environmental Protection, and the corrective actions taken must be justified.

...

b.2) Table No. 4: Permissible limits for waters and liquid discharges in the exploration, production, industrialization, transportation, storage and marketing of hydrocarbons and their derivatives.

4.a) permissible limits at the effluent discharge point (liquid discharges).

4.b) Permissible limits at the control point in the receiving body (immission)

b.3) Table No. 5: Permissible limits for discharges of black and grey waters.

...

c) Annex 3: Parameters, maximum reference values and permissible limits for advanced environmental monitoring and control.

c.1) Parameters to be determined in the characterization of surface waters in Baseline Studies – Environmental Diagnostic.

c.2) Additional parameters and permissible limits for water and liquid discharges in the exploration, production, industrialization, transportation, storage and marketing of hydrocarbons and their derivatives.

c.3) Recommended parameters and reference values for water in remediated pits intended for fish farming.

559. Perenco views the foregoing as being the only relevant set of standards, while Ecuador argues that the RAOHE standards are concerned with the hydrocarbon exploitation process and in respect to evaluating groundwater, TULAS applies.¹¹³⁵

560. A review of RAOHE shows that it contains specific instances of the regulatory treatment of “*Aguas*” (water) and they are of limited purview to the general question of water quality. Table 4 of Annex 2 prescribes limits for the discharge of “water and liquid” in the hydrocarbon production process.¹¹³⁶ Annex 3 sets out the parameters to be determined in the development of base studies for the testing of “surface waters.” Table 5 provides the permissible limits for the discharge of sewage and “grey water.”¹¹³⁷ Annex 5, as described above and the regulation that Perenco invokes, is a table with three columns identifying the parameter, method of testing, and reference material with respect to water.¹¹³⁸ It is notable for the manner it chooses *not* to prescribe limits. It is more likely that its purpose is to provide the testing method for the

¹¹³⁵ Reply, paragraph 166; Rejoinder, paragraph 150. Perenco also argued that if it was wrong in arguing that RAOHE alone applied, properly tested, the groundwater samples still met TULAS’s standards. Rejoinder, paragraph 151.

¹¹³⁶ Exhibit EL-146, RAOHE, p 55.

¹¹³⁷ Exhibit EL-146, RAOHE, p 57.

¹¹³⁸ See above at paragraph 91.

parameters identified in other parts of RAOHE that do prescribe limits in the analysis of water, whether it is water discharged in the production process in Table 4 or grey water in Table 5.

561. In the Tribunal’s view, the particularity of RAOHE’s rules shows that they clearly govern how an operator must conduct itself in relation to specific matters, for example, discharging black and grey waters, but TULAS does have a role to play in terms of evaluating the overall quality of the groundwaters that may be affected by oilfield operations as a whole. With that in mind, the purpose of Table 5, Annex 1, Book VI of TULAS, which was promulgated two years after RAOHE came into effect, is more apparent. Unlike RAOHE, TULAS identifies groundwater contamination as a regulatory concern and proceeds to prescribe the obligation to remedy contaminated groundwater and the criteria that should be applied in determining whether this obligation has been triggered.

562. The Tribunal wishes to emphasise that it recognises the concern with the quality and safety of groundwater in this overarching regulation which, in the words of Perenco’s expert, Dr. Bedón, “applie[s] in a general manner to all of those activities that may cause an impact” on the environment.¹¹³⁹ The imperative of environmental protection and restoration in the 1998 and 2008 Constitutions similarly compels giving effect to this regulation. The Tribunal further notes that Article 4.1.3.6 of TULAS, which introduces Table 5, states that any alteration of the quality of groundwater triggers an obligation to remedy the “*subterráneas contaminadas y el suelo afectado*.”¹¹⁴⁰ This would suggest that its objective is to restore the quality of the groundwater but also to ensure that there is little risk of a resurgence of the problem because of seepage. This, in the Tribunal’s view, is the most environmentally protective approach to take to a difficult question of interpretation.

563. Turning to the equally contested issues of groundwater well construction and filtering. The Tribunal has reservations about both Parties’ approaches to this.

564. On one hand, the Tribunal is concerned that IEMS’ wells may not have been constructed to ‘best practices’ standards.¹¹⁴¹ The variability of IEMS’ sampling results from its various campaigns raises concerns in the Tribunal’s mind about the reliability of its results and Perenco has persuasively pointed out both the variability of results and weaknesses in IEMS’ attempts to explain those variations.¹¹⁴² It appears that neither set of experts did the requisite field work to ascertain the clay content at all of the groundwater wells so as to be able to determine whether TULAS’s Table 5 could be used.¹¹⁴³

¹¹³⁹ 1st Expert Report of René Bedón, Appendix B, paragraph 5(a).

¹¹⁴⁰ Exhibit EL-146, TULAS (translation resubmitted on 10-18-2013).

¹¹⁴¹ On this point, the Tribunal takes note of GSI’s and Mr. Martínez’s comments about the use of machine rather than hand-threaded pipes.

¹¹⁴² Rejoinder, paragraphs 154-156. Perenco’s Post-hearing Brief (at paragraph 69) commented that “Mr. Alfaro admitted that IEMS’ most recent results, from January 2013, showed no exceedances at all in the filtered samples, and only one ‘estimated’ borderline exceedance – about which even IEMS was ‘not certain’ – in the unfiltered samples. Mr. Alfaro agreed that he could not tell from IEMS’ most recent samples whether there were any exceedances, and conceded that IEMS ‘haven’t been able to find an explanation’ for either their December 2012 or their January 2013 results.” [Footnotes omitted.]

¹¹⁴³ On the matter of clay content of the soil, IEMS acknowledged that a number of its monitoring wells “may” be located in areas where the clay content was greater than 25%, but otherwise maintained that TULAS applied to its groundwater samples (or, alternatively, more environmentally protective background values applied). (IEMS III,

565. On the other hand, the Tribunal has reservations about GSI's narrowing of testing and whether that led to underreporting of contaminants. As for its use of filters, if for a particular type of testing the water is not supposed to be filtered, using field filters could lead to results that report lower concentrations of contaminants than are actually present in the groundwater. The Tribunal is mindful in this regard of Ecuador's point that many local inhabitants in the Blocks consume surface water or water drawn from shallow wells. A debate about colloidal suspension skewing test results seems disconnected from reality if the combined effect of consuming unfiltered groundwater and oilfield-related colloids is to push the combined impact over tolerable and acceptable levels.¹¹⁴⁴ Even where filtering might be proper, the Tribunal is not entirely comfortable with GSI's initially sampling groundwater using a 5 micron filter and then switching to a much smaller 0.45 micron filter.¹¹⁴⁵ It is unclear to the Tribunal why GSI chose to switch to a finer filter and the concern is that employing a 0.45 µm filter might have been too restrictive.

566. The sensitivity of the issue is illustrated in the following positions of the Parties. Ecuador argued that:

“[RPS'] Mr. Crouch also demonstrated how GSI's use of 0.45 micron filters was completely inappropriate and biased their groundwater results. If a filter were to be used (and it should be noted that the local population does not have special filtration systems to remove contaminants from their drinking water), the appropriate filter would be much larger than the ones used by GSI. GSI initially used a 5 micron filter, which was already excessively small, and later changed it to a 0.45 micron filter [D5:P1351:L7-P1352:L2]. Hence, while GSI's own samples taken in the Mono CPF, for example, with the 5 micron filter showed the presence of barium concentrations higher than the regulatory standards, when re-

p 77). Perenco criticised IEMS for not conducting this testing (Perenco's Post-Hearing Brief, paragraphs 64, 68); Ecuador retorted that GSI itself had not done so either (Ecuador's Reply Post-hearing Brief, paragraph 46).

¹¹⁴⁴ RPS opined that the use of field filters when collecting groundwater samples for the analysis of metals such as arsenic, barium and lead can result in analytical results that are biased low and should not be used as a substitute for proper sampling techniques. The concern is that colloidal-sized particles which may have contaminants absorbed onto the particles can act as transport contaminants in the groundwater. RPS pointed out that the use of filters of less than 10 µm will remove such mobile colloids down to approximately the pore size of the filter in the observed contaminants will also be removed from the groundwater samples, “thus producing analytical results that are not truly representative of groundwater conditions.” (RPS ER III, section 3.4).

¹¹⁴⁵ RPS's Figure 3-1 in its third expert report (p 24) showed the difference in results as between using a 5 µm filter as compared to a 0.45 µm filter, using, for example, arsenic and barium. GSI argued that some of the substances for which unfiltered samples are required pertain to substances that do not result from oilfield operations. (GSI ER II, section 6.3). Likewise, Perenco's response was that “none of these compounds is even associated with oilfield operations...” (Rejoinder, paragraph 152). But this seems not to accord with the evidence that barium is associated with such operations. RPS holds a different view (ER II, section 3.4, pp 24-25): “The effect of using the 0.45 micron filter is profound when assessing the risk to human health. The concentration report for arsenic dropped from 0.023 mg/l (collected with a 5.0 micron filter), to being not detected at the detection level of 0.0033 mg/l (collected with a 0.45 micron filter). ... The concentration of barium also dropped from a reported value of 0.35 mg/l using the 5.0 micron filter to 0.32 mg/l with the 0.45 micron filter.

On the question of whether arsenic, for example, is potentially associated with Perenco's operations, the Tribunal is not in a position to decide who is correct. It will therefore defer making a final determination. The technical issue, on which the Tribunal will, if necessary, seek additional guidance on, is whether filtering is required for all relevant tests in order to determine whether oilfield activities have caused damage to groundwater supplies in the Blocks and where it is proper to do so, what type of filter is appropriate.

testing the same location using the 0.45 micron filter GSI concluded that there were no impacts [D5:P1353:L11-P1354:L1]. GSI again gives no explanation as to why the initial results were disregarded.”¹¹⁴⁶

567. To this, Perenco replied that:

...Ecuador’s argument regarding the supposed bias introduced by the use of a 0.45 micron filter has no merit. As GSI explained, these filters were specifically designed for groundwater sampling to ensure the lab will test groundwater and not excess mud suspended in it. The Ecuadorian technical guidelines promulgated by INEN and referenced in TULAS even define dissolved concentrations in water as those that will pass through a 0.45 micron filter.¹¹⁴⁷

568. The conflict between the experts demonstrates why the Tribunal considers that it must have its own expert. The importance of uncontaminated water (even if not necessarily potable without treatment¹¹⁴⁸) cannot be overstated and the Tribunal is uncomfortable with the prospect that it might err in deciding the appropriate groundwater testing protocol. This will be referred to the Tribunal’s expert to examine in light of the Tribunal’s determination of the appropriate technical standard.

569. Having regard to the foregoing, the Tribunal will instruct an independent expert to redo the groundwater sampling in accordance with the following directions. Given that both Parties’ experts had ample opportunity to test for groundwater exceedances, the Tribunal’s expert’s sampling shall be:

- (i) Confined to the sampling locations identified by IEMS/GSI.
- (ii) At each location, new wells must be drilled in accordance with best practices.
- (iii) For substances covered by TULAS, Annex 1, Table 5, which the expert considers to be associated with hydrocarbon exploitation, the expert shall use the appropriate sampling technique (whether filtration or no filtration) as reflected in NTE INEN 2169:98 produced by the Ecuadorian Standardisation Institute and referred to in Section 5 of Annex 1 of TULAS.
- (iv) If the expert determines whether filtration is appropriate for the substances being tested, he/she shall determine what size of filter pore is appropriate.
- (v) The expert shall also address GSI’s separation of the TPH parameter into three different parameters: Gasoline Range Organics, Diesel Range Organics and Oil Range Organics. In case of doubt as to whether a substance could be associated with oilfield operations, the expert shall test for that substance.
- (vi) Given the effluxion of time, in the event that the resampling results in findings of contamination in excess of applicable standards, it might be necessary to allocate responsibility for remediation as between Perenco and Petroamazonas.

¹¹⁴⁶ Ecuador’s Post-Hearing Brief, paragraph 101. [Emphasis added.]

¹¹⁴⁷ Perenco’s Reply Post-Hearing Brief, paragraph 40.

¹¹⁴⁸ It might be that water drawn from the surface or from shallow wells is not potable for reasons having nothing to do with oilfield operations.

E. Cost of remediation

570. Another key issue which has divided the Parties and which has an important impact on the quantum of damages concerns the estimated costs of remediation.

571. Ecuador submitted that once found liable Perenco is required to “fully restore the ecosystems in Blocks 7 and 21 or pay damages to allow the State to proceed with the restoration process.” Article 396, paragraph 2, of the 2008 Constitution is said to provide that any harm to the environment “give[s] rise to an obligation to fully restore the ecosystems and compensate the individuals and communities affected.”¹¹⁴⁹ Ecuador’s position was that since Perenco has “refused” to take responsibility for restoration, it must be ordered to pay damages in lieu.¹¹⁵⁰ As the Tribunal has already found, as a matter of Ecuadorian law, an impact on the environment resulting from oilfield operations is not to be equated with an environmental harm; the harm exists in cases of regulatory exceedances, unremediated spills, poorly constructed mud pits, etc. Moreover, production in the Blocks has increased. Perenco is therefore not obliged to incur the costs of returning the Blocks to a pre-anthropogenic pristine state of nature. It must, however, pay for any remediation for which it is legally responsible, such cost of remediation to be calculated having regard to market pricing.

572. In view of the fact that the Tribunal intends to appoint an independent expert to assist in ascertaining the environmental condition of the Blocks in accordance with the legal and factual findings made in this Decision, the Tribunal leaves to one side the extent of remediation which might be required. That depends upon the expert’s resampling results. The Tribunal does consider it important to set out its views on the remediation costs issue.

573. The Parties differ on: (i) the type of remediation technology; (ii) the costs for off-site treatment; (iii) whether off-site remediation is even necessary; and (iv) the costs of transportation and backfilling and contingency and other factors.

574. The Parties and their experts differ on whether all adversely affected soils should be treated off-site.¹¹⁵¹ GSI proposed that such soil be sent to an officially-approved soil remediation facility in the city of Coca for treatment while IEMS proposed that it is sent to an unspecified offsite bio-treatment facility.¹¹⁵² They also disagreed on the treatment of soils contaminated by heavy metals; GSI proposed an on-site lined landfill, while IEMS proposed an off-site landfill.¹¹⁵³

575. Since the Tribunal has rejected IEMS’ principal means of mapping contamination and has held that properly contained drilling muds need not be dug up and transferred to other sites for disposal, the volume of soil requiring remediation will be considerably smaller than the high volumes estimated by IEMS. With respect to what might require remediation, the Tribunal’s views are as follows.

576. In the event that the expert considers that certain mud pits do not meet the requisite standards, they shall be remediated. Consistent with the Tribunal’s findings, this would involve

¹¹⁴⁹ Exhibit EL-89, 2008 Constitution.

¹¹⁵⁰ Counter-Memorial, paragraphs 692-697.

¹¹⁵¹ See above at paragraphs 232-233, 267, 287-288.

¹¹⁵² IEMS ER III, section 3.2.6.

¹¹⁵³ IEMS ER III, section 3.2.6, p 73.

in-situ disposal in properly constructed and sealed pits. In such circumstances, it is unlikely that there would be much in the way of transportation costs associated with the relocation and confinement of such soils.

577. In the case of other soils that are found to be contaminated, the determination of whether such soils can be properly treated and disposed of in the Blocks is not something that the Tribunal can decide in the abstract. If the expert finds that a particular volume of soil requires special treatment due to the nature of the contamination and that that treatment is better provided off-site, it follows that the soil must be treated in the most environmentally protective manner possible and transportation as well as remediation costs will be incurred.

578. If there is any soil that cannot be treated and instead needs to be confined in a hazardous waste landfill, then the Tribunal considers that it must be confined in a properly constructed and licenced hazardous waste landfill. If there is such a facility located within an industrial area situated in the Blocks, such soil could be deposited there. If there is any doubt as to whether such a landfill is suitable, any contaminated soil that must be landfilled should not be kept in the Amazonian rainforest area of Ecuador, but rather disposed of in a less environmentally sensitive area of the country. For this reason, the Tribunal is not attracted to GSI's suggestion of the construction of an on-site landfill in either of the Blocks.¹¹⁵⁴

579. As for the costs associated with the treatment and, if necessary, transport of contaminated soil, the Tribunal considers that the expert must be guided by in-country price quotations that realistically reflect the conditions in which the work will be performed.¹¹⁵⁵ The Tribunal's sense is that the estimates employed by IEMS were too far removed from Ecuador and not tied to actual in-country remediations (such as those conducted at the behest of Petroamazonas and Petroecuador) to be considered to be reliable.¹¹⁵⁶ The Tribunal also has doubts that there is not sufficient in-country expertise to deal with such remediation as might be required.¹¹⁵⁷ If the Tribunal's expert is persuaded otherwise and the matter returns to the Tribunal for final determination, the Tribunal will revisit its present assumption in that regard.

580. Therefore, when estimating costs of any remediation for which Perenco is liable, the expert shall be guided by Ecuadorian costs. These are expected to be much closer to the 'per unit' costs estimated by GSI (the Tribunal noting however the qualification that the work required may be more substantial than that estimated by GSI) than to those employed by IEMS.

¹¹⁵⁴ GSI ER I, paragraph 246, Appendix H.

¹¹⁵⁵ IEMS used, for example, unit costs for remediation of abandoned hazardous waste landfills in the United States as published by the Federal Roundtable on Remediation Technologies and the US EPA's "Cleaning Hazardous Waste", the European Contaminated Land Rehabilitation Network for Environmental Technologies. 2nd IEMS ER, pp 170, 171, 173; IEMS ER III, Attachment 34.2. It also referred to pricing information received from two Ecuadorian contractors, but this was limited. See the "economical quotation" for another site given by GPower and submitted with the Reply. IEMS ER III, Attachment 34.3. In contrast, GSI looked at prior remediation projects in the Oriente area, costs published by the Pit Remediation Project of the Ecuadorian Oriente Region, and quotes from private contractors (GSI ER I, Appendix G.2.).

¹¹⁵⁶ The Tribunal agrees with Perenco that actual costs are the best guide for estimating comparagraphble remediation works (Rejoinder, paragraph 14). Perenco argued that IEMS' costs estimates were some 400% higher than actual, verified costs in Ecuador for the relevant remediation work (Rejoinder, paragraph 25).

¹¹⁵⁷ As Perenco observed, a number of local contractors are licences by the Ministry of Environment and perform work for oil companies, including State-owned companies (Rejoinder, paragraph 212).

F. Validation of the Experts' Conflicting Contamination Determinations and Delineations Thereof

581. The Tribunal has now arrived at the point where it has narrowed the counterclaim on the principal issues of law and fact. The Tribunal has set out the main issues of fact and law which have divided the experts. However, with regard to many of the IEMS/GSI differences, the Tribunal does not feel able to prefer one above the other. It seems to the Tribunal that each was attempting to achieve the best result for the party by whom they were instructed, and that they crossed the boundary between professional objective analysis and party representation. It is clear to the Tribunal that the experts were effectively shooting at different targets and this has made the work of this Tribunal most difficult.

582. After reviewing the evidence, the Tribunal is satisfied that there is some contamination in the Blocks for which it is likely that Perenco will be held liable. Even GSI was prepared to accept that there was contamination in the two Blocks (although Perenco argued that such contamination resulted from the acts of other parties).

583. The Tribunal has carefully considered the evidence and has found that there are certain issues of fact on which it is extremely difficult for it to make proper determinations. As has been seen, the Tribunal has completely rejected the IEMS' mapping exercise based on background values and has found that the appropriate means for establishing the volume of contaminated soils is delineation. In addition, the Tribunal has rejected certain interpretations of the Ecuadorian regulatory standards applied by IEMS. In applying the proper regulatory standards, the Tribunal finds that the expert evidence from both sides does not provide a sufficient degree of confidence as to the actual conditions in the Blocks. The Tribunal considers that there are too many gaps and conflicts between IEMS' and GSI's evidence on these key issues. For example, GSI did not take samples at all of the sites that IEMS tested; for certain sites where IEMS found contamination, GSI also tested the soil but took samples at different depths, and GSI used "indicator parameters" rather than testing comprehensively for all possible oilfield related contaminants. The Tribunal considers that these gaps must be filled and the technical conflicts must be resolved in order to arrive at a fair and proper disposition of Ecuador's counterclaim.

584. In its post-hearing submission, Perenco essentially posited that the Tribunal faces an 'all or nothing' decision:

The various technical issues on which GSI and IEMS so fundamentally disagree are relevant not because the Tribunal should take as its task picking and choosing between the experts on each issue one by one, cafeteria-style, to arrive at some hybrid approach. There is too much interrelationship between the issues to make that kind of exercise productive. Instead, those technical issues are relevant because they provide the basis on which the Tribunal can assess the two approaches, and the basis on which the Tribunal should conclude that GSI's approach is far more reliable and trustworthy than IEMS' approach.¹¹⁵⁸

585. While the Tribunal agrees with Perenco that given the present state of the evidence it should not "take as its task picking and choosing between the experts on each issue one by one, cafeteria-style" – because the Tribunal does not possess the requisite technical expertise to

¹¹⁵⁸ Perenco's Post-Hearing Brief, paragraph 50.

decide between experts' disagreements over highly technical issues – it is equally uncomfortable with simply picking one set of experts' conclusions over the other. The Tribunal well understands that the onus of proof is on a party who makes an allegation and it could be said that because of the doubt in which the Tribunal finds itself Ecuador could be said to have failed in tipping the burden in its favour. However, as the Tribunal is satisfied that there has been some damage for which it seems likely that Perenco is liable, the Tribunal is not disposed to dismiss the counterclaim *in limine*. Given the Constitution's embrace of the importance of the protection of the environment, the most accurate picture of the environmental condition of the Blocks possible – based on the prior sampling locations of both IEMS and GSI – must inform the Tribunal's decision on the counterclaim.

586. Accordingly, the Tribunal has concluded that it must require an additional phase of fact-finding in order to arrive at a proper and just conclusion. It is not content to issue a final determination on the extent of Perenco's liability on the basis of the current expert reports.

587. As already intimated, the Tribunal intends to appoint its own independent environmental expert who will be instructed to apply the Tribunal's findings set out above and work with the Tribunal and the Parties to enable the Tribunal to determine the extent of contamination in the Blocks for which compensation is owed.

588. The Tribunal wishes to underscore the fact that the expert chosen to conduct this investigation (after consultation with the Parties to ensure complete independence and impartiality) will be the Tribunal's expert and will be solely answerable to the Tribunal. In due course, the Tribunal will provide a protocol for the expert, setting out the precise questions to be answered in line with the findings made in this Decision. The Parties will be permitted to attend when the expert and his/her team carries out the necessary investigations and the Parties will receive a copy of the expert's report and will be permitted to comment thereon in due course. Naturally, the costs involved in this exercise will initially be borne by the Parties in equal shares with any subsequent allocation of costs to be determined by the Tribunal at the appropriate time.

589. The Tribunal wishes to emphasise that with the effluxion of time it will be necessary to consider what impact Petroamazonas has had on the environmental conditions in Blocks 7 and 21. It intends to deal with this issue as follows.

590. First, in the Tribunal's view, IEMS and GSI had ample opportunity to take samples in whatever parts of the Blocks either considered necessary. The Tribunal's expert will therefore confine his/her work to the specific sites at which soil samples were taken and groundwater sampling wells were drilled. Although, due to the differences between IEMS and GSI's sampling practices, it will be necessary for the expert to re-sample at those sites where contamination was detected by one or the other party's experts and to delineate the extent of any such contamination, the Tribunal's expert will not sample other sites that the Parties' experts did not sample.

591. Second, the Tribunal recognises that the conditions likely to exist in 2015 might have been affected by the actions of Petroamazonas. It might therefore be necessary for the Tribunal to determine Perenco's share of any responsibility for contamination in order to ensure that it is not made responsible for the acts of Petroamazonas.

592. Third, the Tribunal wishes to make clear that this course of action is not intended to provide any opportunity for the Parties to provide new evidence (except that called for by the

Tribunal in aid of its expert). They have had ample opportunity to present their cases. The purpose of the next phase is for the Tribunal's expert to validate one approach or the other in respect of the remaining technical issues.

593. That said, the Tribunal considers it highly desirable for the Parties to take time to properly digest the contents of this Decision and its implications in the overall scheme of things, and they may wish to consider embarking on a mediation process or some other consensual procedure to assist in arriving at a mutually acceptable figure. Having regard to the Tribunal's findings in relation to: (i) background values; (ii) the temporal application of the 2008 Constitution to the facts of this case; (iii) the applicable standards under Ecuadorian law; (iv) the 2008 Constitution's variation of the limitations period; (v) the Tribunal's criticism of the narrowness of GSI's sampling practices; (vi) the Tribunal's rejection of IEMS' mapping and unit costs for remediation; and (vii) the fact the Tribunal will not permit the sampling of areas in the Blocks which were not previously sampled by either party's experts, the Tribunal believes that the remaining issues are most unlikely to lead to an award of damages anywhere near the amount claimed by Ecuador. The Parties will doubtless take all this into account as well as the considerable cost of the further enquiry which the Tribunal considers is absolutely necessary to arrive at a just result in the circumstances of this case in deciding whether it is possible for them to arrive at a mutually satisfactory resolution of this aspect of the dispute.

594. The Tribunal's strong preference and hope is that after receiving this Decision and considering the Tribunal's findings, the legal aspects of the counterclaim will have been sufficiently clarified so as to enable the Parties to agree on a suitable amount of compensation with or without the assistance of an independent expert or a final Tribunal determination. In the event that such an agreement is reached, it will be recorded and included in the Tribunal's Award. If an agreement is not reached, the Tribunal will await the results of its expert's work and make a final decision which will be included in the Award.

595. The Tribunal is mindful that it is almost certain that the sampling performed by both experts did not adequately capture all of the contamination. Indeed, notwithstanding its initial declaration that its intention was to "achieve a comprehensive assessment of current environmental conditions for each of the 74 oilfield facilities investigated by IEMS in the CPUF, Block 7, and Block 21 area", this is not what GSI did.¹¹⁵⁹ As Ecuador pointed out, GSI accepted that it confined its investigation to seeking to invalidate RECs identified by IEMS.¹¹⁶⁰ Mr. Connor further confirmed that GSI did not attempt to comprehensively estimate the amount of contamination in the Blocks, separately from its review of IEMS' work, and acknowledged that both experts could have missed instances of contamination.¹¹⁶¹ Be this as it may, the present exercise is concerned with an accurate and impartial analysis of the work that was done by the experts – who had ample opportunity to examine the Blocks. Their work must now be evaluated by the expert in accordance with the Tribunal's findings.

596. It need hardly be said that every attempt must be made to base the determination of damages owed on the situation existing at the time of the Consortium's departure in July 2009.

¹¹⁵⁹ GSI ER I, paragraph 2.

¹¹⁶⁰ Transcript, Hearing on Counterclaims, Day 1, p 140 (Opening Statement of Philip Dunham).

¹¹⁶¹ See, for e.g., Transcript, Hearing on Counterclaims, Day 6, p 1709- 1716, 1723-1725, 1729, 1733 (Testimony of GSI).

597. Turning to certain sampling issues, the Tribunal notes that GSI excluded platforms and CPFs from its investigation, because it took the position that they are “operating industrial facilities”, a position which Ecuador rejects as an unjustified basis on which to exclude what it says in effect amounts to some 26% of the contamination beyond regulatory levels identified by IEMS in Block 7, this figure rising to 50% in Block 21.¹¹⁶² Given the fact that platforms and CPFs have been taken over and employed by Petroamazonas, it is difficult to apportion responsibility for any contamination therein. The Tribunal is also mindful of Mr. Connor’s cautionary words about Ecuador’s proposed approach to remediation of operating platforms:

Basically at facilities where operations are ongoing, it doesn't force you to remediate. It says, "You must manage that impact." And the management could include a remediation component, but certainly it doesn't obligate it, and the practice is it doesn't happen. And the reason it doesn't happen is because you don't want to go with very large machines, start digging a platform that has high-pressure pipes, that has a well head under pressure, where you're conducting risky operations. It doesn't make sense.¹¹⁶³

598. The Tribunal considers that the only equitable solution in relation to exceedances that were detected on operating platforms is to have the expert examine the exceedances samples taken by IEMS, consider their significance in light of all relevant circumstances, and if they are deemed to warrant remediation, Perenco is *prima facie* liable for the costs thereof (having regard to the Tribunal’s findings on the operation of Ecuadorian law made above), and subject to the expert’s examining Petroamazonas’ post-16 July 2009 spill reporting records to ensure that Perenco is not being held liable for the acts of its successor. In the event of any overlapping contamination, it will be necessary to apportion responsibility between the two.

599. If there are any platforms in the Blocks that were operated by Perenco and are no longer operated, Mr. Connor’s concern is no longer relevant. Consistent with the 2008 Constitution’s emphasis on full restoration, such platforms must be remediated to the full extent of industry best practice under Ecuadorian law. The same applies to any wells that were retired by Perenco. The objective should be to remediate to the fullest extent possible, consistent with the Constitution’s objective of full restoration (and the Participation Contracts’ objective of returning those areas to their natural state).¹¹⁶⁴

¹¹⁶² See Transcript, Hearing on Counterclaims, Day 1, pp 141-142 (Opening Statement of Philip Dunham). GSI accepts that it excluded from its investigation platforms and CPFs, otherwise referred to as “operating industrial facilities”, because it took the position that remediation was not required within the limits of platforms (GSI ER I, Appendix D: “exceedances in soil were within an operating industrial facility”). RPS challenged this position (RPS ER II, p 12). Ecuador submits that this is an unjustified and significant omission because IEMS identified 20 platforms which exhibited contamination beyond regulatory levels.

¹¹⁶³ Transcript, Hearing on Counterclaims, Day 6, p 1742 (Testimony of GSI).

¹¹⁶⁴ As, for example, stated in the Block 21 Contract at clause 5.1.20.10, which requires the contractor to: “Take responsibility for the cleanup and reforestation of the area with species similar to those originally found at the site, in order to, with time, allow the potential return to environmental conditions similar to those encountered at the beginning of the operations; also take responsibility for the abandonment of wells and installations for which the Contractor has been responsible as a consequence of the execution of this Contract. Said cleanup, reforestation and return to similar conditions and abandonment activities shall be performed in accordance with the Environmental Regulation for Hydrocarbon Operations and the Environmental Impact Study. The Contractor shall not be liable for environmental conditions preexisting at the beginning of operations under the Services Contract. In cases in which

600. In addition to platforms and retired wells, the Tribunal's expert must examine all sites in which regulatory exceedances have been identified by either or both of the Parties' experts. If, because the Parties' experts sampled at different levels, it is necessary to take new samples, that shall be done, and such sampling shall, under the direction of the Tribunal's expert, be comprehensive and designed to determine whether exceedances do or do not exist at each previously identified site. Any resampling must occur only at the specific sites already identified in the IEMS and GSI reports.

601. To the extent that the areas surrounding those points of contamination were not delineated, for example, because IEMS did not delineate them due to its reliance upon the ArcGIS software or because GSI did not delineate certain sites because they did not pass its "indicator parameter" screen or for other reasons, that process of delineation must now occur, and it must be conducted properly, under the direction of the Tribunal's expert.

602. If there is any evidence that any area which remains to be delineated has since been contaminated by Petroamazonas, that evidence must be taken into account and the amount of damages payable must be reduced appropriately. In the event of any dispute about a particular site, Ecuador shall be required to provide all relevant documentation pertaining to the environmental condition of that site since 19 July 2009.

603. The sampling review and any additional delineation must check every instance of contamination identified by IEMS and GSI and determine whether it is established in light of the Tribunal's foregoing determinations of the applicable regulatory rule. Where there are sites that were sampled by IEMS but not by GSI and/or the samples were tested for substances by IEMS but not tested by GSI, the focus will necessarily have to be based on IEMS' samples unless the independent expert concludes that there is a need to take new samples.

604. The same exercise must be performed in relation to the mud pits used by Perenco up to 16 July 2009. Perenco cannot be held liable for pits constructed by prior operators which it itself did not use, because by definition it would be able to show that any damage caused from leachates escaping from such pits cannot be attributed to it. It can only be held liable for damage resulting from the pits which it used or built. It is necessary to ascertain whether the drilling muds were disposed of in a properly constructed sealed pit or disposed of in an unsealed pit or one that was improperly constructed and which therefore may be more susceptible to leaching.

605. Unless visual or other testing clearly demonstrates that a pit was lined, then the more conservative and environmentally protective remediation criteria set out in RAOHE Table 7(a) shall be applied to ensure that any leaching which might have taken place is contained and remediated and that there is no further prospect of contamination. In this respect, mindful of IEMS' allegation that GSI took samples too far away from the pits, which the Tribunal is not in a position to determine, the Tribunal's expert shall ensure that any new samples are taken at the appropriate spots situated around the perimeters of the pits.

the competent authorities order the remediation of the environment in the Contract Area, due to preexisting conditions, the costs and contracting [for this purpose] shall not be the responsibility of the Contractor." (Exhibit CE-17/CE-CC-28, Block 7 Participation Contract (translation resubmitted on 04-12-12), PER 04764, 04768, 04769.)

606. As for pits that Perenco constructed and that have been since used by Petroamazonas, again it will be necessary to apportion responsibility between the two companies in the event of any exceedances.

607. The groundwater issue presents particular difficulties because the Tribunal is uncomfortable with both side's sampling: IEMS' because it appeared to be compromised by the wells and the materials used to take samples, and GSI's because of its filtering of all samples which had the effect of reducing the possibility of detecting certain contaminants that should be looked for without filtering.

608. This issue is complicated by the effluxion of time. The Tribunal considers that the only equitable solution is for a new, proper groundwater campaign to be conducted under its expert's supervision and then an allocation of any remediation costs (if remediation is required) to be made as between Perenco and Petroamazonas. Such sampling shall be taken at the same sites at which the experts took samples. Since Perenco ran the Blocks from late 2002 until mid-July 2009 (roughly six and a half years) and Petroamazonas has operated them from mid-July 2009 to the present day (roughly five and a half years) the allocation will be based on the amount of time in which the Blocks have been under the stewardship of the two operators (e.g. 55/45%).

609. Once this exercise has been completed, it will be possible to arrive either at a negotiated settlement of the damages owed by Perenco to Ecuador, or the Tribunal will be in a position to make a final determination.

610. Finally, the Tribunal has evaluated the infrastructure counterclaim. It has decided that it is most expedient and constructive for this Decision on the principal counterclaim to be issued so as to permit the expert to be selected, appointed, instructed on his/her mandate and to then engage in the work that needs to be done. The infrastructure counterclaim, although important, is for a significantly lesser sum. In addition, the Tribunal considers that it might profit from the evidence pertaining to Perenco's operatorship that will be adduced in the quantum phase and feels that it would be best to leave this claim to be addressed in the overall quantum.

V. DECISION

611. For the foregoing reasons, the Tribunal decides as follows:

- (1) Ecuadorian law, in the form of Ecuador's Constitution, and specific regulatory provisions within RAOHE, TULAS and the Environmental Management Law, provides the standards governing the Tribunal's evaluation of the environmental condition of Blocks 7 and 21. It does not require the Tribunal to generally apply a "background values" or "base values" approach.
- (2) RAOHE and TULAS provide the regulatory limits applicable to the evaluation of the environmental condition of lands on which hydrocarbon operations have been permitted to take place in furtherance of the Environmental Management Law's general framework.
- (3) For the period commencing 4 September 2002, when Perenco first acquired its interests in the Blocks, through to 19 October 2008, the 1998 Constitution's fault-based regime applies.
- (4) For any contamination in excess of regulatory standards shown to have occurred after 20 October 2008 up until the Consortium suspended operations on 16 July 2009, Perenco is strictly liable in accordance with the 2008 Constitution's strict-liability regime for environmental damage.
- (5) With regard to any environmental harm occurring in the Blocks from 16 July 2009, when Petroamazonas took over the Blocks, Perenco bears no liability. Its remediation obligation extends only to regulatory exceedances that predate Petroamazonas's activities and which themselves have not been overtaken by Petroamazonas's new works.
- (6) The four-year limitation period of Article 2235 of the Ecuadorian Civil Code does not bar Ecuador's counterclaim.
- (7) Perenco's submission that it bears no responsibility for the Blocks on the basis that Petroamazonas is now the operator and its ownership interests in the Blocks have been brought to an end is rejected.
- (8) The Tribunal shall appoint an independent environmental expert to assist the Tribunal in ascertaining the environmental condition of the Blocks in accordance with the legal and factual findings made by the Tribunal in this Decision. The Tribunal will consult the Parties with regard to the appointment of the Tribunal's expert and will take their views into account but the decision as to the identity of and scope of work of the expert will be that of the Tribunal alone.
- (9) The Tribunal anticipates that the process of appointing an expert will take some two months; during this period, the Parties are instructed to review the findings made in this Decision and to consult with each other with a view to discussing whether it would be possible to arrive at a settlement of this counterclaim in a manner consistent with this Decision. Any communications or documents exchanged by the Parties in connection

with such discussions shall be on a without prejudice basis and shall not be disclosed to the Tribunal or to the Tribunal's expert in the event that no settlement is reached.

- (10) The expert will be instructed to apply the Tribunal's findings and work with the Tribunal and the Parties to enable the Tribunal to determine the extent of contamination in the Blocks for which remediation is required. At all times the expert will be solely answerable to the Tribunal.
- (11) The expert will be required to perform its work in accordance with the directions set out in this Decision and as set out in any protocol that might be issued by the Tribunal after consultation with the Parties.
- (12) Delineation, instead of modelling, shall be employed to determine the volume of any soil that requires remediation.
- (13) Table 6, Annex 2 of RAOHE applies to the identification and remediation of contaminated soil, but to the extent that it is silent, TULAS Book VI, Annex 2, Table 3, applies.
- (14) Ecuadorian law relevant to evaluation of the environmental effect of hydrocarbon operations on land does not require the use of indicator parameters.
- (15) In any case of doubt as to the applicable land-use criteria, subject to prior determinations of Ecuadorian authorities which have significant probative value, the more stringent land-use designation applies.
- (16) On the matter of mud-pits, Table 7 of Annex 2 of RAOHE provides the applicable technical standard, and Perenco has no obligation to dig up and remediate properly constructed and confined mud pits whose contents do not exceed the applicable regulatory standard. If a pit has an impermeable liner, Table 7(b) applies. If there is no impermeable liner, Table 7(a) applies. In any case of doubt, the more environmentally protective standard in Table 7(a) applies.
- (17) On the matter of groundwater testing, the expert shall undertake groundwater sampling in accordance with the Tribunal's determination of the appropriate technical standard under Ecuadorian law and industry practice as set out in this Decision. Its sampling shall be confined to the sampling locations identified by IEMS and GSI. Given the effluxion of time, it might be necessary to allocate responsibility for remediation as between Perenco and Petroamazonas. The Tribunal will await the expert's report in this regard.
- (18) Questions of remediation method and cost are to be resolved in accordance with the Tribunal's directions in that respect as set out in this Decision.
- (19) The Parties shall be entitled to send a representative to witness the expert's sampling activities.
- (20) The Tribunal will instruct the expert to move with all deliberate dispatch in order for the expert to be in a position to report back to it in a timely fashion. The Parties shall be given an opportunity to comment on the expert's report prior to the Tribunal's rendering a decision or award on this phase of the proceeding.

- (21) The costs of the expert's work will initially be borne by the Parties in equal shares with any subsequent allocation of costs to be determined by the Tribunal at the appropriate time.
- (22) The Tribunal reserves its decision on the infrastructure counterclaim with which it will deal either in its quantum Decision or thereafter.
- (23) The Tribunal reserves its decision as to costs and expenses of the arbitration as claimed by the Parties.

[signed]
Judge Peter Tomka
President of the Tribunal

[signed]
Mr. Neil Kaplan, C.B.E., Q.C., S.B.S.
Arbitrator

[signed]
Mr. J. Christopher Thomas, Q.C.
Arbitrator