

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

AWARD

Members of the Tribunal

H.E. Judge Peter Tomka, President
Mr. Neil Kaplan, C.B.E., QC, SBS
Mr. J. Christopher Thomas, QC

Secretary of the Tribunal

Mr. Marco Tulio Montañés-Rumayor

Date of dispatch to the Parties: 27 September 2019

REPRESENTATION OF THE PARTIES

Representing Perenco Ecuador Limited:

Mr. Mark W. Friedman
Ms. Ina C. Popova
Ms. Floriane Lavaud
Ms. Laura Sinisterra
Ms. Sarah Lee
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Representing the Republic of Ecuador:

Procuraduría General del Estado
Dr. Íñigo Salvador Crespo – Procurador General del Estado (from August 2018); preceded by Dr. Rafael Parreño Navas, Procurador General del Estado (February 2018 – August 2018); and Dr. Diego García Carrión, Procurador General del Estado (April 2008 – January 2018).

Dr. Claudia Salgado Levy – Directora Nacional de Asuntos Internacionales y Arbitraje (from August 2018); preceded by Dra. Blanca Gómez de la Torre (June 2013 – July 2018); preceded by Dra. Christel Gaibor Flor (March 2012 – May 2013); preceded by Dr. Francisco Grijalva (May 2011 – February 2012); preceded by Dr. Álvaro Galindo (August 2008 – April 2011); and preceded by Dr. Carlos Venegas (April 2008 – July 2008).

Ms. Nazaret Ramos – Subdirectora de Asuntos Internacionales (from March 2019); preceded by Dra. Christel Gaibor (April 2008 – February 2019).

Ms. Diana Moya Dávalos – attorney PGE (from July 2013).
Mr. Gary López Vélez – attorney abogado PGE (June 2017 – December 2018).
Mr. Francisco Larrea – attorney PGE (March 2011 – June 2013).
Ms. Gianina Osejo – attorney PGE (September 2009 – May 2012).
Mr. Agustin Acosta – attorney PGE (May 2010 – June 2011).
Mr. Francisco Paredes Balladares – attorney PGE (September 2009 – January 2011).
Dr. Claudia Salgado Levy – attorney PGE (April 2008 – August 2009).

Prof. Eduardo Silva Romero
Mr. José Manuel García Represa
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ANNEX B.	Annex B-1

FREQUENTLY USED ABBREVIATIONS AND ACRONYMS

[CA] [EL]	Legal Authority [Claimant] [Respondent]
[CE] [E]	Exhibit [Claimant] [Respondent]
Amended Request for Arbitration	Claimant's Amended Request for Arbitration, dated 18 July 2008
Arbitration Rules	ICSID Rules of Procedure for Arbitration Proceedings (2006)
BIT or the Treaty	Agreement between the Republic of France and the Republic of Ecuador Concerning the Encouragement and Reciprocal Protection of Investment
Brattle ER II	The Brattle Group Expert Report, prepared by James Dow and Richard Caldwell, dated 4 May 2015 (
Brattle ER III	The Brattle Group Expert Report, prepared by James Dow and Richard Caldwell, dated 16 October 2015
Cl. PHB Q.	Claimant's Post Hearing Brief on Quantum, dated 29 January 2016
Cl. Rep. M.	Claimant's Reply to Respondent's Counter-Memorial, dated 12 April 2012
Cl. Rep. PHB Q.	Claimant's Reply Post Hearing Brief on Quantum, dated 29 February 2016
Combe WS II	Witness Statement of Laurent Combe, dated 19 December 2014
Combe WS III	Witness Statement of Laurent Combe, dated 24 July 2015
Consolidated Expert Report	Parties Annotated Comments on the Independent Expert Report
Resp. C-Mem. Q.	Respondent's Counter-Memorial on Quantum, dated 4 May 2015
Crick WS II	Witness Statement of John Crick, dated 19 December 2014
Crick WS III	Witness Statement of John Crick, dated 24 July 2015

d'Argentré WS IV	Witness Statement of Eric d'Argentré, dated 3 July 2013
d'Argentré WS V	Witness Statement of Eric d'Argentré, dated 19 December 2014
d'Argentré WS VI	Witness Statement of Eric d'Argentré, dated 24 July 2015
Decision on Jurisdiction	Decision on Jurisdiction, dated 30 June 2011
Decision on Liability	Decision on Remaining Issues on Jurisdiction and on Liability, dated 12 September 2014
Decision on Perenco's First Dismissal Application	Decision on Perenco's Application for Dismissal of Ecuador's Counterclaims, dated 18 August 2017
Decision on Provisional Measures	Decision on Provisional Measures, dated 8 May 2009
Decision on Reconsideration	Decision on Ecuador's Reconsideration Motion, dated 10 April 2015
Ecuador or the Respondent	Republic of Ecuador
First Dismissal Application	Claimant's Application to Dismiss the Counterclaims, dated 18 April 2017
GSI ER I	GSI Environmental Inc. Expert Report, dated 20 September 2012
GSI ER II	GSI Environmental Inc. Expert Report, dated 12 July 2013
ICSID Convention	Convention on the Settlement of Investment Disputes Between States and Nationals of Other States, dated 18 March 1965
ICSID or the Centre	International Centre for the Settlement of Investment Disputes
Independent Expert	Mr. Scott MacDonald, from Ramboll, appointed as the Tribunal's independent expert by Procedural Order No. 16, dated 6 July 2016
Independent Expert Report or Report	Mr. Scott MacDonald's Expert Report, dated 19 December 2018

Interim Decision on Counterclaim	Interim Decision on the Environmental Counterclaim, dated 11 August 2015
Intertek I	Expert Report of Geoffrey R. Egan, Intertek, dated 28 September 2012
Intertek II	Expert Report of Geoffrey R. Egan, Intertek, dated 3 July 2013
JOAs	Novation of Joint Operating Agreement in respect of Block 7, Oriente Basin, Ecuador, dated 12 December 2002 (Exhibit CE-31), and Novation of Joint Operating Agreement in respect of Block 21, Oriente Basin, Ecuador, dated 12 December 2002 (CE-32)
Kalt ER III	Expert Report of Joseph P. Kalt, dated 19 December 2014
Kalt ER IV	Expert Report of Joseph P. Kalt, dated 24 July 2015
Loose ER VI	Expert Report of Hernan Perez Loose, dated 19 December 2014
Loose ER VII	Expert Report of Hernan Perez Loose, dated 24 July 2015
Luna WS III	Witness Statement of Pablo Luna, dated 22 February 2013
Memorial/Cl. Mem. Q	Claimant's Memorial on Quantum, dated 19 December 2014
Palacios WS I	Witness Statement of Derlis Palacios, dated 30 November 2011
Palacios WS III	Witness Statement of Derlis Palacios, dated 23 July 2012
Participation Contracts/PSCs	Participation Contracts for Blocks 7 and 21 (Exhibit CE-17/CE-CC-28: Block 7 and Exhibit CE-10/CE-CC-13: Block 21)
Parties	Claimant and the Respondent
Perenco or the Claimant	Perenco Ecuador Limited

Pinto WS I	Witness Statement of Germánico Pinto, dated 28 November 2011
Pinto WS II	Witness Statement of Germánico Pinto, dated 25 July 2012
Quantum Closing	Quantum Closing hearing held in The Hague on 21 April 2016
Quantum Hearing	Hearing on Quantum held in Paris from 9-13 November 2015
Quantum Rejoinder	Respondent's Rejoinder on Quantum, dated 16 October 2015
Quantum Reply/Cl. Rep. Q.	Claimant's Reply on Quantum, dated 24 July 2015
Rejoinder	Ecuador's Rejoinder to Perenco's Second Application to Dismiss Ecuador's Counterclaims, dated 26 April 2018
Reply	Perenco's Reply in Support of its Second Application to Dismiss Ecuador's Counterclaims, dated 5 April 2018
Request for Arbitration	Claimant's Request for Arbitration, dated 30 April 2008
Resp. PHB Q.	Respondent's Post Hearing Brief on Quantum, dated 29 January 2016
Resp. Rep. PHB Q.	Respondent's Reply Post Hearing Brief on Quantum, dated 29 February 2016
Resp. PHB CC	Respondent's Post-Hearing Brief on Counterclaims, dated 6 November 2013
Response	Ecuador's Response to Perenco's Second Application to Dismiss Ecuador's Counterclaims, dated 15 March 2018
RPS ER IV	Expert Report of RPS, dated 4 May 2015
RPS ER V	Expert Report of RPS, dated 16 October 2015
Saltos WS I	Witness Statement of Wilfrido Saltos, dated 28 September 2012
Second Dismissal Application	Perenco's Second Application to Dismiss Ecuador's Counterclaims, dated 30 January 2018

Settlement Agreement	Settlement agreement between Burlington and Ecuador, dated 1 December 2017
Strickland ER I	Expert Report of Richard F. Strickland, dated 19 December 2014
Strickland ER II	Expert Report of Richard F. Strickland, dated 24 July 2015
Tr. (day) (MacDonald) (date) [page:line]	Transcript of the Independent Expert Hearing held in The Hague from 11-12 March 2019
Tr. [J.] [P.M.] [M.][page:line]	Transcript of the hearing on jurisdiction / on provisional measures / hearing on merits
Tr. Q. (day) [page:line]	Transcript of the Hearing on Quantum held in Paris from 9-13 November 2015
Tr. Q. (6) [page:line]	Transcript of the Quantum Closing hearing held in The Hague on 21 April 2016

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. Procedural History

4. On 30 June 2011, the Tribunal issued its Decision on Jurisdiction (“**Decision on Jurisdiction**”).
5. On 12 September 2014, the Tribunal issued its Decision on Remaining Issues on Jurisdiction and on Liability (“**Decision on Liability**”).
6. On 26 November 2014, the Tribunal issued Procedural Order No. 12 fixing the calendar for the quantum phase.
7. In accordance with the calendar, on 19 December 2014, the Claimant filed its Memorial on Quantum (“**Memorial**”). It was accompanied by the witness statements of Messrs. Didier Lafont, Laurent Combe, John Crick, Rodrigo Márquez Pacanins, and François Perrodo (all second witness statements) and Mr. Eric d’Argentré (fifth witness statement); and the expert reports of Dr. Richard Strickland (first expert report), Professor Joseph P. Kalt (third expert report), and Dr. Hernán Perez Loose (sixth expert report).
8. On 10 March 2015, the Tribunal issued Procedural Order No. 13 regarding the Respondent’s request for production of documents.

9. On 10 April 2015, the Tribunal issued its Decision on Ecuador’s Reconsideration Motion (“**Decision on Reconsideration**”).
10. On 4 May 2015, the Respondent filed its Counter-Memorial on Quantum (“**Counter-Memorial**”). It was accompanied by the witness statements of Messrs. Christian Dávalos (fifth witness statement) and Gabriel Freire (first witness statement); and the expert reports of Professor Juan Pablo Aguilar (sixth expert report); The Brattle Group (second expert report); and RPS (fourth expert report).
11. On 12 June 2015, the Tribunal issued Procedural Order No. 14 regarding the Claimant’s request for production of documents.
12. On 24 July 2015, the Claimant filed its Reply on Quantum (“**Quantum Reply**”). It was accompanied by the witness statements of Messrs. Laurent Combe, John Crick and Rodrigo Márquez Pacanins (all third witness statements), and Mr. Eric d’Argentré (sixth witness statement); and the expert reports of Dr. Richard Strickland (second expert report), Professor Joseph P. Kalt (fourth expert report), and Dr. Hernán Pérez Loose (seventh expert report).
13. On 11 August 2015, the Tribunal issued its Interim Decision on the Environmental Counterclaim (“**Interim Decision on Counterclaim**”).
14. On 16 October 2015, the Respondent filed its Rejoinder on Quantum (“**Quantum Rejoinder**”). It was accompanied by the expert reports of Professor Juan Pablo Aguilar (seventh expert report), The Brattle Group (third expert report), and RPS (fifth expert report).
15. On 23 October 2015, the Tribunal issued Procedural Order No. 15 concerning the organization of the hearing on quantum.
16. A hearing on quantum was held in Paris from 9-13 November 2015 (“**Quantum Hearing**”). Present at the hearing were:

Tribunal

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

Assistants to the Tribunal Members:

Ms. Lucille Kante	Assistant to Mr. Neil Kaplan CBE QC SBS
Ms. Emily Choo Wan Ning	Assistant to Mr. J. Christopher Thomas QC

ICSID Secretariat

Mr. Marco Tulio Montañés-Rumayor	Secretary of the Tribunal
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For the Claimant:

Counsel

Mr. Mark W. Friedman	Debevoise & Plimpton LLP
Ms. Ina C. Popova	Debevoise & Plimpton LLP
Mr. Thomas H. Norgaard	Debevoise & Plimpton LLP
Ms. Terra L. Gearhart-Serna	Debevoise & Plimpton LLP
Ms. Z.J. Jennifer Lim	Debevoise & Plimpton LLP
Ms. Laura Sinisterra	Debevoise & Plimpton LLP

Support Personnel

Ms. Prasheela Vara	Debevoise & Plimpton LLP
Mr. Sébastien Darid	Debevoise & Plimpton LLP
Mr. Gaspard de Monclin	Debevoise & Plimpton LLP
Ms. Sarah Lee	Harvard Law School

Parties

Mr. Roland Fox	Perenco
Mr. François Hubert Marie Perrodo	Perenco

Witnesses

Mr. Laurent Combe	Perenco
Mr. John Crick	Perenco
Mr. Eric d'Argentré	Perenco
Mr. Didier Lafont	Petroceltic
Mr. Rodrigo Márquez Pacanins	MQZ Renewables
Mr. François Hubert Marie Perrodo	Perenco

Experts

Prof. Joseph P. Kalt	Compass Lexecon
Mr. Stephen Makowka	Compass Lexecon
Dr. Hernán Pérez Loose	Coronel y Pérez Abogados
Dr. Richard F. Strickland	The Strickland Group

For the Respondent:

Parties

Dr. Procurador Diego Carrión García	Procuraduría General del Estado
Dra. Blanca Gómez de la Torre	Procuraduría General del Estado
Ms. Diana Moya	Procuraduría General del Estado

Counsel

Prof. Eduardo Silva Romero	Dechert (Paris) LLP
Prof. Pierre Mayer	-
Mr. José Manuel García Represa	Dechert (Paris) LLP
Mr. Timothy Lindsay	Dechert (Paris) LLP
Ms. Maria Claudia Procopiak	Dechert (Paris) LLP
Ms. Gabriela González Giráldez	Dechert (Paris) LLP
Mr. David Attanasio	Dechert (Paris) LLP
Ms. Mónica Garay	Dechert (Paris) LLP
Mr. Antonio Gordillo	Dechert (Paris) LLP
Ms. Ruxandra Esanu	Dechert (Paris) LLP
Ms. Maria Quijada	Dechert (Paris) LLP
Ms. Katherine Marami	Dechert (Paris) LLP
Ms. Djamila Rabhi	Dechert (Paris) LLP
Ms. Peggy Alvarez Varas	Dechert (Paris) LLP
Ms. Sara María Moreno Sánchez	Dechert (Paris) LLP
Ms. Verena Wieditz	Dechert (Paris) LLP
Ms. Antonia Pascali	

Witnesses

Mr. Christian Dávalos	Witness
Mr. Gabriel Freire	Witness

Experts

Mr. Juan Pablo Aguilar	Universidad San Francisco de Quito
Mr. Gene Wiggins	RPS Knowledge Reservoir
Mr. Sheldon Gorell	RPS Knowledge Reservoir
Prof. James Dow	The Brattle Group
Mr. Richard Caldwell	The Brattle Group
Mr. Tom Dorrington Ward	The Brattle Group

17. Interpretation to and from English and Spanish was provided. The Quantum Hearing was also sound-recorded and transcribed verbatim, in real time, in both English and Spanish. Copies of the sound recordings and the transcripts were delivered to the Parties.
18. At the end of the Quantum Hearing, the Tribunal and the Parties held a procedural discussion in relation to post-hearing matters. After consulting with the Parties, the Tribunal fixed a calendar for post-hearing submissions, including a hearing on closing arguments.

19. On 29 January 2016, the Parties filed their Post-Hearing Briefs (“**PHBs**”) pursuant to Procedural Order No. 15.
20. On 29 February 2016, the Parties filed their Reply Post-Hearing Briefs (“**Reply PHBs**”).
21. A hearing on closing arguments was held at The Hague on 21 April 2016 (“**Quantum Closing**”). Present at the hearing were:

Tribunal

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

Assistants to the Tribunal Members:

Ms. Lucille Kante	Assistant to Mr. Neil Kaplan CBE QC SBS
Ms. Emily Choo Wan Ning	Assistant to Mr. J. Christopher Thomas QC

ICSID Secretariat

Mr. Marco Tulio Montañés-Rumayor	Secretary of the Tribunal
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Ms. Z.J. Jennifer Lim	Debevoise & Plimpton LLP
Ms. Laura Sinisterra	Debevoise & Plimpton LLP

Support Personnel

Ms. Mary Grace McEvoy	Debevoise & Plimpton LLP
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Parties

Mr. Roland Fox	Perenco
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For the Respondent:

Parties

Dr. Procurador Diego Carrión García	Procuraduría General del Estado
Dra. Blanca Gómez de la Torre	Procuraduría General del Estado
Ms. Diana Moya	Procuraduría General del Estado

Counsel

Mr. Eduardo Silva Romero	Dechert (Paris) LLP
Mr. Pierre Mayer	
Mr. Philip Dunham	Dechert (Paris) LLP
Mr. José Manuel García Represa	Dechert (Paris) LLP
Ms. Maria Claudia Procopiak	Dechert (Paris) LLP
Mr. David Attanasio	Dechert (Paris) LLP
Ms. Ruxandra Esanu	Dechert (Paris) LLP

Expert

Mr. Richard Caldwell	The Brattle Group
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22. On 6 July 2016, the Tribunal issued Procedural Order No. 16 concerning the appointment of Mr. Scott MacDonald as the Tribunal's independent expert ("**Independent Expert**") pursuant to the Interim Decision on Counterclaim.
23. From 1 November 2016 to 5 November 2016, the Parties and the Independent Expert visited the place connected with the dispute relating to the environmental counterclaim pursuant to ICSID Arbitration Rule 37(1).
24. On 18 April 2017, Perenco filed an application to dismiss the environment and infrastructure counterclaims ("**First Dismissal Application**").
25. On 23 May 2017, Ecuador filed its observations on Perenco's First Dismissal Application.
26. On 12 June 2017, Perenco filed a reply on its First Dismissal Application.
27. On 4 July 2017, Ecuador filed a rejoinder on Perenco's First Dismissal Application.
28. On 18 August 2017, the Tribunal issued its Decision on Perenco's Application for Dismissal of Ecuador's Counterclaims ("**Decision on Perenco's First Dismissal Application**").
29. On 30 January 2018, Perenco filed a second application to dismiss the counterclaims ("**Second Dismissal Application**").
30. On 15 March 2018, Ecuador filed observations on Perenco's Second Dismissal Application ("**Response**").
31. On 5 April 2018, Perenco filed a reply on its Second Dismissal Application ("**Reply**").
32. On 27 April 2018, Ecuador filed a rejoinder on the Claimant's Second Dismissal Application ("**Rejoinder**").
33. On 30 July 2018, the Tribunal informed the Parties of its decision, by a majority, to reject Perenco's Second Dismissal Application, with reasons to be given in the Award.

34. On 19 December 2018, the Independent Expert issued his report (“**Independent Expert Report**” or “**Report**”).
35. On 20 December 2018, Perenco filed a request for the Tribunal to decide on production of documents.
36. On 2 January 2019, Ecuador filed observations on Perenco’s request for the Tribunal to decide on production of documents.
37. On 15 January 2019, the Tribunal issued Procedural Order No. 17 concerning production of documents.
38. On 6 February 2019, the Tribunal issued Procedural Order No. 18 concerning the organization of the hearing on the Independent Expert Report.
39. On 23 February 2019, the Parties filed their observations on the Independent Expert Report.
40. On 11 to 12 March 2019, a hearing on the Independent Expert Report was held in The Hague (“**Expert Hearing**”). Present at the hearing were:

Tribunal

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

Assistant:

Ms. Emily Choo Wan Ning	Assistant to Mr. J. Christopher Thomas QC
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Tribunal’s Independent Expert

Mr. Scott MacDonald	Tribunal’s Expert, Ramboll
Mr. Jose Sananes	Ramboll

ICSID Secretariat

Mr. Marco Tulio Montañés-Rumayor	Secretary of the Tribunal
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For the Claimant:

Counsel

Mr. Mark W. Friedman	Debevoise & Plimpton LLP
Ms. Ina C. Popova	Debevoise & Plimpton LLP
Ms. Laura Sinisterra	Debevoise & Plimpton LLP
Ms. Sarah Lee	Debevoise & Plimpton LLP

Ms. Mary Grace McEvoy Debevoise & Plimpton LLP
Ms. Anisha Sud King & Spalding LLP

Parties

Mr. Jonathan Parr Perenco
Ms. Josselyn Briceno Perenco
Ms. Samita Mehta ConocoPhillips

Experts

Mr. John Connor GSI
Mr. Gino Bianchi GSI

For the Respondent:

Counsel

Prof. Eduardo Silva Romero Dechert (Paris) LLP
Mr. José Manuel García Represa Dechert (Paris) LLP
Mr. Philip Dunham Dechert (Paris) LLP
Ms. Maria Claudia Procopiak Dechert (London) LLP
Ms. Gabriela González Giráldez Dechert (Paris) LLP

Support Personnel

Mr. Ricardo Montalvo Lara Dechert (Paris) LLP
Ms. Anne Driscoll Dechert (Paris) LLP

Parties

Dr. Iñigo Salvador Crespo Attorney General for the Republic of Ecuador
Dra. Claudia Salgado Levy National Director of International Litigation and Arbitration at Attorney General Office of Ecuador

Experts

Mr. José Francisco Alfaro Rodriguez IEMS
Mr. Scott Crouch DiSorbo (formerly at RPS)
Ms. Martha Pertusa TRC Environmental (formerly at RPS)

41. On 19 April 2019, the Parties filed their submissions on costs.
42. On 10 May 2019, the Parties filed their reply submissions on costs.
43. The Tribunal deliberated in person at several meetings (held on the following dates: 24-26 April 2016, 26-27 November 2016, 10-11 June 2017, 25-26 November 2017, 27-28 January 2018, 13-15 March 2019, and 3 June 2019) as well as by other means.
44. On 30 August 2019, the Tribunal declared the proceeding closed pursuant to ICSID Arbitration Rule 38(1).

C. **General Remarks**

45. The Tribunal acknowledges at the outset that this arbitration has taken a very long time. However, there are many reasons for this which the Tribunal believes are worth noting at the outset.
46. Two key reasons arose from the damages estimates in both the primary claim and in the environmental and infrastructure counterclaims. With respect to the former, the Tribunal concluded after the Quantum Hearing that consideration of the damages claimed by Perenco required further in-depth work and the adjustment of the financial models that had been used by the Parties' experts during the quantum phase.
47. In the counterclaims proceedings, which continued separately, the Parties were requested to attempt to negotiate a settlement based on the findings of law and fact made in the Tribunal's Interim Decision on Counterclaim, failing which the Tribunal would appoint an independent expert to assist in evaluating Blocks 7 and 21 ("**Blocks**") and estimating any environmental damage assessed in accordance with the Interim Decision on Counterclaim. A negotiated settlement proved not to be possible. It took the Parties some time to jointly identify a suitable independent expert who could be appointed by the Tribunal, as contemplated in the Interim Decision on Counterclaim.
48. This Independent Expert was to assess the work performed by the Parties' experts and to conduct further sampling in Ecuador in accordance with the Tribunal's findings set out in the Interim Decision on Counterclaim. This work was conducted from August to mid-December 2017 and the Independent Expert Report was not received until 19 December 2018. Thereafter, the Tribunal gave the Parties an opportunity to insert comments into the Independent Expert Report as well as to submit general comments on his work, and convened a two-day hearing in The Hague at which the Independent Expert provided a 90-minute presentation of his findings and responded to the Parties' written comments, after which the Parties were given opportunities to put questions to the Independent Expert. The

Tribunal then deliberated in respect of the counterclaims, considered the Parties' submissions on costs, and finalised this Award.

49. In light of the foregoing, in the Tribunal's view, it made sense to deal with all outstanding damages issues in a single Award.
50. The Tribunal acknowledges that this has been too slow a process for at least one of the Parties, but when substantial amounts have been claimed (approximately US\$1.5 billion in the principal claim and US\$2.5 billion in the counterclaim), careful consideration and due deliberation is required.
51. Relatedly, the Tribunal considers it appropriate to recount the principal steps taken in this long arbitration:
 - (a) The Request for Arbitration was filed on 30 April 2008.
 - (b) This was registered on 4 June 2008.
 - (c) An Amended Request for Arbitration was filed on 28 July 2008.
 - (d) The Tribunal was constituted on 21 November 2008.
 - (e) The first session was held on 7 February 2009.
 - (f) The Request for Provisional Measures was filed on 19 February 2009.
 - (g) A hearing on provisional measures was held in Paris on 19 March 2009 which resulted in a 41-page decision of the Tribunal on 8 May 2009 ("**Decision on Provisional Measures**").
 - (h) One arbitrator resigned on 16 December 2009 and the proceedings were suspended. The arbitrator was replaced by Mr. Neil Kaplan CBE QC SBS on 13 January 2010.
 - (i) The late Lord Bingham, who presided over the first phase of the arbitration, resigned due to ill health on 17 February 2010. H.E. Judge Peter Tomka was appointed by the Chairman of the Administrative Council on 6 May 2010.
 - (j) A hearing on jurisdiction was held in The Hague on 2-4 November 2010. The Tribunal rendered its first Decision on Jurisdiction, some 44 pages, on 30 June 2011.
 - (k) While the primary claim was in train, on 5 December 2011, Ecuador filed counterclaims for alleged environmental harm and infrastructure damages. This was fully briefed by the Parties and a hearing was held in The Hague commencing 9 September 2013 and concluding on 17 September 2013.
 - (l) After further briefing by the Parties, the hearing on the merits of the primary claim coupled with the remaining jurisdictional issues which had been set over to the

merits phase, was heard in The Hague commencing on 8 November 2012 and concluding on 16 November 2012. The Decision on Liability, running to 234 pages, was dispatched to the Parties on 12 September 2014. Some delay in the rendering of this decision was occasioned by the translation of the English original into Spanish.

- (m) On 19 December 2014, Ecuador sought a reconsideration of the Tribunal's Decision on Liability. After receiving submissions from the Parties, the request was considered and then dismissed in a 24-page decision on 10 April 2015.
- (n) On 11 August 2015, an Interim Decision on Counterclaim running to 187 pages and which also had to be translated into Spanish running to 211 pages was dispatched to the Parties.
- (o) As noted above, the Tribunal instructed the Parties to consider the findings of law and fact made in the Interim Decision on Counterclaim with a view to encouraging them to negotiate a settlement in light of the Tribunal's findings. The Parties agreed to do so but were unable to arrive at a settlement. As a result, the Tribunal proceeded to act in accordance with the alternative process envisaged in the Interim Decision on counterclaim, namely, that it would appoint its own expert to evaluate the environmental condition of the two Blocks.
- (p) The damages phase of this arbitration was heard for one week in Paris commencing 9 November 2015.
- (q) The oral closing submissions on damages was heard in The Hague on 21 April 2016.
- (r) Immediately following the closing submissions on damages, the Tribunal conducted its first set of in-person deliberations on quantum. In the course of doing so, it concluded that having regard to the work undertaken by the Parties' quantum experts up to closing submissions, the further elaboration of that work was in order and correspondence on this matter with the Parties ensued.
- (s) Shortly after the Quantum Hearing for the primary claim, having consulted on the matter, on 25 April 2016, the Parties jointly proposed to the Tribunal the appointment of Mr. Scott MacDonald of Ramboll as the Tribunal-appointed expert to conduct the sampling contemplated by the Tribunal in the event that the Parties could not agree on a settlement of the environmental counterclaim. The Tribunal conferred with Mr. MacDonald as to how he would approach the exercise in light of the Tribunal's instructions laid out in the Interim Decision on Counterclaim.
- (t) On 6 July 2016, Mr. MacDonald was appointed as the Tribunal's Independent Expert by Procedural Order No. 16.
- (u) From 1 November 2016 to 5 November 2016, Mr. MacDonald visited Ecuador to inspect the two Blocks for purposes of working out his subsequent work plan.
- (v) The Tribunal continued its quantum deliberations at a meeting held on 25 and 26 November 2016 and further analytical work ensued.

- (w) On 7 February 2017, the *Burlington* tribunal rendered its Decision on Reconsideration and Award.¹ After reflection, the Tribunal decided to seek the Parties' views as to what, if anything, in that award was relevant to the Tribunal's consideration of the matters before it, given that Burlington and Perenco constituted the members of the Consortium which operated Blocks 7 and 21 and many of the facts are common to the two disputes. Submissions on the point were received from the Parties on 18 April 2017.
- (x) Also on 18 April 2017, Perenco filed its First Dismissal Application. Perenco submitted with respect to the environmental and infrastructure counterclaim that the *Burlington* award was *res judicata* for the Parties to the present proceeding and thus the Tribunal's Interim Decision on Counterclaim had been overtaken by the *Burlington* tribunal's determinations of the Consortium's liability (as established in a claim brought by Ecuador against Perenco's fellow Consortium member and alleged privy, Burlington). It asserted that therefore the environmental expert's work should be terminated.
- (y) The Tribunal laid down a schedule for further submissions on the point by both Parties, which was transmitted to the Parties on 3 May 2017, after the Parties failed to agree on a schedule.
- (z) On 23 May 2017, Ecuador filed a response to Perenco's First Dismissal Application.
- (aa) On 10 and 11 June 2017, the Tribunal held an in-person deliberation on quantum in The Hague.
- (bb) On 13 June 2017, Perenco submitted a reply on Ecuador's response to Perenco's First Dismissal Application.
- (cc) On 4 July 2017, Ecuador submitted a rejoinder thereto.
- (dd) On 18 August 2017, the Tribunal dismissed Perenco's First Dismissal Application.
- (ee) Meanwhile, starting on August 2017, Mr. MacDonald and his team began conducting field work at identified sites for the purpose of preparing the sampling activities.
- (ff) On 30 January 2018, Perenco filed its Second Dismissal Application. This was on the basis that Burlington's settlement with Ecuador, and payment in full of Burlington and Perenco's joint debt on the counterclaims, extinguished whatever joint liability Perenco as well as Burlington had to Ecuador, and rendered Ecuador's further pursuit of the counterclaims moot.

¹ *Burlington Resources Inc. v. Republic of Ecuador*, ICSID Case No. ARB/08/5, Decision on Reconsideration and Award, 7 February 2017 ("*Burlington* award"), CA-CC-60. The *Burlington* tribunal also issued on the same date a Decision on Counterclaims, CA-CC-59 ("*Burlington* Decision on Counterclaims") which was made an integral part of the *Burlington* award.

- (gg) On 5 February 2018, following the Tribunal's invitation, Ecuador provided its comments on the Second Dismissal Application and proposed an alternative briefing schedule following the Parties' failure to agree on a briefing schedule.
- (hh) On 8 February 2018 and on 12 February 2018, the Parties provided further comments on the way forward with the Second Dismissal Application.
- (ii) On 15 February 2018, the Tribunal laid down the briefing schedule after considering the Parties' comments and decided that Mr. MacDonald's work was to continue. There would be no disclosure in relation to the application nor an oral hearing.
- (jj) Pursuant to this, on 15 March 2018, Ecuador filed its response to Perenco's Second Dismissal Application.
- (kk) On 5 April 2018, Perenco filed its Reply.
- (ll) On 26 April 2018, Ecuador filed its Rejoinder.
- (mm) On 30 July 2018, the Tribunal issued its Decision on Perenco's Second Dismissal Application, deciding, by a majority, to reject the application.
- (nn) On 19 December 2018, after receiving the Independent Expert Report, the Tribunal dispatched it to the Parties to seek their comments thereon. After receiving the Parties' comments thereon, and as requested by the Parties, the Tribunal held a hearing on the Independent Expert Report on 11-12 March 2019. The Tribunal also met on 13-15 March 2019 and 3 June 2019 for the final in-person meetings.
- (oo) On 19 April and 10 May 2019, the Tribunal received the Parties' costs submissions and reply costs submissions in the form requested by the Tribunal.

52. The following comments are *apropos*:

- (a) There have been a total of 7 hearings in this case;
- (b) The pleadings in this case have been voluminous and have run to not less than 3816 pages;
- (c) There have been no less than 55 witness statements running to not less than 1028 pages excluding exhibits;
- (d) The experts' reports in this case total 53. They run in total to no less than 2539 pages excluding exhibits;
- (e) The evidential record in this arbitration, excluding the items listed above, exceeds 125,302 pages; and
- (f) There have been numerous interlocutory skirmishes between the Parties, unfortunately caused by lack of agreement between them on a number of procedural issues, which have occupied the Tribunal's time.

53. As recorded above, since the completion of the written and oral pleadings, the Tribunal has deliberated in-person as well as by electronic means. This has been a complex and hard-

fought case. The Tribunal has considered all the points raised by the Parties even though it has only referred to the most important submissions and points for purposes of its Award.

54. **Part II** of this Award contains the Tribunal’s assessment of the damages due to Perenco for the breaches of Treaty and contract. **Part III** contains the Tribunal’s assessment of the damages payable by Perenco to Ecuador for the environmental damage caused by the Consortium’s operations. **Part IV** contains the Tribunal’s consideration of the infrastructure counterclaim by Ecuador. **Part V** contains the Tribunal’s decision on the Parties’ respective claims and submissions on costs. This Award follows on from the Tribunal’s 30 June 2011 Decision on Jurisdiction, the 12 September 2014 Decision on Liability, the 10 April 2015 Decision on Reconsideration, the 11 August 2015 Interim Decision on Counterclaim, the decisions on Perenco’s two requests for dismissal of the Respondent’s counterclaims of 18 August 2017 and of 30 July 2018, and all of them should be read with and taken as an integral part of this Award.

II. DAMAGES CLAIMED IN RELATION TO THE BREACH OF THE TREATY AND THE PARTICIPATION CONTRACTS

A. The Parties’ Positions in the Damages Phase

55. The damages phase follows from the Tribunal’s Decision on Liability in which the *dispositif* declared that the following breaches had occurred: (i) breach of the Block 7 and 21 Participation Contracts² in respect of Law 42 at 99%, (ii) breach of the Block 21 Participation Contract as a result of the declaration of *caducidad*; (iii) breach of Article 4

² See Contract Modifying the Service Contract to a Participation for the Exploration and Exploitation of Hydrocarbons in Block 7 of the Amazon Region, including the Contract for the Coca-Payamino Unified Field (“**Block 7 Participation Contract**”) and the Participation Contract for the Exploration and Exploitation of Hydrocarbons in Block 21 of the Amazon Region (“**Block 21 Participation Contract**”). Collectively referred to as the “**Participation Contracts**” or “**PSCs**.”

of the Treaty³ in respect of Law 42 at 99%, and (iv) breach of Article 6 of the Treaty as a result of the declaration of *caducidad*.⁴

1. The Claimant's Position

56. With Ecuador's responsibility having been engaged, Perenco initially requested an Award of US\$1.572 billion in damages.⁵
57. Relying upon the testimony of Mr. John Crick (an advisor to the Chief Executive Officer of Perenco⁶), the expert reports of Dr. Richard Strickland, and the expert economic and financial reports of Professor Joseph Kalt of Compass Lexecon, Perenco claimed that it is entitled to US\$1.572 billion, calculated on an *ex post* basis, to compensate it for its losses arising out of Ecuador's breaches of its international law and contractual obligations.
58. Perenco's Request for Arbitration had sought declarations that obligations under the Treaty and the Participation Contracts had been breached, an order that Ecuador declare null and void the relevant measures, the reinstatement of Perenco's rights under the Participation Contracts, an order that Ecuador abide by and perform the terms of the Participation Contracts, and damages.⁷ Perenco had also sought Provisional Measures against Ecuador, seeking to restrain any action to collect Law 42 dues as well as any action to amend, rescind, terminate or repudiate the Participation Contracts.⁸

³ Agreement between the Government of the French Republic and the Government of the Republic of Ecuador on the Reciprocal Promotion and Protection of Investments ("**Treaty**" or "**BIT**").

⁴ Decision on Liability, paragraph 606 and paragraph 713, in particular, paragraphs 713(4), (6), (8), (12) and (14). The Tribunal also found that certain acts of Ecuador taken between the application of Decree 662 and *caducidad* also violated the fair and equitable treatment standard.

⁵ Cl. Rep. Q., paragraph 278(b): updated proxy date of 1 July 2015 (and other adjustments).

⁶ Crick WS II, paragraph 1. Mr. Crick joined Perenco in 1986 and was responsible for all of the geoscience aspects of the company's growth until 1995. From 1995 to 2003, Mr. Crick was the technical manager responsible for the geoscience aspects of the company's development activity. In 2003, he created and headed a long-term planning group. He has been in his present position since 2008. (See also Crick WS II, paragraph 4).

⁷ Request for Arbitration dated 30 April 2008, paragraph 42; Amended Request for Arbitration dated 28 July 2008, paragraph 42.

⁸ Request for Arbitration, paragraph 43; Amended Request for Arbitration, paragraph 43. Claimant's Application for Provisional Measures dated 19 February 2009.

59. Due to various events, the nature of the relief sought changed over time. Ultimately, when it came to the quantum phase, Perenco no longer sought reinstatement of its rights under the Participation Contracts, which had been terminated in July 2010, but instead sought damages “in an amount that would wipe out all the consequences of Respondent’s illegal acts and re-establish the situation which would have existed if those acts had not been committed, valued as of the date of the award, in the amount of US\$1.6984 billion, subject to updating closer to the date of the award.”⁹ This amount was then adjusted to US\$1.572 billion.¹⁰
60. This figure of US\$1.572 billion was further adjusted downwards to US\$1.423 billion as of 18 April 2016. During closing arguments at the Quantum Closing, counsel for the Claimant stated that:
- “...with current oil prices, Perenco, in an extension scenario, we have to confess, likely would not have pursued the Coca and Payamino waterfloods. ... in the but-for world, Perenco would be developing these waterfloods as we speak at this time, and in today’s world of relatively low oil prices, those wells would likely not be economic. Perenco, therefore, has to be true to the ex post principles that it has espoused, and we feel it’s a matter of integrity, and, therefore, we would leave those projects to the side or suggest that you do in valuing damages in an extension case.”¹¹
61. Perenco also requests that post-award interest be at commercial, annually compounding rates, that Ecuador pay all legal and related costs, and all amounts paid by Ecuador pursuant to the Award be net of any Ecuadorian tax or other fiscal obligations. Finally, Perenco also seeks dismissal of Ecuador’s counterclaims.
62. As the damages phase progressed, Professor Kalt helpfully set out his view of the principal points that divided the Parties. As shown in the table extract from his fourth expert report:¹²

⁹ Cl. Mem. Q., paragraph 182(b).

¹⁰ Cl. Rep. Q., paragraph 278 (b).

¹¹ Tr. Q. (6) 1641:17-20, 1642:6-14 (Claimant’s Closing Argument).

¹² Kalt ER IV, Exhibit JK-64.

Revised Kalt Damages	\$1,572.4
	<i>Standalone Effect on Damages (\$Millions)</i>
<i>Key Brattle Assumptions</i>	
Ex Ante Valuation	-\$874.9
RPS Production Levels	-\$910.0
No Stabilization of Law 42 at 50%	-\$724.4
No Block 7 Extension	-\$626.0
Remaining Effect of Other Assumptions	-\$44.5 ¹³

2. The Respondent's Position

63. The Respondent has requested the following different forms of relief, depending upon the Tribunal's findings on key issues. In sum and primarily, it requests that no compensation be awarded to Perenco in order to account for the unpaid amounts of Law 42 dues that Perenco owes Ecuador.¹⁴ However, should the Tribunal be inclined to award any compensation at all, such compensation should be calculated in accordance with Ecuador's submissions.¹⁵
64. In response to Professor Kalt, the Respondent's experts, Professor James Dow and Mr. Richard Caldwell of The Brattle Group ("**Brattle**"), presented a "waterfall chart" (the "**Waterfall Chart**") depicting the effects on quantum of certain decisions which Ecuador contended the Tribunal should take in relation to various aspects of the claim as presented by Perenco. The Respondent's initial version of the Waterfall Chart (dated 15 September 2015) was later updated to reflect the situation as of 18 April 2016.¹⁶

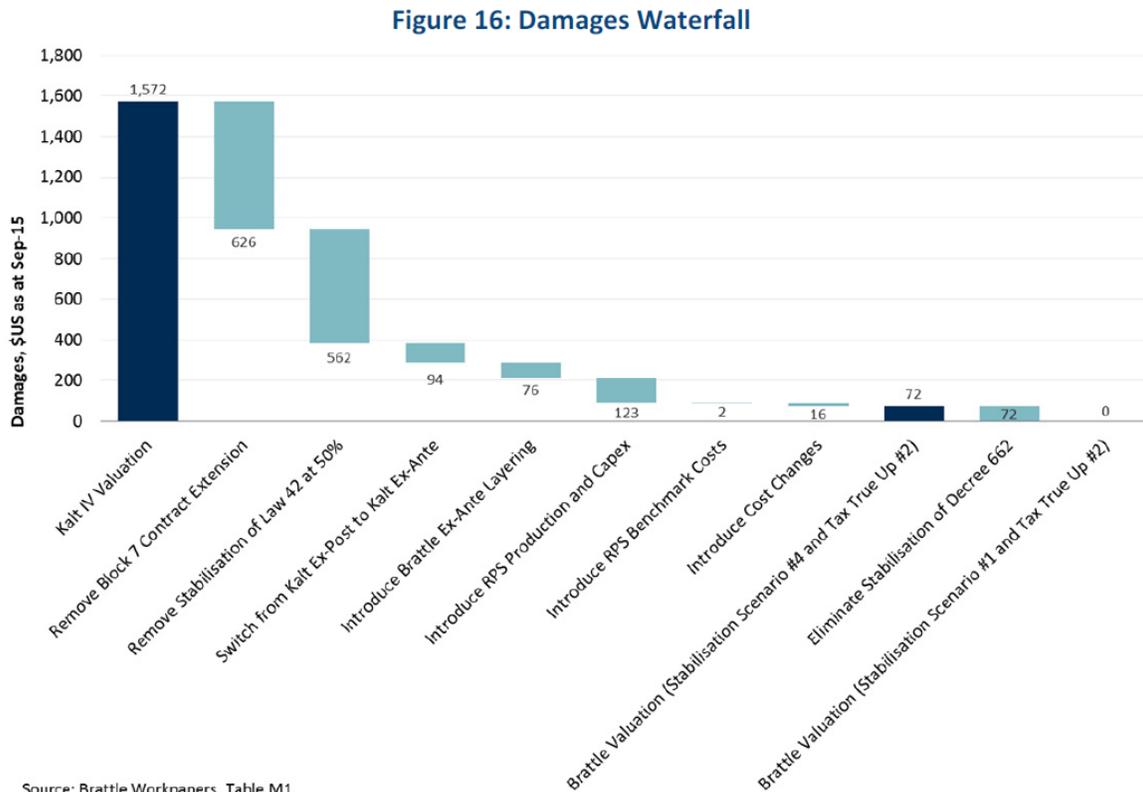
¹³ Other elements of the DCF analysis on which Brattle and Professor Kalt disagreed include the treatment of future oil prices, operating costs, capital costs, the tax treatment of tariffs on the OCP pipeline, and pre-award interest. See Kalt ER IV, paragraph 101ff.

¹⁴ Resp. PHB Q., paragraph 183. Ecuador had earlier sought during the Liability Phase declarations that the enactment of Law 42 and implementing decrees and the institution of *coactiva* procedures did not breach the Participation Contracts or the Treaty.

¹⁵ Resp. PHB Q., paragraph 184. Ecuador asserts that the Quantum Hearing showed that Perenco's real claim amounted to a maximum of \$343 million (Resp. PHB Q., paragraph 1).

¹⁶ Respondent's Closing Presentation Q., Slide 101.

65. Were the Tribunal to accept each of Ecuador’s criticisms of Perenco’s case on damages, the amount estimated by Professor Kalt would be reduced significantly:



B. The Main Issues that Separated the Parties

66. At the Quantum Hearing and at the Quantum Closing, it became clear that the main issues that separated the Parties in relation to the estimation of damages are relatively few.
67. The Respondent’s Waterfall Chart (above) identified five main issues that divided the Parties:
1. The general approach to the valuation of damages: *i.e.*, whether damages are to be assessed *ex ante* or *ex post*, and whether on a ‘layering’ basis;
 2. Whether in the ‘but for’ world, there would have been an extension of the Block 7 Contract (which was due to expire in August 2010), and if so, the nature of such an extension and its terms;

3. Whether, in estimating the damages for expropriation, the Tribunal should accept Mr. Crick's 'but for' drilling programme for both Blocks 7 and Block 21 or RPS' more modest drilling programme;
 4. Whether all, or just a portion, of the effects of Law 42 at 99% should be assumed away in the 'but for' analysis; and
 5. Whether a 'true-up' in favour of Ecuador should be applied, the effect of which would be to adjust the damages owed to Perenco.
68. By the time of the closing day's submissions, counsel for Perenco had narrowed the list to four issues: (i) *restitution*, "under which Perenco's damages should be calculated at Award date rather than breach date"; (ii) *production*, "whereby the number of wells Perenco would have drilled and the volumes of oil they would have produced should be based on Mr. Crick's forecast and not those of RPS"; (iii) *absorption*, "pursuant to which Perenco's contractual right to absorption of all Law 42 amounts should be valued rather than ignored"; and (iv) *extension*, "by which Perenco should be accorded value for the extension of the Block 7 Contract to which it was entitled and that it and Ecuador both wanted and would have agreed absent Ecuador's breaches."¹⁷

C. **The Tribunal's Starting Point**

69. The Tribunal begins by recalling that it is well understood in the jurisprudence on damages generally, that the assessment of damages whether in contract, tort or under a treaty, is "not an exact science."¹⁸ Nor is it an exercise in economic theory to which the Tribunal was much subjected by the Parties in this case. The Tribunal did not find the extensive reference to economic theory developed principally in the analysis of U.S. judicial decisions to be helpful to it when estimating a reasonable figure to compensate Perenco for the damage which it has suffered as a result of Ecuador's breaches. The Tribunal found the debate over

¹⁷ Tr. Q. (6) 1623:15-1624:8.

¹⁸ EL-281, *Joseph C. Lemire v. Ukraine*, ICSID Case No. ARB/06/18, Award, 28 March 2011, paragraph 248: "While the existence of damage is certain, calculating the precise amount of the compensation is fraught with much more difficulty, inherent in the very nature of the 'but for' hypothesis. Valuation is not an exact science. The Tribunal has no crystal ball and cannot claim to know what would have happened under a hypothesis of no breach; the best any tribunal can do is to make an informed and conscientious evaluation, taking into account all the relevant circumstances of the case, not unlike that made by anyone who assesses the value of a business on the basis of its likely future earnings."

“opportunistic” and “efficient” breach, however interesting to economists, legal theorists and judges in the United States, to be of no real value to the Tribunal and irrelevant to its task of deciding the quantum of damages to which Perenco was entitled.¹⁹ That said, the Tribunal has profited from the experts’ highly professional work on the key issues that the Tribunal has ultimately had to decide in arriving at this Award.

70. The Tribunal will begin by setting out in general terms how it intends to deal with the principal issues identified by the Parties. In view of the various determinations made in this Award and the adjustments that had to be made to the financial models employed by the experts to incorporate such changes, the Tribunal considers it to be unnecessary to recite all of the arguments advanced by the Parties.
71. Certain issues are addressed at the outset. These concern: (i) the date(s) of valuation of damages; (ii) the Tribunal’s decision to employ two valuation dates; and (iii) the use of contemporaneous evidence. Having addressed these issues, the Tribunal will then summarise its general approach to the balance of the issues relating to the quantification of damages.

1. The Date of Valuation

72. Perhaps the most significant issue that divided the Parties concerned the date(s) of valuation. Perenco and its expert (on instructions) chose a single date, namely, the date of the expropriation on 10 July 2010. Contending that the expropriation was unlawful and having regard to the restitutionary relief that it initially had sought, Perenco argued that it should be entitled to the higher of the value of Perenco’s interests in the two Blocks: as of the date of the declaration of *caducidad* or as of the date of the Award.²⁰ In this regard,

¹⁹ While the Claimant has contended that the Participation Contracts are governed by Ecuadorian law, it has also asserted that Ecuadorian law on damages articulates essentially the same standard of, and approach to, reparation as the international law standard expressed in the *Chorzów Factory* case (Cl. Mem. Q., paragraph 17; Cl. PHB Q., paragraph 2). In contrast, the Respondent has proceeded on the basis of international law while disagreeing that Ecuadorian law articulates the same standard of full reparation as international law (Resp. C-Mem. Q., paragraphs 17, 28-29). Given the Parties’ focus on the international law issues arising in the quantum phase, the Tribunal has likewise focused on those issues.

²⁰ Cl. Mem. Q., paragraphs 11 & 22; Cl. Rep. Q., paragraphs 34-35 and 46-47. Perenco relies on the approach taken by the Permanent Court of International Justice in the case of the *Factory at Chorzów* which

Perenco's expert, Professor Kalt, described what he saw as the inter-related nature of the various breaches found by the Tribunal; this led him to aggregate the breaches and to treat them as culminating in the formal taking of Perenco's interests in the Participation Contracts effected by the declaration of *caducidad*.

73. The valuation issue was bound up in the Parties' debate over so-called 'layering'. While Perenco argued for a single date (based on the expropriation), for its part, Ecuador and its experts (on instructions) asserted that Perenco and Professor Kalt had wrongly grouped together various independent breaches occurring over approximately two and a half years as if the Tribunal had found a creeping expropriation; this despite the Tribunal's having explicitly rejected Perenco's claim on that point and having held that the *coactivas* and Ecuador's taking over the operatorship of the Blocks after Perenco had suspended operations could not be counted towards a finding of indirect or creeping expropriation.²¹ As counsel for Ecuador put it in closing argument:

“...to be clear, Decree 662 was not enacted, as Perenco suggests implicitly in its arguments, with the intention of expropriating at some later point [,] here in 2010, Perenco's investments. This is not a case of creeping expropriation. What you need to do is calculate from October 2007 onwards and then, to avoid double-counting, calculate from July 2010 onwards without double-computing the impact of Decree 662.”²²

74. In accordance with Article 36(1) of the ILC Articles on the Responsibility of States for Internationally Wrongful Acts (the “**ILC Articles**”), the Tribunal considers that it should award compensation insofar as such damage is not made good by restitution, which compensation should cover “financially assessable damages including loss of profits insofar as it is established.” The Tribunal recalls that it is well-established that the burden of proving damages lies with the claiming party.²³ In the absence of a creeping or indirect

contemplated a different calculation of the damages for an unlawful expropriation than that which would be made in relation to a lawful one. See also Tr. Q. (6)1625 *et seq.* (Claimant's Closing Argument).

²¹ Resp. C-Mem. Q., paragraphs 4, 34-35, 207; Resp. Rej. Q., paragraph 132.

²² Tr. Q. (6) 1828:10-18.

²³ EL-265, *S.D. Myers, Inc. v. Canada*, UNCITRAL, Second Partial Award, 21 October 2003, paragraph 173; CA-002-L, *Archer Daniels Midland Company and Tate & Lyle Ingredients Americas, Inc. v. United Mexican States*, ICSID Case No. ARB(AF)/04/5, Award, 21 November 2007, paragraph 285; CA-439, *Gemplus S.A.*,

expropriation effected by a series of discrete measures, the orthodox approach is for a claimant to identify the damages caused by each breach at the time of its occurrence.²⁴ It is moreover the case that the focus of the inquiry must be on damages *proximately* caused by the breaches found by the Tribunal.²⁵

75. The Tribunal thus does not consider Brattle’s efforts to value the impact of Decree 662, the first unlawful act, on Perenco’s interests in the Blocks to be wrong in principle. Quite the contrary. The Tribunal agrees with Ecuador as to the suitability, in the circumstances of the present case, of valuing the breaches as and when they occurred, rather than focusing exclusively on the last completed breach. The Tribunal considers that counsel for Ecuador’s characterisation of the facts, quoted above at paragraph 73, is correct. Even during the provisional measures phase of this proceeding, counsel for Ecuador confirmed that their client had no intention at that time to expropriate Perenco’s interests in the Blocks. The Tribunal adverted to this intention not to expropriate in the Decision on Liability when discussing whether the Ministry should have stayed its hand in declaring *caducidad* during the pendency of these arbitral proceedings.²⁶
76. As previously held by the Tribunal, Perenco failed to make out a creeping expropriation claim and its attempt now to employ in its stead what it called an “inter-linked course of

SLP S.A., Gemplus, S.A., SLP, S.A. and Gemplus Industrial, S.A. de C.V. v. United Mexican States, ICSID Case No. ARB(AF)/04/3, Award, 10 June 2010, paragraphs 12-56 [hereinafter *Gemplus v. Mexico*].

²⁴ CA-007-L *CME Czech Republic B.V. v. Czech Republic*, UNCITRAL, Partial Award, 13 September 2001, paragraphs 583-585; EL-265, *S.D. Myers, Inc. v. Canada*, UNCITRAL Second Partial Award, 21 October 2003, paragraph 140; CA-004-L, *BG Group Plc. v. Argentine Republic*, UNCITRAL, Final Award, 24 December 2007, paragraph 428; CA-003-L, *Azurix Corp v. Argentine Republic*, ICSID Case No. ARB/01/12, Award, 14 July 2006, paragraphs 417-18, 424; CA-012A-L, *Enron Corp. and Ponderosa Assets, L.P. v. Argentine Republic*, ICSID Case No. ARB/01/3, Award, 22 May 2007, paragraphs 389, 405, 420-23, 436.

²⁵ CA-033-L, Draft Articles on Responsibility of States for Internationally Wrongful Acts, with commentaries 2001, Yearbook of the International Law Commission, 2001, vol. II, Part Two, U.N. Doc. A/CN.4/SER.A/2001/Add.1 (Part 2), p. 92, Art. 31, comment 10.

²⁶ Decision on Liability, paragraph 709, quoting Ecuador’s letter to the Tribunal: “Ecuador intends to carry out the enforcement of Law 42 in such a way as to avoid any disruption of Perenco’s business. In particular, Ecuador does not intend to seize any assets of the Consortium beyond oil equivalent in value to the outstanding debt. Nor does Ecuador intend to terminate the relevant Participation Contracts, or take legal action against Perenco representatives.” CE-212, Letter from Respondents regarding the Tribunal’s Decision on Provisional Measures and Law 42, 15 May 2009.

conduct” is unavailing.²⁷ The breaches are of course inter-linked in that each is a part of the dispute as it evolved, but each has to be examined at its own time and in its own context. This is particularly the case when it is recalled that certain acts claimed to be in breach of contract or of the Treaty were not accepted as such by the Tribunal. For example, while the Tribunal accepted that Perenco could lawfully suspend operations under the *exceptio non adempti contractus* doctrine, it also accepted that the State could in such circumstances lawfully intervene in the Blocks so as to safeguard their operating continuity and productivity after the Consortium suspended operations.²⁸ Similarly, the Tribunal held that the *coactiva* dispute, which arose when Perenco’s decision not to pay Law 42 dues led Ecuador to seek to liquidate the claimed 2008 tax debt, resulted from the acts of both Parties. The Tribunal held that neither of these acts could be counted towards Perenco’s theory of a creeping expropriation.²⁹

77. The Tribunal recalls further that when analysing whether Perenco had made out its claim of a breach of the Treaty in relation to Law 42 at 50%, the Tribunal adverted to the conflation of different events occurring at different times.³⁰ The Tribunal has had the same sense in the quantum phase of the proceeding. It considers that Decree 662 and *caducidad*, separated as they were by a period of over two years, cannot be lumped together so as to land on a single date that is then used to value the breaches’ collective impact.

²⁷ Tr. Q. (6) 1712:4. See the Decision on Liability, paragraph 710, rejecting the creeping expropriation argument advanced by Perenco.

²⁸ Decision on Liability, paragraphs 705, 710.

²⁹ *Ibid.*, paragraph 703.

³⁰ *Ibid.*, paragraph 580: “In advancing its allegation of breach, the Claimant tended to conflate a series of measures which were taken at different times over a course of some four years. In its pleadings, the Claimant tended to lump together: (i) Law 42 at 50%; (ii) the promulgation and application of Decree 662; (iii) the Correa administration’s demands for the migration of participation contracts to a service contract model; (iv) the subsequent demand for a faster migration to service contracts than that initially sought; (v) the demands for payment of levies claimed to have been owed under Law 42; (vi) the launching of *coactivas*; (vii) the decision to enforce the *coactivas* notwithstanding the Tribunal’s recommendation that it not do so during the pendency of the arbitration; and (viii) the breakdown in negotiations which led to the Consortium’s decision to suspend operations, which in turn led to the initiation of the proceeding resulting in the declaration of *caducidad*.”

78. Not only did the Tribunal differentiate in its Decision on Liability between Decree 662, the first completed breach, and *caducidad*, the last completed breach, it also distinguished between Decree 662 and the other fair and equitable treatment breaches that followed before Perenco suspended operations. The Ministry declared *caducidad* a year later after requesting Perenco to return to the Blocks on four separate occasions, requests that Perenco refused to countenance unless Ecuador complied with the Tribunal’s Decision on Provisional Measures. It was only after the Ministry gave these warnings and Perenco refused to resume operations that the Ministry made a declaration of *caducidad*.³¹ To point this out is not to excuse the Ministry – the Tribunal has agreed with Perenco that the *caducidad* amounted to an expropriation under Article 6 of the Treaty – but rather to make the point that Perenco’s decision to suspend operations compelled the government to intervene to protect the Blocks and their production, and the warnings that Perenco should resume operations or face a declaration of *caducidad* were based on one of the grounds for termination listed in Article 74 of the Hydrocarbons Law.³²
79. Of specific relevance to the proposed single date of valuation based on the “inter-linked course of conduct” argument, the Tribunal notes that the fair and equitable treatment breaches themselves were not treated as all in one package in the Decision on Liability. In addition to rejecting the creeping expropriation contention, the Tribunal differentiated between the offending measures as follows:

“606...Decree 662 marked the beginning of a series of other measures in breach of Article 4 taken in relation to the Participation Contracts, namely: (i) demanding that the contractors agree to surrender their rights under their participation contracts and migrate to what for a considerable period of time was an unspecified model, such that the contractors were unable to discern precisely what they were being asked to move to; (ii) escalating negotiating demands, in particular in April 2008 when the President unexpectedly suspended the negotiations and rejected what had recently been achieved in a Partial Agreement in respect of one of the blocks; (iii) making coercive and threatening statements, including threats of expulsion from Ecuador; and (iv) taking steps to enforce Law 42 against Perenco (and Burlington) for non-payment of dues claimed to be owing, a portion of which has been held to be in breach of Article 4, and when no

³¹ *Ibid.*, paragraph 707.

³² *Ibid.*, paragraph 706.

payments were made, forcibly seizing and selling the oil produced in Blocks 7 and 21 in order to realise the claimed Law 42 debt. This set the stage for the Consortium's suspension of operations and ultimately the declaration of *caducidad* which formally terminated the Consortium's rights in the two blocks.

607. The Tribunal has already noted that Ecuador has not contested the Claimant's assertion that Decree 662 was intended to force a renegotiation of the participation contracts in order to migrate Petroecuador's counterparties to service contracts. In the Tribunal's view, moving beyond 50% to 99% with the application of Decree 662 amounted to a breach of Article 4 of the Treaty and the measures, taken collectively, just listed also constituted breaches of Article 4." [Double emphasis added.]

80. As the underlined and italicised passages indicate, the Tribunal distinguished between Decree 662 and the measures that followed. This is not to suggest that none of these were related to the others, but the Tribunal was alive to the fact that some of the breaches (and other alleged breaches which were not accepted as such) arose out of complex interactions between the Consortium and/or the individual acts of its members, Perenco and Burlington, and the State.³³
81. The facts and the findings were thus somewhat more complicated than the way in which they have sometimes been treated in the course of the quantum pleadings. The Tribunal has accordingly found it necessary to revert to specific prior findings from time to time so as to provide context for certain findings made in this Award.
82. Quite apart from the issues of context and timing, the Tribunal considers that Decree 662 had the effect of converting the Participation Contracts into *de facto* service contracts (and, as Perenco pointed out during the quantum phase, imperfect ones at that, because they provided no protection against lower oil prices³⁴), but the decree did not purport to interfere with the Contracts' operation below the reference price.³⁵ Perenco continued to both hold

³³ The first led to the *coactivas* aimed at collecting the claimed tax debt which the Tribunal has found to be a breach of contract (at paragraph 579 of the Decision on Liability, the Tribunal found that it was not necessary to consider the measures as a breach of treaty); the second was found to be a breach but one that Perenco was found to have contributed to; and the third, the State's intervention to operate the Blocks was found to be a lawful response to Perenco's suspension of operations. Decision on Liability, paragraphs 417, 697 and 708.

³⁴ Cl. Rep. Q., paragraph 132.

³⁵ As noted in an email report sent shortly after Perenco representatives met with the Minister of Mines: "If we drill the OSO23 we must explain to the state that this is the last one and that we do it because of contractual

and exercise those contractual rights up to the date of its decision to suspend operations (and thereafter, in that Ecuador credited Perenco's account with revenues derived from sales of crude oil while it operated the Blocks after the Consortium suspended operations and up to the declaration of *caducidad*).³⁶

83. Thus, the Tribunal did not see a set of inter-linked measures so closely connected in time as to convince it to aggregate them and employ the single valuation date for which Perenco contended. Nor did it consider that the challenges of valuing the breaches individually was of such complexity as to require the damages estimation exercise to default to a single date of valuation.
84. Tribunals are not bound to accept a party's proposed date of valuation. In *Sempra*, for example, while the tribunal ultimately agreed with the claimant's proposed date, it observed:

“209. The Tribunal will accordingly use December 31, 2001 as the proper valuation date. This is not because it believes that the Claimant's argument should be given any deference, but simply because the explanation given shows that there was an investment decision made in good faith. Neither does the Tribunal share the interpretation which the Claimant has given to *CMS* with regard to the payment of certain deference in the choice of a valuation date. It is apparent that in *CMS* no acts or decisions taken by the claimant after the injunction raised any doubt about the date which triggered the events complained of.”³⁷

85. Having regard to all of the circumstances and to its prior findings, the Tribunal therefore prefers the kind of 'layering' analysis proposed by Ecuador's experts, albeit with important modifications to Brattle's approach. The Tribunal intends to value the first completed

obligation with the drilling contractor, and that it is obviously difficult to stop a campaign so quickly. In other words we don't want the state to believe that we carry on drilling because it is still profitable.” [Emphasis added.] Exhibit BR-26, Email dated 9 October 2007. See *Murphy Exploration and Production Company v. Republic of Ecuador (II)*, PCA Case No. 2012 –16 (formerly AA 434), Partial Final Award, 6 May 2016, paragraphs 276 – 280 (hereinafter *Murphy v. Ecuador*), which is in accord with the approach taken by the Tribunal in its Decision on Liability.

³⁶ E-398, Updated Table – Auctions Block 7; E-399, Updated Table-Auctions Block 21.

³⁷ *Sempra Energy International v. Argentine Republic*, ICSID Case No. ARB/02/16, Award, 28 September 2007, paragraph 209. See also EL-290, *Anatolie Stati, Gabriel Stati, Ascom Group S.A. and Terra Raf Trans Trading Ltd v. Republic of Kazakhstan*, SCC Case No. V116/2010, Award, 19 December 2013, paragraphs 1493-1498.

breach and then adjust it in certain ways for reasons explained below. It will then turn to the subsequent breaches and do the same (if there is evidence of financially assessable damage proximately caused by each breach). It considers that this approach is consonant with international law and legal practice.

86. The Tribunal notes that bound up in the Parties' debate over 'layering' were arguments as to whether Brattle acted consistently with their declared intention to value the breaches separately on an *ex ante* basis. Perenco criticised Brattle for its having focused on the two breaches of Decree 662 and *caducidad* specified in the Decision on Liability's *dispositif* without estimating the economic effects of the intervening breaches (demanding that contracts migrate to services contracts, making escalating contractual demands, and making coercive and threatening statements).³⁸ Yet, the Tribunal would note that this criticism overlooks the point noted above at paragraph 74 that it is not incumbent upon a respondent to make a claimant's case on damages; that burden is the claimant's.³⁹ Indeed, a respondent is entitled to simply challenge the claimant's approach if it sees fit to do so without proffering an alternative estimation of the damages that might be payable. Perenco was put on notice of the 'layering' approach by the Respondent's first responsive pleading in the damages phase.⁴⁰ The fact that Brattle did not attempt to value escalating contract demands, for example, did not preclude Perenco from seeking to do so.⁴¹ However, while

³⁸ Cl. Rep. Q., paragraphs 257-259.

³⁹ *AIG Capital Partners, Inc. and CJSC Tema Real Estate Company v. Republic of Kazakhstan*, ICSID Case No. ARB/01/6, Award, 7 October 2003, paragraph 12.1.9: "The burden of establishing by reliable evidence the quantum of damages or compensation for the expropriation was and is on the Claimants." See also CA-439, *Gemplus v. Mexico*, Award, paragraphs 13-80: "It is for the Claimants, as claimants alleging an entitlement to such compensation, to establish the amount of that compensation: the *principle actori incumbit probatio* is 'the broad basic rule to the allocation of the burden of proof in international procedure'."

⁴⁰ Brattle ER II, paragraphs 43 and 254; Cl. Rep. Q., paragraphs 257-269 commenting thereon.

⁴¹ The Tribunal takes note of Brattle's Rebuttal Report (Brattle ER III), where it was stated at f 83: "Professor Kalt's approach to *ex-ante* assessment also is incorrect if we were to accept the alternative - that it were possible to quantify separate damages flowing from the separate breaches in paragraph 606. This view would prompt only the introduction of an additional layer in the damages analysis to reflect the separate FET breach (which we deem quantifiable) at the associated date of breach. Perhaps this would be the moment when 'taken collectively', the measures identified in paragraph 606 of the Liability Decision amounted to a separate breach of the FET standard. Because the Liability Decision did not identify any such date, in particular in the dispositive section, we have not undertaken such an analysis. The addition of a third layer is unlikely to have a material impact on the damages to Perenco. We stand ready to introduce a third layer in the analysis if requested by the Tribunal to do so."

it criticised Brattle’s approach in its Quantum Reply, Perenco continued to base its damages case on a single valuation date, thus running the risk that the Tribunal might be persuaded by Brattle’s approach and thus be presented with no attempt to value the breaches arising between Decree 662 and *caducidad*.

87. As for certain other criticisms of Brattle’s ‘layering’ approach, such as Perenco’s observation that Brattle’s avowed *ex ante* approach to valuing the impact of Decree 662 on Perenco was not adhered to when Brattle used *ex post* information to make its ‘true-up’ argument, these are addressed below.
88. For its part, Ecuador maintained that the dispute between the Parties evolved over time. Therefore, it argued that its experts were right to estimate the effects of separate breaches occurring at different times in order to avoid double counting. Brattle estimated the impact of Decree 662 as of 4 October 2007, then estimated the impact of *caducidad* on the already diminished (but also already compensated) value of Perenco’s interests in the Blocks.
89. Ecuador observed in this respect that Brattle’s valuation as of the date of Decree 662 accorded with Perenco’s contemporaneous calculations performed in October 2007, just days after Decree 662 was promulgated. With regard to Law 42 at 50%, Perenco calculated that the NPV for its interests in the two Blocks through to their date of expiry amounted to US\$239.4 million⁴²; Brattle’s initial NPV calculation of the interests was US\$265.7 million⁴³ but this was later adjusted upwards in its Reply Report to either US\$282.2 million (using RPS’ capital costs) or US\$295.8 million (using Professor Kalt’s costs). With regard to Decree 662, Perenco’s contemporaneous NPV calculation for its interests in the two Blocks was US\$154.6 million⁴⁴; Brattle’s initial values were US\$107.7 million⁴⁵ and this was later updated by Brattle to come to US\$127.6 million (using RPS’s costs) or US\$127.5 million (using Professor Kalt’s costs).

⁴² US\$122 million for Block 7 and \$117 million for Block 21. Brattle ER II at fn. 157.

⁴³ US\$111 million for Block 7 and \$171 million for Block 21. Brattle ER II at fn. 157.

⁴⁴ US\$84 million for Block 7 and \$71 million for Block 21. Brattle Table M.

⁴⁵ US\$60 million for Block 7 and \$68 million for Block 21. Brattle Table M.

90. In disputing Ecuador’s attempt to use an earlier date in assessing damages, Perenco argued that ‘layering’ was conceptually flawed in this case because Ecuador’s breaches were inter-related. Such inter-related breaches led to layering being rejected in *SAUR*.⁴⁶ Here, each of Ecuador’s breaches was inextricably linked to the others (and it was irrelevant, in Perenco’s view, that the Tribunal did not find a creeping expropriation).⁴⁷ The principle of full reparation warranted the use of a single valuation date in order to capture the cumulative effect of the breaches and thereby grant Perenco proper restitution. Brattle’s approach was inconsistent with the principle that a breaching State could not be given credit for actions that depressed the value of the investment prior to expropriation (as recognised in *Occidental II*).⁴⁸
91. Perenco argued further that Brattle admitted that they applied ‘layering’ in a way that reduced Perenco’s damages at every turn. Professor Dow conceded that if ‘layering’ were done in a different order, Perenco’s damages would be higher.⁴⁹ Perenco contended that Professor Dow and Mr. Caldwell also admitted on cross-examination that they had essentially transferred only the “good” risk and imposed on Perenco the “bad” risk: they had ignored actual high oil prices after Decree 662 in estimating Perenco’s anticipated revenues, but reduced Perenco’s damages by offsetting the actual Decree 662 payments based on those higher oil prices, and then deprived Perenco of the *coactiva*-seized oil’s actual market price.⁵⁰ Brattle’s approach also presumed that in setting an *ex ante* price, a willing buyer would have foreseen the whole sequence of later events—including, ultimately, oil seizure—yet Mr. Caldwell admitted that “nobody standing in October ’07 would have predicted all the set of the chain of events that would actually occur.”⁵¹

⁴⁶ Cl. Rep. Q., paragraph 264.

⁴⁷ *Ibid.*, paragraph 265.

⁴⁸ Cl. PHB Q., paragraph 20.

⁴⁹ *Ibid.*, paragraph 21.

⁵⁰ Tr. Q. (5) 1538:9-14 (Dow); Tr. Q. (5) 1556:19-1559:2 (Caldwell); see also Brattle Workpapers, Table P.

⁵¹ Tr. Q. (5) 1552:11-13, 1557:18-21 (Caldwell); see also Brattle ER II, paragraph 53; *cf.* Tr. Q. (5) 1552:11-13 (Caldwell).

92. Perenco added that Brattle’s various ‘*stabilisation*’ scenarios made no sense. Professor Dow and Mr. Caldwell admitted that their lump-sum ‘*side payment*’ for Decree 662 amounted to continuing to apply Decree 662 to Perenco, even though the purpose of damages was to wipe out the effects of Decree 662.⁵² It could not be assumed that Perenco would have ceded all of its future upside for a single payment in October 2007. In addition, the notion that Perenco’s expectations were immutable as of October 2007 was inconsistent with the fact that Perenco continued to operate in Ecuador after Decree 662.
93. Moreover, Brattle had not explained why any ‘*hypothetical tax threshold*’ between 50% and 99% was at all appropriate when the Tribunal’s task was to eliminate Decree 662 in its entirety. Brattle’s ‘*stabilisation*’ scenarios were built on variations of what Ecuador contended were the parties’ assumed pre-contractual expectations of the economy of the Contracts, but Mr. Caldwell could not even articulate the rationale for using such expectations to determine the damages to which Perenco was entitled under the Treaty.⁵³
94. Ecuador responded to Perenco’s contentions as follows.
95. First, at the Quantum Hearing, Ecuador presented the Waterfall Chart showing the different components of damages claimed by Perenco and illustrating the impact of correcting each component.⁵⁴ Perenco did not challenge the figures in the Waterfall Chart.⁵⁵
96. Second, in response to Perenco’s criticism that ‘layering’ was invalid because of the inter-related nature of Ecuador’s breaches, Perenco did not explain why the breaches were inter-related and why interrelation would matter at all to ‘layering’.⁵⁶ Professor Kalt acknowledged for the first time at the Quantum Hearing that he himself had done a monthly layering in his *ex ante* analysis, which stood in contradiction to his and Perenco’s criticism

⁵² Tr. Q. (5) 1526:4- 1527:15 (Dow); *ibid.* 1592:17-1593:1, 1593:17-1594:4 (Caldwell); *cf.* id.1259:11-17, 1265:5-1278:1 (Kalt).

⁵³ Tr. Q. (5) 1590:8-1591:7 (Caldwell) (stating it was a matter of instruction).

⁵⁴ Brattle ER III, Figure 16.

⁵⁵ Resp. PHB Q., paragraph 138.

⁵⁶ Resp. Rep. PHB Q., paragraph 101(i).

on ‘layering’.⁵⁷ Professor Kalt’s ‘*mark-to-market*’ contingent contract justification for his *ex ante* calculation was entirely new at the Quantum Hearing and entirely different from the logic advanced in his Fourth Expert Report.⁵⁸

97. In respect of Perenco’s criticism that neither Ecuador nor Brattle addressed the fact that the Tribunal found other breaches apart from Decree 662 and *caducidad*, Ecuador asserted that Brattle’s 16 October 2015 Expert Report (at paragraphs 88 to 90) addressed this at length and it was Perenco who chose not to cross-examine Brattle’s experts on this point during the Quantum Hearing.⁵⁹
98. In respect of SAUR’s rejection of ‘layering’, Ecuador explained that that tribunal rejected ‘layering’ because in that case the first-in-time breach had already deprived the investment of all value, which was not the case here.⁶⁰ In *Occidental II*, the two breaches found by that tribunal were only weeks apart and hence the issue was not even discussed.⁶¹ In contrast, in the present case the two principal breaches occurred in 2007 and 2010.
99. Finally, in respect of Perenco’s claim that Brattle had admitted that they applied ‘layering’ in a way that reduced Perenco’s damages at every turn, Ecuador argued that this illustrated Perenco’s confusion of rather simple economics. Perenco’s sole criticism was directed at Brattle’s calculation of the ‘true-up’, which was *ex post* (*i.e.*, considering actual prices) while calculating damages to Perenco *ex ante*. As Brattle explained, “the true up adopts an *ex-post* perspective inherently, since it must look back and assess what Law 42 amounts were actually paid by the Consortium and which levies remain outstanding.”⁶² There was nothing unsound in this calculation and Professor Kalt never took issue with it. Brattle further explained that imposing on Perenco the change in oil prices when it chose to

⁵⁷ Tr. Q. (5) 1478:12-1479:13 (Kalt).

⁵⁸ Resp. Rep. PHB Q., paragraph 101(i) *c.f.* Cl. PHB Q., paragraph 18 and Kalt ER IV, paragraphs 47-52.

⁵⁹ Resp. Rep. PHB Q., paragraph 101(ii).

⁶⁰ *Ibid.*, paragraph 101(iii).

⁶¹ *Ibid.*, paragraph 101(iv).

⁶² Brattle ER II (4 May 2015; errata 2 June 2015), paragraph 53.

withhold taxes was appropriate, while also acknowledging that the allocation of risks was ultimately an issue for the Tribunal (hence the sensitivity calculations of the ‘true-up’).

100. As noted above in paragraph 77, the Tribunal has decided that it is appropriate to seek to value the damages caused by different breaches occurring at different times. To the extent that the Tribunal accepts that there were any deficiencies in the way in which Brattle performed the exercise, these can be remedied in the damages calculation.
101. Having concluded thus, the Tribunal would also note at this point that Perenco had also contended, in tandem with its single valuation date approach, that an *ex post* approach should be taken where there is an unlawful expropriation and the value of the investment had increased.⁶³ Ecuador disagreed. In light of the Tribunal’s analysis above, and its layering / “clean sheet” approach (discussed below), the Tribunal does not consider it necessary to delve into the arguments on this point.

2. Has Perenco demonstrated any loss or damage proximately caused by the post-Decree 662 fair and equitable treatment breaches?

102. As noted in paragraphs 74 and 85 above, the Tribunal will award damages for any quantifiable financial losses proximately caused by the breaches determined by it in the merits phase. Damages will be awarded for Decree 662 and the declaration of *caducidad*. This raises the question whether the other breaches of fair and equitable treatment suffered by Perenco after Decree 662 but before the expropriation have been shown to result in cognisable harm.
103. To reiterate, these breaches are: “(i) demanding that the contractors agree to surrender their rights under their participation contracts and migrate to what for a considerable period of

⁶³ See Cl. PHB Q., paragraph 7, citing CA-1, *ADC Affiliate Limited v. Hungary*, ICSID Case No. ARB/03/16, Award of the Tribunal, 27 September 2006, paragraphs 496-497; CA-438, *Ioannis Kardassopoulos v. Georgia*, ICSID Case Nos. ARB/05/18 and ARB/07/15, Award, 3 March 2010, paragraph 514, CA-444, *ConocoPhillips Petrozuata B.V., ConocoPhillips Hamaca B.V. and ConocoPhillips Gulf of Paria B.V. v. Bolivarian Republic of Venezuela*, ICSID Case No. ARB/07/30, Decision on Jurisdiction and Merits, 3 September 2013, paragraph 343; CA-447, *Yukos Universal Limited v. The Russian Federation*, PCA Case No. AA 227, Final Award, 18 July 2014, paragraph 1767; EL-327, *Quiborax S.A. and Non-Metallic Minerals S.A. v. Plurinational State of Bolivia*, ICSID Case No. ARB/06/2, Award, 16 September 2015, paragraphs 370 *et seq.*

time was an unspecified model, such that the contractors were unable to discern precisely what they were being asked to move to; (ii) escalating negotiating demands, in particular in April 2008 when the President unexpectedly suspended the negotiations and rejected what had recently been achieved in a Partial Agreement in respect of one of the blocks; (iii) making coercive and threatening statements, including threats of expulsion from Ecuador; and (iv) taking steps to enforce Law 42 against Perenco (and Burlington) for non-payment of dues claimed to be owing, a portion of which has been held to be in breach of Article 4, and when no payments were made, forcibly seizing and selling the oil produced in Blocks 7 and 21 in order to realise the claimed Law 42 debt.”⁶⁴

104. However, with the exception of the sales of oil seized and sold pursuant to the *coactivas*, which must be adjusted in the ‘true-up’ exercise to be consistent with the Tribunal’s finding on Decree 662, it appears that neither Party’s experts undertook the exercise of quantifying damages attributable to those breaches during the pleadings phase. Therefore, it might be that these are breaches for which proximate damage has not been estimated and therefore no damages can be awarded.⁶⁵ This is the position taken by Brattle.⁶⁶
105. The Tribunal understands that Professor Kalt’s view was that breaches (i) and (iii) listed above “would be expected to adversely affect Perenco’s investment and production decisions.”⁶⁷ The Tribunal agrees, but it also considers that this already occurred when Decree 662 took effect and Perenco stopped drilling in both Blocks (except for Oso 23). Since the Tribunal has found that wells would have been drilled in both Blocks after Decree 662 and Perenco will be compensated for the cash flows associated with those ‘but for’ wells as well as for the loss of the opportunity to negotiate the extension of Block 7 (see Sections II.D.3 and II.F below), in the Tribunal’s view, Professor Kalt’s concerns on these particular points are met.

⁶⁴ Decision on Liability, paragraph 606.

⁶⁵ Perenco criticised Brattle’s layering approach for estimating the impact of Decree 662 and *caducidad* only. The Tribunal’s understanding is that Professor Kalt also criticised layering but did not offer any quantification of the damages for these breaches if and when they occurred.

⁶⁶ Brattle ER III, paragraph 90

⁶⁷ Kalt ER IV, paragraph 49.

106. As for the *coactivas* issue, the Tribunal will reflect in the Award a sum of damages flowing from Perenco's being credited for the depressed auction price received for the seized oil rather than the market value. The Parties spent considerable time over the course of this proceeding addressing the impact of the *coactivas*. There is record evidence on the amounts of oil seized, the prices at which it was sold and the amounts that were credited to Perenco. However, the analysis is complicated by the fact that after submitting its claim to arbitration, Perenco (and Burlington) stopped paying Law 42 dues and instead began to deposit them in an account located outside of Ecuador. Given that Perenco failed in its attempt to prove a breach of contract and Treaty for Law 42 at 50%, the Tribunal considers that there is some merit to Ecuador's 'true-up' claim. It follows that some accounting for Perenco's non-compliance with Law 42 must be performed. In the Tribunal's view, this issue is best addressed as part of its discussion of Ecuador's 'true-up' claim below.
107. In sum, the Tribunal considers that the financial impact of the non-Decree 662 breaches has either been accounted for in the 'but for' analysis of Decree 662 as of 4 October 2007 or was not quantified by the expert reports submitted with the Claimant's pleadings on quantum.

3. Use of a 'clean sheet' for the valuation of the expropriation damages

108. The Tribunal has accepted Ecuador's submission that the use of a single date for valuing the damages is not appropriate in the circumstances of this case. The Tribunal recalls that Brattle defended its 'layering' approach based on the need to safeguard against double-counting:

"We then estimated the FMV of Perenco's interests in July 2010, when Ecuador declared Caducidad. The Tribunal deemed Caducidad to amount to expropriation. Our estimate of the July 2010 FMV of Perenco's interests netted off the impact of Decree 662, reflecting our separate quantification of the damages due in relation to it in the first step. Netting off the impact of Decree 662 was necessary to avoid double-counting."⁶⁸

⁶⁸ Brattle ER III, paragraph 67(b).

109. The Tribunal agrees that double-counting must be avoided, but it has arrived at a different solution from that proposed by Brattle.
110. This results from the Tribunal's seeing merit in Perenco's concern that estimating the damages as of the first completed breach could be unfair to it. Depending upon how the compensation for the first completed breach is calculated, it is possible, as Professor Kalt contended, that factoring in the effects of Decree 662 could have a price-depressing impact on Perenco's rights that ended up being expropriated.
111. Having carefully reflected on the Parties' submissions, the Tribunal has concluded that the fairest approach to take in the circumstances of the present case is the following: Since at the time of the first breach it was by no means certain that an expropriation would follow Decree 662 some 33 months later, the Tribunal will calculate the damages proximately caused by Decree 662 for the period 4 October 2007 to 20 July 2010. This is on the basis that Decree 662 was the only compensable breach for that period of time.
112. In principle, the Tribunal would have also awarded any damages proximately caused by the subsequent fair and equitable treatment breaches, but it has already found that the Claimant did not adduce evidence of the financial impact of the post-Decree 662 fair and equitable treatment breaches. Therefore, no damages can be awarded for those breaches. But since Perenco's rights were brought to an end by the act of *caducidad*, the Tribunal will re-estimate the loss of those rights according to then-prevailing market conditions and industry expectations (as well as in light of the hypothetical increased production in the two Blocks in the 'but for' scenario).
113. Having arrived at this approach, the Tribunal's initial thinking was that this would be done based on the ratio between the total number of months between October 2007 and July 2010 and the total number of months from October 2010 until contract expiry. However, a simple temporal pro-rating would lead to a biased result that could assign a lower value to cash flows that would have been generated during the October 2007 to July 2010 period

than should be the case.⁶⁹ In the circumstances, therefore, the Tribunal has added up the discounted cash flows in the October 2007 damages model through to July 2010. This ensures that the value for the October 2007 layer of damages reflects the actual discounting and contribution of pre-July 2010 cash flows to the October 2007 fair market value and also accounts for the full cost of any pre-July 2010 CAPEX.

114. The result is an initial award of damages for Decree 662's impact during the roughly 33-month period between the first completed breach and the last breach. Then, because of the effect of the expropriation, a new valuation is performed, based on pricing and market information available as of the date of the expropriation. The initial award of damages attributable to Decree 662 is capped at that point; this then requires the Tribunal to make certain determinations as to the nature of the contractual rights that were terminated. These are included in the calculation and the value of the one-month interest in Block 7 as well as the approximately 10-year period left on Block 21 will be estimated.
115. The Tribunal has taken this approach because it accepts Professor Kalt's concern about valuing an asset whose value had already been diminished. Thus, rather than valuing what might be called the 'below reference price' contractual rights, in theory compensated by the prior award of damages, as of the day before the expropriation, the Tribunal will establish a new valuation of the totality of the contractual rights that were taken away from Perenco, based on the prevailing market conditions. This analysis will be *ex ante*, but it will allow the Tribunal to consider all relevant actual market developments as well as employ the assumptions as to what Perenco would have done in both Blocks during the prior period and what it would have done in the remainder of the Blocks' lives.
116. Unlike the situation in *ADC v. Hungary*, where the value of the airport concession rights at issue had crystallised after the submission of the claim to arbitration and before the date of

⁶⁹ This is due to the fact that a pro-rating approach would implicitly assume that the value produced by the field was constant in each month over the field's life. Discounting would over-weight cash flows that are nearer in time relative to those further off in the future. In addition, value is often front-end loaded because production rates often start high and then decline over time. Declining profiles result in higher revenue and cash flows earlier in field life than later. Pro-rating would also cause problems with the modeling of capital expenditures.

the award⁷⁰, the Tribunal finds itself in the midst of a period stretching between *caducidad* and the date of expiry. Having regard to the Parties' extensive debate over the use of *ex ante* versus *ex post* valuation data, the Tribunal is concerned about the degree of randomness associated with employing the date of the Award as the valuation date since a single significant event can have dramatic effects on valuation given the volatility of the oil market. In the circumstances of this case, the Tribunal will employ an *ex ante* willing buyer-willing seller approach using the price of oil prevailing at the time of the expropriation (approximately US\$76/bbl WTI as of July 2010).

117. In line with its conclusions that:

- (i) there were no inter-linked breaches such as to justify the use of a single date of valuation;⁷¹
- (ii) it is in principle appropriate to seek to value the damages caused by the different breaches occurring at the relevant times; and
- (iii) the contemporaneous evidence of value is a useful check against the Tribunal's estimates;

the Tribunal considers that an approach using the well-accepted *ex ante* approach to valuation as the primary point of reference is reasonable and appropriate in the circumstances. (It uses the word "*primary*" because of the fact that with the passage of time between the commencement of this arbitration and the rendering of this Award, Petroamazonas has operated the Blocks and inevitably the testimonial and expert evidence pertaining to the operation of Block 21, in particular, has mixed *ex ante* with *ex post* data. In the circumstances, the Tribunal has no interest in attempting to 'unscramble the egg' by drawing a strict line between these data.)

⁷⁰ *ADC Affiliate Limited and ADC & ADMC Management Limited v. Republic of Hungary*, ICSID Case No. ARB/03/16, Award, 2 October 2006.

⁷¹ See above, Section II.C.1) Date of Valuation.

4. The Role of Contemporaneous Evidence of Value

118. The Tribunal is strengthened in its belief that estimating the damages attributable to each breach and in chronological order is the correct approach to be taken in the circumstances of this case, by the availability of Perenco's contemporaneous net present value (NPV) calculations of the impact of Law 42 at both 50% and 99% on both Blocks. These calculations were performed immediately after Decree 662's announcement.⁷² The spreadsheet for Block 21, for example, which was disclosed by Perenco in the documents production phase and reviewed by Brattle, shows that the NPV calculation for Block 21 ran, as would be expected, to Block 21 Contract's expiry date of 2021.⁷³
119. These documents of the Claimant's own making are, in the Tribunal's view, good evidence of the Blocks' estimated value with Law 42 at 50% and 99% in light of the existing and expected market circumstances at the time of the first breach. Brattle studied Perenco's calculations and adjusted them; Perenco had, for example, used July 2007 WTI prices rather than the higher prices prevailing in early October 2007. In fact, Brattle ended up arriving at somewhat higher NPV calculations than Perenco itself did at the time.⁷⁴

⁷² Exhibit BR-26.

⁷³ Exhibit BR-27 (NPV impact of Law 42 at 99%); Exhibit BR-28 (NPV impact of Law 42 at 50%).

⁷⁴ See Brattle ER II, paragraph 253: "Damages for this economy of the contract scenario resemble the financial analysis performed by Perenco, in October 2007 immediately after the introduction of Decree 662. We estimate that Decree 662 reduced the October 2007 fair market value of Perenco's Block 7 and 21 interests by \$158 million (excl. prejudgment interest), just less than double the \$85 million estimated by Perenco at the time." This is further elaborated in footnote 157 to the same paragraph: "Perenco's estimate of \$84.8 million appears in an 9 October 2007 email from Jerome Garcia. With Law 42 at 50%, we estimate the October 2007 fair market value at \$109.1 million for Block 7 and \$156.6 million for Block 21. This compares with the \$122.1 million for Block 7 and \$117.3 million for Block 21 reported in the Jerome Garcia email. At Block 21 (where we have the Perenco models), we assume higher prices and costs than Perenco's models (PERPROD0032725 (Exhibit BR-27) and PERPROD0032726 (Exhibit BR-28)), and more production. With Decree 662, we estimate the October 2007 fair market value at \$58.8 million for Block 7 and \$48.9 million at Block 21. This compares to the \$84.1 million for Block 7 and the \$70.5 million for Block 21 estimated by Perenco at the time. Given the presence of Decree 662, our fair market value estimate for Block 21 is lower than Perenco's because our model assumes higher operating costs."

120. In its Reply Post-Hearing Brief, Perenco downplayed the significance of its NPV calculations, describing them as “*back-of-the-envelope, hurried calculations to understand Decree 662’s immediate impact.*”⁷⁵
121. Ecuador had addressed this contention in its closing submissions at the Quantum Closing. Slides 122 and 123 of Ecuador’s presentation showed that the calculations were closely comparable to Perenco’s other valuations, made prior to Decree 662’s coming into effect, as to the Blocks’ value and indeed in one case what Perenco –*acting as a possible willing purchaser*– might be willing to pay Burlington for the latter’s interests in the Blocks just one month before Decree 662’s promulgation.⁷⁶ In counsel’s submission:

“This confirms that the allegedly hurried calculation of BR-26 is not such hurried valuation. It actually follows from a September 2007 valuation, that’s consistent, and then it’s much higher than the March 2007 valuation. These were prepared with plenty of time, not in a hurry. And as you can see at the bottom of the table, we have put Brattle’s valuation. Brattle’s valuation of Block 7, 111.3 million, is within 10 percent of Perenco’s own valuations in October and September 2007 and higher than their earlier valuation of March 2007.

The same happens with Block 21.”⁷⁷

122. The Tribunal considers that Perenco’s analysts would have had a good preliminary understanding of Decree 662’s impact on the company’s interests in the Blocks. The email chain’s distribution list contains the names of seven Perenco employees who were involved in analysing Decree 662, including Eric d’Argentré, Perenco’s Country Manager for Ecuador. Obviously, the calculations were based on the information available to the company at the time. This necessarily has to be the case when projecting into the future with a new factor added into the mix. But the projections were being made by employees with knowledge of (i) the Participation Contracts’ terms; (ii) the Blocks’ performance to

⁷⁵ Cl. Rep. PHB Q., paragraph 73.

⁷⁶ Tr. Q. (2) 366:18–367:5 (Cross-examination of Combe): “This is a valuation document for purchase. So, I would expect a —and I have to say, I did not participate in it— so, that’s my opinion might be slightly different from what Paddy [Spink] did here —Paddy was our manager for new business— but basically he was being conservative in evaluating prices so he would assume probably the low case. So, if Conoco was not putting any value on the extension, then he wouldn’t offer any additional value. That’s standard practice, basically.”

⁷⁷ Tr. Q. (6) 1833:9-20 (Respondent’s Closing Submission).

date and their characteristics and potential; (iii) Perenco's and the Consortium's intentions; and (iv) wider industry market expectations at the time.

123. During 2007, in the months leading up to Decree 662, Perenco: (i) produced its Mid-Term Outlook in March; (ii) valued Burlington's interests in the Blocks with a view to a potential purchase in September; and (iii) analysed the effect of Decree 662 in October 2007.⁷⁸ The Tribunal notes that Professor Kalt commented in his December 2014 expert report that in his experience, "*investors in oil and gas properties and contracts routinely use DCF analysis in the course of business to provide them with measures of how much they should value an investment and, in certain cases, how much they should be willing to pay, or be paid, for oil and gas development projects.*"⁷⁹ The Tribunal accepts this and is therefore inclined to use Perenco's contemporaneous analysis of the impact of Decree 662 as a check on its own estimation of the Blocks' values.
124. Professor Kalt initially testified that he recalled having seen Perenco's internal calculations of Law 42's effect at 50% and 99% on its interests in the Blocks but then indicated that he was not sure whether he had seen Perenco's spreadsheets. In any event, he stated that he did not find it relevant to discuss them in his reports.⁸⁰ This was an understandable position for him to take because it was consistent with his view that the single date approach to valuation should be taken. Since the Tribunal has *not* taken the 'single date' approach, however, it considers Perenco's NPV calculations to be relevant evidence of its view of the Blocks' values in October 2007 with and without Law 42 at 99%. Obviously, that value would change over time depending upon a host of factors, but it is a good way to check the results that the Tribunal arrives at.

⁷⁸ Exhibit BR-27 and Exhibit BR-28, Spreadsheet analyses for Block 21, which were also attached to Exhibit BR-26, PERPROD0032722 (emails exchanged internally regarding impact of Law 42 at 99%).

⁷⁹ Kalt ER III, paragraph 54.

⁸⁰ Tr. Q. (5) 1333:5-16, 1334:1-4 (Kalt). "Q. Do you understand this e-mail to reflect what Perenco thought at the time would be what would happen in all probability had it continued with the Contracts? A. Well, I don't know. They've obviously done some kind of analysis of that nature. But I can't tell all the assumptions that they are putting in here. They're doing some calculation of that. They're trying to understand something about the impact of Decree 662 on them obviously, but I don't know all the assumptions that go into this. I don't know....Q. ...but did you ever see a copy of those spreadsheets? A. I don't know. I don't recall."

5. Summary of the Tribunal's General Approach

125. The point of departure therefore is the Tribunal's view that it must estimate the damages proximately caused by each breach and that this must be done as of the date of their occurrence. Accordingly, the Tribunal considers primarily on an *ex ante* basis (and referring to contemporaneous evidence where possible):
- (i) the financial impact of Decree 662 on Perenco's interests in the Blocks as of the date of the first completed breach, 4 October 2007, with a view to estimating the compensation for the damage caused by that breach;
 - (ii) and in relation to the foregoing, Decree 662's specific impact on Perenco's drilling plans at the time so as to estimate what they would have been through to contract expiry for both Blocks in the 'but for' world (because this issue drives the expected levels of production and hence the projections of cash flows in the 'but for' world);
 - (iii) the damages to which Perenco is entitled as a result of the termination of its contractual rights in relation to Blocks 7 and 21;
 - (iv) whether, in the 'but for' world, Perenco would have enjoyed an extension of its operatorship in Block 7 after August 2010;
 - (v) Ecuador's 'true-up' submissions to determine whether any damages calculated under the foregoing heads need to be adjusted; and
 - (vi) the applicable rates of interest (to the date of the Award and to the date of payment of the Award).
126. Based on its various findings and conclusions, the Tribunal will then estimate the quantum of damages that should be awarded to Perenco using a 'harmonised model' that draws from the work of both sides' financial experts.

D. The Quantum of Damages for Decree 662, the First Completed Breach

127. The Tribunal did not find a breach of contract or of treaty for Law 42 at 50% and therefore no damages can flow for Law 42 dues at 50%, at least until the promulgation of Decree 662, for the simple fact that no unlawful act was committed until 4 October 2007.⁸¹ The

⁸¹ As the ILC Articles state in Article 31(2), Reparation: "Injury includes any damage, whether material or moral, *caused by the internationally wrongful act* of a State." Commentary (9) notes in this regard that it is "*only* '[i]njury ... caused by the internationally wrongful act of a State' for which full reparation must be made." [Emphasis added.]

question is whether or how the analysis changes as of that date. This affects the analysis on the drilling programme and in turn the volume of oil produced in the ‘but for’ scenario.

1. Economy of the contracts – Whether Law 42 would have been completely absorbed

(a) Perenco’s Position

128. Perenco argued that the economy of the Contracts was the specific contractual bargain reflected in the economic clauses of the Contracts themselves, which guaranteed Perenco’s full exposure to oil prices regardless of IRR.⁸² Dr. Pérez Loose and Professor Aguilar both agreed that, under Ecuadorian law, the ‘*economy*’ of a contract designates the balance of rights and obligations that determined the economic benefits of the contract for the parties.⁸³ This also defined the risks that each party would bear during the performance of the contract.⁸⁴
129. The evidence confirmed that Law 42 triggered the clauses. Perenco would have exercised its ‘*absorption*’ rights in a ‘but for’ world. The Tribunal must assume that Ecuador would have honoured its legal obligations in good faith.
130. Perenco argued that it had not lost its ‘*absorption*’ rights whether on grounds of *res judicata* or waiver. First, the Tribunal has not expressly decided the issue and has not rejected it. The Tribunal found only that Perenco had not established that Ecuador breached Perenco’s ‘*absorption*’ rights before Decree 662. Ecuador’s argument, that the Tribunal’s decision to reject Perenco’s claim that it was futile to exercise its rights when Law 42 applied at 50% should be applied *mutatis mutandis* to the situation where Law 42 applied at 99%, is incorrect because the Tribunal held that pursuing the clauses was indeed futile after Decree 662.
131. Second, Perenco had not waived those rights. Perenco had paid the Law 42 dues on a ‘*bajo protesta*’ (‘*without prejudice*’) basis. It had invoked the Renegotiation Clauses through its

⁸² Cl. PHB Q., paragraph 58.

⁸³ *Ibid.*, paragraph 59.

⁸⁴ *Id.*

December 2006 letters. Perenco also claimed a breach of the clauses in this arbitration. Even if Perenco's attempts to invoke the clauses were not exercised sufficiently vigorously in relation to Law 42 at 50%, this did not amount to a waiver of its rights under Ecuadorian law. Dr. Pérez Loose's testimony that nothing obliged Perenco to exercise the rights within a particular time was unchallenged.⁸⁵ The evidence and testimony of Perenco's witnesses also confirmed that Perenco continued to seek discussions with Ecuador through various avenues. Seeking an abatement of Law 42 was one of the key objectives that Perenco's CEO set for the Ecuador team in 2007.⁸⁶ Mr. Combe and Mr. d'Argentré both testified that they did intend to further assert Perenco's absorption rights, but were attempting to find the right opportunity to do so.⁸⁷ This was confirmed by Mr. Márquez.⁸⁸

132. Ecuador's argument that the clauses mandated nothing more than negotiation must be rejected based on the Tribunal's findings and the evidence. The Tribunal had already rejected Ecuador's contention that the Renegotiation Clauses mandated only that the Parties negotiate a mutually agreeable offset.⁸⁹ The Tribunal found that the absorption clauses "did stipulate the ultimate result, namely, a change in the parties' respective participations 'which absorbs the increase or decrease in the tax burden.'"⁹⁰ Ecuador conflated the clauses' mandated result (full absorption) and the precise means to reach that result (good-faith negotiations). The December 2006 letters confirm Perenco's contemporaneous understanding of the absorption clauses, for example: "the Consortium will present the numbers which illustrate [the] economic impact on the Contract[s], in order to determine the percentage of participation which should be adjusted in favor of the Contractor."⁹¹

⁸⁵ Cl. PHB Q., paragraph 108, citing Tr. Q. (3) 901:9-12 (Pérez Loose); Loose ER VI, paragraph 25-27.

⁸⁶ Márquez WS II, paragraphs 8-9; CE-323, p. 6.

⁸⁷ See Combe WS II, paragraphs 7, 9, 12-16 and d'Argentré WS V, paragraphs 2-3.

⁸⁸ Márquez WS II, paragraphs 26-31.

⁸⁹ Cl. Rep. Q., paragraph 152 *responding to* Resp. C-Mem. Q., paragraph 190; see also *ibid.* paragraph 161, 201.

⁹⁰ Decision on Liability, paragraph 365.

⁹¹ Cl. Rep. Q., paragraph 156 quoting Decision on Liability, paragraph 379; referring further to Combe WS II, paragraph 18.

133. Ecuador's alternative partial absorption theory was not what the Contracts provide. They required that the correction absorb the increase or decrease in the tax burden, not only an increment of the new tax.

(b) *Ecuador's Position*

134. Ecuador stated that its position throughout this arbitration has been that since the economy of the contract was never disturbed, the invocation of the Participation Contracts' taxation modification clauses would not have led to an adjustment of Perenco's participation, and therefore no damages are due.⁹² Ecuador argued that the economy of the contract was a mathematical-economic equation underlying Clauses 8.1 of the Participation Contracts which was either the Consortium's expected average revenue of US\$15/bbl or the Consortium's expected internal rate of return of around 15%.⁹³ Perenco's claim to full absorption found no support in the Participation Contracts themselves (noting in this regard that the Tribunal had found that the Renegotiation Clauses "did not stipulate how the correction factor was to be calculated").⁹⁴ Further, Perenco's reliance on Ecuador's alleged past practice in relation to VAT, SOTE and ECORAE charges is entirely misplaced.

135. Even if the Tribunal were to consider that modification was necessary so that the Consortium might enjoy some form of unspecified 'upside' potential on oil prices, such modification would not simply be to absorb the difference between Law 42 at 50% and 99% but only to absorb such amount necessary to provide the Consortium with the 'upside' exposure to oil prices to which the Tribunal appeared to consider that the Consortium was entitled. As Brattle explained, on this theory, Law 42 would apply to the Consortium at a rate of 81% for Block 21 and 99% for Block 7, but even at those rates, no modification of the X factors was necessary.⁹⁵

⁹² Resp. PHB Q., paragraphs 78-79.

⁹³ *Ibid.*, paragraph 141.

⁹⁴ Resp. C-Mem. Q., paragraph 141, citing Decision on Liability, paragraph 365.

⁹⁵ Resp. C-Mem. Q., paragraph 142.

136. It argued further that since the Tribunal found that once Law 42 at 50% was implemented, “it was incumbent upon [Perenco] to make its case ... at that time”⁹⁶ and since Perenco did not do so, it was too late to do so in the quantum phase by arguing it would have invoked its rights “but for” Decree 662.⁹⁷ Ecuador considered that Perenco was relying on self-serving evidence, “non-credible *ex post facto* testimonies” such as Mr. Márquez’s statement that Perenco was simply waiting for the right opportunity to discuss the matter properly.⁹⁸ The simple truth was that, whether it believed the process was futile or not, Perenco had determined not to seek the application of the Renegotiation Clauses with respect to Law 42 at 50%.⁹⁹
137. Ecuador argued therefore that Perenco could not now seek to invoke the Renegotiation Clauses in the quantum phase to claim full absorption of Law 42.

(c) *The Tribunal’s Decision*

138. The issue is whether the damages to be awarded in respect of Decree 662 should be calculated (i) for the entirety of the 99% of the extraordinary revenues set by the Decree; (ii) for the additional 49% (*i.e.* above Law 42 at 50%) of the above-reference price value required to be collected by Decree 662; or (iii) on some other basis.
139. The Tribunal begins by recalling that its Decision on Liability contains a finding that bears on this issue. At paragraph 703, it stated:

“In the end, the narrow question for the Tribunal is whether Perenco, having sought the aid of the Tribunal, could then take comfort that its refusal to pay the 2008 Law 42 dues to Ecuador would protect it in this arbitration without any potentially adverse consequences. The Tribunal has carefully considered the Parties’ positions. It considers that Perenco had a right to expect that Ecuador would desist from enforcing the *coactivas* during the pendency of the arbitration. It also considers that in deciding to withhold all Law 42 amounts claimed in 2008, Perenco assumed that the Tribunal would accept its claims that none of the Law 42 dues claimed by the State were permissible under the Contracts or the

⁹⁶ Decision on Liability, paragraph 394.

⁹⁷ Resp. PHB Q, paragraph 58.

⁹⁸ Resp. Rej. Q., paragraph 257.

⁹⁹ Resp. C-Mem. Q., paragraph 148.

Treaty. Given that Perenco has not made out its claims in respect of Law 42 at 50%, the Tribunal holds that even though Ecuador should have complied with the Decision on Provisional Measures, the *coactivas* ought not to be included in the Tribunal’s analysis of the measures said collectively to constitute an indirect expropriation...In addition, to the extent that Perenco has succeeded in its claim that the application of Decree 662 at 99% violated Article 4 of the Treaty, as found at paragraphs 606-607 above, the enforcement of the *coactivas* to collect the claimed additional 49% constituted a breach of the fair and equitable treatment standard, but it was not an expropriation of the investment.)”¹⁰⁰ [Emphasis added.]

140. The precise wording of this finding precludes awarding damages for Law 42’s effect prior to the first breach. But the Tribunal also found that futility was proven as of 4 October 2007.¹⁰¹ Beyond that, the Tribunal did not pass on what might be considered in the damages phase with respect to the possible exercise of the tax modification clauses (except to note how the contracts’ provisions were expected to operate).¹⁰²
141. For the purposes of its damages analysis, the Tribunal considers that it must be assumed that if Perenco exercised its contractual rights in the ‘but for’ scenario, Ecuador would have responded in good faith by negotiating an absorption of the additional tax burden effected by Decree 662. After considering the evidence, the Tribunal finds that in the ‘but for’ scenario for the period after Decree 662 came into effect, Perenco would have sought an offset. But having regard to the evidence as whole, the Tribunal is not convinced that Perenco would have sought the complete elimination of Law 42 (*i.e.* stabilisation at 0%). Rather, it would have sought to undo the effect of Decree 662 and, to the extent reasonably possible, Law 42.
142. The Tribunal’s reasoning in this respect is straightforward: (i) it was clear to all that Ecuador was moving away from participation contracts and could be expected to require that any new contracts that it might grant would not follow that model; (ii) even in the ‘but for’ world, this change in the country’s hydrocarbons exploitation policy would exist as a lawful fact; (iii) the Block 7 Participation Contract was approaching its expiry (in August

¹⁰⁰ Decision on Liability, paragraph 703.

¹⁰¹ *Ibid.*, paragraph 411.

¹⁰² *Ibid.*, paragraphs 395-398.

2010) and Perenco was well aware of that fact and the need to adjust its expectations in order to have any chance of obtaining an extension of its operatorship in Block 7; and (iv) it is common ground between the Parties and was well understood at the time that Block 7 was the more valuable of the two Blocks.

143. In these circumstances, the Tribunal believes that Perenco would have recognised that the extraordinary returns generated under the Participation Contracts due to the significant increase in oil prices starting in the early 2000s were, for Ecuador, practically-speaking unsustainable, having regard to the financial implications of the windfalls that had been generated from the country's finite hydrocarbon resources under this form of contract. Moreover, Perenco's interest in obtaining a contractual extension for Block 7 would have provided a strong incentive for it to moderate its demands in seeking the full absorption of Law 42. In short, the Tribunal believes that in the 'but for' world, Perenco would have been most likely to seek a negotiation under the tax modification clauses that would have reduced the State's take of the extraordinary revenues, whilst maximising the company's chances of its obtaining an extension of its operatorship of Block 7.
144. The Tribunal thus holds that after Decree 662 entered into effect, Perenco would have been prompted to trigger negotiations and the Parties would have agreed to Law 42 being stabilised at 33% starting 5 October 2008, to be applied prospectively, for both contracts.
145. The Tribunal adds that while it might be that in the 'but for' world Perenco would use the occasion of the tax modification negotiations simultaneously to seek a Block 7 extension, it cannot be safely assumed that Ecuador would have agreed to an extension. The extension issue is therefore addressed separately below.
146. The Tribunal holds that Perenco's interests in the two Participation Contracts would be adjusted to a stabilised Law 42 rate of 33% as of 5 October 2008 through to contract expiry.

2. Estimating the Direct Financial Impact of Law 42 at 99%

147. In terms of valuing the direct financial impact of Decree 662, Perenco's NPV calculation performed just after Decree 662 was promulgated permitted the Tribunal to perform a rough estimate of the value of the company's interests in the Blocks by subtracting the total

value of the revenues foregone in the remaining years of the Contracts in order to arrive at an estimate of the residual value of Perenco’s interests (what might be termed the “below Decree 662 reference price” value). This was also valued by Brattle and the results are as follows:

Points of differences	Perenco in 2007	Brattle (1st Report)¹⁰³	Brattle (2nd Report)¹⁰⁴ – Updated using RPS’s Costs	Brattle (2nd Report)¹⁰⁵ – Updated using Prof. Kalt’s Costs
Value of Block 7 with Law 42	NPV: \$122.1 million	FMV: \$109.1 million	FMV: \$111.3 million	FMV: \$114.5 million
Value of Block 21 with Law 42	NPV: \$117.3 million	FMV: \$156.6 million ¹⁰⁶	FMV: \$170.9 million	FMV: \$181.3 million
Total Value of Blocks with Law 42 <i>(c.f. Perenco’s 2007 calculations)</i>	\$239.4 million	\$265.7 million <i>(+\$26.3 million)</i>	\$282.2 million <i>(+\$42.8 million)</i>	\$295.8 million <i>(+\$56.4 million)</i>
Value of Block 7 with Decree 662	NPV: \$84.1 million	FMV: \$58.8 million	FMV: \$59.1 million	FMV: \$58.8 million
Value of Block 21 with Decree 662	NPV: \$70.5 million	FMV: \$48.9 million ^{107***}	FMV: \$68.5 million	FMV: \$68.7 million
Total Value of Blocks with Decree 662 <i>(c.f. Perenco’s 2007 calculations)</i>	\$154.6 million	\$107.7 million <i>(-\$46.9 million)</i>	\$127.6 million <i>(-\$27 million)</i>	\$127.5 million <i>(-\$27.1 million)</i>
Fall in value of Block 7 due to Decree 662	\$38 million	\$50.3 million	\$52.2 million	\$55.7 million
Fall in value of Block 21 due to Decree 662	\$46.8 million	\$107.7 million	\$102.4 million	\$112.6 million
Total Loss in Value <i>(c.f. Perenco’s 2007 calculations)</i>	\$85 million	\$158 million <i>(+\$73 million)</i>	\$154 million <i>(+\$69 million)</i>	\$167 million <i>(+\$82 million)</i>

148. In the Tribunal’s view, these estimates provide a useful check against the damages estimate.

¹⁰³ Brattle ER II, fn. 157.

¹⁰⁴ Brattle Table M.

¹⁰⁵ *Id.*

¹⁰⁶ Brattle explained that they assumed higher prices and costs than Perenco’s models and more production.

¹⁰⁷ Brattle explained that their model assumes higher operating costs.

149. To arrive at a final amount calculated on an *ex ante* basis, it is necessary to estimate how many wells Perenco would have drilled in the ‘but for’ world. Here the Parties’ oilfields experts (Perenco’s Mr. Crick, acting not as an independent expert, but rather as a fact witness with certain technical expertise, and RPS, Ecuador’s technical experts) held very different views as to what that drilling activity would have been undertaken but for Decree 662, an issue to which the Tribunal now turns.

3. Decree 662’s Impact on Perenco’s Drilling Plans for Block 7 and Block 21

150. The evidence is that the decree led to a virtually immediate stoppage in the Consortium’s drilling operations.¹⁰⁸ In Exhibit BR-26, the Perenco email which contained the results of the company’s NPV calculations, there was some discussion about continuing with the plan to drill Oso 23.¹⁰⁹ But this was the sole exception to the cessation of drilling activity. Charts depicting the company’s well-drilling history produced at the Tribunal’s request after the Quantum Hearing showed that while Perenco drilled 11 wells in Block 21 in 2005, 13 in 2006 and one in 2007, it did not drill any wells in 2008 or in the first half of 2009 (whereupon it suspended operations).¹¹⁰ Likewise, for Block 7, Perenco drilled six wells in 2005, 11 in 2006 and five in 2007, but it did not drill any wells in 2008 or in the first half of 2009.¹¹¹

151. The Tribunal has no doubt that but for Decree 662, in the absence of its securing an extension of the Block 7 Participation Contract, Perenco would have drilled more wells in Block 7 up to August 2009 (one year before the Contract’s expiry, whereupon Perenco would have ceased drilling wells due to the need to ensure an adequate payback before

¹⁰⁸ Cl. Mem. Q., paragraph 47; d’Argentré WS V, paragraph 16; Perrodo WS II, paragraph 7.

¹⁰⁹ Exhibit BR-26: In response to Mr. Daniel Kadjar’s query, “Do you recommend to drill Oso-23 and release the rig afterwards or to release the rig after Oso-22?”, Mr. d’Argentré wrote in an email, “If we drill the OSO23 we must explain to the state that this is the last one and that we do it because of contractual obligation with the drilling contractor, and that it is obviously difficult to stop a campaign so quickly. In other words, we don’t want the state to believe that we carry on drilling because it is still profitable. To answer your question I think we should drill OSO23 and send our termination notification to H&P in the meantime. We have all drilling equipment ready plus the NPV is still around 3.7M\$.”

¹¹⁰ Block 21 Wells Chart for Tribunal produced on 15 December 2015 by way of email.

¹¹¹ *Id.*

contract expiry¹¹²). As for Block 21 (which, at the time of Decree 662's promulgation, still had some 14 years left before the Contract expired), the Tribunal has to estimate a reasonable drilling programme for that Block, which programme might reasonably be expected to extend past the declaration of *caducidad*.

152. This exercise is also potentially bound up in the evaluation of the drilling activities after the declaration of *caducidad* in that there are two periods with which the Tribunal is concerned: (i) from 4 October 2007 to 20 July 2010; and (ii) from 21 July 2010 to contract expiry. This means weighing the Consortium's actual plans up to 4 October 2007 which were then put on hold and considering what would, on a balance of probabilities, likely have happened in both blocks had Decree 662 not been promulgated. This will be used for the first period. The Tribunal will then perform a further estimate as to what would have happened after the declaration of *caducidad*.
153. This necessarily raises the question of the fate of the Block 7 Contract because Mr. Crick indicated that the Consortium would have continued drilling in Block 7 at least up to August 2009. He testified that this was when, in the absence of an extension, Perenco would stop drilling new wells due to the need to enjoy a suitable payback period before surrendering Block 7 to Ecuador.¹¹³ Accordingly, the Tribunal will first consider whether, in the 'but for' world, Perenco would have enjoyed an extension of its operatorship in Block 7 after August 2010.

(a) *The question of an extension of the Block 7 Contract after August 2010*

154. With good reason, the Parties have argued this issue at considerable length, since it accounted for a substantial portion of Perenco's revised claim of a total of US\$1.493 billion in damages. (See Brattle's Waterfall Chart reproduced above at paragraph 65.) As already

¹¹² Tr. Q. (3) 627:14-22 (Mr. Crick's Direct Presentation).

¹¹³ Crick WS II, paragraph 147: "I have assumed that Perenco would have achieved an average of one well per month, and I assume that it would have stopped any new investments one year before the end of the contract. [August 2010 expiry date for the Block 7 Contract]."

noted, Perenco's rights under the contract to the Block 7 Oso Field were the most valuable of Perenco's Ecuadorian assets.¹¹⁴

155. According to the Contract, Perenco's interest in Block 7 was to expire on 16 August 2010, and as events transpired, this occurred some 27 days after the declaration of *caducidad* was issued.¹¹⁵

156. The Contract contained a clause that permitted the Contract to be extended in certain circumstances:

“Clause 6.2 Production Period: In this case, the Production Period shall last until August sixteenth (16), two thousand ten (2010); this term may be extended, provided that it is in the State's best interest, for the following reasons:

- When the Production area is located far from existing hydrocarbon production infrastructure, with the prior approval of the Ministry of Energy and Mines and for a period of up to five (5) years;
- When the Contractor proposes significant new investments during the last five (5) years of the Production Period, with the prior agreement of the Ministry of Energy and Mines and the approval of the CEL, provided that adequate amortization periods are required for those investments;
- If the Commercially Exploitable Hydrocarbon Deposits are discovered as an exclusive result of new exploration work performed by the Contractor, the Production Period shall be extended with the prior agreement of the Ministry of Energy and Mines and the approval of the CEL.”¹¹⁶

(i) Perenco's Position

157. Perenco argued vigorously that its contractual rights would not have expired, but rather in the 'but for' world it would have been permitted to operate the field in some form or another. In this regard, it pointed to evidence of other extensions granted by Ecuador to

¹¹⁴ Perenco's Chairman, François Perrodo, likewise stated that the Block 7 Contract extension was a “high priority” for Perenco and that Perenco was prepared to offer significant value to obtain an extension. Perrodo WS II, paragraph 10.

¹¹⁵ *Caducidad* was declared on 20 July 2010.

¹¹⁶ CE-17.

operators during the relevant period.¹¹⁷ It also noted that even during the time that it operated under Decree 662 at 99%, it was negotiating an alternative arrangement with Petroecuador – the so-called *Acta*– and that the parties had arrived at an agreement which was not consummated because Perenco’s fellow consortium member, Burlington, having decided to withdraw from Ecuador, refused to agree to its terms. As the Tribunal found, this refusal of its fellow Consortium member was essentially held against Perenco by Ecuador.¹¹⁸

[1] *Ecuador did not have unfettered discretion whether or not to grant an extension*

158. Perenco argued first that the evidence showed that a good faith exercise of Ecuador’s discretion under Clause 6.2 would more likely than not have led to an extension of Perenco’s Block 7 operatorship. Ecuador did not have unfettered discretion to refuse to extend Perenco’s Block 7 operatorship. As Dr. Pérez Loose testified, a fair reading of Clause 6.2 would be that when any of the three circumstances for extension were met,¹¹⁹ the State’s best interest was presumptively satisfied and Ecuador was obliged to grant an extension.¹²⁰

[2] *The Parties could have agreed to extend on different terms*

159. Perenco also contested Ecuador’s reading of Clause 6.2 to the effect that it permitted only an extension of the expiration date of Block 7 Contract, and no amendments of any of the

¹¹⁷ Cl. Rep. Q., paragraph 168 relying on Resp. C-Mem. Q, paragraph 118 which cites the amended contracts for Block 10, Block 14, Block 16, Block 17, MDC, PBHI and Tarapoa.

¹¹⁸ Decision on Liability, paragraph 619.

¹¹⁹ Loose ER VI, paragraph 38: “Clause 6.2 established Perenco’s right to have the term of the contract extended provided that certain conditions are met: (i) when the “production area is located far from the existing petroleum hydrocarbons infrastructure...”; (ii) when the Contractor proposes “significant new investments in the last five (5) [years] of the Production Period...^a and “provided adequate amortization periods are required for said investments”; and (iii) when there is a “...discovery of new Commercially Producing Hydrocarbons Deposits exclusively as the result of new exploration work done by the Contractor...”.

¹²⁰ Cl. PHB Q., paragraph 66. Tr. Q. (4) 932:20-933:8 (Pérez Loose); *see also* Tr. Q. (3) 903:4-10 (Pérez Loose), Tr. Q. (4) 924:6-10, 928:3-8 (Pérez Loose); Loose ER VII, paragraph 52.

contract's other terms, as being both unsupported by the contractual language and unrealistic. It was indeed discredited by Ecuador's own sweeping practice of extending the operatorships of existing contractors on amended contractual terms.¹²¹

160. Ecuador had not contested the fact that it was prepared to extend Perenco's Block 7 operatorship on different terms from the existing ones, and that it would have done so had it complied with its international and contractual obligations. Ecuador's witnesses such as Messrs. Dávalos, Palacios, Pinto, and Chiriboga repeatedly acknowledged during the merits phase that they wanted Perenco to continue operating in Block 7.¹²² As for Perenco's witnesses, they confirmed that the extension was a high priority for the company and that they believed that they could have reached an agreement with Ecuador but for the unlawful acts. This was corroborated by contemporaneous internal documents and correspondence with Ecuador and was not tested on cross-examination.¹²³
161. The Parties' mutual interest in extending Perenco's operations in Block 7 was consistent with the longstanding historical practice in the upstream oil industry generally, and especially in Ecuador, to extend the contracts of incumbent operators. According to Mr.

¹²¹ Resp. C-Mem. Q, paragraph 118 which cites the amended contracts for Block 10, Block 14, Block 16, Block 17, MDC, PBHI and Tarapoa but asserting that these contracts were not extended.

¹²² See Palacios WS I, paragraph 22; Palacios WS II, paragraphs 25, 33; Pinto WS I, paragraphs 22-23; Pinto WS II, paragraphs 9, 17-18; Chiriboga WS I, paragraphs 12-13; Tr. Q. (4) 936:2-17 (Chiriboga). Counsel for Perenco also submitted: "Ecuador—and this will be a theme of my presentation— was always, Members of the Tribunal, a very reasonable partner. Also in his letter of the 1st of March 2006, President Palacio has stated the following: 'On repeated occasions I have invited the oil companies that have contracts with the Ecuadorian State to initiate processes of reaching an understanding for the equitable distribution of the extraordinary earnings. Nonetheless, these invitations have not been responded to, a situation that further justifies the reforms proposed without this meaning that the renegotiation process has been closed.' Well, at the same time President Palacio was submitting the draft of what became Law 42, President Palacio was expressly saying that the negotiation could be possible, that he expected—he hoped that he could actually go to the table, at the table with the oil companies and discuss the oil contracts. [...]"

As a rapid review of the essential facts from Law 42 to the termination of the Participation Contracts through *caducidad* shows, Ecuador was always a reasonable partner. You saw that in the invitations to negotiate in 2005. You saw that in the letter of President Palacio of the 1st of March 2006. And, hence, Ecuador was always willing to negotiate, but let's go right away to the facts ..." (Tr. M. (1) 275:10-22; 276:1-6; 281:4-11).

¹²³ Cl. PHB Q., paragraph 117 referring to CE-323, p. 6; Exhibit BR-32, Slide 36; E-387, Slide 103; CE-324.

Dávalos' testimony on redirect examination, Ecuador apparently declined to extend contracts only twice over the past three decades.¹²⁴

162. In 2010 alone, Ecuador executed seven amended oil contracts, extending the terms of six of the original contracts by between six and fifteen years.¹²⁵
163. Ultimately, Perenco was open to concluding a reasonable services contract for the extension period. Perenco argued that Ecuador did not deny that it would be reasonable to assume that the extension terms would have been somewhere between the parties' initial negotiating positions, and somewhat closer to Ecuador's initial position than to Perenco's, a reasonable proxy for which is effectively Law 42 at 37.5%. The Eni (AGIP) services contract extension provides strong support for this conclusion. That was a services contract in a neighbouring block in which Ecuador agreed to an eleven-year extension. Perenco specifically considered an AGIP-type contract as part of its contemporaneous extension strategy. Therefore, that contract is a good benchmark for the terms that Ecuador would have accepted for an extension. Perenco noted that Brattle's reports offered no opinion on any extension case.

[3] *Extension would have been in Ecuador's best interests*

164. As for Ecuador's argument that it would have been negligent for the State to extend Perenco's operatorship of Block 7 because the economic proposition was unattractive, Perenco argued that Ecuador's assertion relied on a flawed economic analysis. In Perenco's view, Professor Dow's analysis assessed the value of a Block 7 extension to only extend to the acceleration of investment and production, but failed to assess the benefits of partnering with experienced private contractors. In any event, Professor Dow also undervalued the benefit of such acceleration.

¹²⁴ Tr. Q. (3) 792:9-793:6, 830:14-832:5 (Dávalos).

¹²⁵ See <http://www.hidrocarburos.gob.ec/biblioteca/> (website of the Hydrocarbons Secretariat, containing links to the amended contracts for Block 10, Block 14, Block 16, Block 17, MDC, PBHI, and Tarapoa). Cl. Mem. Q., paragraph 146.

165. At the Quantum Hearing, Professor Dow conceded that a contract extension would have resulted in benefits to Ecuador exceeding the amount paid to Perenco and would thus be in Ecuador's best interest.¹²⁶ Professor Dow admitted that Ecuador's costs of capital during the 2008 to 2010 period were likely to be much higher than Perenco's 12% cost of capital and that in his calculations of the extension value he failed to account for the high opportunity costs of Ecuador's having to invest its own capital in the oil industry instead of in the public sector.¹²⁷
166. Further, Ecuador failed to adduce any evidence to support its claims that its policy to migrate to services contracts and Perenco's allegedly unsatisfactory environmental practices meant that extending Perenco's operatorship was not in Ecuador's interest.¹²⁸

[4] Perenco had met the conditions for extension under Clause 6.2

167. Perenco asserted further that it had met the two conditions for extension under Clause 6.2.
168. First, its discovery of oil in the Hollín reservoir in the Oso field met the requirement of discovery of new "Commercially Exploitable Hydrocarbon Deposits." These were "those deposits of Crude Oil which, in the judgment of the Contractor, are commercial deposits and are included in an approved Development Plan or an Additional Development Plan." Perenco did not need to discover new fields. It was immaterial that Perenco had not raised its discovery of the Oso Hollín deposit as a possible ground for extension in its September 2007 Budget Committee Meeting ("BCM").
169. Second, it proposed significant new investments during the last five years of the Contract. Perenco had proposed drilling up to 16 further wells in its 2006 Oso Plan of Development and their positive results would have led to substantial further investment which would in turn have been grounds for an extension of the Contract. In September 2007, Perenco also planned to propose additional projects in exchange for a Block 7 extension. Even during

¹²⁶ Tr. Q. (5) 1458:1-12, 1560:1-8 (Dow); Tr. Q. (5) 1560:12-1561:3 (Dow). Tr. Q. (5) 1560:20-1561:3 (Dow); *see also* Brattle ER III, paragraph 172.

¹²⁷ Tr. Q. (5) 1567:16-1568:5 (Dow); Tr. Q. (5) 1462:14-16 (Dow) *cf.* Tr. Q. (5) 1284:20-1285:7 (Kalt).

¹²⁸ Cl. PHB Q., paragraph 120.

the 2008 negotiations, Perenco agreed to a minimum investment of US\$110 million in Block 7.

[5] *Perenco would have drilled 70 new wells in the event of an extension to 2018*

170. On the assumption that Block 7 would have been extended, albeit on different terms, Mr. Crick's 'but for' drilling plan for Block 7 focused mainly on the Oso Field. Perenco observes that not only did it propose precisely the 70 wells included in Mr. Crick's programme in its 2008 Internal Review, but Petroamazonas has now drilled some 105 new wells in Oso, and based on its April 2014 Oso Development Plan, it intends to drill 28 more.¹²⁹ Petroamazonas is on track to drill roughly double the number of Oso wells that Mr. Crick planned.¹³⁰ This was confirmed at the Quantum Hearing by Mr. d'Argentré¹³¹ and Mr. Crick.¹³²
171. Mr. Crick's analysis was reviewed by Dr. Strickland, the Claimant's independent expert in these proceedings. His C.V. includes 37 years' experience performing and supervising reservoir engineering and geological projects including field studies, economic valuations, audits and field unitizations.¹³³
172. Dr. Strickland reviewed Mr. Crick's plan and noted that these numbers were based on a development plan that Perenco created in late 2008 and appeared reasonable in light of the much greater development of the field that Petroamazonas had since undertaken.¹³⁴ Since 2009, Petroamazonas had drilled 142 wells in Block 7, 105 of which have been in Oso.¹³⁵

¹²⁹ Cl. Rep. Q., paragraph 89.

¹³⁰ See Chart of Block 7 Wells submitted 15 December 2015.

¹³¹ Tr. Q. (2) 520:1-11, Tr. Q. (3) 623:19-624:2.

¹³² Tr. Q. (3) 627:10-628:5.

¹³³ Strickland ER I, paragraphs 5-8.

¹³⁴ Exhibit Strickland Reference 6, Ryder Scott Report dated 30 June 2013; Exhibit Strickland Reference 11, ECPROD29062, Profundidad Total Pozos.xlsx.

¹³⁵ Crick WS II, Appendix U.

173. Perenco argued that these developments would be carried out during an extension of Perenco’s Block 7 operatorship to 2018. The most recent data received from Ecuador in June 2015 indicated that Petroamazonas would shortly be turning its attention to the precise reservoirs that Mr. Crick has slated for waterflooding.¹³⁶

174. Mr. Crick’s latest and revised numbers for the production volumes in Block 7 were:¹³⁷

BLOCK 7			
		Original Term	With Extension
From Existing Wells	from 01/08/2009 to 16/08/2010		from 01/08/2009 to 16/08/2018
	Coca Payamino	1 605 545	9 693 365
	Other block 7	2 651 148	13 818 821
Net Gain			
from new Wells	from 01/12/2007 to 16/08/2010		from 01/12/2007 to 16/08/2018
	Coca Payamino		20 448 190
	Other block 7	13 473 339	78 533 142
Block 7 Totals		17 730 032	122 493 518

[6] *Form and value of an extension*

175. Perenco argued that given the essentially unrebutted evidence that Ecuador and Perenco would have agreed to an extension in Block 7, the only question remaining was the economic terms on which such extension would have been granted. Since the 2008 *acta* terms were the product of what the Tribunal has already held to be coercion,¹³⁸ terms agreed without such coercion would naturally have been more favourable to Perenco.¹³⁹

176. In Perenco’s submission, the Quantum Hearing demonstrated the reasonableness of Professor Kalt’s approach to estimating the extension’s value. Ecuador did not deny that it would be reasonable to assume that the extension terms would have been somewhere

¹³⁶ Cl. Rep. Q., paragraph 91.

¹³⁷ Crick WS III, Figure 1, Revised forecast for Blocks 7 and 21.

¹³⁸ Decision on Liability, paragraphs 606, 609, 612, 686.

¹³⁹ Tr. Q. (1) 150:20-151:10 (Cl. Opening); see also Cl. Mem. Q., paragraphs 151-152, 177; JK ER III, paragraphs 133-134.

between the parties' initial negotiating positions, and somewhat closer to Ecuador's initial position than to Perenco's, a reasonable proxy for which is effectively Law 42 at 37.5%.¹⁴⁰

177. Perenco's approach towards determining the value of the contract extension is therefore a reasonable proxy for the value that would have been generated in a fair negotiation between the parties had Ecuador never acted unlawfully. Perenco has even assumed that Ecuador would have done better in the negotiations and adjusted the bid-and-ask meeting point to the lower quartile of the difference between Perenco's 'best case' scenario (no Law 42) and Ecuador's 'best case' scenario (Law 42 at 50%).¹⁴¹
178. In Perenco's submission, the AGIP services contract extension¹⁴² provides strong support for this conclusion.¹⁴³ That was a services contract (hence consistent with Ecuador's claimed policy direction) in a neighbouring block in which Ecuador agreed to an 11-year extension, so it was nearly 40% longer than the period of the extension that Perenco claims in this arbitration. Perenco specifically considered an AGIP-type contract as part of its contemporaneous "extension strategy."¹⁴⁴ Therefore, the contract is a good benchmark for the terms Ecuador would have accepted for an extension. Whether it is used to corroborate Professor Kalt's approach¹⁴⁵, or as a substitute approach, the result is comparable.
179. Relying upon Professor Kalt's analysis, Perenco argued that the quantum of damages owed to Perenco in respect to the extension of Block 7 is in the area of US\$600 to 625 million (US\$626 million based on Law 42 at 37.5% or US\$604 million based on the AGIP contract,

¹⁴⁰ See Tr. Q. (1) 147:11-148:14 (Cl. Opening); Tr. Q. (5) 1348:2-8 (Kalt); see also Cl. Mem. Q., paragraphs 148-154, 173-176; Cl. Rep. Q. paragraph 179; d'Argentré WS V paragraphs 24-27; Márquez WS II, paragraph 39; JK ER III, paragraphs 130-132.

¹⁴¹ Kalt ER III, paragraphs 130-132.

¹⁴² CE-328.

¹⁴³ Cf. Tr. Q. (1) 149:16-150:1 (Cl. Opening); Cl. Mem. Q., paragraph 153.

¹⁴⁴ See *e.g.*, E-387, Slides 105, 107; BR-32, Slides 36-37; see also Tr. Q. (1) 149:16-150:1 (Cl. Opening), Cl. Mem. Q., paragraph 153.

¹⁴⁵ Cl. PHB Q., paragraph 130 referring to Tr. Q. (5) 1448:21-1449:2 (Kalt) and Kalt ER IV, paragraphs 5, 9, 125-126; JK-64.

used as a proxy for which Perenco and Ecuador would have agreed in the ‘but for’ world).¹⁴⁶

(ii) Ecuador’s Position

180. Ecuador argued that Block 7 would not have been extended for a variety of reasons, including: (i) Ecuador had the discretion to grant or not an extension, but not to extend it on different terms; (ii) it would not have been in the State’s interests to grant the extension; and (iii) Perenco had not met the requirements to trigger the exercise of discretion under Clause 6.2 of the Contract. The issue before the Tribunal was whether the Participation Contract should somehow be extended, not whether it would have been renegotiated into an AGIP-kind of services contract. Moreover, the facts showed that renegotiation failed due to, among other reasons, Burlington’s decision not to engage in a renegotiation but rather to exit Ecuador.¹⁴⁷

[1] Ecuador enjoyed ample discretion to grant or not an extension of the Block 7 Participation Contract

181. Ecuador argued that the Quantum Hearing demonstrated that Clause 6.2 of the Block 7 Participation Contract encompassed two layers of discretion – the State: (i) “*may*” extend the existing contract; and (ii) “*if and when it is in the State’s best interest*” – which discretion was triggered, if and only if, at least one of the three technical requirements under Clause 6.2 was satisfied.

182. As to the first layer of discretion, the wording of Clause 6.2 of the Contract was clear (“...*this term may be extended, if and when it is in the State’s best interest, for the following reasons...*” [Emphasis added.]). This granted ample discretion to Ecuador to decide whether to extend, or not, the term of the existing Contract’s Production Period. In Ecuador’s view, Dr. Pérez Loose was unable to escape the language of Clause 6.2¹⁴⁸ and

¹⁴⁶ Kalt ER IV, Exhibit JK-64.

¹⁴⁷ Resp. Rep. PHB Q., paragraph 20.

¹⁴⁸ Tr. Q. (4) 921:14-21 (Pérez Loose).

Mr. Perrodo had candidly recognised Ecuador’s discretionary power to grant or not an extension.¹⁴⁹

183. Ecuador criticised Perenco’s proposed interpretation for failing to give effect to the expressed intention of the parties¹⁵⁰; it did not give effect to Clause 6.2 as a whole¹⁵¹ as Dr. Pérez Loose ultimately acknowledged under cross-examination¹⁵²; and the word “*shall*” in sub-clause 6.2.3 could not override the word “*may*” in the *chapeau* of Clause 6.2 which commanded the entire provision. Sub-clause 6.2.3 related to the act of obtaining the prior agreement of the Ministry of Energy and Mines, and the approval of the Special Bidding Committee.
184. Perenco also could not prove a purported practice in Ecuador of extending all oil contracts because there was no such practice. As Dr. Dávalos had testified, there were two instances (Texaco and Sinopec) when Ecuador had not granted an extension because they were not in its best interests.¹⁵³ Even if there were such a practice, this could not legally override the discretion that Ecuador held under Clause 6.2.
185. Finally, Perenco could not rely on the good faith principle under Ecuadorian law to transform the word “*may*” into “*shall*.”

[2] *An extension of the Block 7 Participation Contract would not have been in the State’s best interest*

186. Clause 6.2 provided a second layer of discretion reserved to the State, given that the Production Period may only be extended “*if and when it is in the State’s best interest*.” As Dr. Aguilar explained, in establishing the public interest, the State must see first whether the event has occurred. If that occurred, the next step was to decide whether or not it was

¹⁴⁹ Tr. Q. (2) 562: 17-563:18 (Perrodo).

¹⁵⁰ Resp. PHB Q., paragraph 30.

¹⁵¹ *Ibid.*, paragraph 31.

¹⁵² Tr. Q. (4) 827:2-929:6 (Pérez Loose).

¹⁵³ Tr. Q. (3) 792:12-793:8 and Tr. Q. (3) 830:10-832:5 (Dávalos).

appropriate to extend the Contract.¹⁵⁴ Extending the Participation Contract would not have been in Ecuador's best interests for the following reasons.

187. First, Ecuador had chosen at the relevant time to adopt a policy of migration from participation contracts to services contracts. Contrary to Perenco's contention, Ecuador's witnesses had testified to the failed renegotiation of the Participation Contracts and not to the potential extension of the Block 7 Participation Contract.¹⁵⁵ Even if Perenco argued that it would have accepted a different model for the extension of its Block 7 operatorship, Perenco had only calculated the Block 7 extension value based on Law 42 at 37.5%; this must mean that this was an extension under a participation contract (as Law 42 only applied to such contracts), Perenco's last minute change of the basis of its valuation to employ AGIP's services contract must be therefore be dismissed outright.
188. Second, it would have been uneconomical for Ecuador. Ecuador was not just guided by economic gain, but by a plethora of objectives. Perenco's expert, Dr. Pérez Loose, was forced to retract his proposition that the State's interests were reduced to obtaining the largest amount of oil possible, as he ultimately admitted that they encompassed other issues, such as health, the environment, defence, *etc.*¹⁵⁶ Perenco could not rely on *ex post facto* evidence from its own witnesses as to the purported benefits of an extension, and that it was a high priority for Perenco, to argue that Parties would have agreed on the extension.¹⁵⁷
189. Third, Perenco was not a responsible environmental steward, and it would likely be held liable for having caused contamination in the Blocks.

¹⁵⁴ Tr. Q. (4) 985:10-12 (Aguilar).

¹⁵⁵ Resp. Rep. PHB Q., paragraph 21.

¹⁵⁶ Tr. Q. (4) 935:20-936:15 and Tr. Q. (3) 904:18-905:1 (Pérez Loose).

¹⁵⁷ Resp. Rep. PHB Q., paragraph 22.

[3] Perenco did not meet the technical requirements under Clause 6.2

190. Perenco suggested that Ecuador had not disproved at the Quantum Hearing that the two technical requirements in Clause 6.2 invoked by Perenco were met. On the one hand, the burden of proof falls on Perenco. On the other hand, and as shown by Ecuador in its Post-Hearing Brief¹⁵⁸, Perenco failed to demonstrate that it satisfied even one of the technical requirements under Clause 6.2.
191. In this respect, Perenco failed to show that it had discovered new Commercially Exploitable Hydrocarbon Deposits as an exclusive result of new exploration work pursuant to Clause 6.2.3. The evidence adduced at the Quantum Hearing confirmed that Perenco benefited from existing log data already showing the presence of oil in the Hollín. Mr. Combe also confirmed that BP, Perenco's predecessor in the Block, had conducted the first exploration activities at Oso in the 1980s.¹⁵⁹ The presence of oil was confirmed in 1988¹⁶⁰ and Perenco was in possession of this information before it drilled Oso 3.¹⁶¹
192. Therefore, Perenco had not included this alleged discovery when it drilled the Oso 3 well in the Hollín reservoir as part of its strategy for extension in the September 2007 Budget Committee Meeting. Nor did it allocate any value to an extension when it calculated the NPV of its investment in 2007.
193. Perenco did not propose significant new investments before the Participation Contract's expiry in order to qualify for an extension. The Quantum Hearing confirmed that Perenco knew full well that an extension of the Production Period was uncertain. As a consequence, from 2007 onwards, Perenco acted accordingly and accelerated investments and project development to ensure payback within the contract's term:

¹⁵⁸ Resp. PHB Q., Section 3.1.3.

¹⁵⁹ Tr. Q. (2) 345:16-346:10 (Combe).

¹⁶⁰ Tr. Q. (2) 348:19-17 (Combe).

¹⁶¹ Tr. Q. (2) 350:5-16 (Combe).

“Q. So, Mr. Perrodo, is it fair to say that, from 2007, absent a contract extension, Perenco would only make investments in Block 7 that could be amortized or paid back before August 2010?

A. [...] my decision was to, you know, make as much money as possible in case, you know, we wouldn't be granted an extension, which is clearly not what we wished for, but that's the reason why we decided to accelerate the developments.”¹⁶²

[4] Even in a hypothetical extension scenario, Mr. Crick's drilling programme would not have occurred

194. Ecuador further criticises Perenco's Block 7 extension scenario, with the 127-well¹⁶³ waterflood project advocated by Mr. Crick, as being yet another “cynical attempt by Perenco to grossly inflate” its claim.¹⁶⁴ Mr. Crick had based his forecast on a flawed methodology. This flaw was most readily apparent from the significant discrepancy between Mr. Crick's forecasted production and the actual production from the Oso field.
195. The only 2 single well pilot projects undertaken at the Lobo and Coca-Payamino fields failed to establish the continuity of the Napo U formation rock, the cornerstone for a successful waterflood project. Confronted with the fact that the pilot well at Lobo did not have the same impact on two equidistant wells, Mr. Crick conceded that this could be due to the discontinuity of the formation rock in this field.¹⁶⁵ Dr. Strickland was also forced to acknowledge that the results from the limited study undertaken (*i.e.*, one injector well in each of the Lobo and Payamino fields) show heterogeneity (or discontinuity) in the tested Napo reservoir.¹⁶⁶
196. Perenco's subsequent attempt to argue that Mr. Crick's “5-spot” development pattern would de-risk the development and account for any discontinuities only reinforced the inconclusive results obtained by the Consortium. Perenco was equally misplaced in seeking

¹⁶² Tr. Q. (2) 562:5-8, 14-18 (Perrodo). See also Perrodo WS II, paragraphs 6-7.

¹⁶³ Tr. Q. (3) 623:22 -624:2 (Crick's Direct Presentation): “Had there been an extension, we would have drilled 70 wells and an additional 120 wells for waterflooding in other Block 7 reservoirs.”

¹⁶⁴ Resp. Rep. PHB Q., paragraph.76.

¹⁶⁵ Tr. Q. (3) 723:4-9 (Crick).

¹⁶⁶ Tr. Q. (4) 1052:2 (Strickland).

to support Mr. Crick’s 127-well waterflood project through documents reflecting the risky investments proposed by the Consortium during the contract extension negotiations.¹⁶⁷ In fact, Ecuador argued, these documents: (i) showed that the Consortium was only contemplating a maximum of 29 waterflood wells in an extension scenario; and (ii) did not even mention a ‘5-spot’ development pattern.¹⁶⁸

197. Ecuador argued that Perenco persisted with Mr. Crick’s 37-well waterflood project in the Basal Tena reservoir in Coca-Payamino without even having undertaken any pilot testing in this reservoir and notwithstanding Mr. d’Argentré’s acknowledging that, for a waterflood project to work, the concept must first be proved in the reservoir.¹⁶⁹ Even Dr. Strickland had to concede that, “[i]n the Basal Tena, [...] the waterflood reserves are more uncertain there because no pilot has been instigated” causing “greater uncertainty,”¹⁷⁰ thereby further undermining Mr. Crick’s waterflood project.
198. Further, *ex post* data, on which Perenco so heavily relied, did not support waterflooding as a viable development strategy in Block 7. Indeed, Ryder Scott —a company specialised in waterflood projects¹⁷¹— had not once mentioned it in its reports to Petroamazonas.
199. Finally, Perenco was incorrect in alleging that Mr. Combe and Mr. d’Argentré provided support for Mr. Crick’s waterflood project. Mr. Combe never even addressed waterflooding.¹⁷² Mr. d’Argentré did, but his testimony could hardly be presented as supporting Mr. Crick’s extensive waterflood project given that: (i) he did not know how many wells Mr. Crick was proposing to drill as part of this project; and (ii) he did not think Mr. Crick was proposing a lot of development in those fields, because they were already developed.¹⁷³ Perenco failed to point to any evidence indicating that the Consortium

¹⁶⁷ Cl. PHB Q., paragraph 30.

¹⁶⁸ Crick WS II, Appendix L, Slides 114-119.

¹⁶⁹ Resp. PHB Q., paragraph 112 citing Tr. Q. (2) 495:2-9 (d’Argentré).

¹⁷⁰ Tr. Q. (4) 1087:12-15 (Strickland).

¹⁷¹ CE-333, p. 2.

¹⁷² Resp. Rep. PHB Q., paragraph 76.

¹⁷³ Tr. Q. (2) 494:2-8 (d’Argentré).

partners were considering to embark upon Mr. Crick's extensive and costly waterflood project in the northern part of the Block. Mr. Combe conceded that the Consortium "envisioned that all the development or future development would be around Oso."¹⁷⁴

[5] Form and value of an extension

200. Ecuador argued that both sides' experts confirmed at the Hearing the unreasonableness of Perenco's extraordinarily high extension value (presenting over 40% of Perenco's claimed damages). The DCF analysis should not include a hypothetical extension, even more so when Perenco's contemporaneous assumptions did not assign any value to a potential extension.
201. In assessing the purported value of a hypothetical extension, Professor Kalt did not apply the terms of the *Actas de Acuerdo Parcial* of 2008. Instead, Perenco came up with its own terms for a new contract.¹⁷⁵ Professor Kalt did not calculate a value for a renegotiated services contract (in light of Ecuador's policy to migrate to services contracts), and therefore Perenco failed to discharge its burden of proof.
202. On the economics of extension, the issue was not whether extension could have created benefits for Ecuador, but what price Ecuador would have been willing to pay for those benefits. Perenco's terms assumed that Ecuador would have agreed to pay more than the economic benefits it could have expected from an extension. Brattle amply demonstrated that it would have made no economic sense for Ecuador to agree to an extension on Perenco's terms because they gave "more than 100 percent share of the [value generated by the extension] for the Contractor."¹⁷⁶
203. Ecuador framed the issue as follows: Ecuador would agree to pay Perenco on top of the standard return an additional US\$626 million for Perenco to continue operating Block 7 until 2018 when Ecuador was due to receive the fields for free in August 2010 (*i.e.* at

¹⁷⁴ Tr. Q. (2) 326:16-17 (Combe).

¹⁷⁵ Kalt ER IV, paragraph 126 – damages due to Perenco assuming the extension terms contained in the *Actas de Acuerdo Parcial* of 2008 would amount to US\$1.144 million as of July 2015.

¹⁷⁶ Tr. Q. (5) 1463:1-1464:7 (Dow); Brattle ER II, paragraphs 141-176; Brattle ER III, paragraphs 137-155.

contract expiration) and any contractor could have taken over the operations then – only if Perenco offered Ecuador benefits no other contractor could. The only unique benefit Perenco could articulate at the Quantum Hearing was Mr. Crick’s purported knowledge of the fields – and that Ecuador would have granted an 800% IRR which Professor Kalt asserted would be worth \$968 million.¹⁷⁷ However, this would already be part of the costs in Brattle’s model, together with the other benefits that any other operator could provide. Thus, Ecuador’s cost of borrowing is irrelevant: Ecuador could contract with another private contractor, as it did with YPF in Block 21.

204. In response to Perenco’s criticism that “Professor Dow’s analysis wrongly assumed that Ecuador could have reaped all of the extension benefits – except acceleration – for free”,¹⁷⁸ Ecuador explained that a zero NPV (for the acceleration) did not mean that the costs are zero, but the costs had already been factored into the calculation (through the discount rate). Brattle had assumed that Ecuador would pay for an extension the standard return (discount rate) offered to contractors (*i.e.* 12%).
205. Finally, Ecuador pointed out that Perenco’s claim (to justify its unrealistic extension terms) that Ecuador agreed in the AGIP contract to a 25% rate of return on invested capital was misleading because (i) the 25% rate of return in the AGIP contract relates exclusively to investments in exploration or secondary recovery techniques, *i.e.* high-risk investments¹⁷⁹; and (ii) for production from existing fields, the AGIP contract sets a \$35 tariff/barrel produced. The AGIP contract was thus not a good comparable to Block 7.

(iii)The Tribunal’s Decision

206. The Tribunal has carefully considered this important issue and begins by setting out some general findings that have guided its analysis.

¹⁷⁷ Tr. Q. (5) 1387:1 (Kalt) (“But what you don’t have is judgment”); Tr. Q. (5) 1380:18-1381:3 (Kalt); Tr. Q. (5) 1387:17-20 (Kalt) (“But the new employees wouldn’t carry the decision-making judgment that goes into actually making the key decisions on the running of an oilfield”); Tr. Q. (5) 1445:9-20 (Kalt); Tr. Q. (5) 1384:8-20 (Kalt).

¹⁷⁸ Cl. PHB Q., paragraph 122.

¹⁷⁹ E-379, AGIP Contract dated 23 November 2010, Clause 12.3.

207. First, it takes note of the submissions concerning the precise wording of Clause 6.2 of the Participation Contract. It accepts Ecuador's argument that the State had a substantial measure of discretion when it came to deciding whether to grant an extension. Perenco itself accepted that Clause 6.2 was discretionary and the Tribunal did not find persuasive Dr. Pérez Loose's attempt to narrow the scope of Ecuador's discretion so as to make contract extension virtually mandatory.¹⁸⁰
208. Second, the Tribunal considers that even in the 'but for' world an "extension" would at its best, from Perenco's perspective, not have entailed an extension of the existing Participation Contract, but rather the Parties would have agreed that a new model would govern their relationship. Given the way in which the Parties' arguments developed, the Tribunal considers that Perenco essentially conceded this to be the case.¹⁸¹ Hence its argument that a services contract in some form would be granted and Law 42 at 37.5% was used as a proxy for the specific terms that the Parties could have agreed for the extension period had Ecuador not acted unlawfully.¹⁸² Third, the Tribunal takes note of Ecuador's evidence that some contracts were not extended.¹⁸³ This however is not very compelling evidence; Mr. Dávalos, when cross-examined on this point, was able to identify only two such instances of non-extension over the past three decades.¹⁸⁴ Moreover, Ecuador did not tender any witnesses to testify that the State would not have extended the operatorship at issue in the instant case and given that earlier in the proceeding, different witnesses,

¹⁸⁰ Tr. Q. (4) 932:20-933:8 (Pérez Loose); *see also* Tr. Q. (3) 903:4-10 (Pérez Loose), Tr. Q. (4) 924:6-10, 928:3-8 (Pérez Loose); Loose ER VII, paragraph 52.

¹⁸¹ Perenco asserted: "Ecuador's reading of Clause 6.2 to permit only an extension of the expiration date of the Block 7 Contract, and no amendments to any other terms, is unsupported by the contractual language and unrealistic." (Cl. Rep. Q., paragraph 164).

¹⁸² Cl. Rep. Q., paragraph 171. *See also* Cl. PHB Q., paragraph 120: "The un rebutted evidence also shows that Perenco was open to concluding a reasonable services contract for the extension period. Cf. Tr. Q. (1) 137:14-16 (Cl. Opening); *see also* PRQ [Cl. Rep. Q.], paragraph 165-170; d'Argentré WS V, paragraph 24 ('Perenco was prepared to accept less favorable economic terms during a Block 7 extension'); E-387, Slides 105, 107; BR-32, Slides 36-37 ('Block 7 extension strategy guidelines: . . . [c]hange the type of contract: a service contract')."

¹⁸³ Tr. Q. (3) 792:8-793:6, 830:14-832:5 (Dávalos).

¹⁸⁴ Tr. Q. (3) 792:8-793:6, 830:14-832:5.

including former ministers, conceded that Ecuador wanted Perenco to continue to operate, the absence of such testimony is telling.

209. The record evidence in fact suggests a willingness on the State's part to deal with incumbent operators. As counsel for Perenco pointed out in closing argument:

“... in 2010, Ecuador executed seven amended contracts, extending the terms of all of them, and in 2014, Ecuador extended the terms of three expiring Services Contracts with another three operators. Thus, even if Ecuador had discretion to grant an extension, so long as it was exercised in good faith, the facts compel a conclusion that Ecuador would, indeed, have extended Perenco's term in Block 7.”¹⁸⁵

210. The evidence of extensions also accords with common sense. There are considerations of convenience resulting from the incumbent's knowledge of and experience with the unique operating characteristics of each oilfield, the operator's access to a lower cost of capital than that which the State could achieve¹⁸⁶, the professional relationships between operators and their counterparts in the State's regulatory apparatus, and so on.

211. The Tribunal is convinced that there is substantial evidence that, all other things being equal, senior officials and ministers of Ecuador would have preferred that Perenco continue its operatorship of Block 7 rather than its leaving the Block. There is a substantial body of evidence on the record to support this finding in addition to the general evidence showing that Ecuador tended to extend operatorships.¹⁸⁷

212. The fundamental problem for the extension claim is that it is not possible, on the evidence before it, for the Tribunal to know *what* contractual terms might have been arrived at in a successful negotiation but for the unlawful acts. Having regard to the situation in the last quarter of calendar year 2008, the Tribunal recalls that, as Perenco asserted in its pleadings

¹⁸⁵ Tr. Q. (6) 1701:6-14.

¹⁸⁶ Tr. Q. (5) 1567:16-1568:5 (Dow); Tr. Q. (5) 1462:14-16 (Dow); *cf.* Tr. Q. (5) 1284:20-1285:7 (Kalt).

¹⁸⁷ As pointed out by Perenco in Cl. Mem. Q., paragraph 146: “In 2010 alone, Ecuador executed seven amended oil contracts, extending the terms of six of the original contracts by between six and fifteen years. See <http://www.hidrocarburos.gob.ec/biblioteca/> (website of the Hydrocarbons Secretariat, containing links to the amended contracts for Block 10, Block 14, Block 16, Block 17, MDC, PBHI, and Tarapoa).” See also CE-331 and CE-332.

during the merits phase, it did sign the Minutes of Partial Agreement (the actual title of the *Actas*), and did what it could to reach a solution acceptable to all parties.¹⁸⁸ But it faced Burlington’s disinterest, Ecuador’s insistence that both members of the Consortium agree to the new arrangement, and the fact that the minutes themselves did not constitute a binding legal agreement.

213. In this regard, the Tribunal recalls what Perenco asserted during the merits phase of the arbitration:

The Minutes were, rather, without prejudice minutes of the parties’ negotiations, which set forth certain commercial issues on the basis of which the parties agreed to continue their negotiations. RMP WS ¶¶ 31-33, 58-59. The Minutes contained an express reservation of all rights; they stated on their face that they were not binding; and they expressly referred to the need for all parties (including Burlington) to execute duly agreed contractual modifications before any of the points recorded in the Minutes could take effect. See RMP WS ¶ 32; see also, e.g., E-84, p. 2 (“The parties declare that the information contained in the present Minutes of Partial Agreement . . . will not be binding.”); *ibid.* p. 2 (“The parties declare that these agreements will be incorporated into the general negotiations that will take place in the following days and will concern mainly the following points: Arbitration and Mediation Clause. . . .”); E-87, ¶ 6 and E-89, ¶ 8 (“For the application and validity of this agreement the parties shall negotiate and execute the Transitory Participation Contracts . . .”); E-87, p. 2 (“This agreement is without prejudice and does not constitute a waiver of the rights to which Perenco Ecuador Limited and PETROECUADOR believe they are entitled . . .”) and E-89, p. 2 (“The agreements contained in these minutes are without prejudice and do not constitute a waiver of the rights to which Perenco Ecuador Limited and PETROECUADOR believe they are entitled . . .”). It was perfectly clear to all concerned that no binding agreement modifying the Contracts could be reached without Burlington’s agreement. See also GCZ WS ¶ 24 (acknowledging the Minutes were subject to Burlington approval).¹⁸⁹ [Emphasis added.]

214. Indeed, when defending its inability to persuade Burlington to continue negotiations, Perenco argued that “Burlington cannot be faulted for refusing to accept *the vague*,

¹⁸⁸ Cl. Rep. M., paragraph 490.

¹⁸⁹ *Ibid.*, paragraph 491.

incomplete and risky substitute contract it was being offered *and to take on faith that its economic interests would be preserved.*”¹⁹⁰ [Emphasis added.]

215. This is the fundamental difficulty facing this claim. The October 2008 *Acta*, which is the last indication of an apparent shared ‘in principle’ intention to establish a contractual basis for the Consortium’s continued operation of Block 7, was in the form of “minutes” and itself was not put into final legal form. The intention of the parties at the time was that, if finally agreed, the *Acta* would be a transitory agreement that would be succeeded by some form of services contract. But the final expression of the *Acta* itself, let alone the expression of the parties’ respective rights and obligations in the contract that would follow, were never reduced to writing. In the end, the Tribunal considers that Perenco’s characterisation of the *Acta* as a “*vague, incomplete and risky substitute contract*” illustrates the inherent difficulties of choosing a proxy for the Block 7 extension scenario.
216. Perenco saw the AGIP Contract as a proxy for what would have happened to Block 7 and adverted to the fact that it had considered a contract of this type as part of its extension negotiation strategy.¹⁹¹ This part of its damages claim therefore married together the financial aspects of that contract with Mr. Crick’s ‘but for’ drilling programme for Block 7.
217. But this approach founders on Perenco’s concession that there is no record evidence that *Ecuador* ever considered that the AGIP Contract could be a model for an extension of the Block 7 operatorship for Perenco.¹⁹² For all of these reasons, the idea of employing a

¹⁹⁰ *Ibid.*, paragraph 495.

¹⁹¹ See Cl. PHB Q., paragraph 130: “The Eni (AGIP) services contract extension (CE-328) provides strong support for this conclusion. Cf. Tr. Q. (1) 149:16-150:1 (Cl. Opening); PMQ ¶ 153. That was a services contract (hence consistent with Ecuador’s claimed policy direction) in a neighboring block in which Ecuador agreed to an eleven-year extension, so one that was nearly 40% longer than what Perenco claims in this arbitration. Perenco specifically considered an Eni-type contract as part of its contemporaneous ‘extension strategy’ See, e.g., **E-387**, Slides 105, 107; **BR-32**, Slides 36-37; see also Tr. Q. (1) 149:16-150:1 (Cl. Opening), PMQ ¶ 153. “Therefore, the Eni contract is a good benchmark for the terms Ecuador would have accepted for an extension. Whether it is used to corroborate Prof. Kalt’s approach (see Tr. Q. (5) 1448:21-1449:2 (Kalt); JK ER IV ¶¶ 5, 9, 125-126; JK-64), or as a substitute approach, the result is comparable.”

¹⁹² Tr. Q. (6) 1704:8-12 (Claimant’s Closing Argument).

services contract like the Block 10 AGIP Contract as a proxy for what might or might not have been agreed for Block 7 is, in the end, a bridge too far for the Tribunal.

218. The Tribunal has also taken note of the fact that much of Perenco's damages analysis is based on what Petroamazonas has done since it assumed operation of the Blocks. But the Tribunal is not convinced that the economics of the operations of Petroamazonas, a State-owned entity, provides an appropriate "apples to apples" comparator of what Perenco would have done in the 'but for' scenario.¹⁹³

219. As a matter of law, the Tribunal is also mindful of the fact that the decisions of international courts, tribunals, and claims commissions show that while financially assessable damages are to be awarded, the adjudicator must seek to avoid awarding speculative damages. As the *BG Group* tribunal noted:

"...Damages that are 'too indirect, remote, and uncertain to be appraised' are to be excluded. In line with this principle, the Tribunal would add that an award for damages which are speculative would equally run afoul of "full reparation" under the ILC Draft Articles."¹⁹⁴

220. Having regard to all of the circumstances, therefore, the Tribunal considers that it is too remote, uncertain and ultimately too speculative to accept Perenco's extension argument, particularly when Perenco itself accepted that it is necessary to use other contractual models as a proxy for what *might* have been agreed between the Parties. At the end of the day, it simply cannot be ruled out that the Parties might have been unable to arrive at an agreement or for its own reasons the State might have simply decided in an exercise of its lawful discretion not to extend the Block 7 contract. There is, therefore, in the present circumstances an insufficient degree of confidence as to the terms of a contract that might have been concluded such that there could be an estimate of lost cash flows.

221. All of that said, the Tribunal is firmly of the view that Perenco has adduced persuasive evidence that it suffered a loss of opportunity and further that this loss is compensable. The

¹⁹³ *Murphy v. Ecuador* took a similar approach in rejecting that claimant's reliance on what Repsol achieved in after it took over operations from Murphy. See *Murphy v. Ecuador*, paragraph 485.

¹⁹⁴ CA-004, *BG Group v. Argentine Republic*, UNCITRAL, Final Award, 24 December 2007, paragraph 428.

Tribunal notes in this regard that the *Burlington* tribunal found that the claimant in that case did not make out its ‘loss of opportunity’ claim. But this points to a key difference in the facts before the *Burlington* tribunal and those before the present Tribunal. The *Burlington* tribunal appears to have been influenced by the fact that Burlington itself appeared to have assigned a zero value to the chance of a contract extension in 2007.¹⁹⁵ The evidence before the present Tribunal is quite different. As the Tribunal’s Decision on Liability found, Perenco sought ways to preserve its presence in Ecuador and to arrive at some form of accommodation with the State.¹⁹⁶ Indeed, the Tribunal found that Ecuador’s holding Burlington’s recalcitrance against Perenco constituted a breach of the Treaty.¹⁹⁷ It also appears that Burlington and Perenco argued over the course of action to be followed.¹⁹⁸ In these circumstances, the Tribunal is of the view that in the ‘but for’ world of dealings between Perenco and Ecuador, there was a real opportunity for the incumbent operator to extend its operation of Block 7, which opportunity was lost due to the unlawful conduct of the State.

222. The loss of opportunity is thus established and compensable and the Tribunal’s estimate of that loss is addressed below in Section II.I.10.
223. The upshot of the foregoing analysis is that since the Tribunal has found that it cannot assume that the extension of Block 7 would have been based on the AGIP contract or some other proxy, Mr. Crick’s drilling plans for Block 7 for the period after the date of the Block 7 Contract’s expiry on 16 August 2010 cannot be taken into consideration. With the Participation Contract’s having come to an end shortly after the expropriation, there is no basis for considering the hypothetical drilling plans that might have been implemented had the Contract been extended.¹⁹⁹

¹⁹⁵ *Burlington* award, paragraph 282.

¹⁹⁶ Decision on Liability, paragraphs 620-625.

¹⁹⁷ *Ibid.*, paragraph 626.

¹⁹⁸ E-91, Letter from Burlington to Perenco dated 16 December 2008 in which Burlington: “...wish[ed] to clarify that Burlington is not under any legal obligation of any kind to sign the draft agreements. Burlington is entitled to stand on its rights under existing PSCs, and those rights cannot be modified without Burlington’s effective participation.”

¹⁹⁹ The *Burlington* tribunal reached the same conclusion. *Burlington* award, paragraphs 271-278.

224. The Tribunal turns to the ‘but for’ drilling scenarios.

(b) Block 7 ‘but for’ drilling programme from Decree 662 to August 2010

225. Since the Block 7 Participation Contract expired in August 2010 and in light of the Tribunal’s finding above, the Tribunal is concerned only with the impact of Decree 662 upon the Consortium’s drilling activities in Block 7 up to August 2010.

(i) Perenco’s position

226. Having regard to the August 2010 contract expiry scenario, Mr. Crick estimated that 21 new wells (of a total of 70 new wells in the extension scenario) would be drilled. Perenco notes that, as Mr. Crick explained, for the Oso 19-26 grouping, the average well had a 6-month payback period and outperformed even the “high case” predicted at the time of drilling.²⁰⁰ In fact, Oso 23, the last well that Perenco drilled shortly after Decree 662 was promulgated, was the best well yet.²⁰¹

227. Perenco argued that with three years remaining on the Block 7 Contract, in October 2007 it was far from being in a “shut-down mode” and the Consortium was not intending to limit Block 7 drilling to Oso wells which were expected to pay out the drilling investment by mid-2007. Following completion of the 8 firm Oso wells in the 2006 Plan of Development (“POD”), the Consortium would have begun drilling the 8 contingent wells contemplated by the Plan; those wells would have been re-categorised as “firm” wells. Perenco noted in this regard that it was common practice in Ecuador to budget only “firm” wells, with the operator later submitting budget adjustments when the “contingent” wells were moved into the “firm” category.²⁰²

228. Both Mr. Combe and Mr. d’Argentré testified that the September 2007 BCM presentation showed that Perenco had substantially expanded its estimates of Oso’s oil in place and

²⁰⁰ Crick Direct Presentation Q., Slide 9.

²⁰¹ Crick WS III, paragraph 156.

²⁰² Cl. Rep. Q., paragraph 81, citing Crick WS III, paragraph 147; d’Argentré WS IV, paragraphs 9-11, Combe WS III, paragraph 9.

planned to move more personnel to Oso and to build a new camp to accommodate them, and further that the Consortium had constructed the infrastructure backbone for further Oso development.²⁰³ Perenco needed time to process the “exciting results” from the firm wells before choosing additional locations.²⁰⁴ A rig was available to keep drilling.²⁰⁵

229. But for Decree 662, Perenco argued, it would have continued to drill one well per month in Oso, just as it was doing at the time that Decree 662 came into effect and it would have continued this drilling programme for as long as it remained profitable to do so.²⁰⁶ Perenco asserted that this ought not to be controversial: further Oso wells would undeniably produce new reserves²⁰⁷ and Perenco indisputably had previously achieved a one-well-per-month drilling schedule in Oso.²⁰⁸
230. No reasonable operator, amid rising oil prices and excellent results, would decide not to drill further wells.²⁰⁹ As soon as contract renegotiations were underway, Perenco proposed initially 33, then 70, new Oso drilling locations – hardly a hallmark of disappointment (as alleged by RPS).²¹⁰ Perenco would have continued drilling further wells so long as they would pay for themselves and make a return prior to contract expiry. Such further drilling would have been particularly attractive given the high oil price environment, and given the fact that estimates of the amount of oil in Oso “only grew with each new batch of wells.”²¹¹

²⁰³ Tr. Q. (2) 323:10-327:1 (Combe); Tr. Q. (2) 530:1-533:22 (d’Argentré); *c.f.* RPS ER IV, paragraphs 67, 81; E-387, Slides 15-17, 55-68, 85-94, 97-99.

²⁰⁴ Tr. Q. (2) 501:8-21, 506:16-510:12, 512:5-19, 534:1-535:20; see also d’Argentré WS VI, paragraphs 7-15; Combe WS III, paragraphs 9-11.

²⁰⁵ Tr. Q. (2) 435:1-8 (Combe).

²⁰⁶ Tr. Q. (2) 520:1-11 (d’Argentré); Tr. Q. (3) 623:19-62.4:2; 627:10-628:5 (Crick); Crick WS II, paragraph 147; Crick WS III, paragraphs 143-159; see also Tr. Q. (2) 327:2-13 (Combe); Combe WS II, paragraph 54; d’Argentré WS V, paragraph 16; d’Argentré WS VI, paragraph 14.

²⁰⁷ Tr. Q. (4) 1139:22-1140:12 (RPS).

²⁰⁸ Cl. PHB. Q., paragraph 25; Chart of Block 7 Wells submitted on 15 December 2015.

²⁰⁹ Cl. PHB. Q., paragraph 28.

²¹⁰ See Exhibit BR-31, Slide 35 (2008 MTO); Crick WS II, Appendix L, Slides 31-32.

²¹¹ Cl. Rep. Q., paragraph 82 referring to Crick WS II, paragraphs 158-160; Crick WS III, paragraph 144; d’Argentré WS VI, paragraphs 6, 12-14.

(Perenco noted in this regard that Petroamazonas' estimates for Oso have continued this trend, indeed coming in much higher than Perenco's highest estimate.²¹²)

231. The only "uncertainty" was whether Oso was "excellent or merely very good."²¹³ While RPS asserted that the Oso field was not as promising as Mr. Crick asserted on the basis of four of the 13 Main Hollín wells that were already off production prior to June 2007, Dr. Strickland explained that in any given field, the number of "bad" wells can be expected to exceed the number of "good" wells.²¹⁴ For RPS to imply that Oso was somehow a poor performer based on the number of wells that had been taken off production was seriously misleading. The only reason for halting drilling at Oso was Decree 662's promulgation.²¹⁵
232. As for the Lobo and Coca-Payamino fields, Mr. Crick also forecasted waterflood developments.²¹⁶ These were noted in Perenco's 2008 Internal Review and in the September 2007 BCM.²¹⁷ Dr. Strickland explained that this meant that produced water would be re-injected into the reservoir. He reviewed the Perenco pilot waterflood results and found that they showed the required good communication between the wells to implement a waterflood development. He further confirmed that Mr. Crick's methodology was consistent with industry practice and the proposed waterflood projects should be successful.²¹⁸ (Perenco also contended that this was validated by Ryder Scott, which had produced a reserves report for Petroamazonas in June 2013.²¹⁹)
233. The foregoing analysis was reviewed by Dr. Strickland who concluded that Mr. Crick's methodology was consistent with that employed by other buyers and sellers of international

²¹² Cl. Rep. Q., paragraph 82 referring to Crick WS II, Appendix T; Crick WS III, paragraph 144 and Appendix P.

²¹³ Cl. Rep. Q., paragraph 84 referring to Crick WS III, paragraph 154; Combe WS III, paragraph 13.

²¹⁴ Cl. Rep. Q., paragraph 88, relying on Strickland ER II, paragraphs 73-79.

²¹⁵ Cl. Rep. Q., paragraph 84; Cl. Mem. Q., paragraph 46 referring to d'Argentré WS V, paragraph 13.

²¹⁶ Cl. Rep. Q., paragraph 90.

²¹⁷ Cl. Rep. Q., paragraph 90 referring to Crick WS II, Appendix L, pp. 34 – 38; E-387, pp. 114-122.

²¹⁸ Strickland ER I, paragraph 87.

²¹⁹ *Ibid.*, paragraph 88.

oil and gas assets and was applicable to the particular fields under review. Dr. Strickland's own production numbers were:²²⁰

Block 7 Existing Wells Forecast Expected Ultimate Recovery (MMStb) Initial Production to 8/16/2018			
Field Name	Forecast Method		
	Rate Time MMStb	Rate Cum MMStb	Average of Methods
Oso	19.9	19.8	
Lobo	6.5	6.5	
Coco-Payamino	67.1	67.1	
All Others	22.7	22.7	
Sum of Block 7 Fields	116.2	116.1	116.2
Analysis of John Crick			118.5

234. Dr. Strickland noted that Mr. Crick had used Petroamazonas' own production rates and used decline curve analysis. Dr. Strickland conducted an analysis of wells in Coca-Payamino, Oso and Lobo and combined Mono and Gacela. In applying the 'production performance analysis'/'decline curve analysis' methodologies,²²¹ Dr. Strickland found that the '*Water to Oil Ratio vs Cumulative*' method did not result in trends that could be conscientiously extrapolated to make a reliable forecast.²²² He instead summed up the results obtained using the '*Rate vs Time*' and '*Rate vs Cumulative*' methodologies to obtain the Expected Ultimate Recovery ("EUR") for Block 7.

235. All the fields except Lobo exhibited good trends under both methodologies. Lobo was the exception because that field was still being developed with the drilling of additional wells, such that the decline curve had not yet settled. Dr. Strickland made what he called a conservative extrapolation for Lobo. He then summed the EURs for the fields calculated

²²⁰ Strickland ER II, paragraph 68.

²²¹ Strickland ER I, paragraph 42: (1) Rate vs Time; (2) Type Curve; (3) Rate vs Cumulative; (4) Water to Oil Ratio vs Cumulative.

²²² Strickland ER I, paragraph 81.

under each technique to determine the cumulative EUR for existing wells in Block 7. He averaged the EUR calculated and compared it to Mr. Crick's calculated EUR. Dr. Strickland found that Mr. Crick's EUR (118.5 MMStb) was a very close match to Dr. Strickland's EUR of 116.6 MMStb (higher only by 2%).²²³ Mr. Crick's forecasts for the existing wells were thus in his view valid and reliable.

236. In response to RPS's argument that these developments were too uncertain and risky, during the Quantum Hearing both Mr. Crick and Dr. Strickland testified that the proposed "5-spot" development pattern for the waterfloods would effectively de-risk the development and account for any minor discontinuities in the reservoirs.²²⁴

(ii) Ecuador's Position

237. In Ecuador's view, the Quantum Hearing demonstrated that the Consortium did not intend to extend its drilling campaign at Oso beyond its 8-well commitment (*i.e.*, up to Oso 26).²²⁵ The only additional drilling that the Consortium was envisaging beyond that was in the form of "risky" investments intended at the time to satisfy the investment requirement to be considered for an extension of the Block 7 Participation Contract. The Consortium, in short, was in a shut-down mode unless and until it was granted an extension.²²⁶ RPS's conclusion that the Consortium would only have drilled up to 3 wells reflected the strategy set out in the September 2007 BCM and other contemporaneous documents²²⁷, that is, that there would be no further drilling of the Oso Main Hollín reservoir beyond Oso 26, and the focus instead would be on "new investment" projects to be undertaken if negotiations for the extension of the Block 7 Participation Contract succeeded.

²²³ *Ibid.* paragraph 84.

²²⁴ Tr. Q. (3) 729:17-731:10 (Crick); Tr. Q. (4) 1051:20-1052:7 (Strickland).

²²⁵ Tr. Q. (2) 503:20-504:4 (d'Argentré).

²²⁶ Resp. Rep. PHB Q., paragraph 72.

²²⁷ RPS ER V, paragraph 32; E-415, Consortium's Budget Committee Meeting Presentation, 28 September 2006; E-412, Consortium's Budget Committee Minutes, 28 September 2006; E-314 Information Committee Meeting, December 2006/15, p. 3; E-414, Consortium Presentation, 8 January 2007, p. 29; Exhibit BR-32, MTO Presentation, 22 March 2007, p. 53; E-387, Consortium's Budget Committee Meeting Presentation, 26-27 September 2007, pp. 51-53.

238. In response to Perenco’s maintaining that even in the absence of an extension being granted it would have drilled 21 new wells at Oso from January 2008 onwards, Ecuador argued that there was no contemporaneous support for this drilling campaign. The September 2007 BCM made no reference to any drilling beyond Oso 26, even though Mr. d’Argentré acknowledged at the Quantum Hearing that such meetings were the forum for discussing further drilling.²²⁸ He insisted that “the technical people on the background were exchanging information and discussing future wells.”²²⁹ Yet Perenco failed to provide proof of such discussions, which only confirmed the lack of evidence in support of its development programme. It was repeatedly made clear that drilling beyond Oso 26 was only envisaged in an extension scenario.²³⁰
239. Ecuador argued further that Perenco’s reliance upon the proposed construction of a new camp at Oso as proof of the intention to engage in further drilling was misplaced, because it was not the “infrastructure backbone for further Oso development”²³¹, but rather was foreseen to rationalise existing production operations in Block 7.²³²
240. As conceded by Dr. Strickland at the Quantum Hearing, the commercially exploitable boundaries (or outer edges) to the south, east and north of the Oso field had all been reached by August 2006.²³³ By late 2007, it only remained to be determined how far the Main Hollín reservoir extended to the west following the promising, yet still preliminary, results from Oso 21. As pointed out by RPS, faced with this uncertainty, Perenco had decided upon the safer option of infill drilling for the last three Oso wells contemplated on the eve of Decree 662, rather than investing in further (riskier) wells to probe the western flank of

²²⁸ Tr. Q. (2) 510:2-6 (d’Argentré).

²²⁹ *Id.*

²³⁰ Tr. Q. (2) 516:20-522:18 (d’Argentré); Tr. Q. (3) 646:14-647:10 (Crick); Tr. Q. (4) 1077:9-1080:21 (Strickland); Tr. Q. (4) 1117:15-1118:18 (RPS).

²³¹ Cl. PHB Q., paragraph 28.

²³² E-387, Consortium’s Budget Committee Meeting Presentation, 26-27 September 2007, p. 93.

²³³ Tr. Q. (4) 1077:9-1080:21 (Strickland).

that field. Perenco was thus in a “shut-down mode” pending an extension being secured for Block 7.

241. In fact, on the eve of Decree 662, Block 7 was not the success story that Perenco was now presenting. First, Perenco misleadingly relied on the Oso mapping update following the results of Oso 21 to suggest that the Consortium “substantially expanded its estimates of Oso’s oil in place based on drilling results.”²³⁴ However, this increase was only reflected in the maps and was not further mentioned nor quantified during the September 2007 BCM.²³⁵ More importantly, if the Consortium was as enthusiastic about Oso at the time as Perenco contended, the increase of oil in place would have encouraged the Consortium to schedule further drilling beyond January 2008. But it did not do so.
242. Second, Perenco disregarded the fact that it was not only a matter of some disappointing results, but of the location of the disappointing wells in question. RPS referred in this respect to the “poor results of the first 18 wells drilled in Oso field, particularly the results of the four failed Main Hollín wells.”²³⁶ These 4 wells, which were probing for the edges²³⁷, indicated limited potential to the north, south, east, and southwest of the Oso field. As a result, Oso 21 and 23 were drilled in an apparent effort to test the northwest extension of the reservoir. As explained by RPS, the mixed results that these wells yielded, coupled with the looming contract expiry in 2010 and the poor quality of the seismic data in the western flank, would have persuaded the Consortium to limit additional drilling to three infill wells (Oso 24, 25 and 26), *i.e.*, between Oso 21 and 23, and wells drilled of the main northern drilling pad (Oso 9). Once Petroamazonas took over operations, it benefited from new seismic data which allowed it to further step-out drilling to the north and to the west.²³⁸

²³⁴ Cl. PHB Q., paragraph 28.

²³⁵ E-387, Consortium’s Budget Committee Meeting Presentation, 26-27 September 2007, pp. 55-68.

²³⁶ RPS’ Direct Presentation, Slide 31; RPS ER V, paragraphs 74-75 and Appendix B.

²³⁷ Tr. Q. (4) 1077:9-1080:21 (Strickland).

²³⁸ Resp. Rep. PHB Q., paragraph 75.

243. Further, the development programme would have required both an amendment to the Oso Development Plan and further authorisations from the Ecuadorian authorities.²³⁹ It would also have required an extensive upgrade to the Block 7 facilities.²⁴⁰ Not only would the looming contract expiry date not have allowed the Consortium to amortise the US \$35 million necessary to undertake this upgrade, but there was also no evidence to show that the Consortium was even considering such a heavy investment absent an extension of the Block 7 Participation Contract.²⁴¹

244. In contrast to Mr. Crick’s estimates and Dr. Strickland’s numbers, RPS’s numbers were:²⁴²

<i>4-Oct-07 (Case 1)</i>	“Rest of Block 7” – Risked		
	Reserves Class/Category	Description	Reserves, MMStb
	1P Producing	Existing Wells at 04-Oct-2007	7.10
	1P Undeveloped	Three “but for” new wells	1.38
	Total 1P		8.48
	2P Producing	Existing Wells at 04-Oct-2007	8.55
	2P Undeveloped	Three “but for” new wells	1.84
	Total 2P		10.39

<i>20-Jul-10 (Case 2)</i>	“Rest of Block 7” - Risked and Adjusted *		
	Reserves Class/Category	Description	Reserves, MMStb
	1P Producing	Existing Wells at 20-Jul-2010	0.18
	Total 1P		0.18
	2P Producing	Existing Wells at 20-Jul-2010	0.18
	Total 2P		0.18

<i>4-Oct-07 (Case 1)</i>	Coca-Payamino – Risked		
	Reserves Class/Category	Description	Reserves, MMStb
	1P Producing	Existing Wells at 04-Oct-2007	3.88
	Total 1P		4.61
	2P Producing	Existing Wells at 04-Oct-2007	3.88
	Total 2P		4.61

²³⁹ Tr. Q. (2) 375:6-381:15 (Combe).

²⁴⁰ Crick WS II, Appendix C, pp. 20-21.

²⁴¹ Brattle ER II, Section IV.A.5.

²⁴² RPS ER V, Appendix V.

20-Jul-10 (Case 2)	Coca-Payamino - Risked and Adjusted *		
	Reserves Class/Category	Description	Reserves, MMStb
	1P Producing	Existing Wells at 20-Jul-2010	0.11
	Total 1P		0.11
	2P Producing	Existing Wells at 20-Jul-2010	0.11
	Total 2P		0.11

245. RPS asserted that its forecast for the existing wells was based on a well-by-well analysis consistent with industry valuation practice.²⁴³ The reliability of RPS' analysis was confirmed by the fact that its 2P "most likely" forecast is within 10% of actual production.²⁴⁴ Conversely, the forecast for the three new wells was derived from Perenco's own AFEs²⁴⁵ for these wells. Under Case 2²⁴⁶, RPS forecasted 289,200 barrels of 1P²⁴⁷ and 2P²⁴⁸ oil from the existing wells in Block 7²⁴⁹, a figure undisputed by Perenco.
246. Ecuador and RPS criticised Mr. Crick's type-curve forecasting methodology (because he first determined the initial oil rate for his new wells, before applying to these (and to the existing) wells a type curve calculated at field level). This could be very imprecise, differing from reality by as much as 45%, as Mr. Crick himself acknowledged.²⁵⁰

²⁴³ *Ibid.*, Section 2.2.

²⁴⁴ *Ibid.*, paragraph 95.

²⁴⁵ As explained by RPS in its Fourth Expert Report, fn. 35: An AFE, sometimes referred to as an Authorization for Financial Expenditure, is a document which itemizes the costs associated with projects requiring significant expenditures. The AFE is typically presented to management for approval before the work can commence. Economic justification for the expenditure is usually part of the "AFE package." For new wells, the justification will include, among other items, production forecasts for the life of the well, sometimes referred to as the AFE production prognosis.

²⁴⁶ Existing wells (includes wells drilled "but for Decree 662") as of 20 July 2010 through contract expiration on 16 August 2010; Forecast then adjusted by subtracting production attributable to wells drilled "but for Decree 662" – See RPS ER IV, Table 2.

²⁴⁷ 1P (proved).

²⁴⁸ 2P (proved plus probable).

²⁴⁹ RPS ER IV, Tables 8 and 9; RPS ER V, Appendix U.

²⁵⁰ Tr. Q. (3) 655-657:13 (Crick).

247. Mr. Crick’s production figures were also grossly inflated as compared to the actual production of the Blocks. Mr. Crick’s forecasting methodology not only failed to accurately forecast the past, but RPS also demonstrated that the results obtained by applying Mr. Crick’s decline curve to each of the existing Oso wells from their initial production through to 31 March 2013 significantly exceeded (*i.e.* inflated) the actual production of the very wells for which Mr. Crick claimed to have obtained an excellent match. RPS undertook an independent check of Crick’s forecasts and provided an apples-to-apples comparison with actual production, which resulted in an overstatement of reserves of Oso of 21 MMbo.²⁵¹
248. RPS demonstrated that in order to achieve the claimed “excellent match” between his forecast and the actual production of the Perenco wells, Mr. Crick had adjusted the data, thereby discrediting his validation technique.²⁵² For the new wells, Dr. Strickland did not validate Mr. Crick’s forecast for those wells, which represented some 99 MMbo out of his total forecast of 122.5 MMbo²⁵³. RPS also showed that Petroamazonas (unlike Perenco) had the capacity to handle a significant number of new wells and water production – beyond that of the 56 wells in Mr. Crick’s analysis – with no operational restriction.²⁵⁴ Therefore, contrary to what Perenco alleged,²⁵⁵ the divergence between Mr. Crick’s forecast and actual production could not be attributed to Petroamazonas’ operational policies, but only to his flawed methodology.²⁵⁶

(iii) Perenco’s response

249. In response to Ecuador’s and RPS’ arguments, Perenco argued that RPS had wrongly criticised Mr. Crick and Dr. Strickland for employing “aggregate” forecasting methods derived from group of wells. Mr. Crick and Dr. Strickland had explained in detail why aggregate methods were better suited to the individually unpredictable Block 7 wells than

²⁵¹ RPS’ Direct Presentation, Slide 42.

²⁵² *Ibid.*, Slides 32-39.

²⁵³ Tr. Q. (4) 1068: 5 (Strickland); see also Crick’s Direction Presentation, Slide 3.

²⁵⁴ RPS’ Direct Presentation, Slide 33.

²⁵⁵ Cl. PHB Q., paragraph 38.

²⁵⁶ Tr. Q. (4) 1188:11-1189:2 (RPS); RPS’ Direct Presentation, Slide 42.

well-by-well forecasts.²⁵⁷ Petroamazonas' own reserves evaluator, Ryder Scott, had used type curves in its forecasting for these Blocks, just as Mr. Crick had. Mr. Crick's method produced an excellent match to actual production from the wells it was designed to predict.

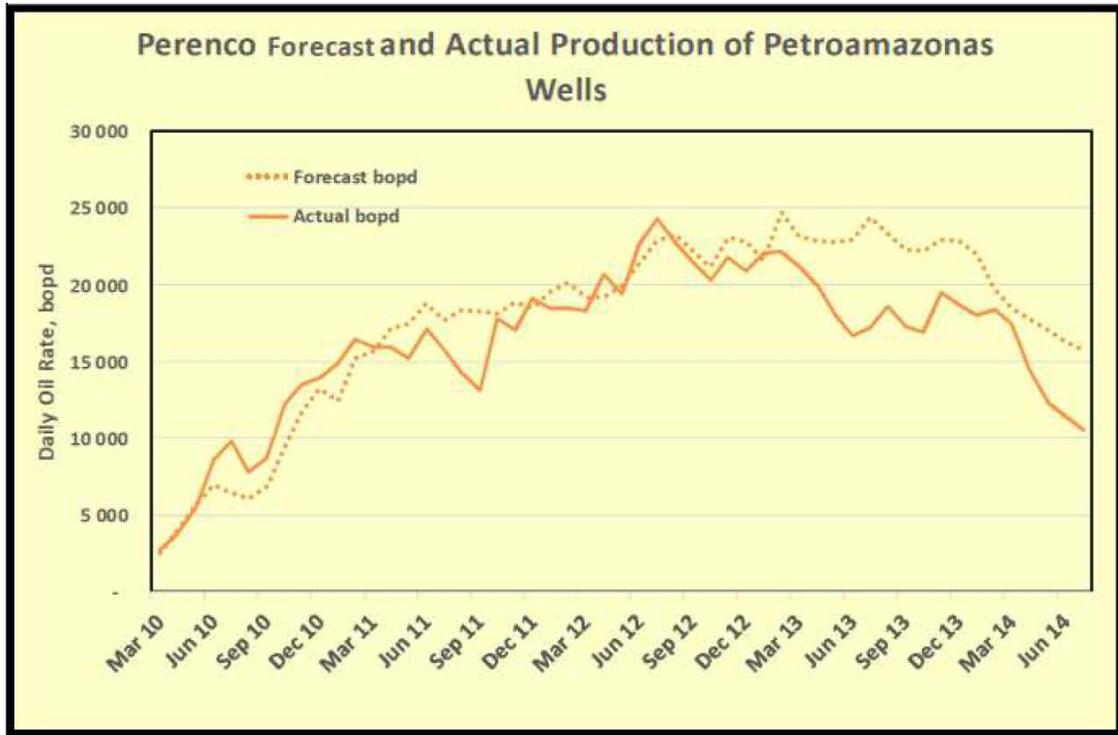


Figure 12: Comparison of forecasted and actual well performance for the new Petroamazonas wells. JC WS II, Fig. 39.

²⁵⁷ Crick WS III, paragraphs 14-27; Strickland ER II, Section II.

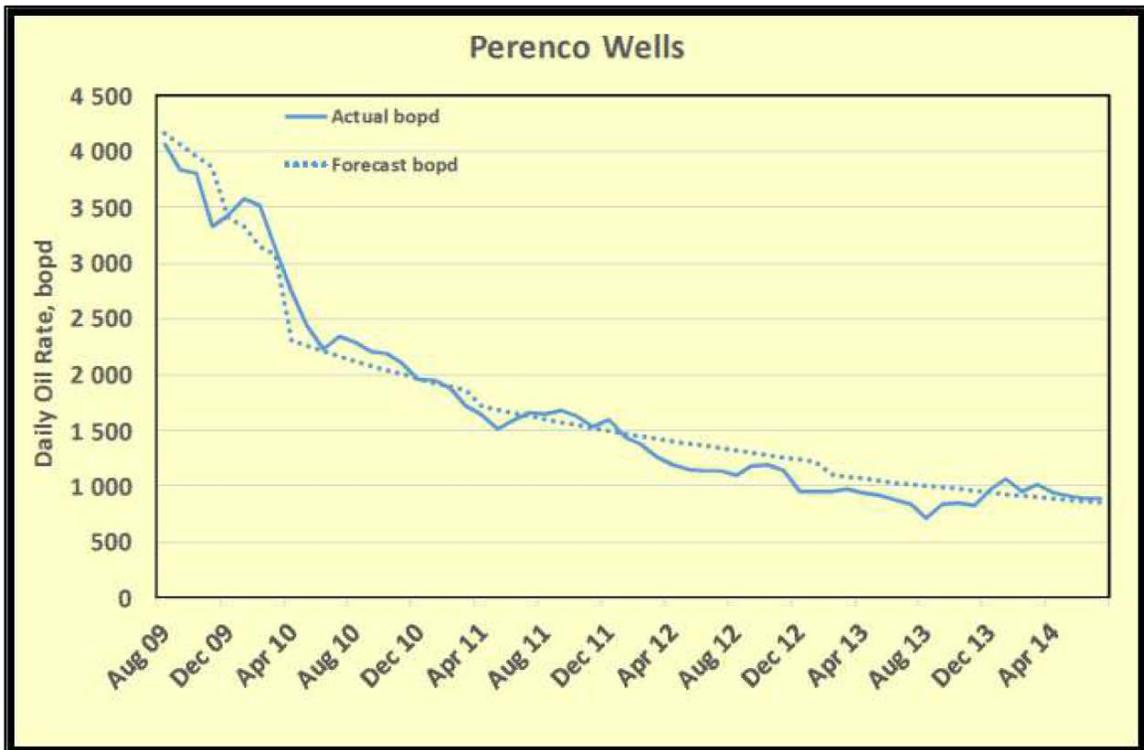


Figure 13: Comparison of forecasted and actual well performance for the Perenco-operated wells. JC WS II, Fig. 41.

250. Despite the earlier criticisms, RPS was forced to admit on cross-examination that Mr. Crick’s methods in fact produced more accurate results (2%) than RPS’ own results (8%).²⁵⁸ RPS’ only criticism was that Mr. Crick should have begun his forecast not in August 2009, but rather at the very beginning of each well’s productive life.²⁵⁹ In other words, the method’s “good match” —its proven reliability in forecasting the future— should be disregarded because it fails to accurately forecast the *past*. Yet as RPS readily agreed, the point of ‘*decline-curve analysis*’ is “to predict the future.”²⁶⁰ RPS had itself not provided a forecast that ran from the start of production of every well; rather, much like Mr. Crick, RPS has chosen a particular point in history (in RPS’ case, October 2007) as the start of its forecast and then generated a prediction from that point forward.

²⁵⁸ Tr. Q. (4) 1179:20-1180:7 (RPS).

²⁵⁹ See Tr. Q. (4) 1173:20-1174:5 (RPS).

²⁶⁰ Tr. Q. (4) 1175:17-1176:2 (RPS).

251. RPS did not deny that Dr. Strickland's independent forecast for the existing Block 7 wells, which coincided closely with Mr. Crick's numbers, were reliable and accurate.

(iv) The Tribunal's decision

252. In the Tribunal's view, it is a given that the Consortium's thinking would have been dominated by the looming contract expiry. The Tribunal believes that the sharply rising price of oil leading up to October 2007 would have induced Perenco to seek to drill as many wells as were economically possible in the Oso field in the time remaining in that Contract. According to Mr. Crick, in the absence of a contract extension, Perenco would have stopped drilling in Block 7 in August of 2009 in order to ensure an adequate payback on the new wells.²⁶¹ Mr. Crick estimates that Perenco could have drilled 24 wells per year in Block 7. The Tribunal agrees and accepts Mr. Crick's production profiles.
253. The Tribunal is satisfied that in the 'but for' scenario commencing October 2007, to the extent that it would have engaged in new drilling, Perenco would have concentrated on the more predictable and technically less challenging Oso field rather than the riskier and more expensive waterflooding that Mr. Crick proposed for the Lobo and Coca-Payamino fields. It notes that Mr. Crick himself stated in his second Witness Statement that: "Lobo is one of the two fields, the other being the Coca-Payamino Unified Field, where, *in the event of an extension to the Block 7 contract*, Perenco was prepared to invest in further development using water injection."²⁶² The Tribunal takes from this statement that drilling in the Coca-Payamino Unified Field would not have occurred unless a contract extension was granted and, in any event, the statement accords with the Tribunal's own sense of the evidence overall.
254. Therefore, the Tribunal believes that the drilling that would have occurred in Block 7 'but for' Decree 662 would more likely have taken place in the Oso field only.

²⁶¹ Crick WS II, paragraph 147; Tr. Q. (3) 627:10-22 (Crick).

²⁶² Crick WS II, paragraph 203. [Emphasis added.]

(v) Conclusion on the estimation of how many Block 7 wells would have been drilled up to August 2009

255. In the Tribunal's view, the Consortium would have drilled four wells by January 2008 and 19 wells from February 2008 to August 2009. It has therefore used this number and timing of wells in its estimate of the damages suffered by Perenco up to the date of the expropriation.

(c) Block 21 'but for' drilling programme up to caducidad

256. As noted above, the valuation of this Block is a two-step process. The first step is to value the future cash flows resulting from Decree 662 as of 4 October 2007 (calculated on the assumed basis that the Contract would operate until their date of expiry). The second step requires an estimation of lost future cash flows performed as of 20 July 2010 for Block 21, 20 July 2010 being the date of the declaration of *caducidad* which took away the remaining lifespan of the Participation Contract.

257. As discussed previously, the second estimate is performed on a "clean sheet" basis. That is, instead of considering Decree 662's "price-depressing" effect on the value of the assets through to the date of the Contract's expiry, to use Perenco's words, the initial estimated lost cash flows for Block 21 will be cut off as of the date of the second valuation, and damages awarded for that period, whereupon a fresh valuation will be performed based on the conditions prevailing in the market as of the day before the declaration of *caducidad* was issued, and a second award of damages will be made for the loss of the Contract's remaining life, based upon the market conditions and the operator's assumed expectations in the 'but for' world of July 2010.

(i) Perenco's Position

258. Perenco points out that at the time of Decree 662's implementation in October 2007, it was only one-third of the way through its Block 21 operatorship, with nearly 14 years left before the Contract's expiry in June 2021. Mr. Crick's 'but for' development programme therefore addressed this lengthy period of time left in the Contract's life. Of the 24 wells estimated, 21 would be infill wells drilled in the central, developed part of the Yuralpa field containing an oil column of at least 90 feet, and the remaining three wells would be located outside of

this area.²⁶³ In Mr. Crick’s opinion, infill wells would have been recommended because of the water coning mechanism. Perenco noted that Ecuador’s experts, RPS, accepted that infill drilling would indeed lead to new reserves. Half of RPS’ own proposed wells were clearly infill.²⁶⁴

259. Perenco pointed that in contrast to Mr. Crick’s approach, RPS, who had previously claimed in the *Burlington* case that “additional drilling was not justified in Yuralpa field at all because the field was fully developed [in 2007]”²⁶⁵, had changed its mind in the present proceeding and it now proposed a limited six-well programme.²⁶⁶ Perenco noted that even its minimum investment commitment included in its 2008 negotiations with Ecuador *after* Decree 662 was promulgated, which contemplated operations on much less favourable economic terms than those contained in the Participation Contract, included seven Yuralpa wells.²⁶⁷
260. Dr. Strickland evaluated Mr. Crick’s forecast as well as RPS’s forecasted performance of the six new Yuralpa wells that it opined would have been drilled. He concluded that both programmes were attainable and the question was which was more reasonable. In his opinion, Mr. Crick’s development plan was more reasonable in terms of the volumes forecasted and more reflective of what a prudent operator seeking to maximise its production would do, while RPS failed to explain why a prudent operator would cease drilling after six successful wells in such a large field.²⁶⁸

²⁶³ Mr. Crick assumes it will begin in January 2008, instead of July 2008 as proposed in the September 2007 BCM, absent Ecuador’s coercive conduct, earlier in particular given the rise in oil prices at that time. The difference in date only causes an overall reduction of 2% in Mr. Crick’s numbers. Mr. Crick has provided revised profiles that use the July 2008 start date for new Yuralpa drilling. This adds a layer of conservatism to Mr. Crick’s production forecast. Professor Kalt has in turn used Mr. Crick’s revised profiles in his updated damages calculation.

²⁶⁴ Cl. Rep. Q., paragraph 75; Crick WS III, paragraphs 88 – 90 and Figure 9.

²⁶⁵ CE-335, paragraph 144.

²⁶⁶ RPS ER IV, paragraph 167.

²⁶⁷ Cl. Rep. Q., paragraph 69.

²⁶⁸ Strickland ER II, paragraph 46.

261. Dr. Strickland had opined that the critical characteristics of the Main Hollín reservoir affecting its ability to produce oil were:²⁶⁹

1. Amount of Oil: There was a large amount of oil in place in the Main Hollín. Since only a low percentage had been recovered to date, the ultimate recovery was likely to be even greater than Mr. Crick predicted. In Dr. Strickland's opinion, if oil prices were high enough, even more oil could be recovered than that forecasted by Mr. Crick.
 2. Geology and Depositional Environment: In the Yuralpa field, the vast majority of the oil was found in the upper level of the Main Hollín reservoir, which consists of braided stream channels. The braided stream channels of the Main Hollín had a porosity of 20-25%, which was considered excellent for oil recovery. The braided stream channels also had high permeability. Porosity and permeability were two critical characteristics because they dictate whether oil was capable of moving through the reservoir to the well bore.
 3. Water Drive: Yuralpa was a "bottom water drive reservoir." As oil was produced, water replenishes the reservoir pores, resulting in a relatively constant pressure of 3,300 psi. The amount of water produced from a well in a water drive reservoir would increase over time as the invading water reached the well. Typically, the recovery of oil-in-place in water drive reservoirs was high.
 4. Viscous Oil: The oil in the Main Hollín was relatively heavy and viscous, which made it easy for the underlying water from the aquifer to break through the oil if pulled upward towards the low-pressure area around well perforations. This would lead to the creation of "water cones."
 5. Presence of Shales: Shales, which are a type of low permeability, non-productive rock that impede the movement of fluids, were randomly distributed throughout the Main Hollín. The logs from the Main Hollín confirmed the presence of shales in a number of well bores in Yuralpa and Oso. However, the location and extent of shales could not be accurately predicted in the area between wells based on information from existing wells.
262. Perenco argued further that RPS wrongly rested its entire development plan for Block 21 on a proposal made at a single Consortium Budget Committee Meeting (BCM) held in September 2007. It was unreasonable to assume that the Consortium would have proposed and approved a full development plan for the 14 years remaining on the Block 21 Contract. Further, RPS' six proposed wells would produce more than one million barrels each. With

²⁶⁹ Strickland ER I, paragraph 15.

such productive wells forecasted, it was irrational to assume that the operator would be content to take no further action in the ensuing years.

263. The Quantum Hearing testimony made clear that Perenco’s ‘but for’ infill wells in Yuralpa would produce new reserves. As Dr. Strickland demonstrated in his presentation, RPS’ own model disproved RPS’ longstanding denial of water coning and its contention that “there are no areas available that would be a good target for infill drilling.”²⁷⁰ In fact, the case for infill wells was even better than what RPS’s model had showed: correcting RPS’s apparent error in its modeling and using the appropriate 40-acre spacing between existing wells, the simulated infill wells produce even more oil.²⁷¹
264. Hence, Perenco argued that Dr. Gorell’s “puzzling refusal” to call a “conical shape” a “cone” notwithstanding²⁷², there was no longer any question that infill drilling between the existing wells’ water cones would be productive. In fact, RPS explicitly “agreed[d] that you will produce oil [from the infill wells] .”²⁷³ The only remaining debate concerned not oil production, but the associated water production²⁷⁴, with RPS claiming for the first time in its report filed with the Rejoinder that the water production associated with Mr. Crick’s wells would substantially exceed the 120,000 barrels of water per day (bwpd) limit imposed by Mr. Crick.²⁷⁵
265. Prior to the Quantum Hearing, Perenco had criticised RPS for failing to run the Yuralpa simulation model, which it used to generate its Yuralpa forecasts, in a reasonable way.²⁷⁶

²⁷⁰ Cl. PHB Q., paragraph 41 referring to RPS ER V, App O, paragraph 27. Tr. Q. (4) 1027:13-14 (Strickland); Strickland Presentation at 9-23; see Strickland Model Displays submitted 15 December 2015.

²⁷¹ Tr. Q. (4) 1042:19-1043:20 (Strickland). The Tribunal observes that Mr. Crick and Dr. Strickland both proposed 40 acres in the expert reports; however, Dr. Strickland talked about 50 acres during his direct presentation (working off of RPS’ model) and also reproduced RPS’ 70-acre spacing. He opined that more oil would be produced from the 70-acre spacing: Tr. Q. (4) 1043:4-8: “If you want 70-acres, then 70-acres per well is a square that’s 1746 feet per side. Well, that’s a bigger spacing. If you want a bigger spacing, that’s going to be more oil in place, that’s going to increase recovery, delay the water breakthrough.”

²⁷² Tr. Q. (4) 1223:22-1224:2 (RPS).

²⁷³ Tr. Q. (4) 1103:16-21 (RPS).

²⁷⁴ Tr. Q. (4) 1103:122-1104:2 (RPS).

²⁷⁵ Tr. Q. (4) 1113:4-1115:2(RPS); RPS ER V, paragraphs 205-211.

²⁷⁶ Cl. Rep. Q., paragraphs 103-104.

For example, RPS did not assume the behavior of a rational operator who would have allowed the field's fluid offtake rate (the amount of fluid produced through operations) to increase over time.²⁷⁷ RPS's own results indicated that even a modest increase in fieldwide water production significantly increased oil production.²⁷⁸ RPS nevertheless chose to keep fluid offtake levels low, with no explanation as to why Perenco would behave so irrationally.²⁷⁹

266. As Mr. Crick explained, in a water-drive reservoir such as the Yuralpa Hollín, where a powerful aquifer underlies all the oil and could be expected to encroach into the wells, increasing water-handling capacity was required to maximise the fields' productivity.²⁸⁰ Put simply, to produce greater volumes of oil, the operator must be prepared to produce and handle ever-greater volumes of water. As RPS was aware, Mr. Crick used a field-wide limit of 120,000 barrels per day.²⁸¹ Yet RPS said nothing about Mr. Crick's proposed limit and provided no explanation for its decision to restrain its own forecast with much lower limits. In fact, Mr. Crick demonstrated that based on the latest data, his initial water estimate was actually pessimistic and the water production from his proposed new wells would be entirely manageable.²⁸² RPS' only technical objection (that the water production associated with Mr. Crick's wells would substantially exceed the 120,000 barrels of water per day limit imposed by Mr. Crick) was thus invalid. Hence, RPS' only technical reason for opposing Mr. Crick's Yuralpa development plan is invalid.
267. Perenco argued further that in contrast to Mr. Crick's plan, the Quantum Hearing revealed that RPS' own water production estimate was premised on a fundamental error: trusting the full-field Yuralpa model to make an accurate forecast of water production. Dr. Strickland showed that this is what RPS did. The flaw in that approach was that the model

²⁷⁷ Crick WS III, paragraphs 56-63.

²⁷⁸ See RPS ER IV, Appendix E, Tables 2-3 and 5-6; Crick WS III, paragraphs 57-59.

²⁷⁹ Crick WS III, paragraphs 60, 108.

²⁸⁰ Crick WS III, paragraphs 56, 63; Crick WS II, paragraphs 47-55, 77-81, 166, 197-200; see Strickland ER II, paragraph 36.

²⁸¹ Crick WS III, paragraph 61.

²⁸² Tr. Q. (3) 642:22 – 644:22; 711:13 – 712:9 (Crick); Crick's Direct Presentation, Slides 27-33.

contained no water-blocking shales beneath the simulated infill wells (it was therefore a ‘worst case’ scenario). Such a model would obviously forecast abundant water production, when in reality the presence of shales would substantially *reduce* water production. Dr. Strickland explained that full field models in a bottom waterdrive reservoir where there are shales that block water production is not a good forecasting tool.²⁸³ Actual data proves that the model is empirically wrong: it predicts a much higher water-oil ratio (WOR) than has been actually observed in the field.²⁸⁴

268. Perenco also contended that RPS misused a graph displaying Yuralpa’s WOR as a function of cumulative production. RPS made a water production forecast for both existing and new wells using a WOR graph that records the behavior of existing Yuralpa wells only.²⁸⁵ This made no sense, in that it assumed that the new wells would add no reserves, which is indisputably false.
269. Finally, in addition to the vindication of Mr. Crick’s Yuralpa development plan as a technical matter, the evidence also disproved Ecuador’s contention that the outlook in Yuralpa was so “bleak” and “disappointing” that Perenco would simply have given up on the field.²⁸⁶ To the contrary, somewhat lower than expected per-well recoveries compelled Perenco to drill more wells, even marginally profitable ones, in order to recover this investment.²⁸⁷ The wells were still turning a profit, and as Mr. Caldwell of Brattle conceded, if Perenco had a reason to drill even marginal wells, there is no economic reason not to do just that.²⁸⁸ Hence, the 2007 Yuralpa Study’s six new wells can only be a minimum, not a maximum —a plan for the next set of work, not the full set of work.²⁸⁹

²⁸³ Tr. Q. (4) 1048:16-22 (Strickland); see also Tr. Q. (4) 1064:21-1065:11 (Strickland) (discussing water production in RPS’s four-well model from its Fifth Report).

²⁸⁴ Tr. Q. (3) 641:18-642:21 (Crick); Crick’s Direct Presentation, Slide 26; Tr. Q. (4) 1049:14-19 (Strickland).

²⁸⁵ Tr. Q. (4) 1113:7-1115:2 (RPS); RPS’ Direct Presentation, Slide 19; RPS ER V, paragraph 210, Figure 2.

²⁸⁶ See *e.g.* Tr. Q. (1) 242:18-243:1 (Respondent’s Opening); Tr. Q. (2) 385:10-11, 393:12-15 (Combe); Tr. Q. (2) 489:7-490:10 (d’Argentré); Tr. Q. (3) 675:7-11 (Crick).

²⁸⁷ Tr. Q. (2) 418:13-419:1, 420:4-14, 425:14-426:9 (Combe); Tr. Q. (2) 490:7-20 (d’Argentré).

²⁸⁸ Tr. Q. (5) 1582:15-1583:14 (Brattle).

²⁸⁹ *Ibid.*

The 2007 Study itself discusses “new infill wells” and lists further analysis to be completed in support of such wells.²⁹⁰

270. Dr. Strickland also reviewed Mr. Crick’s forecasted production volumes, pursuant to his drilling plan, against a series of tests as well as the actual drilling plans executed by Petroamazonas. He also considered the critical characteristics of the Main Hollín affecting its ability to produce oil as set out at paragraph 261 above.²⁹¹ Mr. Crick forecasted that the existing wells would recover 52.1 MMStb²⁹² of oil and the new forecasted wells 11.3 MMStb.²⁹³
271. Dr. Strickland noted that the presence of water coning, and the effects of good water-blocking shales, had been documented in Yuralpa.²⁹⁴ Due to the unpredictability of the location and extent of shales, it was difficult to extrapolate individual well performance in the Main Hollín so as to predict reservoir production with reasonable confidence since great differences existed between wells; however, it was easier to determine what the next group of wells would likely produce.²⁹⁵
272. Dr. Strickland also confirmed that additional oil between wells could be recovered by infill drilling, *i.e.* placement of new wells, as suggested by Mr. Crick in his development plan for Yuralpa.²⁹⁶ Such additional wells would be needed if the operator was to capture the significant amounts of oil remaining in the Yuralpa field.²⁹⁷

²⁹⁰ Crick WS II, Appendix E, p. 3

²⁹¹ Strickland ER I, paragraph 15.

²⁹² Crick WS II, paragraph 121, noted that the production from existing wells in Block 21 drilled until January 2008 was 20.19 million barrels. The additional production from the original Perenco wells between that date and contract end in June 2021 would be influenced by the new wells, estimated at 31.84 million barrels, giving a total recovery from the original Perenco wells of 52.03 million (20.19 from 2004 to January 2008 + 31.84 from February 2008 to June 2021).

²⁹³ Crick WS III, Figure 1.

²⁹⁴ Strickland ER I, paragraph 30.

²⁹⁵ *Ibid.*, paragraph 34.

²⁹⁶ *Ibid.*, paragraphs 35-36.

²⁹⁷ *Ibid.*, paragraph 37.

273. Dr. Strickland tested Mr. Crick’s forecasts using four types of ‘*production performance analysis*’/ ‘*decline curve analysis*’:
1. Rate vs Time
 2. Type Curve
 3. Rate vs Cumulative
 4. Water to Oil Ratio vs Cumulative²⁹⁸
274. He found that Mr. Crick’s application of the type-curve analysis was consistent with industry methods of forecasting future production for fields where individual wells were not well-behaved (*i.e.*, where the plotted production data for each do not follow a predictable trend).²⁹⁹ He confirmed that the data from these wells were not well-behaved on a well-by-well basis.³⁰⁰ However, the data was well-behaved on a group or field-wide prediction basis. Dr. Strickland applied the four techniques to a field-wide analysis of all wells as of August 2009 and then to each group of wells according to the year that they were drilled. Comparing Mr. Crick’s calculation to his independently calculated estimates, Dr. Strickland found that Mr. Crick’s calculations fell within his independent calculations and therefore he was confident that Mr. Crick reasonably and validly calculated the reserves and EUR of existing wells in the Yuralpa field.³⁰¹
275. For the new wells that Mr. Crick forecasted in Block 21, Dr. Strickland applied a different methodology because historical information did not exist. He found Mr. Crick’s forecasting approach to be consistent with industry practice.³⁰² On the basis that wells drilled later in time would have lower initial rates and per-well EURs, Dr. Strickland plotted the average

²⁹⁸ *Ibid.*, paragraph 42. Dr. Strickland explained that this technique plots the water-to-oil ratio (“WOR”) on the y-axis against the cumulative oil production on the x-axis. This type of plot is useful for wells that produce a great deal of water as compared to oil, as is the case with the wells producing from the Main Hollin. Only focusing on oil rates may give a pessimistic estimate of reserves in such circumstances. The common economic cut-off is a WOR of 49, meaning that 49 barrels of water are produced with each barrel of oil. A WOR of 49 is equivalent to a 98% water cut.

²⁹⁹ *Ibid.*, paragraph 49; he explains definition of well-behaved wells at paragraph 44.

³⁰⁰ *Ibid.*, paragraph 50.

³⁰¹ *Ibid.*, paragraph 51.

³⁰² *Ibid.*, paragraph 68.

per-well EUR for the same group of wells and found a well-behaved trend, providing a prediction of the average per-well EUR for the next group of wells drilled in Yuralpa.³⁰³ He confirmed that Mr. Crick’s forecasts were reasonable, and likely conservative.³⁰⁴ Dr. Strickland’s numbers were:³⁰⁵

Block 21 Yuralpa Existing Wells Forecast Expected Ultimate Recovery (MMStb)						
Well Group	Wells Included	Forecast Method				Average of 4 Methods
		Rate Time MMStb	Rate Cum MMStb	WOR Cum MMStb	Type Curve MMStb	
1	Drill 2004	12.5	12.4	13.3	14.5	
2	Drill 2005	20.2	20.0	23.7	23.2	
3	Drill 2006-7	15.7	15.6	18.3	18.3	
Sum of Groups 1, 2 & 3		48.4	48.0	55.3	56.0	51.9
4	All Perenco Operated	47.9	48.0	62.6	53.3	53.0
Analysis of John Crick						52.1

276. Using Perenco’s history-matched numerical model, developed in 2007 and later updated,³⁰⁶ Dr. Strickland confirmed that there was enough oil remaining in un-swept locations to drill the 24 wells forecasted by Mr. Crick.³⁰⁷
277. Although Mr. Crick’s correlation was acknowledged to be imperfect³⁰⁸, Perenco contended that Mr. Crick’s correlation was a useful and conservative basis for forecasting the new wells’ production. Decline curve analysis was a reliable forecasting tool where, as here, there is every reason to believe that Perenco would continue to undertake the necessary work and investments – just as Petroamazonas has in fact done.³⁰⁹ Although RPS had argued in its Fifth Report that Mr. Crick used an improper averaging technique in creating

³⁰³ *Ibid.*, paragraphs 68-69.

³⁰⁴ *Ibid.*, paragraph 71.

³⁰⁵ Strickland ER II, paragraph 41.

³⁰⁶ Strickland Reference 5.

³⁰⁷ Strickland ER I, paragraph 76.

³⁰⁸ Tr. Q. (3) 636:2-6, 658:20-660:8 (Crick).

³⁰⁹ Cl. PHB Q., paragraph 46.

- his type curves, Mr. Crick argued that this was not true and RPS made no attempt to revive this point.³¹⁰
278. Perenco asserted further that RPS argued for adoption of a 17% decline rate sourced from Petroamazonas' Block 21 contract with YPF that RPS had itself explicitly rejected in the *Burlington* proceeding. Having conceded that this rate ought never to have been used, RPS attempted to reach the same steep decline rate by extrapolating the field's decline over a period that included the negative impact of Decree 662.³¹¹ On cross-examination, Dr. Gorell agreed that any extrapolation should be sensitive to the import of historical events.³¹²
279. Perenco submitted further that Mr. Crick's forecasts have been verified by other independent sources, including later estimates from Petroamazonas, Ryder Scott and Dr. Strickland. RPS on the other hand offered no criticism at all of Dr. Strickland's Yuralpa predictions and Ecuador did not cross-examine Dr. Strickland on his forecasting methods or results.³¹³
280. Based on Mr. Crick's technical work, as reviewed by Dr. Strickland, Professor Kalt then estimated the value of Block 21 foregone by Perenco as a result of Ecuador's Treaty and contractual breaches. He calculated that Perenco's damages arising from Block 21 suffered as a result of the breaches amounted to \$501.5 million if valued on an *ex ante* basis³¹⁴ and \$651.6 million, if valued on an *ex post* basis.³¹⁵

(ii) *Ecuador's Position*

³¹⁰ Tr. Q. (3) 637:9-15 (Crick).

³¹¹ Cl. PHB Q., paragraph 52 referring to Tr. Q. (4) 1209:8-10 (RPS) (discussing RPS ER V, Appendix Q, Figure 3).

³¹² Cl. PHB Q., paragraph 52; Tr. Q. (4) 1209:11-1212:8 (RPS).

³¹³ Cl. PHB Q., paragraph 53.

³¹⁴ Kalt ER IV, Exhibit JK-64, PSC Extension 2010 scenario.

³¹⁵ *Id.*

281. In Ecuador's view, the Consortium would have only drilled up to six, not 24, new wells at Yuralpa.
282. Ecuador observed that it was not in dispute that the Yuralpa field was Perenco's first greenfield project and that its development was strewn with unforeseen challenges and unexpectedly poor results. As admitted by Mr. Combe, following the sudden and inexplicable loss of its two best producers in 2004, the field never again met the Consortium's 20,000 barrels of oil per day 'ship-or-pay' commitment³¹⁶, notwithstanding investments substantially higher than originally expected.³¹⁷ Subsequent consecutive drilling campaigns also yielded disappointing results.
283. Against this backdrop, Perenco halted drilling in February 2007 (months before Decree 662 was promulgated) and, in an attempt to address the significant challenges encountered at Yuralpa, commissioned a state-of-the-art full-field study. The preliminary results of this study were presented at the September 2007 BCM. This and a slightly refined and final version of the Yuralpa Simulation Study issued by Perenco in June 2008 identified two unswept areas in which the existing wells alone would not have drained the reservoir by 2021. As a result, the September 2007 BCM presentation set out a preliminary programme of between six and eight new wells in the main and south-eastern fringe areas of the field, to be drilled starting in July 2008. This was later reduced to between five and seven wells in the subsequent Simulation Study, in order to effectively sweep the reservoir.³¹⁸
284. Accordingly, RPS concluded that six new wells would have been drilled at Yuralpa from July 2008 onwards but for Decree 662: two in the main area of the field, three in the south-eastern fringe and one re-drill towards the south.³¹⁹ Ecuador rejected the contention that RPS had shifted positions between the *Burlington* and *Perenco* arbitrations; the two

³¹⁶ Tr. Q. (2) 383: 22-384:4 and Tr. Q. (2) 390:15-391:1 (Combe); see also E-155, Chart analysing oil production data by Block, field and reservoir of Blocks 7 and 21, p. 5.

³¹⁷ Tr. Q. (2) 386:14-20 (Combe); see also Tr. Q. (2) 330:2-10; Tr. Q. (2) 419:2-8 (Combe).

³¹⁸ Crick WS II, Appendix E, Yuralpa Field Study, pp. 2, 32, 34.

³¹⁹ Crick WS II, Appendix E, Yuralpa Field Study, Figure 161; see also Tr. Q. (4) 1097:21-1098:2 (RPS).

tribunals had made different findings and hence different perspectives needed to be adopted as a result.³²⁰

285. Perenco's purported 24-well drilling programme, which would have commenced in July 2008, was at odds with Perenco's September 2007 BCM presentation and the Yuralpa Simulation Study issued in June 2008, which contemplated drilling between five and (no more than) seven horizontal wells so as to effectively sweep the two areas which would have been otherwise left undrained by 2021.
286. Neither the Yuralpa Simulation Study nor any contemporaneous document implied, let alone demonstrated, that there was any significant issue with respect to how Perenco's Geoscience department carried out the Study or constructed its state-of-the-art model. Nor were the conclusions and recommendations criticised or in any way impugned prior to Mr. Crick's testimony. The Study simply did not envisage the need for, or indeed identify the benefit of, proceeding with an extensive infill drilling campaign in the main area of the Yuralpa field and instead focused on further development of the fringe area, where the oil column thickness was inferior to 90 feet.³²¹
287. Yet, Mr. Crick's evidence was that the Consortium would have set aside the conclusions and recommendations from this in-depth study and instead embark upon a spur-of-the-moment 24 vertical well campaign, commencing with 21 infill wells in the main area of the field. Mr. Crick's justification was because he wanted to do vertical wells.³²²
288. Mr. Crick's extensive infill drilling programme was premised on the assumption that water coning was a pervasive occurrence at Yuralpa.³²³ In Ecuador's view, this was not supported by any document on the record and infill drilling was inconsistent with the recommendations of the Yuralpa Study. RPS demonstrated that, consistent with the Kerr McGee report³²⁴, water movement was actually far more complex in the Main Hollín

³²⁰ Resp. Rep. PHB Q., paragraph 67; RPS ER V, Section 2.4; RPS ER V, Section 2.4.

³²¹ Resp. Rep. PHB Q., paragraph 69.

³²² Resp. Rep. PHB Q., paragraph 68; Tr. Q. (3) 623:9-18 (Crick).

³²³ Tr. Q. (3) 634:19-635:2 (Crick).

³²⁴ Crick WS III, Appendix G, p. 15.

reservoir. As shown in RPS's 4-well sample simulations, each well drilled gave rise to extensive lateral water movement, which extended outward with time and, by interacting with the water movement caused by neighbouring wells, eliminated any "infill" drilling targets.

289. Neither Mr. Crick nor Dr. Strickland levied any material criticism against RPS' simulation runs or their ultimate conclusion. Dr. Strickland did not outright reject the notion of extensive lateral water movement. Instead, he sought to downplay its impact by purporting to show that even in RPS' 4-well water encroachment model, enough oil remained trapped between wells so as to warrant drilling the fifth "infill" well. This failed for two reasons:

1. Dr. Strickland focused on representations of the 4-well sample at 12, 19 and 25 months into production. However, this overlooked the fact that the actual Yuralpa wells were much older than that. On average, the wells drilled in this area would have been producing between 33 months and 57 months between the commencement and end of Mr. Crick's drilling campaign. These wells would have caused far more extensive water encroachment and left far less recoverable oil between them.
2. The recovery of any such incremental oil, would be accompanied by the production of large amounts of water.³²⁵ The aggregate water production of 24 such wells would very rapidly surpass the handling capacity of 45,000 bwpd of the field in 2008, thus requiring substantial investment towards an upgrade. Dr. Strickland did not seek to quantify the associated water production.³²⁶

290. Mr. Crick's development plan and his own run of the Yuralpa model would yield far more water than his assumed upgraded handling capacity of 120,000 bwpd. In particular, according to Mr. Crick's development plan, the water production was expected to increase steadily up to 180,000 bwpd in 2021. As a remedy to such increase, Mr. Crick provided for three water shutoff workovers (WSOs) to be carried out per year, starting in 2015. However, as shown by RPS, such WSOs could not achieve the massive reduction in water production that they were credited with.³²⁷ In addition, Mr. Crick's own run of the Yuralpa model also yielded water production figures far higher than his stated 120,000 bwpd, which

³²⁵ Tr. Q. (4) 1104:3-1105:4 (RPS).

³²⁶ Resp. PHB Q., paragraph 100.

³²⁷ RPS ER V, paragraphs 213-216.

he then sought to cap through over 100 automatic WSOs. As demonstrated by RPS and conceded by Mr. Crick, however, such operations were unrealistic and costly.

291. RPS also took issue with Mr. Crick's observation that the simulator over-predicted water production. This was true so long as the field operations remained unchanged, but it was not a valid assumption to make if 24 new wells were put into production in the reservoir and the way in which the wells were operated was significantly changed. This meant that a reasonable proportional cutback of liquid production would inevitably require a significant reduction in the total amount of oil produced, something which was ignored by Mr. Crick.³²⁸ Moreover, in response to Perenco's argument that since "the model contains no water-blocking shales beneath the simulated infill wells" RPS was using a "worst-case scenario" forecasting tool³²⁹, it is not possible to accurately predict the location of shales.³³⁰ This meant that Mr. Crick's 24 new wells were just as likely *not* to encounter shales as they were drilled. Even if the shales could be accounted for prior to any drilling, it was not true that they would have an effect on cumulative water production. Ecuador asserted that such shales would, at best, laterally deviate the otherwise vertical course of water,³³¹ which would increase the amount of mobile water in the field and consequently the amount of water produced by another well.³³²
292. RPS further asserted that in addition to not imposing a field wide limit on the total water production, Mr. Crick also changed how the simulation controls the wells by simultaneously changing well minimum production rates and workover procedures, "all in manners which tend to increase oil production."³³³ RPS found these to be "outrageously optimistic."³³⁴

³²⁸ *Ibid.*, paragraph 208.

³²⁹ Cl. PHB Q., paragraph 44.

³³⁰ Tr. Q. (4) 1023:3-8, 1045:13-17 (Strickland); Tr. Q. (3) 635:5-8 (Crick).

³³¹ Resp. Rep. PHB Q., paragraph 71 referring to Strickland ER I, Figure 1 and Figure 5; Tr. Q. (3) 635:8-11 (Crick).

³³² Resp. Rep. PHB Q., paragraph 71.

³³³ RPS ER V, paragraph 209.

³³⁴ *Id.*

293. Ecuador also criticised Mr. Crick’s type-curve forecasting methodology³³⁵ asserting that it can be very imprecise, differing from reality by as much as 45%, as acknowledged by Mr. Crick.³³⁶ The initial rate of the wells was incorrectly determined; Mr. Crick purported to derive this rate from an alleged correction between the actual initial rates of 27 Perenco wells and 11 wells drilled by Petroamazonas, but Mr. Crick conceded at the Quantum Hearing that this was not a reliable correction³³⁷: its 0.25 coefficient was far below the 0.6 required to find a valid statistical correlation. Moreover, the well data Mr. Crick relied on to derive this “non-correlation” was selected in an inconsistent manner because he had chosen to exclude eight wells out of a total of 35 (23% of the available data) on the ground that he considered them to be “outliers.”³³⁸ As RPS pointed out, it is statistically unsound to exclude 23% of the data.³³⁹
294. Mr. Crick’s attempt to validate his method by reference to “the initial rate from the Petroamazonas wells to predict the performance of the Petroamazonas wells” is plainly unavailing, as it is achieved through a circular (and thus technically incorrect) process.
295. Despite it being “readily acknowledged” to be flawed³⁴⁰, Perenco sought to re-characterise Mr. Crick’s initial rate correlation as a useful and conservative basis for forecasting but Ecuador argued that this relied on statements that Mr. Crick did not actually make at the Quantum Hearing.³⁴¹

³³⁵ Resp. PHB Q., paragraph 118: Mr. Crick first determines the initial oil rate for his new wells, before applying to these (and to the existing) wells a type-curve calculated at field level. Tr. Q. (3) 628:9-629:19 and Tr. Q. (3) 635:20-636:2 (Crick). See also, Crick WS II, paragraphs 113-115, 183-188.

³³⁶ Tr. Q. (3) 655-657:13 (Crick).

³³⁷ Tr. Q. (3) 636:3-5, 658:7-660:8 (Crick). See also, RPS’ Direct Presentation, p. 11; RPS ER V, paragraphs 175-176.

³³⁸ Resp. PHB Q., paragraph 119.

³³⁹ Resp. PHB Q., paragraph 119 referring to Tr. Q. (4) 1107:23-1108:15 (RPS). See also, RPS ER V, paragraphs 173-177.

³⁴⁰ Resp. Rep. PHB Q., paragraph 80 referring to Cl. PHB Q., paragraph 50; Tr. Q. (3) 660:2-5 (Crick).

³⁴¹ Resp. Rep. PHB Q., paragraph 80 referring to Cl. PHB Q., paragraph 50; Tr. Q. (3) 636:18-637:8, 659:19-660:2 (Crick).

296. RPS estimated that the aggregate oil production from Block 21 would have totaled 29.64 MMbo through to contract expiry. Such production would have been derived from both the existing wells (22.83 MMbo) and from the six new wells the Consortium would have drilled but for Decree 662 (6.81 MMbo).³⁴² RPS' forecast was derived from the Yuralpa simulation model which represented the culmination of a major phase of geomodelling and simulation work carried out by Perenco's own geoscience department. This model was undoubtedly the best and most up-to-date prediction tool available to the Consortium from late 2007 onwards and is therefore, the most appropriate means of forecasting oil production in Block 21.³⁴³

(iii)The Tribunal's Decision

297. The Tribunal notes that for Block 21, Mr. Crick's plan was that all 24 of his Yuralpa field wells would be drilled in the period commencing January 2008 through to the end of 2009 (assuming two rigs operating, each one taking a month to drill a well³⁴⁴) and he projected no additional drilling from the end of 2009 through to contract expiry in 2021, a period of some 11 years. In his third witness statement, he adjusted his commencement date to July 2008.³⁴⁵ However, he still contemplated all 24 wells being drilled before the declaration of *caducidad* and none being drilled thereafter.

298. His 'but for' drilling programme was thus 'front-end loaded'.

299. The Tribunal has taken note of documentary and oral evidence which showed that:

³⁴² RPS ER IV, paragraph 150, Table 14.

³⁴³ While Perenco sought to depict RPS' reliance on the 2010 updated version of this model as being inconsistent with its *ex ante* approach, the fact remains that RPS was not provided the June 2008 version of the model. The implications of RPS' use of the 2010 update would, in any event, appear to be inconsequential in light of Crick's own testimony that what happened in 2010 was a typical minor adjustment to the model and not a full update incorporating all of the knowledge available at the time. See Crick WS III, paragraphs 53-54.

³⁴⁴ Crick WS II, paragraph 256. Perenco employed such a programme starting in December 2004, where it drilled 28 wells until it halted drilling in order to conduct a field study. RPS ER V, paragraph 143.

³⁴⁵ Crick WS III, paragraph 3.

- (1) Block 21 consistently performed below expectations after its first three months of production in 2004.³⁴⁶
- (2) This led to Perenco's decision to halt drilling in February 2007, some seven months before Decree 662 came into effect.³⁴⁷
- (3) Burlington's parent, ConocoPhillips, produced a Latin America Reserves Review in May 2007 which noted that drilling in Yuralpa had been "*currently halted to conduct field study (water production key issue)*" and further that "*disappointing well results in latter part of 2006 reduced development [drilling] opportunities - Field study currently underway.*"³⁴⁸
- (4) The ConocoPhillips Information Memorandum (also of May 2007) stated that "...due to earlier than expected water breakthrough in the latest wells, further drilling has been put on hold pending the completion of a reservoir and completion practices study."³⁴⁹
- (5) Based on the preliminary study being performed by Perenco, ConocoPhillips at this point anticipated nine wells as "potential targets" (four infill and five offset (*i.e.*, flank) locations, but by the September 2007 Budget Committee Meeting (BCM), the number was reduced to five to seven with fewer interior wells.³⁵⁰
- (6) Perenco informed the BCM of 26-27 September 2007 that there would be "*no investment [in Block 21]... for first half of 2008.*"³⁵¹
- (7) Perenco's "preliminary programme" in September 2007 was that five to seven wells be drilled.
- (8) The final report on the field study was distributed only in June 2008, eight months after Decree 662 came into effect.³⁵²
- (9) It is conceded by RPS that the field study identified two unswept areas in Block 21 where oil which would not have been drained by the existing wells.³⁵³

³⁴⁶ Tr. Q. (2) 383:3-387:9 (Combe); Tr. Q. (2) 390:18-393:15.

³⁴⁷ Tr. Q. (4) 1053:22-1054:14 (Strickland). E-393, ConocoPhillips Latin America Reserves Review Ecuador, 7 May 2007, p. 13; E-275, Confidential Memorandum, ConocoPhillips, May 2007, p. 44.

³⁴⁸ RPS ER IV, Appendix K, pp. 5 and 13. RPS contended that this shows that the Consortium saw this drilling programme as a "last opportunity" for success. See RPS ER V, paragraph 164.

³⁴⁹ E-275, ConocoPhillips Information Memorandum.

³⁵⁰ RPS ER IV, Appendix H, p. 164.

³⁵¹ E-387, Budget Committee Meeting Slides, Slide 164.

³⁵² RPS ER V, paragraph 161.

³⁵³ RPS ER V, paragraph 54: "In addition, in order to properly reflect the Consortium's perspective, RPS adopted the model developed by Mr. Crick's Perenco colleagues, as referenced by Perenco on 19 December 2014 in Dr. Strickland's First Report. RPS proceeded to use this model in a diligent and prudent manner to investigate

300. The real questions for the Tribunal are: (i) given the Yuralpa field's history, at what pace would drilling have occurred in the 'but for' world; and (ii) what would be the financial impact of the water handling required to exploit the wells in Yuralpa.

301. RPS noted the following points about the Perenco simulation study:

“Base case reserves were 20.3 MMstb. They were calculated using the wells that existed as of October 2007, and using the fluid production rates at that time.

Water handling capacity was 45,000 barrels per day.

Perenco evaluated the potential to increase reserves to 25.7 MMstb by maintaining the current drawdown in the existing wells. This would necessitate increase in water handling to 60,000 barrels per day.

[...]

Perenco evaluated drilling between five and seven wells, which could increase reserves to 32.0 MMstb with the current liquid production rates in existing wells. [...]”³⁵⁴

302. Based on the evidence before it, the Tribunal considers that in the 'but for' period following 4 October 2007, the Consortium would have been, on the one hand, incentivised to drill by the rising oil prices experienced in the period leading up to October 2007. On the other hand, the Consortium would have been more conservative than Mr. Crick in committing to an ambitious drilling programme, given the hitherto disappointing performance of Block 21. That said, the general view must be that in the 'but for' world, particularly with a relatively long period of time remaining on the Contract and strong oil prices at the time, the Consortium would have drilled all wells that were technically and economically feasible.

303. In the circumstances, and given Mr. Crick's adjustment in timing, the Tribunal therefore considers that this programme would have commenced no earlier than July 2008.³⁵⁵

the robustness of the Perenco simulation team's findings regarding the two potentially unswept areas of the Main Hollin reservoir in Yuralpa and its recommendation to drill 5 to 7 wells to exploit the opportunity to recover the volumes therein.” [footnotes omitted.]

³⁵⁴ RPS ER V, paragraph 151.

³⁵⁵ Mr. Crick initially used a January 2008 start date but later adjusted it to July 2008 which reduced his predicted oil volumes by 2%. See Crick WS III, paragraph 3.

Therefore, when estimating the Yuralpa field's value for the purposes of calculating the effect of Decree 662, there would be no increase in the number of Block 21 wells until mid-2008. As for what would happen thereafter, the Tribunal considers that it would be appropriate to assume that Perenco would have drilled six wells between Decree 662 and the declaration of *caducidad*.

304. The Tribunal considers that the starting point for the analysis is a model based on the drilling programme as contemplated in 2008 (six wells) in the period leading up to *caducidad* and to adjust for an increased number of wells.

E. The impact of *caducidad*'s termination of the balance of Perenco's contractual rights

305. The declaration of *caducidad* terminated the Participation Contracts. This was done only one month before the Block 7 Participation Contract expired. As already noted, the Tribunal has declined to assume a particular contractual model that might have governed the Parties' relationship in relation to Block 7 and has chosen instead to treat this as a compensable loss of opportunity, addressed below.

306. The Tribunal therefore begins by considering the situation in Block 21, which Perenco would have operated for some approximately 11 years had *caducidad* not been declared. This raises Mr. Crick's 'but for' drilling plan for the Yuralpa field.

307. With respect to the 11 remaining years on the Contract and prices prevailing in the period leading up to July 2010, had *caducidad* not been declared, given that there is exploitable oil in Block 21, the Tribunal considers that Perenco would have conducted further drilling, particularly when it is assumed as the Tribunal has decided to assume that as of October 2008, the Participation Contracts would be stabilised at 33%. In the end, the Tribunal has decided to employ a mid-range number of wells from Mr. Crick's scenario. In the Tribunal's view, having regard to industry practices and in particular the desirability of maximising Perenco's returns in Block 21 over a still lengthy period of time as well as the value of accelerating drilling in order to capture as much production as possible, but mindful of the Block's history of watering issues, Perenco would have drilled additional wells after expropriation.

308. Having arrived at this conclusion, the Tribunal is aware of the fact that the *Burlington* tribunal took a different view, namely, that having regard to the situation as of September 2007 before the enactment of Decree 662 only six wells were scheduled to be drilled. This was the number of wells that that tribunal found it was reasonable to assume would be drilled in the circumstances. The present Tribunal cannot agree with *Burlington*'s heavy reliance on the September 2007 BCM Presentation and accepts Perenco's argument that "budget committee presentations are not development plans and that Perenco had not intended, in the course of a single budget meeting in 2007, to lay out its plans for the 14 years remaining on the Block 21 Contract."³⁵⁶ The Tribunal believes that given the 14 year time horizon, the Consortium would have been likely to drill more wells so long as it considered that there was commercially exploitable oil.³⁵⁷
309. Knowing that Petroamazonas has to some extent validated Mr. Crick's modeling of the Blocks' productive capacity is of some comfort to the Tribunal that it has arrived at a fair and reasonable valuation, but at the end of the day the Tribunal's approach is to: (i) use market conditions prevailing at the time of the taking; (ii) take the common sense commercial view that with 11 years remaining on Block 21's life, Perenco more likely than not would have sought to maximise its efforts to extract as much value from the Block as was reasonably attainable; (iii) Perenco's drilling programme would have been conducted somewhat more conservatively than Mr. Crick's plan, but still would have sought to overcome the Yuralpa field's technical challenges; and (iv) as Perenco gained more knowledge and experience with the field, it would have put that knowledge and experience to commercial benefit in its drilling decisions.
310. The Tribunal considers that 'but for' the declaration of *caducidad*, Perenco would have drilled ten wells (in addition to the six wells drilled before *caducidad*) between 2010 and 2020.

³⁵⁶ See Perenco's 18 April 2017 comments on the *Burlington* award, p. 4.

³⁵⁷ *Burlington* award, paragraphs 425-426, 436, 449.

311. Having considered the record evidence and the arguments of the Parties, the Tribunal further concludes that the water production levels associated with a 16-well drilling programme would be 120,000 bwpd.³⁵⁸

F. Valuation of Perenco's loss of opportunity to operate Block 7

312. The Tribunal turns to the valuation of the loss of opportunity to negotiate an agreement to continue to operate Block 7 until August 2018. As discussed above, this exercise differs from valuing the loss of profits expected under an executed contract and the question is how to value this opportunity.

1. Perenco's Position

313. Perenco submitted (in the alternative to its asserted claim of US\$626 million based on the AGIP contract, which the Tribunal has already rejected), Ecuador must pay damages for the value of Perenco's lost opportunity to obtain and benefit from a contract extension. Tribunals are willing to apply the loss of chance doctrine even when the probability is low. Here, Perenco established that an extension would very likely have been granted and at the very least should be compensated for its loss of chance to operate in Block 7 until 2018. Perenco's case was unlike that of the claimants in the *Gemplus* case, where the claimants based their extension claim solely on the ground that the concession gave rise to a legitimate expectation that significant additional revenue could be expected from the second 10-year period.³⁵⁹ Perenco had established a strong factual basis for the extension and this was not a claim for speculative and uncertain damages.

2. Ecuador's Position

314. In contrast, Ecuador relied on the *Gemplus* award, where that tribunal looked at the language of a similarly drafted clause and concluded that, while the exercise of the State's discretion was not unfettered under municipal law, the claimant's claim for the second

³⁵⁸ See Section 0) below regarding CAPEX.

³⁵⁹ *Gemplus. v. Mexico*.

period of ten years was far too contingent, uncertain and unproven, lacking any sufficient factual basis for the assessment of compensation under the two applicable BITs. At the relevant date, the concessionaire had no legal right to any extension.³⁶⁰ Likewise, while Ecuador's discretion was not unfettered under Ecuadorian law, Perenco's claim for an eight-year extension was far too contingent, uncertain and unproven, lacking any sufficient factual basis for the assessment of compensation under the Treaty. At the date of *caducidad*, Perenco had no legal right to an extension.³⁶¹

3. The Tribunal's Decision

315. The Parties have argued over the relevance of the *Gemplus* award, where the concession contract at issue contained a clause that contemplated an extension of the initial 10-year term. The main reason why that tribunal refused the loss of opportunity claim based on the possible renewal of the contract stemmed from the fact that the circumstances which initially threw the motor vehicle registry project into disarray and forced the authorities to intervene to administer the concessionaire occurred at the very outset of the Concession's life.³⁶² This caused an understandable decline in public confidence in the registry initiative.³⁶³ Hence, the tribunal had little difficulty rejecting that part of the claim.
316. However, although it was facing dramatically different factual circumstances than the present case, and it was then attempting to value a loss resulting from extant contractual

³⁶⁰ *Gemplus v. Mexico*, Award, paragraph 12-49.

³⁶¹ Resp. Rep. PHB Q., paragraph 15.

³⁶² The events in question centered on the arrest of the concessionaire's general manager, Ricardo Cavallo, for his alleged role in the Argentinian "dirty war", his detention in Mexico and subsequent extradition to Spain at the request of a Spanish investigating judge, and his further extradition to Argentina to face war crimes charges in that country. Mr. Cavallo's arrest was quickly followed by the death in murky circumstances of the senior government official, Dr. Raúl Ramos, responsible for the motor vehicle registry project.

³⁶³ *Gemplus v. Mexico*, Award, paragraphs 13-96: "As found by the Tribunal, [by the time of termination] the project was by then already severely damaged from earlier events for which the Respondent bears no liability under the BITs; and it remained subject to several commercial, legal and political risks. Moreover, it was the Respondent's own efforts in September 2000 that kept the project even half alive (as regards new vehicles) and not destroyed completely by the twin calamities of August/September 2000, namely the Cavallo incident and the death of Dr. Ramos. But for Dr. Blanco's efforts at the time (at the Secretariat), the Concessionaire would have failed in or soon after September 2000. Moreover this half-life project, by 24 June 2001, was far from the project originally envisaged with its business dependent on the registration of both new and used vehicles."

rights, the *Gemplus* tribunal highlighted two points on ‘loss of opportunity’ that resonate with the present Tribunal. First, there was “no certainty or realistic expectation of this project’s profitability as originally envisaged, but there was nonetheless a reasonable opportunity” and that “opportunity, however small, has a monetary value” at international law.³⁶⁴ Second, “it would be wrong in principle to deprive or diminish the Claimants of the monetary value of that lost opportunity on lack of evidential grounds when that lack of evidence is directly attributable to the Respondent’s own wrongs.”³⁶⁵

317. This is in line with the present Tribunal’s view. The facts are that: (i) Block 7 was a proven field with valuable oil reserves; (ii) there is no question that even with a changed contractual model, Perenco wanted to stay in Ecuador and continue to operate the block; and (iii) there is considerable evidence that the State itself would have preferred Perenco to stay in Ecuador. The Tribunal believes that ‘but for’ the breaches, the parties more likely than not would have arrived at a solution whereby Perenco would be operating Block 7 under a different contractual regime. But the Tribunal has also found that it cannot engage in the kind of speculation about a specific contractual model which would then be married with Mr. Crick’s projections in order to arrive at an amount of damages.

318. Perenco referred the Tribunal to Ripinsky and Williams’ *Damages in International Investment Law*, where the authors observed:

“Loss of chance can thus be used as a tool allowing the injured party to receive *some* form of compensation for the loss of chance to make profit. In theory, the loss of chance is assessed by reference to the degree of probability of the chance turning out in the plaintiff’s favour, although in practice the amount awarded on this account is often discretionary.”³⁶⁶

319. The authors continue:

“In some other cases, arbitral tribunals have determined the amount of lost profits in a discretionary manner. Where this lack of numerical support

³⁶⁴ *Ibid.*, paragraphs 13-98.

³⁶⁵ *Ibid.*, paragraphs 13-99.

³⁶⁶ CA-511, Ripinsky, Sergey & Williams, Kevin, *Damages in International Investment Law* (London: British Institute of International and Comparative Law, 2008), pp. 291-292.

was due to the fact that a tribunal could not estimate the loss of profits with satisfactory precision, such awards may be classified as compensation for the loss of business opportunity. Amounts awarded under this head of damage are likely to be conservative and reflect a tribunal's view of an equitable, reasonable and balanced outcome rather than being a result of a mathematical calculation."³⁶⁷

320. The Tribunal observes that the claim here is not to be equated to a lost profits claim based upon a final, executed contract. There is an element of uncertainty that must be taken into consideration.

321. In arriving at its decision, the Tribunal has considered the ILC Articles, particularly Article 36 thereof, and the commentaries (specifically (27) and (32) thereto. Article 36 provides that:

“1. The State responsible for an internationally wrongful act is under an obligation to compensate for the damage caused thereby, insofar as such damage is not made good by restitution.
2. The compensation shall cover any financially assessable damage including loss of profits insofar as it is established.”³⁶⁸

322. The key point is that financial damage must not only be proximately caused by the unlawful act(s), but that it also be “*assessable*”, that is, capable of being assessed. The Tribunal has already observed that it is also alive to the cases’ and commentaries’ reminder that international courts, tribunals and claims commissions seek to avoid granting “inherently speculative” claims or to put it the other way, seek to determine whether there are “sufficient attributes to be considered a legally protected interest of sufficient certainty to be compensable.”³⁶⁹

³⁶⁷ *Ibid.*, p. 293.

³⁶⁸ ILC Articles.

³⁶⁹ *Ibid.*, Commentary (27) to Article 34. Particularly the concern expressed about the need to ensure that there is “financially assessable” damage: “Tribunals have been reluctant to provide compensation for claims with inherently speculative elements. When compared with tangible assets, profits (and intangible assets which are income-based) are relatively vulnerable to commercial and political risks, and increasingly so the further into the future projections are made. In cases where lost future profits have been awarded, it has been where an anticipated income stream has attained sufficient attributes to be considered a legally protected interest of sufficient certainty to be compensable. This has normally been achieved by virtue of contractual arrangements or, in some cases, a well-established history of dealings.”

323. The circumstances of the present case are unusual. The parties arrived at an ‘in principle’ negotiated change to their contractual relationship which contemplated the extension of Block 7’s term. However, it was Ecuador, and not Perenco, which, due to Burlington’s recalcitrance, balked at its implementation. The Tribunal found this refusal was a breach of the Treaty by Ecuador which deprived Perenco of the chance to reach an agreement on extension.³⁷⁰ Therefore, the Tribunal considers that Perenco is entitled to compensation for the loss of that opportunity.
324. The Tribunal frankly acknowledges that any estimation of the value of the loss of opportunity is an exercise of discretion and therefore it has decided to award a nominal value. In this regard, the Tribunal recalls a comment made by the *Murphy v. Ecuador* tribunal with which the Tribunal agrees:
- “...The applicable international law standard of full reparation, as reflected in the *Chorzów Factory* judgment and Article 31 of the ILC Articles on State Responsibility, does not determine the valuation methodology. Nor does the Treaty. Tribunals enjoy a large margin of appreciation in order to determine how an amount of money may “as far as possible, wipe out all the consequences of the illegal act and re-establish the situation which would, in all probability, have existed if that act had not been committed.”³⁷¹
325. Because it is a loss of opportunity to have the contract extended rather than the loss of a fully crystallised legal right to an extension of a contract, the expected cash flows of which could be modelled on a DCF basis, such value must necessarily be significantly lower than the amount claimed by Perenco based on the AGIP contract model applied by Mr. Crick’s drilling forecasts for Block 7 through to 2018.
326. In all of the circumstances, the Tribunal holds that an award of US\$25 million is appropriate. It cannot but note that the equities tend strongly in favour of the granting of this relief. This however is not a decision *ex aequo et bono*. It is one grounded in law.

G. Contributory Negligence

³⁷⁰ Decision on Liability, paragraphs 622-624.

³⁷¹ *Murphy v. Ecuador*, paragraph 481.

327. Ecuador’s defences on liability and on quantum advanced various arguments to the effect that Perenco was either the author of its own misfortune or otherwise has contributed to the harm in respect of which it now seeks damages. This was prominent in Ecuador’s argument during the liability phase that Perenco and Burlington pursued a so-called “*self-expropriation*” strategy in refusing to comply with Law 42 by paying sums into an offshore account, and calculating that they would be better off keeping that money and not operating the Blocks.³⁷² In the damages phase, Ecuador argued similarly that Perenco contributed to the *coactiva* dispute by refusing to pay Law 42 dues, by threatening suit against persons who purchased the oil at auction, and by suspending operations, knowing that this would force the State to intervene and ultimately could be a ground for *caducidad*.³⁷³

1. Ecuador’s Position

328. Ecuador thus argued that if Perenco was entitled to any damages at all, they ought to be reduced on grounds of contributory negligence. It argued that international law is clear that simple negligence (demonstrating a lack of due care for one’s own property or rights³⁷⁴) that concurrently contributes to a loss is sufficient to establish contributory negligence.³⁷⁵

329. In its view, Perenco’s refusal to pay the amounts due under Law 42 was inherently negligent because it compelled Ecuador to react. Ecuador argued that its own alleged breaches of international law were irrelevant to Perenco’s contributory negligence because the doctrine of contributory negligence exists in order to reduce the damages from a respondent’s breach on account of the claimant’s own negligent contribution to the loss it has suffered. Ecuador submitted that if Perenco’s excuse for what Ecuador termed “tax evasion”³⁷⁶ (that is, Ecuador’s response was contrary to its international rights) were to be accepted, the doctrine of contributory negligence would have no possible application. Ecuador relied in this regard on the awards in *Goetz*, *Occidental* and *Yukos* where tribunals

³⁷² Resp. C-Mem. M., paragraph 599; Resp. Rej. M., paragraphs 16, 290-296.

³⁷³ Resp. Rej. Q., paragraphs 507-512, 523-525.

³⁷⁴ ILC Articles, Art. 39, comment 5.

³⁷⁵ Resp. Rep. PHB Q., paragraph 105.

³⁷⁶ Resp. PHB Q., paragraph 167.

found the claimants were contributorily negligent for instigating the State's breach and therefore the damages to be awarded were adjusted downward.³⁷⁷

330. In addition, Ecuador contended, Perenco was negligent, or even reckless, in suspending ongoing operations in the Blocks and consciously ignoring the risks of environmental harm and production losses. By suspending operations on short notice,³⁷⁸ Perenco acted in reckless disregard even in relation to its own rights, even though it foresaw that Ecuador would be forced to respond. Even if Perenco were permitted in principle to suspend operations, Perenco could not do so regardless of the risks. Mr. Perrodo repeatedly conceded that he decided to suspend operations despite his full awareness of the risks. Specifically, Mr. Perrodo admitted that he was aware that suspending operations involved serious risks, including production losses in Blocks 7 and 21 and environmental damage to the Ecuadorian Amazon.³⁷⁹ He recognised that these risks would force Ecuador to respond and might result in *caducidad*.³⁸⁰ He admitted that, consciously disregarding these serious risks, he decided to suspend operations in Block 7 and 21.³⁸¹
331. Ecuador argued further that Perenco's conduct during the Parties' negotiations was negligent and led to the breakdown of negotiations. It had rejected Ecuador's proposals,

³⁷⁷ Resp. PHB Q., paragraph 169, fn. 265 referring to Cl. Rep. Q., paragraph 208 ("... in *Goetz II*, the tribunal reduced the damages awarded to claimants on the grounds that claimants had failed to comply with the applicable exchange regulation. [...] In *Occidental II*, the tribunal recognized that 'an award of damages may be reduced if the claiming party also committed a fault which contributed' to its loss, and held that in that case the investor 'acted negligently and committed an unlawful act' in failing to obtain prior ministerial authorization to transfer rights under its participation contract. [...] In *Yukos*, the tribunal found that, unlike other Russian companies, Yukos 'breached the legislation and abused the low tax regimes...through the sham-like nature' of its operations in certain regions") (citing *Antoine Goetz & Consorts et S.A. v. Burundi*, Award, 21 June 2012, ¶ 258, EL-289; *Occidental Petroleum Corporation and Occidental Exploration and Production Company v. Ecuador*, Award, 5 October 2012, ¶¶ 678-679, CA-431; *Yukos Universal Ltd. v. Russia*, PCA Case No. AA 227, Final Award, 18 July 2014, ¶¶ 1611, 1615, CA-447). *Gemplus* is the exception that proves the rule: the tribunal rejected contributory negligence only because it was impossible for the claimants to have known that its employee had a criminal past. *Gemplus v. Mexico*, Award, 10 June 2010, ¶ 11.14, CA-439."

³⁷⁸ Decision on Liability, paragraph 199: "On 13 July 2009, Perenco and Burlington jointly wrote to Minister Pinto to inform Ecuador of the Consortium's intention to commence the suspension of its operations on 16 July 2009."

³⁷⁹ Tr. Q. (2) 554:13-555:12 (Perrodo).

³⁸⁰ Tr. Q. (2) 560:11-19 (Perrodo).

³⁸¹ Tr. Q. (2) 561:3-8 (Perrodo).

making the negotiation process even more difficult. Contrary to what Perenco alleges, the Tribunal never found that Perenco was justified in terminating the negotiations based on “Ecuador’s unlawful coercion.”³⁸² Perenco’s failure to “make its best efforts” to finalize the renegotiation of the Participation Contracts pursuant to the *Actas de Acuerdo Parcial* of October 2008, after having signed three partial agreements throughout 2008, amounted to an “unjustified” termination of the negotiation which gave rise to *culpa in contrahendo*.³⁸³

332. Ecuador further argued that Perenco could not rely on the argument that Ecuador’s unlawful conduct was the proximate cause of *caducidad*. A single event might have multiple proximate causes. The doctrine of contributory negligence depends on this possibility. Contributory negligence reduces compensation exactly when the respondent and the claimant both contribute to or proximately cause the claimant’s loss. Article 39 of the Articles on State Responsibility deals with this situation.³⁸⁴ Ecuador’s alleged proximate causation does not change the fact that Perenco’s refusal to pay its Law 42 taxes and its decision to abandon the oil fields directly contributed to *caducidad*.³⁸⁵
333. Finally, if Perenco referred to *coactivas* and the oil auction as the proximate cause of *caducidad*, Perenco’s reckless decision to suspend operations in the Blocks were a more direct cause of *caducidad* than the *coactivas* and the oil auction.³⁸⁶

2. Perenco’s Position

334. Perenco responded that Ecuador bears the burden of proving two elements of its contributory fault theory. First, Ecuador must show that Perenco committed a wrongful act, whether intentional or negligent; bad business decisions that might have increased the

³⁸² Resp. Rej. Q., paragraph 519.

³⁸³ *Ibid.*

³⁸⁴ ILC Articles, Art. 39, comment 1.

³⁸⁵ Resp. PHB Q., paragraph 181.

³⁸⁶ *Idem.*

investor's risks do not rise to the level of culpable fault capable of supporting a finding of contributory fault.³⁸⁷

335. Perenco's refusal to pay the Law 42 amounts cannot be characterised as negligent because the Tribunal has already rejected Ecuador's claim that Perenco had no legal basis to withhold Law 42 payments. The Tribunal has acknowledged that Perenco was justified in withholding direct payment of Law 42 dues after commencement of the arbitration.³⁸⁸ Perenco legitimately expected that Ecuador would comply with the Tribunal's binding orders and that this relieved Perenco from making those direct payments. Its refusal thus could not be characterised as a culpable act that manifested a disregard for Ecuador's rights and for which Perenco should be penalised.
336. Moreover, given the position taken by two Ecuadorian Attorney-Generals that Law 42 was not a tax law and that the dues collected pursuant to it were not collected by Ecuadorian tax authorities, it was not reasonable and realistic to suggest that Perenco should have paid Law 42 dues to Petroecuador and then petitioned Ecuador's tax authorities in order to contest them.³⁸⁹
337. In relation to Perenco's suspension of operations following Ecuador's disregard of the Tribunal's Decision on Provisional Measures and issuance of *coactivas*, the Tribunal had found that Perenco's suspension of operations was justified under the *exceptio non adimpleti contractus* principle. The defence was open to Perenco and that therefore Perenco could lawfully suspend operations when faced with a breach of contract without itself being found to be in breach.³⁹⁰ And, as Mr. Perrodo had testified, there had been no interruptions in operations and the company had taken the decision to suspend only as a last resort.
338. Regarding Perenco's alleged failure to obtain Burlington's agreement to abandon the Participation Contracts and agree to an unspecified future contractual form, the Tribunal

³⁸⁷ Cl. Rep. Q., paragraphs 202-216.

³⁸⁸ *Ibid.*, paragraphs 219-221.

³⁸⁹ Cl. PHB Q., paragraph 134.

³⁹⁰ Decision on Liability, paragraphs 435 & 704; 412.

had found that Perenco was not liable for Burlington's decision not to abandon its contractual rights, that Burlington had good reasons for doing so, that Ecuador acted abruptly and coercively during the negotiations, and that Ecuador – not Perenco – was responsible for the failure of negotiations.³⁹¹ In any event, Ecuadorian law recognises that liability for breaking off contractual negotiations (*culpa in contrahendo*) does not arise unless there are exceptional circumstances. There can be no liability if there was a legitimate basis to end negotiations. Even if Perenco had terminated negotiations (which, as the Tribunal found, was not the case), Ecuador's unlawful coercion of Perenco would have been a more than sufficient justification.³⁹²

339. Perenco argued further that Ecuador could not show the second element of contributory fault, namely, that this fault interrupted the chain of causation. Contributory fault requires conduct by the investor that breaks the causal nexus such that the injury can be considered severable.³⁹³ Perenco pointed out that Ecuador's own authorities recognised that wrongful conduct by the investor that is a concurrent cause for the loss does not exonerate the State from liability altogether. Ecuador must prove that Perenco would have suffered the loss even if Ecuador had not committed its unlawful acts.³⁹⁴
340. The Tribunal has already confirmed that Ecuador's unlawful conduct was the proximate cause of *caducidad*. This was not addressed by Ecuador at the Quantum Hearing.³⁹⁵ Ecuador could not establish that any of the above was the proximate cause of Ecuador's declaration of *caducidad*. It was Ecuador's choice in exercising its discretion that directly triggered *caducidad*.³⁹⁶

³⁹¹ Cl. Rep. Q., paragraph 226.

³⁹² *cf.* Decision on Liability, paragraphs 609-612; 621-625.

³⁹³ Cl. Rep. Q., paragraph 213.

³⁹⁴ *Ibid.*, paragraph 215.

³⁹⁵ *Ibid.*, paragraph 136.

³⁹⁶ *Ibid.*, paragraph 234 citing Decision on Liability, paragraphs 708, 710.

341. Further, Perenco had made it clear it would resume operations if Ecuador complied with the Tribunal’s Decision on Provisional Measures.³⁹⁷ If that had occurred, the Consortium would have continued to operate the Blocks, and Ecuador would not have declared *caducidad*. The proximate cause was therefore Ecuador’s failure to comply with the provisional measures, not Perenco’s later suspension of operations.³⁹⁸
342. Ecuador also did not declare *caducidad* due to Burlington’s attitude but because of a suspension that was caused by Ecuador’s failure to comply with the Decision on Provisional Measures.
343. Finally, Perenco pointed out that Ecuador did not deny that its contributory fault defence was limited to *caducidad* in any event. Even if it had any legal or factual basis, it could not affect damages for Ecuador’s violations of Article 4 of the Treaty or for its breach of the Contracts through Decree 662.³⁹⁹

3. The Tribunal’s Decision

344. The Tribunal recalls that Article 39 of the ILC Articles, entitled “*Contribution to the injury*”, states that in the determination of reparation, “account shall be taken of the contribution to the injury by wilful or negligent action or omission of the injured State or any person or entity in relation to whom reparation it sought.”⁴⁰⁰ While the inclusion of the word “wilful” broadens the scope of the article beyond negligence, such broadening does not, in the Tribunal’s view, appear to be substantial. The ILC Commentaries noted in this regard that the focus “is on situations which in national law systems are referred to as ‘contributory negligence’, ‘comparative fault’, ‘*faute de la victime*’, etc.”⁴⁰¹ Commentary (5) to the article notes further that it allows to be taken into account “*only* those actions or omissions which can be considered as wilful or negligent, *i.e.* which manifests a lack of

³⁹⁷ CE-238; CE-243; Decision on Liability, paragraph 692.

³⁹⁸ Cl. Rep. Q., paragraph 236.

³⁹⁹ Cl. PHB Q., paragraph 137.

⁴⁰⁰ ILC Articles, Article 39.

⁴⁰¹ *Ibid.*, Commentary (1).

due care on the part of the victim of the breach *for his or her own property or rights.*”⁴⁰²
The Tribunal therefore proceeds on the basis that in order for Ecuador’s submissions to succeed, the Tribunal must be satisfied that Perenco manifested a lack of due care for its own property or rights.

345. Ecuador has identified a number of instances where it considers Perenco contributed to the damages which it has suffered.
346. Putting them in rough chronological order, the first is the contention that Perenco’s overall conduct during the negotiation process contributed to its loss in that on several occasions, Perenco rejected Ecuador’s proposals, thus making the negotiation process more difficult, refused to discuss drafts of transfer agreements that Ecuador proposed on 16 May 2008 and 10 July 2008, did not make its best efforts to finalise the new renegotiation of the Participation Contracts into services contracts as agreed in the October 2008 *Actas*, failed to secure Burlington’s agreement to the final draft transitory agreement despite knowing that such failure would have serious consequences, and “cynically” sought to reopen the negotiations in May 2009.⁴⁰³
347. Second, Ecuador contended that Perenco’s refusal to comply with Ecuadorian law and pay Law 42 dues was “grossly negligent.”⁴⁰⁴
348. Third, Perenco’s boycott of the auctions of the seized oil during the *coactiva* process and its threatening legal action against any company that participated in the auction was said to have contributed to its loss.⁴⁰⁵
349. Fourth, Perenco was said to have acted negligently and recklessly in suspending operations while consciously ignoring the risk of environmental harm and production loss. In doing

⁴⁰² *Ibid.*, Commentary (5).

⁴⁰³ Resp. Rej. Q., paragraphs 517-519.

⁴⁰⁴ Resp. PHB Q., paragraph 166; Resp. Rep. PHB Q., paragraph 106. In an earlier version of this contention, Ecuador seemed to argue that Perenco was negligent when it stopped paying despite the fact that it was economically capable of doing so (Resp. C-Mem. Q., paragraphs 316, 323).

⁴⁰⁵ Resp. Rej. Q., paragraphs 523-524.

so, Perenco acted in “reckless disregard for its own rights” despite specifically foreseeing that Ecuador would be forced to respond.⁴⁰⁶

350. Fifth, Perenco’s failure to resume operations in the Blocks (after having suspended operations) despite invitations for it to do was also said to have contributed to the harm which it suffered.⁴⁰⁷
351. Before addressing these claimed instances of contributory fault, it is worth noting that the first completed breach, Decree 662, set in train two main types of damage: (i) a further reduced “take” for the contractor; and (ii) the virtual immediate cessation of drilling activity in both Blocks. Perenco in no way contributed to the damage proximately caused by this measure. Indeed, the various acts complained of by Ecuador all followed Ecuador’s decision to ratchet up the State’s take from 50% of the ‘above reference price revenues’ to 99%.
352. Some of the alleged instances of contributory fault can be dismissed summarily. The Tribunal cannot accept that Perenco’s overall conduct during the negotiation process contributed to its loss. None of the alleged instances of contributory fault said to arise from Perenco’s responses to Ecuador’s contractual demands can be considered to amount to wilful or negligent conduct within the meaning of Article 39 of the ILC Articles. The Tribunal has already found that it was Ecuador that escalated its demands and threats over time and that for its part Perenco sought to accommodate such demands to the best of its ability.⁴⁰⁸ For example, the failure to secure Burlington’s consent to the terms of the October 2008 *Acta* simply cannot be viewed as being within Perenco’s control, let alone a wilful or negligent act on its part.
353. Likewise, for two reasons, Perenco’s decision to suspend operation of the two Blocks in July 2009, which the Tribunal has already found in its Decision could be justified under

⁴⁰⁶ Resp. PHB Q., paragraph 171; Resp. Rep. PHB Q., paragraph 106,

⁴⁰⁷ Resp. Rej. Q., paragraph 505.

⁴⁰⁸ Decision on Liability, paragraph 625.

Ecuadorian law⁴⁰⁹, cannot be viewed as a wilful or negligent act which contributed to the harm that it ultimately suffered. The Tribunal has found that Ecuador committed a breach of contract by failing to comply with the Tribunal’s Decision on Provisional Measures, that Perenco had a contractual right to expect Ecuador’s compliance with such, and that faced with Ecuador’s refusal, Perenco had the right to suspend performance under Ecuadorian law.⁴¹⁰ (The Tribunal also found that just as Perenco had a right to suspend performance Ecuador had a correlative right to intervene in order to operate and protect the Blocks.⁴¹¹) Ultimately, it was the State’s decision to declare *caducidad* that amounted to the last completed breach.

354. To the extent that Ecuador traces this back to a refusal to pay Law 42 dues, as discussed below, given the intermediation of the Decision on Provisional Measures, the Tribunal cannot find that Perenco contributed to Ecuador’s decision to expropriate its interests in the Blocks.
355. In addition, to the extent that Ecuador complains that, for example, the day after Perenco suspended operations, it notified its employees in the Blocks that their employment contracts were terminated, and therefore it “prematurely manufactured a situation in which was difficult to resume operations”⁴¹², in the Tribunal’s view, Ecuador has not quantified the loss that it might have suffered when Petroamazonas had to take over production, nor has it shown that laying off employees led to a loss occasioned to Perenco for which Perenco now seeks compensation. (The issue of employee costs is comprehended in the calculation of lost profits for Block 21 and does not arise to any significant degree in

⁴⁰⁹ *Ibid.*, paragraphs 434 – 435.

⁴¹⁰ *Ibid.*, paragraph 417. In the Tribunal’s view, a plain reading of clauses 22.2.2 indicates that the contracting parties agreed that they would comply not only with a final award (i.e., in Spanish, the ‘*laudo*’ issued by a tribunal), but in addition, they would observe and comply with the decisions (i.e., in Spanish, the ‘*decisiones*’) of the tribunal. 657 The latter term constitutes a more capacious category of tribunal decisions of which the final award forms a part. Thus, under the Participation Contracts, Ecuador was bound to comply with the Decision on Provisional Measures and its failure to do so constituted a breach of contract.

⁴¹¹ *Ibid.*, paragraph 704.

⁴¹² Resp. Rej. Q., paragraph 507.

relation to Block 7 since *caducidad* applied only to the remaining one month of the Block 7 Contract's life.)

356. As to the steps taken by Perenco to refuse to pay Law 42 dues and instead depositing them in an off-shore account rather than paying them to Ecuador (which began after the dispute was submitted to arbitration but before the Tribunal issued its Decision on Provisional Measures and therefore initially was taken without the cover of a tribunal decision), in the Tribunal's view, Perenco *did* assume the risk that the Tribunal might not uphold its legal position in all respects. In addition, by declining to pay Law 42 dues to Ecuador, it was or should have been reasonably foreseeable to Perenco that this could invite a strong response from the State.

357. Such a response did in fact occur in the form of Ecuador's notice of its intention to commence *coactivas* in order to liquidate Perenco's Law 42 debt for 2008.⁴¹³ To that extent, Perenco's action exacerbated the situation, but this is not the end of the analysis of this claimed instance of contributory fault. Not long after the Tribunal held its first meeting with the Parties –at which Perenco had foreshadowed the possibility of a provisional measures application– such an application was in fact made. The Tribunal ended up granting Perenco's request and recommended such measures. The Tribunal specifically recommended that Ecuador refrain from taking *coactiva* measures against Perenco and further called upon the Parties to negotiate an escrow arrangement that would preserve their respective claims to the disputed funds pending the outcome of the arbitration.⁴¹⁴ This proved not to be possible for Ecuador. Ecuador explained its view in a respectful and nonconfrontational manner that it could not comply with the measures recommended by the Tribunal and that it was bound to initiate the *coactivas*. But the Tribunal later found in its Decision on Liability that Perenco was within its contractual rights to expect that Ecuador would comply with the Tribunal's provisional measures recommendations.

358. The Tribunal recalls the relevant findings in its prior Decision on Liability:

⁴¹³ Decision on Provisional Measures, paragraph 22.

⁴¹⁴ *Ibid.*, paragraphs 79, 80.

“694. The Tribunal has already found that Perenco had a reasonable expectation under the Participation Contracts that Ecuador would comply with any decision of the Tribunal. This contractual expectation was buttressed by the general expectation that any disputing party has that once the dispute is submitted to arbitration, both parties will seek to conform their conduct to the Tribunal’s directives, particularly with respect to the non-aggravation of the dispute.

695. Ecuador found itself unable to comply with the Tribunal’s Decision in this case. The Tribunal can well understand why in 2009, in applying a domestic law, Ecuador would wish to liquidate the amounts claimed to be owing for 2008. However, when the matter was put before the Tribunal, Ecuador’s duty to enforce the law conflicted with its contractual obligation to comply with decisions of the Tribunal. The Tribunal recommended what it considered to be a reasonable way to protect both Parties’ rights pending a final determination of their dispute. Regrettably, this was not possible in the circumstances. Perenco is correct to point out that had the State stayed its hand in relation to the *coactivas*, the dispute would not have been aggravated in the way in which it was.”⁴¹⁵ [Emphasis added.]

359. In adversarial proceedings, a disputing party’s view of its adversary’s conduct as unacceptable or inappropriate is usually viewed by the other party as perfectly acceptable and appropriate in the circumstances. In the Tribunal’s view, it is wrong to equate a party’s zealous protection of its legal rights and interests with wilful conduct or contributory negligence within the meaning of the ILC Articles. Perenco did assume a risk when it unilaterally decided to pay the Law 42 amounts into an offshore account. However, and crucially, it then obtained the protection of a Tribunal recommendation that Ecuador not take *coactiva* action, as well as a recommendation that the Parties agree an escrow account arrangement so that the disputed Law 42 dues could be paid into it pending the outcome of the arbitration (an arrangement which proved to be unattainable in the circumstances).
360. Perenco was, in the circumstances, entitled to rely upon the Tribunal’s recommendation and this cannot be considered to be a wilful or negligent contribution to the loss that it ultimately suffered when Ecuador enforced the *coactivas*. While Perenco’s act of self-help *prior* to the Tribunal’s consideration of its request for provisional measures was aggressive and perhaps even provocative, it must be viewed in context. Ecuador itself was hardly

⁴¹⁵ Decision on Liability, paragraphs 694-695.

blameless in terms of the way in which it escalated pressure on Perenco.⁴¹⁶ In the end, since provisional measures were granted, the Tribunal does not find Perenco's conduct in this regard to be wilful or negligent within the meaning of the ILC Articles once that conduct received the colour of right conferred by the Tribunal's ruling in Perenco's favour. At that point, Perenco was legally entitled to act as it did and it was Ecuador that acted inconsistently with the Tribunal's recommendation.

361. Although the Tribunal declines therefore to find this to be an act of contributory fault, one aspect of Ecuador's argument is accepted. As discussed below, Ecuador's point is addressed through the Tribunal's calculation of the damages owing. In deciding the amount of compensation owing for the unlawful imposition of Decree 662, the Tribunal has agreed with Brattle's view that if a party that claims compensation for the levying of a tax has not actually paid some or all of the tax, it cannot be compensated for that part of the damages which have been calculated on the assumption that the tax was paid. Thus, the Tribunal's 'true-up' addresses this aspect of Ecuador's contributory negligence argument.
362. Turning to the conduct of the auctions of oil seized through the *coactivas*, once again the Tribunal agrees that Perenco contributed to the depressed price of oil obtained in the *coactiva* auctions (by threatening suit against would-be purchasers). But when considered in light of the provisional measures already granted by the Tribunal, Perenco has the better position. Ecuador was evidently able to sell the seized oil at the market price. Given that it was the purchaser of the oil, it benefited from the depressed purchase price yet credited Perenco's Law 42 debt with the depressed price rather than the market value of that oil. In

⁴¹⁶ Such as, for example, blaming Perenco for failing to get the *Acta* agreed and threatening it with termination and even expulsion from the country. In its Decision on Liability, paragraphs 144-145, with reference to the Parties' correspondence, the Tribunal recounted the fact that on 24 December 2008, Perenco received a letter from the Ministry of Mines and Petroleum stating that "as a result of the impossibility of arriving at a final agreement between the parties, due to the intransigent position of your partner Burlington Resources, I would be very grateful if you would immediately instruct your work team to initiate the process of reversion of Block 7, the contract for which ends in the year 2010. Moreover, PERENCO, in its capacity as Operator, must also immediately assign its negotiating team to early termination of the Block 21 contract, by mutual agreement." Perenco then wrote to the Minister of Mines and Petroleum requesting him to reconsider the position expressed in the letter of 24 December 2008. But on 21 January 2009, the Minister of Mines and Petroleum announced that the negotiations to have Perenco continue operating in Ecuador had become "practically impossible."

doing so, it realised an enrichment that in the Tribunal's view, having regard to the status of the provisional measures ruling, it would be unjust to enjoy.⁴¹⁷ For that reason, the Tribunal cannot find that Perenco acted wilfully or negligently in standing on its rights and threatening suit against would-be purchasers. In all of the circumstances, it was unfair for Ecuador to buy the oil at a discount and then credit Perenco for only that depressed value. For that reason, the Tribunal also includes this in the 'true-up' adjustment to the damages, an adjustment that this time redounds to Perenco's benefit.

363. Therefore, the various claims of contributory negligence are unavailing.

H. **The 'true-up' issue**

364. This takes the Tribunal to the final part of the damages exercise, which is to consider Ecuador's 'true-up' case. The essence of the case is that Ecuador considers, among other things, that since the Tribunal found no breach of contract or the Treaty for Law 42 at 50% and because, on Ecuador's reading of the Contracts, their economy was never disturbed at 50% or at 99%, Perenco owes it a substantial amount of unpaid Law 42 dues.

1. Ecuador's Position

365. Ecuador contended that the damages owed to Perenco were either nil – once offsetting dues said to be owed under Law 42 are included in the analysis (the "true-up") or at best the Respondent owed Perenco US\$114.3 million.⁴¹⁸

⁴¹⁷ Decision on Liability, paragraph 703.

⁴¹⁸ Brattle ER III, Table 1.

Table 1: Summary of Damages (US\$ mn)

				Stabilisation Scenario			
				#1	#2	#3	#4
				(No Stabilisation)	(Stabilisation Decree 662 Only, New X Factor)	(Hypothetical Tax Threshold at 81%)	(Stabilisation Decree 662 Only, Side-Payment of Oil)
Gross Damages							
	FET Claim (Oct-07)	[1]	See note	0.0	3.6	62.9	184.4
	Expropriation (Jul-10)	[2]	See note	13.7	13.7	13.7	13.7
	Gross Harm	[3]	[1]+[2]	13.7	17.3	76.6	198.1
True Up							
	#1 (Auction Prices)	[4]	See note	216.2	216.2	216.2	216.2
	#2 (Market Prices at Date of Production)	[5]	See note	125.6	125.6	125.6	125.6
	#3 (Market Prices on Auction Date)	[6]	See note	83.7	83.7	83.7	83.7
Damages Net of True Up							
	Net of True Up #1	[7]	Max{[3]-[4],0}	0.0	0.0	0.0	0.0
	Net of True Up #2	[8]	Max{[3]-[5],0}	0.0	0.0	0.0	72.5
	Net of True Up #3	[9]	Max{[3]-[6],0}	0.0	0.0	0.0	114.3

Notes and sources:

All values in US\$ mn as at September 2015, including simple interest.

[1] & [2]: Brattle Workpapers, Tables M3 & M4.

[4] to [6]: Table 2.

366. Ecuador argued that the Tribunal should apply the ‘true-up’ so as to account for the amount owed by Perenco to Ecuador as a consequence of: (i) the Consortium’s withholding significant Law 42 dues (not only Decree 662 dues) since 2008; and (ii) Ecuador’s having to fund the Blocks’ operations for one full year from July 2009 until July 2010, while crediting the Consortium with production.
367. Brattle calculated three alternative ‘true-up’ figures depending on the price used to account for the oil seized and sold by Ecuador under the *coactivas* (higher prices meaning a lower debt for Perenco).⁴¹⁹ Ecuador contended that any compensation should take into consideration Perenco’s contribution to the reduced sales price for the oil auctioned in the

⁴¹⁹ US\$216.2 million (price at which Ecuador sold the seized oil), US\$125.6 million (market prices as of the date of production of the seized oil), and US\$83.7 million (market prices on auction date) (Brattle ER II, Table 1, p. vi). However, this distinction becomes irrelevant in three of the four stabilization scenarios analyzed by Brattle because the damages net of true up are US\$0 regardless of the alternative used (Brattle ER II, Table 1, p. vi.).

coactivas process. It is undisputed that Perenco boycotted the auctions, which led to the seized oil being sold at below the prevailing market price.

368. Ecuador contended that the appropriate amount to be set-off is \$216 million, given that Perenco illegally prevented Ecuador from selling the oil at a higher price. Should the Tribunal consider that Ecuador was to blame for the reduced auction, the set-off would be \$125.6 million.
369. Brattle explained that the calculation of ‘true-up’ is *ex post* in nature (*i.e.*, it employs actual prices)⁴²⁰ in contrast to the approach proposed by Brattle (accepted by the Tribunal) of calculating damages to Perenco *ex ante*. The ‘true-up’ must adopt an *ex post* perspective since it must assess what Law 42 amounts were actually paid by the Consortium and which levies remain outstanding. Ecuador asserted that Professor Kalt never took issue with the concept.⁴²¹ It further explained that imposing on Perenco the change in oil prices when it chose to withhold taxes was entirely appropriate, while also acknowledging that the allocation of risks was ultimately an issue for the Tribunal. Hence the sensitivity calculations that it performed of the “true-up.”

2. Perenco’s Position

370. Perenco takes issue with Professor Dow’s claim that his analysis of the impact of Decree 662 as of October 2007 does not benefit from the use of hindsight. This is untrue. When Professor Dow calculated his “true-up” for Law 42 amounts and for the 2009-2010 operating expenses allegedly owed by Perenco to Ecuador, he improperly mixed his *ex ante* calculation with *ex post* data. This was not an inconsequential error. The oil prices produced as of October 2007 were substantially lower than the actual prices in the market. Thus, in Professor Dow’s model, Perenco was made purportedly indifferent to Decree 662 in

⁴²⁰ Brattle ER II, paragraph 53.

⁴²¹ Resp. Rep. PHB Q., paragraph 101(v).

October 2007 at relatively low forecasted prices, but that price of indifference sum is then offset by actual Law 42 assessments made on the basis of far higher prices.⁴²²

371. On this basis, Professor Dow calculated minimum and maximum true-up amounts of US\$83.7 million and US\$216.2 million, respectively.⁴²³ Yet in Perenco’s view, there is no reason why *ex post* data should be allowed to calculate Perenco’s alleged liabilities, but not to calculate Perenco’s entitlement to damages. In fact, such mixing of *ex post* and *ex ante* data fails to transfer the risks of oil prices to Ecuador, despite Professor Dow’s claim that an *ex ante* approach “acknowledges this transfer of risk, for good or for bad, at the time of the expropriation.”⁴²⁴ Professor Dow’s willingness to mix and match *ex ante* and *ex post* information when the result is reduction in Perenco’s damages is unprincipled.

3. The Tribunal’s Decision

372. For present purposes, the Tribunal considers that to the extent that a ‘true-up’ is appropriate with respect to *unpaid* Law 42 levies, after the Consortium suspended payment in April 2008, the true-up must adhere to the *ex ante* assumptions of future oil prices. Obviously, this issue is also linked to the level of taxation pursuant to Law 42 that the Tribunal has decided was not proven to be unlawful prior to the adoption of Decree 662 (*i.e.*, Law 42 at 50% up to October 2008 and Law 42 at 33% thereafter.)

373. Either way, the Tribunal agrees in this respect with Professor Kalt that Brattle mixed *ex ante* and *ex post* data in order to arrive at its true-up calculations for the difference between the tax payments assumed in the 4 October 2007 FMV estimation and the actual amounts that were subsequently calculated by Ecuador and imposed in the latter part of 2007-2008 before prices crashed, and again in 2010, when prices recovered.

374. Professor Kalt made the point as follows:

“The hypothetical ‘buyer’ of rights in Brattle’s framework (Ecuador) has essentially said to the hypothetical willing seller (Perenco): ‘Back in

⁴²² Cl. Rep. Q., paragraph 255.

⁴²³ See Brattle ER III, Table 1 (also set out above).

⁴²⁴ Cl. Rep. Q., paragraph 256 citing Brattle ER II, paragraph 65.

October 2007, we agreed I would pay you \$X (plus interest) in 2015 for you to allow me to impose a 99% tax on your revenues for the life of the Blocks. As it turns out, market conditions were such that I've ended up levying \$2X on you, but only actually collecting \$.9X from you. So, I am going to deduct \$1.1X (\$2X minus \$.9X) from X and I won't have to pay you anything. After all, you agreed in our fair market transaction back in 2007 to let me levy a 99% tax on you, and you took the risk that my tax assessments would turn out to be larger than either of us originally anticipated.'"⁴²⁵

375. The Tribunal agrees with the general thrust of this criticism.⁴²⁶ Ecuador cannot have it both ways and must be held to its side of the compensation calculation. With an *ex ante* approach, the financial impact of the tax is assessed as of October 2007 and that is the measure of compensation. It would be unfair to permit Ecuador to take the position that an unforeseen increase in oil prices and consequently higher actual Law 42 levies should be imposed on Perenco when conducting the 'true-up'. By the Tribunal's acceptance of Ecuador's argument that damages must be calculated on an *ex ante* basis, this crystallises the tax's impact as of 4 October 2007 in the 'but for' world. Ecuador thus foregoes the right to seek additional amounts based on subsequent unforeseen market developments. Therefore, the Tribunal will not permit the difference between the anticipated levies used in the FMV calculations and the actual amounts levied to be set-off against Perenco.⁴²⁷ The 'true-up' as originally calculated by Brattle has therefore been adjusted to take out Brattle's

⁴²⁵ Kalt ER IV, paragraph 56.

⁴²⁶ The Brattle Group essentially admitted that this was the case at Brattle ER III, paragraph 103: "Professor Kalt is nevertheless correct that this approach to computing the true-up imposes on Perenco the risk of deviations between the price and production expectations implicit in our ex-ante assessment of the damages for Decree 662, and the prevailing prices and production when the various decisions to withhold payment, seize oil and vacate/enter the blocks occurred. Prevailing prices, production and costs at the time of the separate decisions to withhold payment, seize production and vacate/enter the blocks turned out to be at times higher and at times lower than those expected in October 2007, resulting in either higher or lower credits to Perenco than implicit in the ex-ante analysis of Decree 662." At paragraphs 106-107, Brattle sought to justify its approach, but the Tribunal considers that it would be most consistent with the *ex ante* approach to hold both Parties to the assumed financial impact of the tax going forward.

⁴²⁷ The Tribunal notes that Brattle has stated at fn 6 of its Brattle ER III that it performed this sort of calculation: "... we compute a fourth alternative, which uses October 2007 price expectations instead of outturn prices (whether actuals or coactivas auctions). This fourth measure insulates Perenco from the risk of deviations between the price expectations prevailing at the time Ecuador issued Decree 662, and when Perenco then withheld payment, Ecuador seized consortium production in response, and Perenco finally vacated/Ecuador entered the blocks. We present these calculations in Appendix E."

initial use of *ex post* pricing data which had the effect of increasing the amount that Perenco was said to owe Ecuador.

376. There are, however, some *ex post* developments that in fairness must be taken into consideration. The payment of damages for Decree 662 calculated on an *ex ante* basis assumes not only a particular oil price, as just discussed, but also that the person subject to the unlawful tax has actually paid it. The Consortium paid Law 42 dues at 99% from 4 October 2007 until 30 April 2008 when it opened the off-shore bank account into which Law 42 dues were thereafter deposited. Perenco would be unjustly enriched if it received damages for the period when it did not actually remit the Law 42 fees to Ecuador. Therefore, the Tribunal has taken that into consideration when calculating the true-up.
377. It has been further adjusted to reflect the fact that Perenco did not succeed in proving a breach of contract or Treaty in respect of Law 42 at 50%. However, it reflects the unlawful demand for an additional 49% of the extraordinary revenues as well as the Tribunal's finding that Perenco would have sought absorption pursuant to the Contracts' modification clauses and the Parties would have agreed to stabilisation at 33% as of October 2008.
378. Additionally, it has been adjusted to address Perenco's share of termination costs related to the implementation of Decree 662⁴²⁸ as well as Ecuador's claimed expenses during the time of Perenco's suspension of its operatorship.
379. The 'true-up' must also address the *coactivas* issue in Perenco's favour. As the Tribunal noted in its earlier Decision on Liability, it was unfair and inequitable for Ecuador to seize Perenco's production in order to satisfy its tax payment demand and then to credit Perenco with the depressed price rather than the market price. The Tribunal acknowledges that this occurred in the contentious circumstances of Ecuador's non-compliance with the Tribunal's attempt to prevent the further aggravation of the dispute. It also notes that since Ecuador successfully defended the claims against Law 42 at 50%, Perenco's having assumed the risk that it would prevail on all claims exposed it to the situation it now finds

⁴²⁸ Exhibits JK-64 and JK-51.

itself in, namely, that only the collection of Law 42 at 99% was found to amount to a breach for which compensation is due and therefore Law 42 at 50% – at least up until Decree 662 – must be presumptively treated as lawful. As the Tribunal noted in its previous Decision on Liability:

“It considers that Perenco had a right to expect that Ecuador would desist from enforcing the *coactivas* during the pendency of the arbitration. It also considers that in deciding to withhold all Law 42 amounts claimed in 2008, Perenco assumed that the Tribunal would accept its claims that none of the Law 42 dues claimed by the State were permissible under the Contracts or the Treaty. Given that Perenco has not made out its claims in respect of Law 42 at 50%, the Tribunal holds that even though Ecuador should have complied with the Decision on Provisional Measures, the *coactivas* ought not to be included in the Tribunal’s analysis of the measures said collectively to constitute an indirect expropriation...In addition, to the extent that Perenco has succeeded in its claim that the application of Decree 662 at 99% violated Article 4 of the Treaty, as found at paragraphs 606-607 above, the enforcement of the *coactivas* to collect the claimed additional 49% constituted a breach of the fair and equitable treatment standard, but it was not an expropriation of the investment.”⁴²⁹ [Emphasis added.]

380. In the end, neither Party emerges from this part of the dispute as the clear winner and the ‘true-up’ must reflect this mixed success.

I. **Quantum Based on a ‘Harmonised Model’**

381. Before the Tribunal estimates the financial consequences on Blocks 7 and 21 in light of Ecuador’s breaches, it is necessary to explain the methodology that was used to estimate the damages to be awarded for each individual claim in light of the factual and legal findings that the Tribunal has made in the preceding parts of this Award.

382. Having considered the Parties’ submissions, the expert evidence and the other evidence on record, a ‘harmonised model’ was devised through which the Tribunal has calculated the damages to be awarded.

⁴²⁹ Decision on Liability, paragraph 703.

383. As described above, the Tribunal had been presented with damages valuation based on spreadsheet models submitted by Professor Kalt⁴³⁰ and Brattle.⁴³¹ These models employed the same overall architecture⁴³² but differed in respect of five major assumptions, which were the main issues that separated the Parties as ultimately identified and addressed in Section II.B, as well as other minor differences in assumptions. Given these similarities, a ‘harmonised model’ could be produced through the adjustments of the models to implement the Tribunal’s findings. These changes are described below and also describes the ‘harmonised model’ employed by the Tribunal.

1. The ‘harmonised model’

384. The ‘harmonised model’ assumes away the effect of Decree 662 and *caducidad* in order to arrive at the net present value of the discounted cash flows that would have been derived from Blocks 7 and 21. This is based on the production decisions that the Tribunal has found Perenco would have made but for the unlawful measures. In order to address Professor Kalt’s concerns, the Tribunal has employed the model to make an initial valuation of the damage caused by Decree 662 and then a second valuation of the damage caused by the declaration of *caducidad*.

385. The Tribunal finds that in the ‘but for’ world, Law 42 at 50% would have continued to apply from October 2007 until 5 October 2008 at which point, by party agreement, the rate would have been 33%, which rate would have applied from that date through to the respective expiry dates of the two Participation Contracts.

386. The Tribunal therefore first seeks to forecast the production in both Blocks in the ‘but for’ world for the first period and for Block 21 for the second period on an *ex ante* basis. After estimating the production levels, the production is then priced on the basis of *ex ante* expectations at the relevant times. The Tribunal then also seeks to estimate the amount of

⁴³⁰ Prof. Kalt’s spreadsheet models were provided as Exhibit JK-32 in the first round of pleadings on quantum and Exhibit JK-64 in the second round.

⁴³¹ Brattle’s spreadsheet models were provided as Tables B and C in the first round of pleadings on quantum and Tables P and O in the second round.

⁴³² The similarities in the models reflected in part the fact that Brattle took Professor Kalt’s original spreadsheet models and then adjusted them to reflect its own assumptions and inputs.

capital expenditure and operating expenditure, and other costs, associated with the assumed levels of production. The cash flows are then discounted to the relevant date of valuation, and then brought forward to the date of the Award at pre-award interest rates.

387. Finally, the true-up is applied to reflect the acts discussed previously that affect the quantum calculation.
388. The following sections explain further each of these steps taken in relation to the ‘harmonised model’.

2. Valuation Dates

389. The first of the major assumptions that had to be adjusted in the ‘harmonised model’ was the relevant valuation dates. First, Professor Kalt’s modelling of damages flowing from the period between October 2007 and June 2010, which was done on an *ex post* basis, was adjusted to reflect the Tribunal’s conclusion that an *ex ante* analysis is to be employed. At the same time, Brattle’s sequential ‘two layer’ approach was then adjusted to create a ‘clean sheet’ for damages in respect of the expropriation on 20 July 2010.
390. This means that the damages are estimated in respect of the 4 October 2007 breach on the basis of forecasted cash flows up until June 2010, and cash flows that would have occurred between October 2007 and June 2010 are discounted back to the October 2007 valuation date. For damages flowing from the July 2010 expropriation, this is based on forecasted cash flows until the expiry of the Blocks 7 and 21 Participation Contracts (16 August 2010 and 8 June 2021, respectively⁴³³). If a cash flow would have occurred after July 2010, this is discounted back to the July 2010 valuation date. The discount rate applied is 12%, which was the rate utilised by both Parties’ experts.⁴³⁴

⁴³³ Crick WS II.

⁴³⁴ Kalt ER III, paragraph 30 and Brattle ER II, paragraph 163.

3. Production and Investment

391. The second issue on which the experts' models differed was the investment and production to be forecasted 'but for' Ecuador's conduct. Professor Kalt's models reflected Mr. Crick's analysis and projections; the Brattle models reflected RPS' analysis and projections.
392. For Block 7, the Tribunal has estimated that 23 additional wells would have been drilled during the life of the Block 7 Participation Contract. Four wells would have been drilled by January 2008 and the remaining 19 would have been drilled between February 2008 and August 2009. Further, having concluded that Mr. Crick's production profiles as presented at the Quantum Hearing were to be preferred over those presented by RPS, and consistent with Mr. Crick's forecasts of new oil wells, the Tribunal accepts that all 'but for' wells during the production lifetime of Block 7 would be drilled in the Oso field within Area Base. The production volume calculated relies on Mr. Crick's forecasts⁴³⁵ but which are slightly adjusted for purposes of an *ex ante* analysis as of October 2007.⁴³⁶
393. Mr. Crick also provided forecasts for Coca-Payamino. The 'harmonised model' adopts those numbers without amendments.⁴³⁷
394. On this basis, the Tribunal forecasts that the 'but for' production in Block 7 would have been as follows. This is broken down into 'base' production *i.e.* oil which would have been produced in addition to base production absent Decree 662, and 'incremental' production *i.e.* oil which would have been produced in addition to base production but for Decree 662. Risk-adjustment factors as used in Exhibit JK-94 were applied to reflect the proved and probable reserves planned.

⁴³⁵ Crick WS III, Appendix B.

⁴³⁶ Mr. Crick's profile incorporates historical production figures for wells drilled prior to 2008 (see Crick WS II, paragraphs 6-8, 159, 172).

⁴³⁷ Crick WS III, Appendix B; Exhibit JK-94.

<i>All values in stb mln</i>	Risky production		
	Base	Incremental Oso Only	Total
Block 7 Area Base			
Oct-07 to Jun-10	7.9	12.3	20.2
Jul-10 to Aug-10	0.3	0.4	0.8
Total	8.2	12.7	21.0
Coca-Payamino			
Oct-07 to Jun-10	4.9	n/a	4.9
Jul-10 to Aug-10	0.2	n/a	0.2
Total	5.0	n/a	5.0
Block 7 Total			
Oct-07 to Jun-10	12.8	12.3	25.1
Jul-10 to Aug-10	0.5	0.4	0.9
Total	13.3	12.7	26.0

Note: Gross production volumes.

395. In view of the Tribunal's decision on the Block 7 extension question, no forecasts for production in Block 7 from August 2010 onwards are made.
396. In relation to Block 21, the Tribunal has concluded that an incremental six wells would have been drilled *pre-caducidad* and 10 would have been drilled *post-caducidad*. The *pre-caducidad* wells are assumed to have been drilled on a one-well-per-month schedule with incremental production commencing in August 2008, consistent with the drilling schedule proposed by Mr. Crick.⁴³⁸ Production for these six wells reflects the production from the first six wells (all 1P wells) according to Mr. Crick's schedule.⁴³⁹
397. The *post-caducidad* wells are assumed to have been drilled on a one-well-per-month schedule with incremental production commencing August 2010. In addition, Mr. Crick's testimony was that a small portion of oil produced from the new wells would have been produced from the existing wells, which were adjusted for in his profiles set out in his

⁴³⁸ Crick WS III, paragraph 3.

⁴³⁹ *Ibid.*, Appendix B.

witness statement.⁴⁴⁰ Mr. Crick’s small adjustment has been scaled to reflect the chosen production scenario.

<i>All values in stb mln</i>	Production		
	Base	Incremental	Total
<i>Block 21</i>			
Oct-07 to Jun-10	11.1	2.3	13.4
Jul-10 to Jun-21	23.2	5.8	28.9
Total	34.3	8.0	42.3

Note: Gross production volumes.

4. Prices for Oil Production

398. As alluded to above, *ex ante* prices are applied to the production from each Block. However, as the evidence showed and which was not disputed, the oil quality of each Block differs – Block 7 produced Oriente quality crude oil and Block 21 Napo quality. Therefore, the *ex ante* prices for oil production from each Block and over different time periods had to be calculated.
399. First, *ex-ante* WTI prices were used. These were NYMEX futures prices as of the two key dates of valuation: October 2007 and July 2010.⁴⁴¹ These prices were slightly increased to reflect an insurance component embedded in futures prices.⁴⁴²
400. Second, these prices were adjusted to reflect the differences in quality between WTI crude oil and that produced in Ecuador *i.e.* Oriente and Napo crude oil. Since Oriente crude oil is of a relatively higher quality than Napo crude oil, the former generally commands a higher price.⁴⁴³ Using the historical price discounts applied to the two types of crude oil produced

⁴⁴⁰ *Id.*

⁴⁴¹ Brattle Workpapers, Table D.

⁴⁴² Brattle ER II, paragraphs 214-219.

⁴⁴³ This difference is reflected in the historical price data exhibited in Exhibit JK-57 and Brattle Workpapers, Table D.

in Ecuador relative to WTI prices, the expected *ex ante* WTI prices were adjusted downwards to derive the expected *ex ante* Oriente prices, and downwards further for *ex ante* Napo prices.⁴⁴⁴

401. Third, these prices are adjusted further to reflect the specific quality of the crude oil produced in Blocks 7 and 21. These adjustments were made on the basis of the historical relationship between the prices and quality of the Oriente and Napo benchmarks and the prices and qualities of the field-specific oil, and the resulting field-specific price adjustment factors are consistent with formulas detailed in Ecuador’s own calculations of oil prices in its Law 42 assessments.⁴⁴⁵ The field-specific adjustment factors are then applied to the benchmark oil prices in Ecuador (Oriente for Block 7 Area Base and Napo for Block 21) to generate field-specific prices.⁴⁴⁶

5. Operating Expenses (OPEX)

402. Benchmark operating costs have been adopted in the ‘harmonised model’. This is consistent with the experts’ financial models which both used similar operating cost calculations. However, these calculations were adjusted to reflect an *ex ante* modelling perspective as of the two valuation dates. Reliance has largely been placed on the benchmarks found in Exhibit JK-64, but with the Amazonian Eco-development Fund (“*Fondo ecodesarrollo región amazónica*”) benchmarks adjusted to reflect the increase in its rate between the two valuation dates. This was done by using a 2006-2007 average of the cost for the October 2007 to June 2010 period and the 2008 cost for the post-July 2010 period.⁴⁴⁷ The ‘harmonised model’ used by the Tribunal continues to inflate the benchmark operating costs over time, which is consistent with the expert evidence on this issue.⁴⁴⁸ It also credits Ecuador with the outstanding AGIP pipeline tariff balance as of October

⁴⁴⁴ Exhibit JK-57 and Exhibit JK-96; Brattle Workpapers, Tables D and E; Kalt ER III, paragraphs 35-36; Brattle ER II, fn. 42.

⁴⁴⁵ E-228.

⁴⁴⁶ Exhibit JK-57, Exhibit JK-96, and Brattle Workpapers, Table E.

⁴⁴⁷ See Exhibit FL13 (Audit Report - *Dirección Nacional de Hidrocarburos*).

⁴⁴⁸ Kalt ER III, paragraph 103; Brattle ER II, paragraphs 225, 230.

2007.⁴⁴⁹ Accordingly, the relevant OPEX benchmarks for Blocks 7 and 21 are shown in the table below. These values are applied to production volumes, where appropriate.

	Block 21	Block 7	
		Area Base	Coca-Payamino
Variable Operating Costs			
\$ per Contractor Barrel of Oil			
<i>Amazonian Eco Fund, 2006-07</i>	\$0.49	\$0.60	\$0.52
<i>Amazonian Eco Fund, 2008 onwards</i>	\$1.02	\$0.98	\$1.02
<i>Other</i>	\$0.87	\$2.33	\$2.24
\$ per Gross Barrel of Oil			
<i>Non-Deductible</i>	\$0.03	\$0.00	\$0.05
<i>Deductible</i>	\$0.60	\$1.19	\$1.52
Total	\$0.63	\$1.19	\$1.57
\$ per Barrel of Fluid			
	\$0.43	\$1.27	\$1.62
Fixed Operating Costs			
\$ per Month	\$410,058	\$0	\$408,512

Note: Estimated using account information contained in FL13 & JK-49.

6. Capital Expenditure (CAPEX)

403. In relation to the productions forecasted for Block 7 as set out above, the Oso capital expenditure is based on Mr. Crick's evidence which was utilised by Professor Kalt in his financial model.⁴⁵⁰ All assumed capital expenditures reflect the same essential build-up of individual per-well and facilities costs reflected in Professor Kalt's first Quantum calculations⁴⁵¹ but adjusted to reflect the Tribunal's conclusions that (i) 4 wells would have been drilled by January 2008 and 19 wells drilled between February 2008 to August 2009; and (ii) the starting point for calculations should be on an *ex ante* basis. The relevant capital

⁴⁴⁹ Brattle ER III, fn. 232; Brattle Workpapers, Table N; Kalt ER III, paragraph 104; Kalt ER IV, p. 121.

⁴⁵⁰ See Crick WS II, Appendix C for Block 7's Oso; and Exhibit JK-94 which includes Crick's inputs.

⁴⁵¹ Kalt ER III, paragraph 112.

expenditure is risked to reflect the proved and probable reserves planned.⁴⁵² The resulting Block 7 expenditures total US\$140.8 million.

404. For Block 21, capital expenditure is estimated following cost information contained in Mr. Crick's Yuralpa development plan.
405. Mr. Crick's capital expenditure was adjusted to reflect the 16-well programme as found above. According to Mr. Crick's Yuralpa development plan, the timing of fluid handling capital expenditure is tied to when overall fluid rate (oil plus water) approaches predetermined thresholds. The 16-well scenario results in a slower fluid rate increase compared to Mr. Crick's original scenario. This slower fluid rate increase in the 'harmonised model' causes delays for some capital expenditures relative to Mr. Crick's original schedule. Since Mr. Crick considered the first 16 wells in his drilling programme to be 1P wells, risking is not necessary.
406. Further, Mr. Crick considered that the water produced in relation to 24 wells would have been limited to 120,000 barrels of water per day (bwpd). Given the number of wells the Tribunal considers would have been drilled, the Tribunal considers that water production would have been limited to 120,000 bwpd, *i.e.* there is no additional water production that needed to be addressed, and therefore there is no need to further adjust for water sensitivities.

⁴⁵² *Ibid.*, paragraph 107.

407. The estimated Block 21 capital expenditures are as follows:

<i>All values in \$ mln</i>	Capex
Block 21	
Oct-07 to Jun-10	86.3
Jul-10 to Jun-21	47.8
Total	134.1

7. Net Present Value of Cash Flows

408. The section above sets out the Tribunal's forecasts for productions in Block 7 and 21 over the two periods of time. In relation to the production between October 2007 and June 2010, the Tribunal has priced that production on the basis of *ex ante* expectations in October 2007 of oil prices for each month during this period. Likewise, production from July 2010 onwards was priced at *ex ante* July 2010 expectations for each month after July 2010.

409. The cash flows derived from each period are then discounted at a rate of 12% to October 2007 and July 2010, respectively. The discounted cash flows derived for the two periods are then added up.

410. Prejudgment interest is then added to the net present value as of 2007 and 2010 to bring them forward to the date of the Award. First, monthly yields on 10-year US Treasury notes⁴⁵³ are used as the risk-free benchmark rate. This rate stood at 4.53% in October 2007 and had fallen to 1.75% as of 11 September 2019. Second, in each month between the dates

⁴⁵³ This is based on actual historical published annualised yield of the 10-year US T-note as reported by the US Federal Reserve and published daily by the US Federal Reserve Board. This historical yield data is contained in Prof. Kalt's Exhibits JK-39 and JK-77C, as well as Brattle Exhibits BR-20 and BR-116. The Tribunal understands that Federal Reserve publishes annualised yields. The experts have consistently used the same series of annualised yields throughout the quantum proceedings. Accordingly, a standard formula has been used to translate the published annual yields to their monthly equivalents: $Monthly\ rate = (1 + Annual\ yield)^{1/12} - 1$.

The series has been subsequently updated to include more historical data, and the most recent calculations include accrued prejudgment interest through to September 2016.

of valuation and the date of the Award, the monthly prejudgment interest amount is computed by applying the monthly interest rate⁴⁵⁴ to the outstanding damages balance including all accrued prejudgment interest up to the start of that month. Third, different cumulative prejudgment interests are applied which reflects the different time periods over which the prejudgment interest accrues.⁴⁵⁵

411. Accordingly, based on this, the initial amount of damages estimated to be awarded for Block 7 is calculated to be US\$145.2 million and the amount of damages to be awarded for Block 21 is calculated to be US\$273.7 million, totalling US\$418.9 million (as of September 2016). As explained below, certain further adjustments must also be made.

8. The ‘True-Up’

412. The Tribunal must now consider the implications for the quantum of damages thus far calculated in light of the matters discussed above. First, Perenco had not paid Law 42 dues since 30 April 2008 and accordingly did not actually suffer losses in that respect. Second, where Perenco had paid those dues, there was an ‘overpayment’ of actual Law 42 dues paid relative to Law 42 dues which should have been paid based on *ex ante* price assumptions. Third, the *coactivas*. Fourth, and relatedly, Petroamazonas had incurred costs in operating the field in Perenco’s absence. Fifth, there were termination costs associated with Perenco’s exit.

413. Accordingly, the ‘true-up’ adjusts the quantum of damages already calculated as follows.

414. First, Ecuador is credited for the amounts of Law 42 dues that Perenco should have paid but did not pay since 30 April 2008 (based on *ex ante* prices).

415. Second, Perenco is given credit for the Decree 662 dues that it did pay calculated based on real world prices but which were in excess of Decree 662 dues already accounted for in the ‘harmonised’ model.

⁴⁵⁴ See *ibid.*

⁴⁵⁵ This results in more prejudgment interest for damages relating to the October 2007 damages as opposed to that for 2010.

416. Third, the confluence of events and the Parties' various actions surrounding the *coactivas* has been taken into account.
417. Fourth, Perenco is credited in the 'true-up' for the termination costs that it actually incurred in response to Decree 662.⁴⁵⁶ Perenco's share of the nominal termination costs is \$4 million.⁴⁵⁷
418. Fifth, based on an *ex ante* analysis, Petroamazonas' costs based on the operating cost benchmarks (as already discussed above) and the barrels forecasted by Mr. Crick for the base wells during the relevant period is US\$45.3 million (this is Perenco's share of the costs).
419. In light of these factors and the amounts involved, the Tribunal concludes that a fair amount for the 'true-up' should be US\$36.4 million (after discounting and bringing forward the relevant cash flows). Thus, the total compensation for Blocks 7 and 21 is reduced by that sum to US\$382.5 million.

9. OCP Deductibility

420. The Tribunal concludes that there should be full tax deductibility in relation to Block 21's OCP ship-or-pay costs. Accordingly, this adds US\$9 million to the quantum to be awarded to Perenco. The amount of US\$382.5 million is therefore increased by US\$9 million to amount to US\$391.5 million.

10. Value of Loss of Opportunity

421. Finally, the Tribunal concludes that this should be valued at US\$25 million. This sum is added to the amount of US\$391.5 million to arrive at a total of US\$416.5 million as of September 2016.

⁴⁵⁶ Based on Kalt ER IV, Exhs. JK-64 and JK-51.

⁴⁵⁷ Kalt ER IV, Exhibit JK-51.

11. Conclusion on Damages in relation to the breach of the Treaty and the Participation Contracts

422. The sum of US\$416.5 million arrived at above is then brought forward to the date of this Award by means of multiplying that sum by an adjustment factor of 1.0776 to arrive at a final figure of US\$448,820,400.00. This sum is the damages that are awarded to Perenco and shall be paid by the Respondent, the Republic of Ecuador.

III. DAMAGES CLAIMED IN RELATION TO THE ENVIRONMENTAL COUNTERCLAIM

A. Circumstances leading to the appointment of Mr. Scott MacDonald as Independent Expert

423. The Tribunal has already adverted to its decision to appoint an Independent Expert if the Parties proved to be unable to settle the environmental counterclaim in light of the findings of fact and law made in the Interim Decision on Counterclaim. By way of introduction to this part of the Award, it warrants repeating why the Tribunal acted as it did.

424. In the Interim Decision on Counterclaim, the Tribunal made the following observations:

“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.

...

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.

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 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.

...

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."

425. As it turned out, the Parties failed to reach an agreement. They then jointly interviewed and agreed on the appointment of Mr. Scott MacDonald as the Independent Expert and the

Tribunal accepted their recommendation. Accordingly, Mr. MacDonald was formally appointed as the Independent Expert on 6 July 2016.⁴⁵⁸

426. Mr. MacDonald directed a team of environmental specialists of Ramboll in the design and conduct of the sampling campaign that the Tribunal contemplated in its Interim Decision on Counterclaim. Under the supervision of the Tribunal, Mr. MacDonald created field sampling protocols and was assisted by Jose Sananes, Clement Ockay, Miles Ingraham, Tais dos Santos, Pablo Yoshikawa, Adrian Gomez, Guillermo Gloria and Aldo Rodriguez (all from Ramboll).⁴⁵⁹

B. Procedural History

427. While Mr. MacDonald was reviewing the IEMS and GSI data and was designing his workplan, the *Burlington* proceeding concluded. Accordingly, on 2 March 2017, the Tribunal invited the Parties to comment on that tribunal's Decision on Reconsideration and Award and its Decision on Counterclaims.

428. On 18 April 2017, the Parties filed their comments. On the same date, Perenco also filed its First Dismissal Application.

429. On 18 August 2017, following the filing of the Parties' written submissions, the Tribunal issued its Decision on Perenco's First Dismissal Application. It rejected Perenco's First Dismissal Application and reserved costs for future determination.

430. On 27 October 2017, the Parties agreed on the Protocol for the Independent Expert's Second Site Visit.

431. On 30 January 2018, Perenco submitted a Second Dismissal Application. Perenco also proposed a briefing schedule in its letter accompanying the application and suggested that while the Tribunal considered Perenco's Second Dismissal Application, Mr. MacDonald should suspend work on his report, or complete his report but refrain from submitting it to

⁴⁵⁸ Procedural Order No. 16.

⁴⁵⁹ Annex 2 to Protocol for the Independent Expert's Second Site Visit to Blocks 7 and 21 dated 27 October 2017.

- the Tribunal and the Parties until the Tribunal's decision on the Second Dismissal Application.
432. On 31 January 2018, the Tribunal invited Ecuador to reply to Perenco's letter of 30 January 2018. Also, the Tribunal invited the Parties to agree, by 5 February 2018, on the briefing schedule for Perenco's Second Dismissal Application.
 433. On 5 February 2018, Ecuador replied to Perenco's letter of 30 January 2018 and proposed an alternative briefing schedule for the Second Dismissal Application.
 434. On 6 February 2018, Perenco requested the Tribunal for leave to reply to Ecuador's letter of 5 February 2018. On the same day, the Tribunal granted Perenco's request to comment on Ecuador's letter of 5 February 2018.
 435. On 8 February 2018, Perenco replied to Ecuador's letter of 5 February 2018 regarding the schedule and procedure for determining Perenco's Second Dismissal Application.
 436. On 9 February 2018, Ecuador asked the Tribunal for leave to respond to Perenco's letter of 8 February 2018. On the same day, the Tribunal granted Ecuador's request.
 437. On 12 February 2018, Ecuador submitted a reply to Perenco's letter of 8 February 2018.
 438. On 15 February 2018, the Tribunal informed the Parties that it would decide the Second Dismissal Application but at the same time Mr. MacDonald's work would continue. His Independent Expert's Report would be submitted to the Parties only if the Tribunal decided to deny Perenco's Second Dismissal Application.
 439. On 15 March 2018, Ecuador filed its Response to Perenco's Second Dismissal Application.
 440. On 5 April 2018, Perenco filed its Reply on Perenco's Second Dismissal Application.
 441. On 26 April 2018, Ecuador filed its Rejoinder on Perenco's Second Dismissal Application.
 442. On 30 July 2018, the Tribunal informed the Parties through a letter from its Secretary that the Tribunal had decided, by a majority, to dismiss Perenco's Second Dismissal

Application, and reasons for this decision, as indicated in that letter, are now provided in this Award.

443. On 3 October 2018, the Independent Expert informed the Tribunal that he would need additional time to complete his work and submit the Independent Expert Report. No useful purpose would be served by recounting the various exchanges between the Parties and the Tribunal relating to the inevitable delays in the production of what turned out to be a most detailed, useful and comprehensive report.

C. Perenco’s Second Dismissal Application

444. The Parties’ submissions and the Tribunal’s reasons for its rejection of Perenco’s Second Dismissal Application are set out as follows.

1. Perenco’s Arguments

445. In its Second Dismissal Application, Perenco argues that “Ecuador asserted the same counterclaims in both the *Burlington* and *Perenco* arbitrations.”⁴⁶⁰ Perenco contends that “the *Burlington* arbitration has come to a final and irrevocable end, and Ecuador has now received payment of the entire amount due in respect of the counterclaims that it presented to the two tribunals” in performance of the settlement agreement between Burlington and Ecuador dated 1 December 2017 (the “**Settlement Agreement**”).⁴⁶¹ Perenco submits that Burlington’s settlement with Ecuador, and the full payment of the Burlington’s and Perenco’s joint counterclaims debt, means that Ecuador’s counterclaims against Perenco should be dismissed.⁴⁶²
446. In its Reply, Perenco disagrees with Ecuador’s contention that its Second Dismissal Application is untimely. Perenco contends that its failure to raise *lis pendens* cannot constitute a bar to its application, because “*lis pendens* is not a proxy for satisfaction of a

⁴⁶⁰ Second Dismissal Application, paragraph 6.

⁴⁶¹ *Ibid.*, paragraph 19 referring to Annex 3, CE-CC-431.

⁴⁶² Second Dismissal Application, paragraph 1.

liability, *res judicata*, mootness, or abuse of process.”⁴⁶³ According to Perenco, the situation resulting from the *Burlington* award and Burlington’s payment would have been the same, “[e]ven if Perenco had sought, and this Tribunal had granted, a temporary stay based on *lis pendens*.”⁴⁶⁴ Perenco further claims that its conduct cannot be construed as a waiver, for it “cannot conceivably have waived in advance the right to rely on intervening factual circumstances with dispositive effect on the arbitration.”⁴⁶⁵ Perenco adds that Ecuador’s plea of estoppel cannot succeed in this case, as “Perenco had no ‘contradictory behaviour’, and Ecuador did not change its position in detrimental reliance on Perenco’s failure to seek a *lis pendens* suspension.”⁴⁶⁶

447. In support of its submission to dismiss Ecuador’s counterclaims, Perenco advanced three main arguments:

“(1) satisfaction of the joint and several counterclaims liability extinguishes Perenco’s underlying obligation to Ecuador...; (2) Ecuador’s identical counterclaims in these proceedings are moot because there is no dispute for this tribunal to decide; and (3) Ecuador’s counterclaims are *res judicata* because the Burlington CC Decision [i.e. the Burlington Decision on Counterclaims] is no longer subject to any uncertainty, and continuing to litigate them would be an abuse of process.”⁴⁶⁷

448. Perenco argues that “Burlington’s payment of the Consortium’s counterclaims liability satisfies and extinguishes the joint debt so that, as a matter of law, Ecuador cannot continue to pursue Perenco on that debt.”⁴⁶⁸ Perenco contends on the basis of the applicable Ecuadorian law that a joint and several liability is extinguished for all of the joint debtors when one debtor satisfies that liability.⁴⁶⁹ According to Perenco, Ecuador has now received

⁴⁶³ Reply, paragraph 9.

⁴⁶⁴ *Ibid.*, paragraph 10.

⁴⁶⁵ *Ibid.*, paragraph 12.

⁴⁶⁶ *Ibid.*, paragraph 13.

⁴⁶⁷ Second Dismissal Application, paragraph 20.

⁴⁶⁸ *Ibid.*, paragraph 22.

⁴⁶⁹ *Ibid.*, paragraphs 23-29.

full satisfaction with respect to the counterclaims.⁴⁷⁰ Relying on Annex 3 of the Settlement Agreement, Perenco alleges that Ecuador “accepted that the payment represented ‘the principal amount and the applicable interest’ ordered by the *Burlington* tribunal, that it was paid ‘as the full and final settlement of the environment and infrastructure counterclaims presented by Ecuador against Burlington[,]’ and that by doing so ‘*all obligations and liabilities related to the Counterclaims* against Burlington and the Decision on the Counterclaims shall be deemed to have been *irrevocably, fully and finally paid, discharged, and satisfied.*’”⁴⁷¹

449. Perenco emphasises that Ecuador presented the same claims, obligations and liabilities to both the *Perenco* and *Burlington* tribunals on the basis that Perenco and Burlington were jointly and severally liable.⁴⁷² Perenco asserts that “Ecuador has now received what it acknowledges to be full satisfaction of the obligation it asserted against Burlington” and “that obligation is necessarily the same as the obligation it asserted against Perenco.”⁴⁷³ Perenco adds in this respect that the fact “that the factual records before the *Perenco* and *Burlington* tribunals diverge in some respects does not mean the underlying obligations are legally distinct.”⁴⁷⁴ Furthermore, Perenco maintains that Ecuador expressly claimed the total amount of damages from each of Burlington and Perenco and not the aliquot share.⁴⁷⁵ In addition, Perenco emphasises that “the possibility that the *Perenco* Tribunal ... might ultimately determine higher or lower quantification of the counterclaims damages is irrelevant”, because “the obligation on which those damages were premised has been satisfied and extinguished.”⁴⁷⁶ Perenco stresses that “Ecuador has been satisfied not just for the ‘amounts’ the *Burlington* tribunal calculated, but also for the underlying damage or

⁴⁷⁰ *Ibid.*, paragraph 30.

⁴⁷¹ *Ibid.* citing Annex 3, Settlement Agreement, CE-CC-431, p. 2, WHEREAS (2) and p. 4, paragraph 2 (emphasis in the original).

⁴⁷² Second Dismissal Application, paragraphs 33-35; also Reply, paragraphs 17-19.

⁴⁷³ Second Dismissal Application, paragraph 36.

⁴⁷⁴ Reply, paragraph 23.

⁴⁷⁵ Second Dismissal Application, paragraphs 37-40.

⁴⁷⁶ *Ibid.*, paragraph 41.

harm; and not just for the obligations and liabilities the *Burlington* tribunal specified in its Decision on the Counterclaims, but for the counterclaims themselves.”⁴⁷⁷

450. In its Reply, Perenco responds to Ecuador’s argument that “Perenco was not a signatory to the Settlement Agreement and that Burlington’s payment can have no effect on Perenco.”⁴⁷⁸ Perenco contends that “the operation of satisfaction as a matter of Ecuadorian law does not depend on, or result from, the content or existence of Annex 3”, because “the obligation was extinguished through full payment, by operation of law.”⁴⁷⁹ In addition to the arguments put forward in its Second Dismissal Application, Perenco alleges that “[t]here would...be no point in acknowledging that Burlington would seek ‘contribution’, or in Perenco disclosing the Annex to its Tribunal, if Burlington’s payment to Ecuador was just for its own distinct liability.”⁴⁸⁰
451. According to Perenco’s interpretation, the provision relied upon by Ecuador “allows joint debtors to settle their own share of a joint and several liability and provides that such a settlement would be binding between its signatories only.”⁴⁸¹ However, Perenco contests the applicability of this rule in this case in which “Ecuador did not ‘settle’ Burlington’s aliquot share of the environmental harm with Burlington”, but “Burlington paid Ecuador... *full reparation* for the environmental harm claimed against the Consortium.”⁴⁸² Perenco asserts that Ecuador “was prevented [by the Ecuadorian Constitution] from ‘settling’ with Burlington for anything other than ‘full reparation’ for the joint and several liability” allegedly according to Ecuador’s own admission.⁴⁸³ Perenco, furthermore, rejects the view that Ecuadorian law does not recognise the notion of mutual representation, pointing in this regard to a provision stipulating that “by virtue of an agreement, a will or the law, the full

⁴⁷⁷ *Ibid.*, paragraph 44 citing Annex 3, CE-CC-431, p. 4, paragraph 2.

⁴⁷⁸ Reply, paragraph 27 referring to Response, paragraphs 95, 97, 100.

⁴⁷⁹ Reply, paragraph 28.

⁴⁸⁰ *Ibid.*, paragraph 37 citing Annex 3, CE-CC-431, p. 3, paragraph 5.

⁴⁸¹ Reply, paragraph 32 referring to Ecuadorian Civil Code, EL-390, Article 2363.

⁴⁸² Reply, paragraph 32 (emphasis in the original).

⁴⁸³ *Ibid.*, paragraph 33.

debt can be sought from any one of the debtors and by any one of the creditors; in that case, the obligation is *solidaria* or *in solidum*.”⁴⁸⁴

452. Perenco maintains that “the satisfaction of Perenco’s and Burlington’s counterclaims liability also makes Ecuador’s counterclaims in this arbitration moot.”⁴⁸⁵ Perenco refers to the case law of the International Court of Justice in which the Court has declined to give judgment in cases where “circumstances that have since arisen render any adjudication devoid of purpose”, or the “dispute has disappeared because the object and purpose of the claim has been achieved by other means.”⁴⁸⁶ Perenco alleges that this Tribunal recognised mootness as a separate and independent basis on which to dismiss Ecuador’s counterclaims, but refrained from doing so because the *Burlington* Decision on Counterclaims was at the time subject to annulment proceedings.⁴⁸⁷ Perenco contends that this is not the case any longer as “[t]here is simply no question about...the final settlement of Ecuador’s counterclaims.”⁴⁸⁸
453. Perenco states that the fact that “Ecuador believes the *Burlington* tribunal should have awarded more damages is not a dispute to be adjudicated.”⁴⁸⁹ According to Perenco, “[m]ootness is assessed objectively as to the dispute, not the particular form of relief ultimately obtained.”⁴⁹⁰ In support of this claim, Perenco suggests that in the *Nuclear Tests* cases “the dispute had disappeared, since the object of the claim had effectively been accomplished by ‘other means’ than the relief requested.”⁴⁹¹ It also maintains that, in those

⁴⁸⁴ *Ibid.*, paragraph 34 citing Article 1527, Ecuadorian Civil Code, CA-CC-128.

⁴⁸⁵ Second Dismissal Application, paragraph 49.

⁴⁸⁶ *Ibid.*, paragraph 53 citing *Northern Cameroons, Judgment of 2 December 1963, I.C.J. Reports 1963*, p. 38; *Nuclear Tests (Australia v. France), Judgment of December 20, 1974, I.C.J. Reports 1974*, pp. 270-271, paragraph 55.

⁴⁸⁷ Second Dismissal Application, paragraphs 49-50 referring to the Tribunal’s Decision on Perenco’s First Dismissal Application.

⁴⁸⁸ *Ibid.*, paragraphs 50-52.

⁴⁸⁹ *Ibid.*, paragraph 54.

⁴⁹⁰ *Id.*

⁴⁹¹ *Ibid.* paragraph 55 citing *Nuclear Tests (New Zealand v. France), Judgment of 20 December 1974, I.C.J. Reports 1974*, paragraph 58; *Nuclear Tests (Australia v. France), Judgment of 20 December 1974, I.C.J. Reports 1974*, paragraph 55.

cases, “the fact that the *applicants* did not consider the dispute concluded ‘[did] not prevent the Court from making its own independent finding on the subject.’”⁴⁹² Perenco further suggests that the reasoning of the *Orascom* award is instructive for the application of the principle in the investor-State arbitral context.⁴⁹³

454. In its Reply, Perenco underlines that the mootness doctrine is not limited only to cases in which the requested relief is specific performance.⁴⁹⁴ Perenco places particular emphasis on the *Orascom* award. The claimant in that case “sought damages, not specific performance” and “the tribunal nevertheless dismissed the claims...because the ‘claims arising from Algeria’s measures have ceased to exist due to the settlement agreement’ between a claimant-controlled company and Algeria.”⁴⁹⁵
455. Perenco submits that “Ecuador’s counterclaims are also *res judicata* because of the now unequivocal finality of” the *Burlington* Decision on Counterclaims.⁴⁹⁶ Perenco asserts that “*res judicata* precludes re-litigation of the same dispute” and “applies to privies of the parties to the dispute.”⁴⁹⁷ Perenco asserts that this Tribunal “recognized that the *Burlington* Award was formally *res judicata*”, but denied Perenco’s First Application “because of the uncertainty about [its] finality...pending annulment.”⁴⁹⁸ It furthermore contends that “there can be no residual argument that Perenco waived *res judicata* by failing to earlier raise *lis pendens*.”⁴⁹⁹

⁴⁹² Second Dismissal Application, paragraph 55 citing *Nuclear Tests (New Zealand v. France)*, Judgment of 20 December, 1974, I.C.J. Reports 1974, paragraph 62; *Nuclear Tests (Australia v. France)*, Judgment of 20 December 1974, I.C.J. Reports 1974, paragraph 59.

⁴⁹³ Second Dismissal Application, paragraph 57 referring to *Orascom TMT Investments S.à.r.l v. People’s Democratic Republic of Algeria*, Award, ICSID Case No. ARB/12/35, 31 May 2017, paragraphs 488, 492-494, 518-520, 524-526.

⁴⁹⁴ Reply, paragraph 40 referring to Response, paragraph 95.

⁴⁹⁵ Reply, paragraph 41 citing *Orascom TMT Investments S.à.r.l v. People’s Democratic Republic of Algeria*, ICSID Case No. ARB/12/35, Award, 31 May 2017, paragraph 524.

⁴⁹⁶ Second Dismissal Application, paragraph 59.

⁴⁹⁷ *Ibid.*, paragraph 60.

⁴⁹⁸ *Ibid.*, paragraph 62.

⁴⁹⁹ *Ibid.*, paragraph 64.

456. In its Reply, Perenco rejects Ecuador’s contention that *res judicata* is inapplicable because the party identity requirement is not met.⁵⁰⁰ Perenco relies on the *Grynberg*, *Apotex III*, and *Ampal-American* awards to argue that “*res judicata* applies to privies or other stakeholders.”⁵⁰¹ Contrary to Ecuador’s allegations, Perenco adds that privity does not require ownership, even if the principle has been applied so far only in the specific context of a shareholder-parent company relationship.⁵⁰² Perenco asserts that “privity exists when two entities share an identity of interest that means they equally stand to benefit or suffer economically as a result of an outcome.”⁵⁰³ According to Perenco, such an identity of interests exists between Perenco and Burlington.⁵⁰⁴
457. Perenco also denies Ecuador’s argument that dismissing Ecuador’s counterclaims on the grounds of *res judicata* would imply revisiting and reversing the Tribunal’s 2015 Interim Decision.⁵⁰⁵ According to Perenco, “[t]he Tribunal would not need to incorporate inconsistent findings or in any way prejudice its Interim Decision”, but it would only decide that the *Burlington* Decision on Counterclaims “has preclusive effect as of the time it became *res judicata*.”⁵⁰⁶
458. Perenco also takes issue with Ecuador’s supplementary request to the Tribunal to apply by analogy Article 51(1) of the ICSID Convention and analyse evidence that was not taken into consideration by the *Burlington* tribunal.⁵⁰⁷ Perenco argues that Article 51(1) of the

⁵⁰⁰ Reply, paragraphs 44 and 46 referring to Response, paragraph 66.

⁵⁰¹ Reply, paragraph 45 referring to *Rachel S. Grynberg, Stephen M. Grynberg, Miriam Z. Grynberg and RSM Production Corporation v. Grenada*, ICSID Case No. ARB/10/6, Award, 10 December 2010, paragraphs 7.1.5 and 7.2.1; *Apotex Holdings Inc. and Apotex Inc. v. United States of America*, ICSID Case No. ARB(AF)/12/1, Award, 25 August 2014, paragraphs 7.38 and 7.40; *Ampal-American Israel Corp., EGI-Fund (08-10) Investors LLC, EGI-Series Investments LLC, and BSS-EMG Investors LLC v. Arab Republic of Egypt*, ICSID Case No. ARB/12/11, Award, paragraphs 268-270.

⁵⁰² Reply, paragraph 47.

⁵⁰³ *Ibid.*

⁵⁰⁴ *Ibid.*, paragraphs 48-50.

⁵⁰⁵ *Ibid.*, paragraphs 51- 52 referring to Response, paragraphs 56-58.

⁵⁰⁶ Reply, paragraph 52.

⁵⁰⁷ *Ibid.*, paragraphs 51 and 53.

ICSID Convention does not allow “reviving a liability that has already been extinguished” and, in any case, “such argument lies before the *Burlington* tribunal, not this one.”⁵⁰⁸

459. Perenco further contends that “even if this Tribunal were to find that some formal requirement of the doctrine of *res judicata* is not met, the doctrine of abuse of process would still apply.”⁵⁰⁹ According to Perenco, decisions of other tribunals support the view that the doctrine of abuse of process precludes “pursuing duplicative claims for a dispute that has already been resolved.”⁵¹⁰
460. In its Reply, even though Perenco concedes the point that Ecuador had the right to commence proceedings in multiple *fora*, it stresses that “it would be an abuse of that right to *continue* to pursue those parallel proceedings after Ecuador has obtained full satisfaction and payment.”⁵¹¹ Furthermore, it claims that there is no support to Ecuador’s argument that “abuse of process may only occur when multiple proceedings are brought between the *same parties*.”⁵¹² In addition, Perenco maintains that it is not necessary to establish that the “sole purpose for continuing Ecuador’s counterclaims would be to harm Perenco.”⁵¹³ Perenco suggests that multiplication of proceedings could also constitute an abuse of process when it is done “for the purpose of evading a rule of law” or “in order to maximize its chances of success.”⁵¹⁴
461. In the alternative, if the Tribunal proceeds to the merits of Ecuador’s claims, Perenco submits that the Tribunal should “offset Burlington’s entire US\$42 million payment against

⁵⁰⁸ *Ibid.*, paragraph 53.

⁵⁰⁹ Second Dismissal Application, paragraph 65.

⁵¹⁰ *Ibid.*, citing *Eskosol S.p.A in liquidazione v. Italian Republic*, ICSID Case No. ARB/15/50, Decision on Respondent’s Application under Rule 41(5), March 20, 2017, paragraphs 134 and 167; *Ampal-American Israel Corp., EGI-Fund (08-10) Investors LLC, EGI-Series Investments LLC, and BSS-EMG Investors LLC v. Arab Republic of Egypt*, ICSID Case No. ARB/12/11, Decision on Jurisdiction, 1 February 2016, paragraph 331; *Orascom TMT Investments S.à.r.l v. People’s Democratic Republic of Algeria*, ICSID Case No. ARB/12/35, Award, 31 May 2017, paragraph 534.

⁵¹¹ Reply, paragraph 57 (emphasis in the original) referring to Response, paragraph 78.

⁵¹² *Ibid.*, paragraph 59 citing Response, paragraph 78 (emphasis in the original).

⁵¹³ *Ibid.*, paragraph 63 citing Response, paragraph 81.

⁵¹⁴ *Ibid.*, paragraph 63.

the total amount of any counterclaim damages this Tribunal might find.”⁵¹⁵ According to Perenco, the approach proposed by Ecuador is conceptually inappropriate, because “the *Burlington* tribunal awarded, and Burlington paid, the total amount of damages for the entirety of the alleged harm.”⁵¹⁶ Moreover, Perenco suggests that the method proposed by Ecuador would lead to double recovery and is technically not feasible.⁵¹⁷ In its Reply, Perenco objects to Ecuador’s arguments for the same reasons.⁵¹⁸

462. Perenco also rejects Ecuador’s objections to its request for an order of the Tribunal that would hold Perenco harmless against any future claims based on alleged environmental and infrastructure liability arising out of Blocks 7 and 21.⁵¹⁹ Perenco denies that its request would require this Tribunal to assume jurisdiction over third parties or subject-matters not encompassed by Ecuador’s counterclaims.⁵²⁰ It also rejects the contention that its request is abusive.⁵²¹ Contrary to Ecuador’s allegation that the request is untimely, Perenco argues that it sought a similar relief in its Rejoinder on the Counterclaims.⁵²² In the alternative, Perenco requests that “the Tribunal should exercise its discretionary powers under the Arbitration Rules to consider and grant Perenco’s request...even if ICSID Rule 40 applies here and somehow makes Perenco’s request untimely.”⁵²³

463. In its Second Dismissal Application, Perenco seeks an order from the Tribunal:

“(a) Dismissing Ecuador’s counterclaims:

(b) In the alternative:

(i) Deducting US\$42,762,619 (the “Payment) from any damages it may find on Ecuador’s counterclaims in this proceeding (the “Gross Counterclaims Amount”), including issuing an order for zero damages if the Gross Counterclaims Amount is lower than the Payment, such that any damages Perenco is ordered to pay on

⁵¹⁵ Second Dismissal Application, paragraph 68.

⁵¹⁶ *Ibid.*, paragraph 70; see also Reply, paragraph 66.

⁵¹⁷ Second Dismissal Application, paragraphs 73-77.

⁵¹⁸ Reply, paragraphs 66-72.

⁵¹⁹ *Ibid.*, paragraphs 73-75 referring to Response, paragraphs 175 *ff.*

⁵²⁰ Reply, paragraph 73.

⁵²¹ *Ibid.*, paragraphs 74-75.

⁵²² *Ibid.*, paragraph 76.

⁵²³ *Ibid.*

Ecuador's counterclaims (the "Net Counterclaims Amount") do not exceed the higher of the Payment or the Gross Counterclaims Amount;

- (ii) Declaring that Perenco has no further liability with respect to Ecuador's counterclaims beyond the Net Counterclaims Amount;
 - (iii) Further ordering that Perenco may satisfy the Net Counterclaims Amount by deducting it from the amount that Ecuador owes to Perenco under this Tribunal's final Award; and
 - (iv) Otherwise conditioning the above order on obtaining satisfactory guarantees from Ecuador that it will not enforce this Tribunal's final Award, the *Burlington Award*, or the Payment cumulatively, whether by offset or otherwise, such that the net Counterclaims Amount is the full amount that Ecuador can recover against both or either of Perenco and Burlington with respect to the counterclaims against each of them; and
- (c) Ordering that Ecuador hold Perenco harmless against any future claims based on alleged environmental and infrastructure liability arising out of Blocks 7 and 21, before any jurisdiction whatsoever, whether arbitral or judicial, national or international; and
- (d) Ordering Ecuador to pay all the costs of the arbitration, as well as Perenco's fees and expenses, for the counterclaims phase of these proceedings.⁵²⁴

464. In its Reply, Perenco seeks an order from the Tribunal:

- “(a) Dismissing Ecuador's counterclaims;
- (b) In the alternative:
- (i) Deducting US\$42,762,619 (the "Payment) from any damages it may find on Ecuador's counterclaims in this proceeding (the "Gross Counterclaims Amount"), including issuing an order for zero damages if the Gross Counterclaims Amount is lower than the Payment, such that any damages Perenco is ordered to pay on Ecuador's counterclaims (the "Net Counterclaims Amount") do not exceed the higher of the Payment or the Gross Counterclaims Amount;
 - (ii) Declaring that Perenco has no further liability with respect to Ecuador's counterclaims beyond the Net Counterclaims Amount;
 - (iii) Further ordering that Perenco may satisfy the Net Counterclaims Amount by deducting it from the amount that Ecuador owes to Perenco under this Tribunal's final Award; and
 - (iv) Otherwise conditioning the above order on obtaining satisfactory guarantees from Ecuador that it will not enforce this Tribunal's final Award, the *Burlington Award*, or the Payment cumulatively, whether by offset or otherwise, such that the net

⁵²⁴ Second Dismissal Application, paragraph 79.

Counterclaims Amount is the full amount that Ecuador can recover against both or either of Perenco and Burlington with respect to the counterclaims against each of them; and

- (c) Ordering that Ecuador hold Perenco harmless against any future claims based on alleged environmental and infrastructure liability arising out of Blocks 7 and 21, before any jurisdiction whatsoever, whether arbitral or judicial, national or international; and
- (d) Ordering Ecuador to pay all the costs of the arbitration, as well as Perenco's fees and expenses, for the counterclaims phase of these proceedings.⁵²⁵

2. Ecuador's Arguments

465. Ecuador requests the Tribunal to dismiss Perenco's Second Dismissal Application for several reasons.⁵²⁶
466. Ecuador argues that Perenco is barred from relying on its objections, because they are untimely.⁵²⁷ Ecuador maintains that, according to ICSID Arbitration Rules 41(1), 26(3) and 27, "objections shall be made as early as possible; if not, the practice is to dismiss them outright."⁵²⁸ Ecuador points out that Perenco should have invoked *lis pendens* when Ecuador first introduced its counterclaims.⁵²⁹ In Ecuador's opinion, the fact that Perenco's objections were presented more than six years after the introduction of Ecuador's counterclaims should be considered a waiver of these objections.⁵³⁰ According to Ecuador, Perenco is also precluded from requesting the dismissal of Ecuador's counterclaims on account of estoppel.⁵³¹ Ecuador argues that it relied on Perenco's participation in the counterclaims proceedings without raising any objections and, as a result, Ecuador "invest[ed] considerable time and public funds to establish Perenco's liability in the understanding that it would be adjudicated by this Tribunal."⁵³² In its Rejoinder, Ecuador

⁵²⁵ Reply, paragraph 77.

⁵²⁶ Response, paragraph 48.

⁵²⁷ *Ibid.*, paragraph 54.

⁵²⁸ *Ibid.*, paragraph 55; see also Rejoinder, paragraph 51.

⁵²⁹ Response, paragraph 55.

⁵³⁰ *Ibid.*

⁵³¹ *Ibid.*, paragraph 93; see also Rejoinder, paragraph 52.

⁵³² Rejoinder, paragraph 55.

stresses that Perenco's failure to raise *lis pendens*, request a stay of the proceedings or the consolidation of the counterclaims is also abusive.⁵³³

467. Ecuador further contends that Perenco's objections are barred on the ground of *res judicata*. In particular, Ecuador claims that the *Burlington* Decision on Counterclaims is incompatible with this Tribunal's Interim Decision on Counterclaim in which it made a number of legal and factual determinations on Ecuador's environmental counterclaim and thus constitutes *res judicata*.⁵³⁴ According to Ecuador, "holding that the *Burlington* Decision on Counterclaims is *res judicata* would go against the widely established principle that it is the first decision rendered on an issue that is *res judicata*."⁵³⁵ Ecuador further observes that these arguments have been espoused by the Tribunal in its previous decisions.⁵³⁶
468. Ecuador submits that the finality of the *Burlington* Decision on Counterclaims does not render its counterclaims moot,⁵³⁷ as the requirements of *res judicata* are not met in this case.⁵³⁸ Ecuador concedes that the Tribunal's Decision on Perenco's First Dismissal Application found that that application was premature in light of the then-pending annulment proceedings concerning the *Burlington* Decision on Counterclaims.⁵³⁹ However, Ecuador stresses that the Tribunal only considered such proceedings "a bar to a hypothetical argument... which the Tribunal only mentioned without approving it; namely, that the case was moot."⁵⁴⁰
469. Ecuador argues that neither Perenco nor the Consortium were parties to the *Burlington* arbitration.⁵⁴¹ Ecuador emphasises that *Burlington* and Perenco are legally and

⁵³³ *Ibid.*, paragraphs 42-49.

⁵³⁴ Response, paragraph 57; Rejoinder, paragraph 60.

⁵³⁵ Response, paragraph 58; also Rejoinder, paragraph 63.

⁵³⁶ Response, paragraphs 57-58 citing Decision on Perenco's First Application, paragraphs 36 and 40-42.

⁵³⁷ Response, paragraph 49.

⁵³⁸ *Ibid.*, paragraph 61.

⁵³⁹ *Ibid.*, paragraph 50.

⁵⁴⁰ *Ibid.*, referring to Decision on Perenco's First Dismissal Application, paragraph 46.

⁵⁴¹ Response, paragraph 63.

economically independent entities.⁵⁴² According to Ecuador, “the party identity requirement is applied strictly under both international law and Ecuadorian law”, so that “privies in interest cannot be considered the same parties for the purposes of a *res judicata* analysis.”⁵⁴³

470. Ecuador claims in the alternative that Burlington and Perenco are not privies in interest, since “privity only exists when one party owns the other.”⁵⁴⁴ In its Rejoinder, Ecuador emphasises that the three tribunals in *Grynberg*, *Apotex III* and *Ampal-America* – upon whose decisions Perenco relies – “decided to extend the *res judicata* effect to the shareholders on the basis that, as shareholders are entitled to claim for investments held through a corporation under investment law, they must be bound by any previous finding reached in relation to a claim of this corporation on the same facts.”⁵⁴⁵ According to Ecuador, this rationale cannot be extended to parties that share the same economic interest in the outcome of a dispute as proposed by Perenco.⁵⁴⁶
471. Ecuador submits that there is no identity of subject-matter between these proceedings and the *Burlington* proceedings. Ecuador notes in this respect a passage in the *Burlington* Decision on Counterclaims in which that tribunal indicated that “it reache[d] a conclusion different from that of the Perenco tribunal.”⁵⁴⁷ Ecuador observes that there are “material differences in the evidentiary records before the *Burlington* tribunal and this Tribunal” consisting of differences “in the evidence relied upon” and “in the witnesses as well as in the questions put to the witnesses and experts during the hearings and the *Burlington* tribunal’s site-visit where those experts and witnesses were the same.”⁵⁴⁸ Ecuador asserts that “the different evidentiary record translated, in turn, into radically different approaches

⁵⁴² *Ibid.*, paragraph 62.

⁵⁴³ *Ibid.*, paragraph 66.

⁵⁴⁴ *Ibid.*, paragraph 67.

⁵⁴⁵ Rejoinder, paragraph 114.

⁵⁴⁶ *Ibid.*, paragraphs 115-117.

⁵⁴⁷ Response, paragraph 33 citing *Burlington* Decision on Counterclaims, paragraph 69.

⁵⁴⁸ Response, paragraph 69; also *ibid.*, paragraphs 9-47 and Rejoinder, paragraphs 8-34.

by the tribunals.”⁵⁴⁹ Ecuador draws the Tribunal’s attention, *inter alia*, to the fact that the two tribunals “adopted distinct approaches as to how the extent of the contamination and the obligation to remediate should be assessed.”⁵⁵⁰ It also observes that the *Burlington* tribunal decided to rely on party-appointed experts and a site visit, whereas the present Tribunal decided to appoint its own independent environmental expert.⁵⁵¹ In its Rejoinder, Ecuador contends that, contrary to Perenco’s claims, “when two separate tribunals analyze different evidence presented in different manners, they do not consider the same facts and, hence, they decide on different subject-matters.”⁵⁵²

472. In the event that the Tribunal finds that the *Burlington* Decision on Counterclaims is final and binding in the present proceedings, Ecuador requests the Tribunal to apply by analogy Article 51(1) of the ICSID Convention on revision of awards in order “to pursue its mission and analyze the new evidence before it, which was not taken into consideration by the *Burlington* tribunal when rendering [its] Decision.”⁵⁵³
473. In its Rejoinder, Ecuador stresses that the site-specific data and analytical results gathered by Mr. MacDonald constitute a “new potentially decisive fact.”⁵⁵⁴ Ecuador agrees with Perenco that Article 51(1) of the ICSID Convention would have entitled the *Burlington* tribunal to revise its Decision on Counterclaims, but this rationale applies *a fortiori* before this Tribunal while this arbitration is still pending.⁵⁵⁵ Ecuador further argues that it would be entitled to institute proceedings under Article 51(1) of the ICSID Convention, were this Tribunal to uphold Perenco’s Application.⁵⁵⁶ To this end, Ecuador requests that

⁵⁴⁹ Response, paragraph 23.

⁵⁵⁰ *Ibid.*, paragraph 71; see also Rejoinder, paragraph 120.

⁵⁵¹ Response, paragraph 71.

⁵⁵² Rejoinder, paragraphs 125-126 citing *CME Czech Republic B.V. v. The Czech Republic*, UNCITRAL, Final Award, 14 March 2003, paragraph 432.

⁵⁵³ Response, paragraphs 73-75.

⁵⁵⁴ Rejoinder, paragraphs 137-139.

⁵⁵⁵ *Ibid.*, paragraph 140.

⁵⁵⁶ *Ibid.*, paragraph 141.

Mr. MacDonald’s Independent Expert Report be communicated to it, even if the Tribunal ultimately accepts Perenco’s Application.⁵⁵⁷

474. Ecuador rejects Perenco’s submission that its counterclaims constitute an abuse of process. Ecuador contends that the doctrine of abuse of process is inapplicable in this case for several reasons. First, Perenco should establish that the sole purpose of continuing Ecuador’s counterclaims would be to harm Perenco or would be otherwise vexatious which is not the case in the present proceedings.⁵⁵⁸ Relying on the *Lauder* and *Busta* awards, Ecuador asserts further that pursuing parallel proceedings with a view to maximising its chances of success does not constitute an abuse of process.⁵⁵⁹ Ecuador adds that the cases cited by Perenco suggest that “the dispute must be brought by the same claimant against the same respondent” for an abuse to be found.⁵⁶⁰ In Ecuador’s view, the *Orascom* and *Ampal-American* tribunals deemed that companies at different levels of the same ownership chain were the same party, whereas the *Eskosol* tribunal’s approach was even narrower, the tribunal holding that two companies of the same ownership chain were distinct parties.⁵⁶¹
475. Ecuador rejects Perenco’s claim that Ecuador’s counterclaims are moot, arguing that Perenco’s reliance on mootness is inapposite because all the pronouncements cited by Perenco related to cases “where specific performance is requested in order to prevent the

⁵⁵⁷ *Id.*

⁵⁵⁸ Response, paragraphs 81-82; Rejoinder, paragraphs 104-108.

⁵⁵⁹ Response, paragraphs 83-85 referring to *Lauder v. Czech Republic*, UNCITRAL, Final Award, 3 September 2001, paragraph 177 and *Ivan Peter Busta and James Peter Busta v. Czech Republic*, SCC Case No. V 2015/014, Final Award, 10 March 2017, paragraph 211; also Rejoinder, paragraphs 104-105.

⁵⁶⁰ Response, paragraph 87.

⁵⁶¹ *Ibid.*, referring to *Orascom TMT Investments S.à.r.l v. People’s Democratic Republic of Algeria*, ICSID Case No. ARB/12/35, Award, 31 May 31 2017, paragraphs 494-495; *Ampal-American Israel Corp., EGI-Fund (08-10) Investors LLC, EGI-Series Investments LLC, and BSS-EMG Investors LLC v. Arab Republic of Egypt*, ICSID Case No. ARB/12/11, Decision on Jurisdiction, 1 February 2016, paragraph 331; *Eskosol S.p.A in liquidazione v. Italian Republic*, ICSID Case No. ARB/15/50, Decision on Respondent’s Application under Rule 41(5), 20 March 2017, paragraphs 168-169; also Rejoinder, paragraphs 100-101.

occurrence of harm and, either the harm occurred in the meantime, or the responding party voluntarily complied.”⁵⁶²

476. Ecuador contends that Perenco’s liability is not extinguished under Ecuadorian law.⁵⁶³ In its Rejoinder, Ecuador takes issue with Perenco’s argument that the quantification of damages is a conceptually distinct issue from the existence of the liability itself.⁵⁶⁴ According to Ecuador, “tort liability...depends on the extent of the harm suffered.”⁵⁶⁵ Ecuador emphasises that the present Tribunal “is entrusted with determining the extent of the harm to establish the extent of Perenco’s liability” in contrast to the *Burlington* tribunal whose mandate was limited to the determination of the extent of Burlington’s liability.⁵⁶⁶
477. In Ecuador’s view, the notion of mutual representation is alien to the Ecuadorian joint and several liability legal regime.⁵⁶⁷ Ecuador claims that it was entitled to sue Burlington, Perenco, or both.⁵⁶⁸ Furthermore, Ecuador suggests that the non-extinction of Perenco’s debt can be inferred from the fact that the victim/creditor can commence one or several proceedings against its co-debtors under Ecuadorian law.⁵⁶⁹
478. In its Rejoinder, Ecuador maintains that Perenco’s reliance on the Ecuadorian joint and several liability regime is misplaced, since the effect of full payment by one co-debtor with respect to the other co-debtors is not disputed.⁵⁷⁰ According to Ecuador, the issue is “whether the first-in-time decision of one tribunal is or is not binding on the other tribunal and renders or does not render the second-in-time proceedings moot...when parallel proceedings are commenced and pursued against different co-authors.”⁵⁷¹ In this respect,

⁵⁶² Response, paragraph 95.

⁵⁶³ *Ibid.*

⁵⁶⁴ Rejoinder, paragraph 71.

⁵⁶⁵ *Ibid.*, paragraph 77.

⁵⁶⁶ *Id.*

⁵⁶⁷ Response, paragraphs 97-103.

⁵⁶⁸ *Ibid.*, paragraph 96.

⁵⁶⁹ *Ibid.*, paragraphs 104 and 106.

⁵⁷⁰ Rejoinder, paragraph 85.

⁵⁷¹ *Id.*

Ecuador reiterates that this Tribunal has established its own criteria for the determination of the extent of damage for which Perenco will be held liable and the fact that the both proceedings have materially different evidentiary records.⁵⁷² It also points out that the *Burlington* Settlement Agreement does not envisage the termination of the *Perenco* proceedings by providing, *inter alia*, that Ecuador will not seek double recovery in these proceedings.⁵⁷³

479. Ecuador places particular emphasis on a provision of the Ecuadorian Civil Code which stipulates that “[a] settlement is binding between its signatories only. Where there are several co-debtors who may have an interest in the settlement, the settlement made by one of them cannot be enforced by or against the others, except where there is novation and the underlying obligation is joint and several.”⁵⁷⁴ Ecuador submits that Perenco is not bound by the *Burlington* proceedings nor by the *Burlington* settlement.⁵⁷⁵ In its Rejoinder, Ecuador adds that the *Burlington* Settlement Agreement cannot benefit Perenco, because “[f]or a settlement to exist, the parties must make reciprocal concessions.”⁵⁷⁶ In particular, Ecuador alleges that “the set off of the damages awarded against Burlington for the environmental and infrastructure harms” was part of a larger settlement including a discount to the amount owed by Ecuador as a result of the *Burlington* award and the termination of the *Burlington* proceedings.⁵⁷⁷

480. Ecuador also requests the Tribunal to dismiss Perenco’s request to offset the entirety of Burlington’s payment from any counterclaims’ damages awarded by the Tribunal. Whilst Ecuador agrees to avoid double recovery, it maintains that Perenco’s approach is flawed.⁵⁷⁸ According to Ecuador, “[t]he risk of double recovery can only materialize...if the Tribunal finds exactly the ‘same harm’ as the one identified and quantified by the *Burlington* tribunal

⁵⁷² *Ibid.*, paragraphs 86-90.

⁵⁷³ *Ibid.*, paragraph 92.

⁵⁷⁴ Response, paragraph 100 citing Article 2363, Ecuadorian Civil Code, EL-390.

⁵⁷⁵ Response, paragraph 97.

⁵⁷⁶ Rejoinder, paragraph 69.

⁵⁷⁷ *Id.*

⁵⁷⁸ Response, paragraphs 109-111.

pursuant to its own (different) interpretation of the legal framework and technical methods.”⁵⁷⁹ Ecuador suggests that “[s]ame loss’ (or ‘same harm’ in the circumstances) requires that both tribunals assess the object of the underlying obligation in an identical manner.”⁵⁸⁰

481. Ecuador does not dispute that some part of the harm could be the same as that identified by the *Burlington* tribunal, but argues that it remains entitled to claim for “any...different or additional harm and/or costs with respect to the environment and infrastructure in Blocks 7 and 21.”⁵⁸¹ Ecuador contends that Perenco remains liable for any additional and/or different volumes of soil, mud pits, and groundwater contamination warranting remediation and/or additional remediation costs in Blocks 7 and 21.⁵⁸² With respect to infrastructure harm, Ecuador claims that Perenco remains liable for any additional item and/or additional cost identified in Blocks 7 and 21.⁵⁸³
482. In its Rejoinder, Ecuador defends the technical feasibility of its approach. It stresses that Perenco did not challenge the feasibility of Ecuador’s approach with respect to the infrastructure counterclaim.⁵⁸⁴ With respect to its environmental counterclaim, Ecuador further argues that its approach can be applied where Mr. MacDonald finds contamination in clearly distinct areas or sites from that identified by the *Burlington* tribunal or where the depth of contamination can be discerned through a comparison between Mr. MacDonald’s findings with respect to the contaminated area and the *Burlington* tribunal’s findings with respect to the volume to be remediated.⁵⁸⁵ Ecuador also proposes that in the cases where the exact shape of the contaminated area is not delineated in the *Burlington* Decision on Counterclaims, the Tribunal “could compare abstract square meters of contamination (not

⁵⁷⁹ *Ibid.*, paragraph 118.

⁵⁸⁰ *Ibid.*, paragraph 117.

⁵⁸¹ *Ibid.*, paragraphs 119 and 121.

⁵⁸² *Ibid.*, paragraphs 122-170.

⁵⁸³ *Ibid.*, paragraphs 171-173.

⁵⁸⁴ Rejoinder, paragraph 150.

⁵⁸⁵ *Ibid.*, paragraphs 155-156.

monetary damages) found at the same depth, deduct the overlap, and apply the remediation unit cost estimated by Mr. MacDonald to the balance.”⁵⁸⁶

483. Ecuador further requests the Tribunal to reject Perenco’s request for an order that “Ecuador hold Perenco harmless against any future claims based on alleged environmental and infrastructure liability arising out of Blocks 7 and 21, before any jurisdiction whatsoever.”⁵⁸⁷ Ecuador maintains that this request is unrelated to the application, because “[w]hether or not Ecuador’s counterclaims must be dismissed in the present arbitration does not have any consequences on, or relationships with, potential future claims against Perenco, including by third parties, based on environmental and infrastructure liability arising out of Blocks 7 and 21.”⁵⁸⁸ Ecuador contends that Perenco is barred for presenting such a request at this phase of the proceedings, since it has not previously sought the authorisation of the Tribunal in accordance with ICSID Arbitration Rule 40(2).⁵⁸⁹ Ecuador emphasises that Perenco cannot invoke any special circumstance for its belated presentation of this request for relief.⁵⁹⁰ It adds that Perenco’s request for relief is unfounded, because Ecuador cannot assume responsibility for claims that may arise from third parties.⁵⁹¹ For the same reason, Ecuador submits that the Tribunal lacks jurisdiction to grant such an order.⁵⁹² Ecuador argues that this request is also abusive, because it is inconsistent with the other requests formulated in Perenco’s Second Dismissal Application.⁵⁹³

484. In its Response, Ecuador requests the Tribunal to:

- “(a) Dismiss Perenco’s Second Application;
- (b) Dismiss Perenco’s alternative requests for relief;

⁵⁸⁶ *Ibid.*, paragraph 162.

⁵⁸⁷ Response, paragraph 175.

⁵⁸⁸ *Ibid.*, paragraph 177.

⁵⁸⁹ *Id.*

⁵⁹⁰ Rejoinder, paragraphs 172-173.

⁵⁹¹ Response, paragraph 178; Rejoinder, paragraphs 179-183.

⁵⁹² Response, paragraph 179.

⁵⁹³ *Ibid.*, paragraphs 180-181.

(c) Dismiss Perenco’s request that Ecuador hold Perenco harmless against any future claims based on alleged environmental and infrastructure liability arising out of Blocks 7 and 21, before any jurisdiction whatsoever arbitral or judicial, national or international; and

(d) Order Perenco to reimburse Ecuador all the costs and expenses incurred in responding to Perenco’s Second Application, with interest.”⁵⁹⁴

485. In its Rejoinder, Ecuador amended its request. It requests that the Tribunal:

“(a) Dismiss Perenco’s Second Application;

(b) Dismiss Perenco’s alternative requests for relief;

(c) Dismiss Perenco’s request that Ecuador hold Perenco harmless against any future claims based on alleged environmental and infrastructure liability arising out of Blocks 7 and 21, before any jurisdiction whatsoever arbitral or judicial, national or international;

(d) Communicate Mr. MacDonald’s expert report, including its exhibits, appendices and all supporting data (in native format) to the Parties; and

(e) Order Perenco to reimburse Ecuador all the costs and expenses incurred in responding to Perenco’s Second Application, with interest.”⁵⁹⁵

3. Tribunal’s Reasons for Rejecting Perenco’s Second Dismissal Application

486. As noted above, the Tribunal, by a majority, rejected Perenco’s Second Dismissal Application. The reasons are as follows.

487. The Second Dismissal Application raises issues of both Ecuadorian and international law. The latter argue in favour of the Tribunal’s continuing the counterclaim proceeding. As for the former, a review of the Parties’ submissions shows that the position under Ecuadorian law is not as clear-cut as Perenco has contended.

⁵⁹⁴ *Ibid.*, paragraph 183.

⁵⁹⁵ Rejoinder, paragraph 190.

488. The Tribunal begins by recalling that it held in the Decision on Reconsideration that its prior decisions are *res judicata* and cannot be re-opened.⁵⁹⁶ This finding applies with equal force to the Interim Decision on Counterclaim; the Tribunal cannot reopen and reconsider its findings, either explicitly or implicitly.
489. Among the Tribunal's (explicit and implicit) findings in the Interim Decision on Counterclaim and the Decision on Perenco's First Dismissal Application were the following:
- (a) The Tribunal had jurisdiction to entertain the counterclaim against Perenco even though a similar counterclaim was on track in the *Burlington* proceeding;⁵⁹⁷
 - (b) the counterclaim was not inadmissible;⁵⁹⁸
 - (c) the Tribunal decided with finality a number of issues pertaining to the interpretation of the Ecuadorian Constitution and the applicable environmental regulations and recommended that the Parties settle the dispute;⁵⁹⁹

⁵⁹⁶ Decision on Reconsideration, paragraph 43: "There is ample prior authority in support of the view once the tribunal decides with finality any of the factual or legal questions put to it by the parties, as was the case in the Decision on Liability, such a decision becomes *res judicata*."

⁵⁹⁷ Decision on Perenco's First Dismissal Application, paragraph 44.

⁵⁹⁸ *Id.*, paragraphs 43 and 51.

⁵⁹⁹ Interim Decision on Counterclaim, paragraph 593: "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."

- (d) the Tribunal did not find the expert evidence adduced by both Parties sufficiently reliable and accepted Perenco’s argument that it would not be appropriate to ‘pick and choose’ between the experts in order to fashion relief;⁶⁰⁰
- (e) the Tribunal refused to reject the claim on the basis of a failure to discharge the burden of proof, holding instead that in light of the Constitution’s strong interest in environmental protection and in the interest of a just and fair result it would appoint an independent expert if the Parties were unable to negotiate a settlement. The Tribunal stated that it considered such “further enquiry [to be] absolutely necessary to arrive at a just result in the circumstances of this case”;⁶⁰¹
- (f) it also explicitly instructed that: “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”;⁶⁰² and
- (g) finally, the Tribunal stated, without qualification, that the Independent Expert Report would be disclosed to the Parties.⁶⁰³

⁶⁰⁰ Interim Decision on Counterclaim, paragraph 585: “...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 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 favor. 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.”

⁶⁰¹ Interim Decision on Counterclaim, paragraph 593.

⁶⁰² *Ibid.*, paragraph 594.

⁶⁰³ *Ibid.*, paragraph 20 of the *dispositif*: “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.” [Emphasis added.]

490. Having failed to arrive at a negotiated settlement, the Parties jointly agreed on Mr. MacDonald's suitability as the Independent Expert and the Tribunal accepted their joint proposal. The Tribunal then instructed him on how to conduct his sampling.

(a) *The international law analysis*

491. From the foregoing, it can be seen that the Tribunal faces two *rei judicatae*: (i)) a decision rendered in this proceeding, which on the basis of the logic of the Decision on Reconsideration, and on general principle, is binding on Perenco and Ecuador; and (ii) a decision rendered in a parallel proceeding *after* the present Tribunal rendered its own Interim Decision on Counterclaim (that other decision being binding on Burlington and Ecuador). Perenco now requests that this Tribunal declare that the Ecuador-Burlington settlement following the *Burlington* award is binding upon the Parties to this proceeding. Perenco essentially contends that a *res judicata* created by a different tribunal, after this Tribunal had spoken, which award was subsequently reflected in a settlement between the parties to that dispute, overrides the *res judicata* created by the present Tribunal.

492. There are a number of troubling aspects to this argument.

493. First, from the standpoint of an international tribunal's duty to exercise its jurisdiction once established⁶⁰⁴, it seems counter-intuitive that a tribunal that has made certain findings of law and fact and has decided that a particular course of action must be followed because of the infirmities of the expert evidence before it must be bound by the later finding of another tribunal considering similar issues (based on a different evidential record and in some cases deciding differently from this Tribunal) and which was less troubled by the infirmities in the expert evidence.

494. One can reasonably ask why the *res judicata* represented by the Interim Decision on Counterclaim of this Tribunal must yield to the *res judicata* of a later-in-time decision rendered by another tribunal that chose a different means of estimating the damage suffered

⁶⁰⁴ *SGS Société Générale de Surveillance S.A. v. Islamic Republic of Pakistan*, ICSID Case No. ARB/01/13, Decision on Jurisdiction, 6 August 2003, paragraph 187. *Tokios Tokelès v. Ukraine*, ICSID Case No. ARB/02/18, Decision on Jurisdiction, 29 April 2004, paragraph 36, *The Rompetrol Group N.V. v. Romania*, ICSID Case No. ARB/06/3, Decision on Jurisdiction and Admissibility, 18 April 2008, paragraph 115.

by Ecuador (and which, when rendering its award, declined to give effect to this Tribunal's prior decision).

495. Second, the Tribunal sees the force in Ecuador's argument that given the procedure which the Tribunal previously laid down and which was being followed in the present case, were the Tribunal to accept the *Burlington* award as being a final disposition of the counterclaim, it would essentially be re-opening its Interim Decision on Counterclaim and grafting on to it reasons and findings made by another tribunal which are inconsistent with this Tribunal's own prior findings.⁶⁰⁵
496. Thus, from the perspective of a de-centralised international legal regime in which investment treaties confer jurisdiction over *ad hoc* tribunals which in turn have jurisdiction only over the parties to the disputes brought before them, and where it is accepted that different tribunals considering similar matters can arrive at different conclusions, in the Tribunal's view, by the time of Perenco's Second Dismissal Application it was far too late to turn off the process which the Tribunal had ordered to be conducted and which was nearing its completion.
497. Third, the only party which has sought to treat the *Burlington* Decision on Counterclaim as having *res judicata* and preclusive effect on the continued prosecution of the present counterclaim is Perenco. Likewise, the only party that characterises the *Burlington* Settlement Agreement as bringing the environmental and infrastructure counterclaims to an end is Perenco, a non-party to that agreement. The 2011 agreement on the counterclaim between Burlington and Ecuador, the *Burlington* Decision, and the Burlington-Ecuador Settlement Agreement do not purport to hold that the Consortium's liability was definitively and finally determined by that tribunal's decision.

⁶⁰⁵ Interim Decision on Counterclaim, paragraph 581: "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." [Emphasis added.]

(b) *Ecuadorian law on the effect of the Settlement Agreement and Annex 3 on Perenco's liability*

498. The Ecuadorian law issue concerns the effect of the Ecuador-Burlington Settlement Agreement and its Annex 3 on Perenco's liability to Ecuador under Ecuadorian law.
499. The stated purpose of Annex 3 to the Settlement Agreement was to amongst other things ensure that Ecuador does not receive double recovery for the same damage/harm through the counterclaims against Perenco in the *Perenco* arbitration. The Settlement Agreement also explicitly contemplated certain relationships between the Burlington settlement and the ongoing *Perenco* arbitration and the implications of the former for the latter.
500. In the Tribunal's view, the Settlement Agreement shows that the parties thereto did not intend for that agreement to affect the prosecution of the *Perenco* environmental counterclaim, except to the extent that Burlington secured Ecuador's agreement not to pursue it for additional damages and not to seek double recovery for those damages which were paid pursuant to the Agreement.
501. The "fairness" argument advanced by Perenco, namely, that Burlington would not have truly achieved a "full and final settlement and release" from the counterclaims because it continues to bear exposure to damages on the counterclaims if this Tribunal were to order a larger quantum of damages, is undermined by the fact that no attempt was made by Burlington or Ecuador to vary Burlington's JOAs with Perenco. Without Perenco's consent, it was not open to the other two parties to attempt to change the terms of the JOAs, specifically the contribution provision. Perenco therefore stands in the same position now as it was in before the Burlington-Ecuador settlement, namely, Perenco has the contractual right to call upon Burlington to assume its aliquot share of any damages ultimately awarded by this Tribunal.
502. While Perenco relies on its joint and several liability with Burlington to argue that the Settlement Agreement discharges its own liability, it appears that under Article 2363 of the Ecuadorian Civil Code, Perenco cannot enforce the Settlement Agreement against Ecuador. That article reads:

“A settlement is binding between its signatories only. Where there are several who may have an interest in the settlement, the settlement made by one of them cannot be enforced by or against the others, except where there is a novation and the underlying obligation is joint and several.”⁶⁰⁶

503. Ecuador explains that, by virtue of this provision, the civil law notion of mutual representation does not apply. This means that a debtor (*i.e.* Perenco) would be not able to rely on a settlement entered into by the creditor with another co-debtor (*i.e.* Burlington). The Settlement Agreement is binding between Ecuador and Burlington only.
504. Perenco seeks to read Article 2363 of the Ecuadorian Civil Code restrictively. It appears to argue that the provision only addresses situations where joint debtors to settle *their own share* of a joint and several liability and provides that such a settlement would be binding between its signatories only.⁶⁰⁷ It therefore argues that the provision is inapplicable here because Ecuador did not settle Burlington’s aliquot share of the environmental harm with Ecuador. Rather, Burlington paid Ecuador full reparation for the environmental harm Ecuador claimed against the Consortium. In this regard, Perenco relies on (in addition to its own pleadings in relation to its First Dismissal Application and the Second Dismissal Application) the recitals in the Settlement Agreement and the *Burlington* Decision on Counterclaims.⁶⁰⁸
505. Perenco’s argument can be addressed on two levels: first, whether Burlington and Ecuador settled the whole of the Consortium’s joint and several liability in such a way as to bind Ecuador towards Perenco under Article 2363 of the Civil Code; and second, whether as a matter of Ecuadorian law, Article 2363 of the Civil Code operates in the way that Perenco contends. With respect to the first issue, the Tribunal considers that it is addressed by the language in the Settlement Agreement which discusses the limits of that agreement, its relationship to the *dispositif* of the *Burlington* Decision on Counterclaims, and that award’s relationship in turn to the ongoing *Perenco* arbitration.

⁶⁰⁶ EL-390.

⁶⁰⁷ Reply, paragraph 32.

⁶⁰⁸ *Burlington* Decision on Counterclaims, paragraph 1099.

506. While it is indeed the case that Ecuador was making “*a full claim for the alleged environmental harm in each of the Burlington and Perenco cases*”, the *Burlington* tribunal clearly contemplated that the present Tribunal could come to a different conclusion on the quantum of damages and left it to this Tribunal to fashion its decision to prevent double recovery by Ecuador. The Settlement Agreement itself recognises this state of affairs.
507. In the Tribunal’s view, the parties to the Settlement Agreement intended that the *Burlington* decision was determinative of the liability owed by Burlington to Ecuador, but *not* determinative of the entirety of the environmental harm caused to Ecuador more generally.
508. This appears to accord with the notion of tortious liability in the Ecuadorian civil law system. In this regard, the Tribunal accepts Ecuador’s submission that the notion of tortious liability in the civil law system is significantly different from that in the common-law system. Unlike the common law, which looks for the existence of a relationship between the tortfeasor and the victim (such as to establish the existence of a duty of care, breach of which leads to liability), the civil law system is more concerned with whether damage has been caused by a person’s act(s). If damage occurs, tortious liability follows (without any inquiry as to whether the parties were in a particular relationship such that tortious liability could arise). Thus, Ecuador’s explanation, which emphasises the civil law’s preoccupation with the occurrence of damage, supports the Tribunal’s continued determination of the full extent of the contamination (subject, of course, to the restrictions laid down for the work of the Independent Expert). Ecuador has argued that the *Burlington* tribunal almost certainly did not accurately estimate the extent of the contamination. (As shall be seen, the expert opinion of Mr. MacDonald supports this view.) Given that situation, a failure to properly estimate the damage would mean that the victim of the tortious conduct would be under-compensated.
509. The Tribunal considers further that the *Burlington* tribunal, comprising three distinguished civil law-trained arbitrators, could be taken to be familiar with the civil law system’s approach towards tortious liability. The members of that tribunal did not evince any concern in proceeding independently to decide the *Burlington* counterclaim even though their decision was rendered after this Tribunal’s Interim Decision on Counterclaim, and

despite the fact that the Consortium operator (Perenco) was not before them. Moreover, instead of declaring that they were determining the whole of the Consortium's liability, the *Burlington* tribunal explicitly left it to the present tribunal to address any risk of double recovery:

“69. The Tribunal is mindful of the separate nature of the two arbitrations and of its duty to resolve the dispute before it solely on its own record and merits. This said, the Tribunal is also mindful of the risk of double recovery, to which it will revert, and of the potential risk of contradictory decisions. For reasons linked to the value of coherence of the legal system, it considers that contradictory decisions on identical issues should be avoided to the degree possible without sacrificing any party's rights of due process or fairness. While ruling on the basis of the record in this case exclusively, the Tribunal will refer to the *Perenco* Decision in those instances where, in spite of the desire to avoid contradictions, it reaches a conclusion different from that of the *Perenco* tribunal.

70. As regards the risk of double recovery (item (iv) above), Ecuador does not dispute that it seeks what *Burlington* calls “identical overlapping compensation with regard to the same alleged damage” in both proceedings. It also agrees that there is a risk of double recovery. This being so, at the end of the Hearing, Ecuador explained that it does not intend to recover its claimed damages twice, but that it will rely on whichever decision proves to be more favorable to its position. *Burlington*, on its part, requested that the Tribunal expressly address the risk of double recovery, such that “if the dispositive part of either of the awards on counterclaims provides for any compensation, Ecuador would be prevented from enforcing the second award to the extent that it has already been compensated by the first”. The Tribunal addresses double recovery below (Section D).”⁶⁰⁹ [Emphasis added.]

510. Therefore, based on the above, the Tribunal finds that the Settlement Agreement could only have been intended to settle what the *Burlington* tribunal thought was the damage suffered by Ecuador (subject to intra-Consortium claims under the JOAs which apply as between the two Consortium partners and, crucially, subject to what this Tribunal would decide).
511. Turning to the second issue, it is difficult to read Article 2363 in the manner which Perenco contends when the provision does not state that it applies only to partial settlements. In any event, the fact of the settlement by one party that is jointly and severally liable with one or

⁶⁰⁹ *Ibid.*, paragraphs 69-70.

more others does not in and of itself permit a non-settling party to plead the settlement. By its own terms, Article 2363 requires not only a relationship of joint and several liability, but also a novation of the settlement agreement. Thus, on a plain reading of that provision, Perenco can claim the benefit of Settlement Agreement *only if* there has been a novation *and* the underlying liability is joint and several.⁶¹⁰ There is no allegation that the Ecuador-Burlington Settlement Agreement has been novated to the benefit of Perenco. Indeed, the terms of the Settlement Agreement are explicitly to the contrary in that the rights and benefits of the settlement are expressly limited to the parties thereto.

512. Finally, the *Burlington* tribunal expressly recognised “its duty to resolve the dispute before it solely on its own record and merits” while the *Perenco* proceeding continued.⁶¹¹ This point, with which the Tribunal agrees, has particular salience because of the fundamentally different approaches taken by the two tribunals on the environmental counterclaim. The *Burlington* tribunal decided to conduct a site visit and to rely upon the expert evidence of IEMS and GSI, picking and choosing between their respective findings on individual items. This Tribunal believes that its Independent Expert is in a better position to provide a more technically-sound and more rigorous evaluation of the conditions in the sites than what can be obtained through a site visit. Nor was it willing to rely upon the reports produced by the Parties’ experts without their data and findings being evaluated and confirmed (or not) by an independent expert.
513. Accordingly, the Tribunal has dismissed Perenco’s Second Dismissal Application⁶¹² and it now turns to the work of the Independent Expert.

⁶¹⁰ Response, paragraph 100.

⁶¹¹ *Burlington* Decision on Counterclaims, paragraph 69.

⁶¹² Mr. Kaplan cannot agree with the majority on this conclusion. He considers that on its true interpretation the Settlement Agreement between Burlington and Ecuador releases the other co-contractor, namely Perenco.

D. **The Independent Expert's Work**

1. **Mr. MacDonald's Qualifications**

514. The Tribunal noted above at paragraph 47 that after the Parties were unable to negotiate a settlement of the environmental counterclaim, they jointly agreed on the appointment of Mr. Scott MacDonald as the Tribunal's Independent Expert. Mr. MacDonald's qualifications are set out in his Independent Expert's Report and they are not repeated here. Suffice to say that he has some 30 years of experience in advising corporate clients, conducting risk-based multimedia investigations and remediation under various federal, state and local regulatory programmes on a global basis; performing different types of environmental assessments, and providing expert witness testimony in litigations and arbitrations on, among other things, the performance or non-performance of environmental obligations, defences against claims for primary restoration and compensatory damages for groundwater in natural resource damages litigation; private-party cost-recovery actions as related to the source, distribution, and fate of soil sediment and groundwater contamination; underground storage tanks; cost recovery actions under US legislation, and insurance coverage disputes. Much of his work has involved the oil sector.⁶¹³ Finally, although he had not previously worked in Ecuador, Mr. MacDonald has experience working throughout much of Latin America.

2. **Scope of the Independent Expert Report**

515. On 19 December 2018, Mr. MacDonald issued his Independent Expert Report. He confirmed that he was and remained independent of the Parties and also confirmed that the scope of his work was bound by the Tribunal's Interim Decision on Counterclaim.⁶¹⁴

516. The following partial summary of the Independent Expert Report is included to set out the Independent Expert's description of his work, his findings, and prescriptions for remediation so as to provide the requisite context for the Tribunal's discussion of the Parties' comments and criticisms of the Independent Expert Report and the Tribunal's

⁶¹³ Independent Expert Report, p. 2.

⁶¹⁴ *Id.*

findings thereon. The following summary of the Independent Expert Report is merely that; no inference should be drawn from the Tribunal's attempt to extract and reproduce here what it considers to be the most salient points made by the Independent Expert. The Report stands as a whole and is the authoritative statement of the Independent Expert's views, as supplemented by his presentation and testimony given during the course of the Expert Hearing.

517. Mr. MacDonald began by describing his mandate as to resolve certain key issues bearing on the extent, if any, of compensable environmental contamination in Blocks 7 and 21 as determined in accordance with the Tribunal's findings set out in its Interim Decision on Counterclaim and the Tribunal's clarifications of his mandate.
518. In order to do so, he first reviewed what the Parties' experts had done, identified what he considered to be significant data gaps that required resolution, and to the extent that he found contamination in the sampling conducted at sites that had previously been identified by one or both of the Parties' experts as being contaminated, estimated the remediation cost based on the Tribunal's finding that in-country cost estimates should be employed.⁶¹⁵ His Independent Expert Report describes the documentary material provided to him by the Tribunal and the Parties.⁶¹⁶ This was supplemented by visits to representative sites during November 2016 and again during field work performed in the fall of 2017.⁶¹⁷ Finally, under his direction, Ramboll generated independent data and analyses to close significant data gaps in the investigation of soils, and generated a technically valid data set to replace prior groundwater data gathered by the Parties. Ramboll also conducted work needed to document the compliance status of mud pits previously used by Perenco with applicable Ecuadorian regulations.⁶¹⁸ Mr. MacDonald described how his samples were taken, how

⁶¹⁵ Section 1.3 of the Independent Expert Report, p. 2.

⁶¹⁶ Listed at Section 8.0 of the Independent Expert Report.

⁶¹⁷ Section 1.5 of the Independent Expert Report, p. 4.

⁶¹⁸ Section 1.3 of the Independent Expert Report, p. 2.

they were handled, and where they were shipped in order to be analysed by a qualified laboratory.⁶¹⁹

519. Mr. MacDonald stated that his intent was to supplement the existing work performed by the Parties' experts in conservative compliance with Ecuador's laws and regulations so as to establish a more reliable technical platform to support the Tribunal's decision in this matter.⁶²⁰ As instructed by the Tribunal, his technical work was limited to:⁶²¹

- (a) Investigation at sites at which: (i) soil contamination was identified by one or both Parties above applicable Ecuador regulatory remediation criteria; (ii) groundwater was previously investigated by the Parties; and (iii) mud pits determined to have been used by Perenco were present;
- (b) For soils, investigation was limited to areas previously assessed by one or both Parties, where existing data were insufficient to develop a technically valid remediation cost estimate;
- (c) For groundwater, investigation was limited to sites where groundwater sampling had previously been conducted by the Parties, but where more technically sound investigation methodologies were needed. Mr. MacDonald's work was intended to confirm the presence or absence of groundwater contamination at these sites utilising more advanced and accepted well installation and sampling methods. The delineation of groundwater contamination was not requested by the Tribunal and was outside the scope of this effort; and
- (d) For mud pits, investigation was limited to mud pits that were determined to have been used during Perenco's operations.

⁶¹⁹ Appendices D and E to the Independent Expert Report.

⁶²⁰ Independent Expert Report, p. 5.

⁶²¹ *Ibid.*, p. 4.

520. Mr. MacDonald considered that his work was sufficient to significantly narrow the range of potential environmental cleanup costs at the site. While some uncertainties remained, he stated that he had sought to reduce the degree of these uncertainties.⁶²² He considered that his engineering cost estimates are both locally implementable and technically viable.
521. The Independent Expert Report was transmitted to the Parties for their review and comment. The paragraphs that follow are intended to provide a summary of the points made in the Independent Expert Report.

3. Assessment of Baseline Information

522. Mr. MacDonald confirmed the Tribunal's view that despite the work conducted by the Parties' experts, considerable uncertainty regarding site conditions remained, and in his opinion, this was largely attributable to the differing philosophical purposes of the experts' work as well as their technical approaches to obtaining and processing data. His Independent Expert Report identified the most significant issues as follows.
523. The Parties' experts took different approaches to their analyses. In his view, IEMS attempted to mirror what he called an "ASTM-type due diligence process", through which potential areas of environmental concern could be identified by means of reviewing documentation provided by the Parties or other sources of information; interviews with representatives of the Parties, site personnel with knowledge of historical site activities (currently with Petroamazonas) and local community members; and site inspections. Follow-up sampling was conducted in selected areas to assess whether contamination was present in areas previously identified as RECs.⁶²³ Where it did identify contamination

⁶²² *Id.*

⁶²³ ASTM (E 1527-05, as cited by IEMS) defines a REC as "*The presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include de minimis conditions that generally do not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. Conditions determined to be de minimis are not recognized environmental conditions.*"

(defined by IEMS as being above its base values), modeling of the data gathered via the IDW method was then conducted to derive an estimate the extent of contamination.⁶²⁴

524. GSI's work, on the other hand, was intended to test the validity of IEMS' findings. GSI conducted its own site inspections to confirm and/or identify new areas of potential impact, conducted further characterisation activities with respect to ground water, and used soil contamination delineation techniques, as well as human health risk assessment tools, to evaluate IEMS' findings. GSI's efforts were, in Mr. MacDonald's view, more like a remedial investigation, in which delineation of limited and previously identified areas of contamination was conducted.
525. Mr. MacDonald concluded that in the case of both experts, the "technical choices made by the Parties, intended or not, embedded biases within their findings":⁶²⁵ IEMS significantly overestimated actual contamination at the sites while GSI underestimated it.⁶²⁶ This accorded with the Tribunal's own view expressed in the Interim Decision on Counterclaim.
526. This resulted in incomplete site characterisation as well as radically different conclusions. Mr. MacDonald discussed how this affected the experts': (i) site investigation practices (discussed in the Report at Section 2.5.2); (ii) data evaluation techniques (discussed in the Report at Section 2.5.4); and (iii) cost estimation approaches (discussed in the Report at Section 2.5.5).
527. In order to evaluate these methods and the results that they generated, Mr. MacDonald reviewed the Tribunal's Interim Decision on Counterclaim and distilled the key findings which bore on the applicable Ecuadorian environmental standards to be applied. His summary of the relevant findings is contained in his Independent Expert Report at Section 3.

⁶²⁴ Independent Expert Report, pp. 32-33.

⁶²⁵ *Ibid.*, p. 11.

⁶²⁶ *Ibid.*, pp. 11 & 12.

528. He also took note of the Tribunal’s findings on the changes effected to the Ecuadorian legal regime insofar as the Constitution’s changes to the fault-based liability regime was concerned.⁶²⁷

4. The Land Use Issue

529. Mr. MacDonald noted that the Tribunal rejected Ecuador’s assertion that natural background conditions were required to be met as a remediation objective at the sites and therefore provided direction on which numerical criteria should be applied. In the case of soils, such criteria depend on the land use of the area being evaluated. The basis for determining land use and the criteria used to classify land use are described below.

(a) Land Use Designations

530. Neither RAOHE nor TULAS provided clear guidance as how best to identify the applicable land use criteria for any particular site. GSI evaluated 20 remediation projects at oil fields in the Oriente operated by Petroecuador, Petroproducción, and other operators, which showed that in 80-90% of cases reviewed, the agricultural land use criteria were generally applied.⁶²⁸

531. GSI considered that IEMS had applied the ‘sensitive ecosystem’ criteria too broadly. RAOHE defines the sensitive ecosystem criteria as “*maximum permitted concentrations aimed for the protection of sensitive ecosystems such as National Heritage Natural Protected Areas and other identified in the corresponding site-specific Environmental Assessment.*” These are further described as follows:

- (i) **National Heritage Natural Protected Areas** – Under Articles 66 and 67 of the Forest and Natural Areas and Wildlife Conservation Law or “LFCANVS” (*Ley Forestal y de Conservación de Areas Naturales y Vida Silvestre*) certain areas are expressly designated and mapped for protection due to their flora and fauna or their

⁶²⁷ *Ibid.*, point 5 of Section 1.6.1.

⁶²⁸ *Ibid.*, fn. 112.

constituting ecosystems that contribute to the maintenance of ecological equilibrium.⁶²⁹ Boundaries for these protected areas include or are in the immediate vicinity of the Payamino 1/CPF, Payamino 2/8, Payamino 4 and 14/20/24, Payamino 18, Payamino 19, Payamino 23, Waponi-Ocatoe, and Nemoca platforms.⁶³⁰

- (ii) **Environmental Assessment** – Under RAOHE, Article 33, indicates that Environmental Impact Assessments (EIS) may include *inter alia* an Environmental Diagnosis – Base Line (*Estudio de Impacto Ambiental inclusive el Diagnóstico Ambiental - Línea Base*), which is defined under the Environmental Management Law (*Ley de Gestión Ambiental*) as a technical administrative procedure which seeks to determine beforehand the environmental viability of a project, construction activity, or private or public activity.

532. Pursuant to RAOHE Article 3.1, the Environmental Diagnosis – Base Line, where available, would be an appropriate resource to identify site-specific sensitive areas. Article 41, section 3.2.2, of the RAOHE requires the identification of land ecosystems, vegetative cover, flora and fauna, aquatic or marine ecosystems, sensitive areas, unique flora and fauna specimens, endangered or in danger species, and potential threats to the ecosystem. No further guidance is provided regarding sensitive ecosystems.⁶³¹

(b) *Selected Criteria for Classifying Land Use*

533. Mr. MacDonald found that for most of the subject sites, baseline assessments were either unavailable or did not provide sufficient information to determine whether the site was located in a sensitive ecosystem.⁶³² He took note of the Tribunal’s finding that, given the importance of the rainforest ecosystem, one should err on the side of the most protective

⁶²⁹ *Ibid.*, fn. 113: <http://www.ambiente.gob.ec/areas-protegidas-3/>.

⁶³⁰ *Ibid.*, fn. 114: IDEC paragraph 494 and GSI ER I Appendices L.23, L.26, and L.29.

⁶³¹ Independent Expert Report, p. 37.

⁶³² *Id.*

criteria.⁶³³ For purposes of evaluating sampling results, he therefore applied the following guidelines:

- (a) The land uses identified within the Interim Decision on Counterclaim and documents provided by the Parties were reviewed. In most cases, Ramboll's observations were generally consistent with those of the Parties. Ramboll relied on its own observations rather than documentation presented by others; however, Mr. MacDonald stated, in no case was a conflict between Ramboll's observations and the determination of an Ecuadorian authority identified.
- (b) Industrial criteria applied within the boundaries of existing platforms or CPFs that contain processing equipment, operating wells, or dormant wells that could be returned to service. Operating areas containing other in-use infrastructure (such as waste transfer stations, soil treatment areas, power oil pumping stations) were also considered to be industrial. The areas of these platforms are generally defined by fencing and/or perimeter collection trenches.
- (c) Soils that are not situated on platforms were considered to be potentially accessible to the public, livestock, and wildlife. Such areas were therefore subject to more stringent, non-industrial criteria (*i.e.*, sensitive ecosystem/ residential or agricultural). For mud pits located outside of the platform limits, the upper 30 centimeters of material were assumed to be bio-available and considered to have the same land uses as neighboring soils. Commercial criteria were generally not applicable to the sites and are not considered in his work.
- (d) Agricultural criteria would apply within cleared areas, open pastures, or areas that were under active cultivation. The agricultural criteria would also apply to areas clearly used for animal grazing.

⁶³³ IDEC, paragraph 495.

- (e) Residential and sensitive ecosystem criteria would apply to all other lands, including:
 - (i) Designated parks and preservation lands;
 - (ii) Residential properties;
 - (iii) Primary forests, secondary forests, and open pastures that do not appear to be heavily used by livestock;
 - (iv) Formerly cultivated lands that are fallow, or lands that contain both native and infilled crops, and/or native plants that are harvested; and
 - (v) Former platforms that have been abandoned or are designated for closure.⁶³⁴

534. The very broad applicability of the sensitive ecosystem criteria was intended to best facilitate restoration of lands that might have been affected by oil extraction activities, but are protected under Ecuador’s 2008 Constitution. This application also was also considered to be responsive to the local residents’ dependency upon the natural environment for food.

535. Where individual parameters were found naturally at concentrations exceeding the most stringent applicable criteria (either agricultural or sensitive ecosystem/residential), then in accordance with Ecuador’s regulations, the “background criteria” would apply (see the further discussion in Section 3.1.2.1 and Appendix C to the Tribunal’s Independent Expert Report).⁶³⁵

5. Remediation Standards

536. The remediation standards applicable to soil, mud pits and groundwater are defined in TULAS and RAOHE. In the case of soils, published remediation criteria are defined based on the specific land use of the area investigated and consider the development of background criteria where baseline conditions indicate the natural presence of regulated

⁶³⁴ Independent Expert Report, p. 38.

⁶³⁵ *Id.*

constituents above the published criteria. The numerical criteria for all media are described at Section 3.2 of the Independent Expert Report.⁶³⁶

6. Selection of Analytical Parameters

537. Based on the findings from the prior work, as well as the analytical suite of parameters chosen by Ecuador’s own consulting team,⁶³⁷ the compounds assessed by Mr. MacDonald in the Blocks are set out in Table 3.4 of his Independent Expert Report:⁶³⁸

Analyte	Soils	Mud	Groundwater	Notes
TPH	X	X	X	TPH represented by the sum of GRO, DRO and MRO (see Section 3.1.6).
PAHs	-	X	-	PAHs were initially evaluated by the Parties in soils and groundwater but were not found at levels of concern and were omitted from later work.
Barium	X	X	X	Ba was evaluated by the Parties in all media.
Cadmium	X	X	X	Cd was evaluated by the Parties in all media.
Chromium	X	X	X	Cr had been initially evaluated by the Parties in soil but did not carry forward in subsequent phases of investigation because “no relevant concentrations of such component were detected.” However, Cr was retained because it is a compound required for leachability testing in the mud pits, was included in the original suite of groundwater constituents analyzed by the Parties, and had been found above applicable numerical remediation standards in multiple soil samples.
Copper	-	-	X	Cu was not tested by the Parties in soils and is not required in RAOHE for mud pit materials but was analyzed by the Parties in groundwater.
Lead	X	-	X	Pb is not required in RAOHE for mud pit materials.
Nickel	X	-	X	Ni is not required in RAOHE for mud pit materials.
Vanadium	X	X	-	V was not assessed in groundwater because there is no corresponding groundwater or drinking water standard, nor did the Parties test for this metal in their groundwater work.
Conductivity	-	X	X	Soil conductivity and pH were not retained for soils because these are indicator parameters only.
pH	-	X	-	

⁶³⁶ See Independent Expert Report, Table 3.1 for soils, Table 3.2 for mud pits, and Table 3.3 for groundwater.

⁶³⁷ Independent Expert Report, p. 44 & fn. 123, referring to IEMS, 2011, p. 31.

⁶³⁸ *Ibid.*, pp. 44-45.

(a) *Indicator Parameters*

538. Earlier in the proceeding, Perenco's expert, GSI, contended that the only reliable parameters that could be used to assess the impact of oilfield operations are TPH (crude oil), barium (drilling mud), and soil electrical conductivity (produced water). "*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 oil field material and was therefore not retained for further investigation.*"⁶³⁹ GSI's contaminant delineation methodology reflected this opinion; heavy metals that were not also found in the presence of an indicator compound were not identified as contaminants requiring further delineation and/or remedy and were not investigated.
539. In Mr. MacDonald's view, TPH, barium, and conductivity are useful indicators that, where elevated, suggest a potential impact on the environment resulting from petroleum operations. However, heavy metals may also be associated with well drilling operations, crude oil extraction and/or with formation water management. While Perenco asserted that its formation waters were reinjected, the potential exists for this material to have been discharged during its storage, conveyance and management. Therefore, the presence of heavy metals in soils at levels above background due to petroleum operations could not be entirely discounted. That said, where metals were found in absence of barium or TPH, special attention was considered to be merited to assess whether the detections are more likely to be attributable to oilfield activities or to natural background conditions.⁶⁴⁰

(b) *Conductivity and pH*

540. Mr. MacDonald concurred with IEMS and GSI that there was limited utility in using conductivity or pH as parameters to determine the presence or extent of contaminated soils. Electrical conductivity and pH were included in the assessment of mud pit materials (as required by RAOHE).⁶⁴¹

⁶³⁹ Independent Expert Report, p. 45 & fn. 124, referring to the Interim Decision on Counterclaim, paragraph 242.

⁶⁴⁰ *Ibid.*, pp. 45-46.

⁶⁴¹ *Ibid.*, p. 46.

7. Analyses

(a) Laboratory and Method Selection

541. Mr. MacDonald explained that selecting a laboratory for this project was challenging due to the limited availability of an adequate local facility that could complete all necessary tests, and which was also satisfactory to both Parties. In the end, ALS Environmental, based in Houston, Texas, was chosen based on its certifications, its having an office in Ecuador that could support sample handling and management, and its ability to manage the transport of the samples from the sites to its laboratory in Houston.
542. Mr. MacDonald sought to ensure that method selection adhered as closely as possible to those methods specified by Ecuador in RAOHE Annex 5 and TULAS. However, he noted, in some cases, the laboratory methods stipulated in the regulations were outdated. He therefore chose alternatives which, in his professional judgement were appropriate. Details on the sample management procedures and the methods for analysis used in his work are provided in Appendices D and E of his Report.

(b) Total Petroleum Hydrocarbons

543. Mr. MacDonald also gave consideration to the TPH methods selected for use at this site since the methods specified in RAOHE Annex 5 have largely been withdrawn and are no longer in professional use.⁶⁴² Two potentially suitable methods were used by the Parties in their investigations: IEMS used the Texas Natural Resources Conservation Commission (TNRCC) Method 1005, while GSI used SW846 8015C for soil and groundwater samples and TNRCC Method 1006 for soil samples. In consultation with the laboratory, Mr. MacDonald chose to use SW846 8015C for analysis of GRO (C6-C10), DRO (C10-C28), and ORO (C20-C35), so that the possible sources of the petroleum could be better

⁶⁴² *Ibid.*, p. 46 & fn. 126: The following methods and publications were referenced in RAOHE Annex 5, but were not selected for various reasons: (a) 6/1997 ECY 97-602 is not a method, but is a publication summarizing multiple TPH methods; (b) EPA 413.1 s used for measurement of oil and grease, not TPH; (c) EPA 418.1, which was applicable to TPH, was withdrawn by the USEPA in 2007 due to its use of Freon 113 as a solvent; (d) method 1664 (SGT-HIEM) is used for measurement of oil and grease, not TPH; (e) ASTM D3921-96 was withdrawn by ASTM in 2013, and not replaced due to its limited use by industry; and (f) German standard DIN 38409-H18 is inactive.

evaluated.⁶⁴³ To compare the results appropriately to the standards, he elected to add these fractions together to obtain a total TPH value. This technique has the potential for increasing the reported concentration of TPH in a sample due to overlapping carbons between the fractions. However, in Mr. MacDonald's professional opinion, this was a reasonable and conservative approach.

(c) *Metals*

544. All soil, groundwater and mud pit leachate samples were analysed for metals using USEPA Method SW6020A. Consistent with prior analyses conducted by the Parties' experts, only the following metals were analyzed: barium, cadmium, chromium, copper, lead, nickel, vanadium, and zinc.
545. RAOHE specifies a number of specific atomic absorption methods for the analysis of metals. In Mr. MacDonald's view, IEMS used such methods for metals analyses consistent with RAOHE. As for TPH, Ecuador allows for substitution of equivalent methods for metals analysis in place of those listed in Annex 5. As such, GSI used method 6010B, an inductively coupled plasma-atomic emission spectrometry method, for all metals. Ramboll's selected method 6020A, also performed via inductively coupled plasma mass spectrometry, was similar to that selected by GSI. All of the methods used by the Parties' experts and by Ramboll would be considered acceptable and equivalent pursuant to RAOHE.
546. TULAS does not identify specific methods, but rather indicates that they should be consistent with those specified within the Institute of Ecuadorian Normalization or by ASTM or the USEPA.

(d) *Leachability Testing*

547. Mr. MacDonald subjected mud pit samples to both TCLP and SPLP analyses ((EPA SW-846 1311 and 1312, respectively). The leachate generated would then be analysed for the

⁶⁴³ Independent Expert Report, p. 46 & fn. 127: Carbon ranges may vary slightly; those listed in the text were obtained from a fact sheet "Petroleum Hydrocarbon Ranges" presented by ALS, the laboratory used for this work.

parameters required in RAOHE Table 7: TPH, barium, cadmium, total chromium, and vanadium using the analytical methods described above; and PAHs, using USEPA Method 8270D.

(e) *Geotechnical Testing*

548. As part of the monitoring well installation, Mr. MacDonald's team collected soil samples from the screened interval in the water bearing zones for sieve and hydrometer analysis to define the percentage of clay in accordance with ASTM Methods and D6913 and D7928, respectively. (No geotechnical testing methods are specified in RAOHE or TULAS.)

8. Bounding of Scope and Site Screening

(a) *Key Scope Considerations*

549. Mr. MacDonald noted that he was mandated by the Tribunal to conduct additional soil, groundwater and mud pit sampling in the Blocks as needed to determine the presence and/or extent of contamination for which remediation is required. The scope of these activities was further bound as follows:⁶⁴⁴
- (i) Mr. MacDonald was directed only to consider areas at the sites that were previously investigated by the Parties. His investigation was not to include sampling either at new RECs that he may have independently identified, or at RECs previously identified by the Parties that had not been sampled.
 - (ii) Only one sampling programme was authorised by the Tribunal. As such, a multi-phased sampling approach as might be more typical to delineate contamination was not implemented. Therefore, Mr. MacDonald decided that by use of a "macro" sampling approach, the data that could be obtained from one field campaign would still serve to narrow the extent of potential contamination at the sites.

⁶⁴⁴ Independent Expert Report, p. 49.

- (iii) Mr. MacDonald also sought to identify usable data generated by prior work conducted by the Parties to avoid unnecessary duplication.
- (iv) He also determined it was not necessary to delineate every point where contamination was observed above a standard in soils. In some cases, the available data and other factors (*e.g.*, topography) were sufficient in his view to reasonably estimate remedial quantities even if not fully delineated in all directions. In other instances, the available data suggested that the “exceedance” was likely not related to oil field contamination but rather to probable background conditions.
- (v) Mr. MacDonald also determined that it was appropriate to analyse for the full metal suite in every sample where any metal was previously detected above applicable criteria, rather than to restrict the analysis to specific metal exceedances in each area investigated. He did not test samples for TPH if no TPH was suspected, based on prior data, nor did he test for metals if prior data suggested only the presence of hydrocarbons.

(b) *Site Screening*

550. Ramboll reviewed all data collected by the Parties for the purpose of developing a sampling programme in Blocks 7 and 21. Mr. MacDonald stated that the key consideration in this exercise was to determine appropriate screening criteria with respect to: (i) sites selected for additional sampling; (ii) data screens for various media or features, including soils, groundwater, and mud pits; and (iii) the basis and background for the additional site investigation approach.⁶⁴⁵ Along with Ramboll’s exercise of professional experience and judgement, this was considered appropriate to address what he called “*significant gaps in the overall technical analyses*” performed by the Parties’ experts.

⁶⁴⁵ *Id.*

551. A total of 69 sites were subjected to a “*desktop screening*” evaluation.⁶⁴⁶ Screening included consideration of:

- (a) The numerical criteria defined in RAOHE or, in its absence, TULAS, for unrestricted, agricultural, and industrial land uses;
- (b) Reassessment of land use designations by the Parties;
- (c) Location and quantity of temporary monitoring wells previously installed by the Parties;
- (d) The historical use of mud pits by Perenco; and
- (e) The nature of claims made on behalf of Ecuador.

552. Initial screening resulted in a proposed suite of work that flagged 38 sites for supplemental investigation, including 30 sites where soils were to be investigated, 14 sites where groundwater was to be investigated, and 9 sites where mud pits were to be investigated. Mr. MacDonald then eliminated the following from his initial workplan:⁶⁴⁷

- (a) 21 sites were eliminated from consideration because no damages claims were made in respect of them;⁶⁴⁸

⁶⁴⁶ Independent Expert Report, fn. 129: Mr. MacDonald used the total of 70 sites presented in IEMS’ cost estimate; however, Coca 2 and Coca CPF were considered as one site.

⁶⁴⁷ *Ibid.*, pp. 49-50.

⁶⁴⁸ *Ibid.*, fn. 130: “While numerous sites were included in IEMS’ initial financial claim (above the “base value”), some sites were ultimately excluded from their claim based on application of the regulatory criteria. All such sites were initially screened out from further investigations by Ramboll. During implementation of the investigation, Ecuador identified to Ramboll that some soil samples collected from sites where no regulatory claim was made may have exceeded regulatory criteria (see Appendix B). As a result, Ramboll re-examined these sites and where appropriate, expanded our program to include sites or areas of sites that had originally been omitted from the sampling program (e.g. Oso A).”

- (b) Eight additional sites were excluded because there were: (i) no groundwater claims; (ii) no evidence of mud pit use by Perenco; and (iii) no soil samples contained contamination above applicable soil cleanup criteria (excluding conductivity); and
- (c) Eight additional sites were excluded because: (i) contaminant delineation was near-complete; or (ii) only marginal exceedances of a single contaminant was detected.

553. As a result of further consultation with the Parties, the initial screening evaluation was expanded to incorporate additional facts and findings. The final results of the screening evaluation are presented in the subsections below.

(i) Sites Excluded from Further Consideration

554. Certain sites identified by GSI and IEMS did not require any supplemental investigation based on the results of the Parties’ previous work. The following sites did not require further testing for any media:⁶⁴⁹

Table 4.1 – Sites Omitted from Ramboll’s Investigation			
Block	Site	IEMS Claim (\$ millions) ¹	Rationale ²
CPUF	Coca 7	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
CPUF	Coca 11	1.8	No soil exceedances, Perenco mud pits, or prior groundwater sampling
CPUF	Coca 12	1.0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
CPUF	Coca 13	8.2	No soil exceedances, Perenco mud pits, or prior groundwater sampling
CPUF	Coca 15	11.0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
7	Gacela 3	0	IEMS claim limited to oil well closure (\$0.5 million); no soil exceedances, Perenco mud pits, or previous groundwater sampling
7	Gacela 6,9	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling

⁶⁴⁹ *Ibid.*, Table 4.1.

Table 4.1 – Sites Omitted from Ramboll’s Investigation

Block	Site	IEMS Claim (\$ millions) ¹	Rationale ²
7	Lobo 2	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
7	Mono 10/12	1.0	Soil exceedances limited to trace barium concentration adjacent to a mud pit not associated with Perenco; no previous groundwater sampling
7	Oso 2	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
CPUF	Payamino 5	4.9	Soil exceedances limited to trace vanadium concentration (background condition); no Perenco mud pits or prior groundwater sampling
CPUF	Payamino 6	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
CPUF	Payamino 9	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
CPUF	Payamino 18	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
CPUF	Payamino 19	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
21	Waponi – Dayuno	12.9	Site was abandoned prior to Perenco’s operations in the Blocks. IEMS cost estimate includes soil and groundwater remediation
21	Waponi – Ocatoe	2.3	No soil exceedances or Perenco mud pits. Previous groundwater sampling found only zinc above TULAS criteria. As zinc is a non-oil field parameter, and there were no other affected media, this exceedance was not considered for further evaluation.
21	Yuralpa - Puerto Napo	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
21	Yuralpa Pad B	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling
21	Yuralpa – Sumino 1	0.5	No soil exceedances, Perenco mud pits, or prior groundwater sampling
CPUF	Coca 7	0	No soil exceedances, Perenco mud pits, or prior groundwater sampling.

Notes

¹ Value of IEMS claim based on regulatory criteria obtained from 2013 IEMS cost estimates presented in Attachment 35. This information is presented to provide the Tribunal with a sense of scale as to the potential importance of the site to the overall matter; these claims did not drive Mr. MacDonald’s determination of whether to include or exclude a site from further consideration. The claims exclude costs for oil well closure.

² “No soil exceedances” means that upon reassessment of land use at the sites, no soil samples were found above the applicable numerical remediation criteria.

555. The initial desktop-based screening process reduced the total number of sites from 69 to 49 (an ~30% reduction in sites requiring review). The next step was to identify the environmental media to be sampled at each of the 49 sites. The tables below provide Mr. MacDonald’s rationale for the exclusion of soil, groundwater, and/or mud pit investigations at specific sites based on his review of the available data.

(ii) Soils Excluded from Further Consideration

556. The table below summarises those sites where Mr. MacDonald considered that further evaluation was appropriate for mud pits and/or groundwater, but no additional testing of soils was merited. Rationales for the exclusion of the soil medium are provided for each site.⁶⁵⁰

Block	Site	IEMS Soil Claim		Adjusted Soil Claim (\$ millions)	Rationale ³
		\$ millions ¹	% Associated with Mud Pit ²		
7	Jaguar 9	38.3	0%	38.3	No exceedances of soil regulatory criteria when correct land use applied (e.g. industrial criteria on platform and excluding samples collected from inside mud pits).
7	Lobo 3,5,6,7	3.6	100%	0	No exceedances of soil regulatory criteria. IEMS claim was restricted to area of mud pit.
7	Oso 3-7, 13-14	0	0%	0	No exceedances of soil regulatory criteria. Site only considered due to Perenco mud pit.
7	Oso 9,12,15-20	22.3	100%	0	No exceedances of soil regulatory criteria. IEMS claim was restricted to area of mud pit.
CPUF	Payamino 13	0	0%	0	No exceedances of soil regulatory criteria. Site only

⁶⁵⁰ *Ibid.*, Table 4.2.

Table 4.2 – Sites Where Soils Not Further Investigated

Block	Site	IEMS Soil Claim		Adjusted Soil Claim (\$ millions)	Rationale ³
		\$ millions ¹	% Associated with Mud Pit ²		
					considered due to previous groundwater testing.
21	Yuralpa LF	7.8	100%	0	No exceedances of soil regulatory criteria (all prior samples above soil criteria collected from mud pits, although IEMS attributed 0% to the pits in its memorandum).
21	Yuralpa Pad E	2.6	100%	0	No exceedances of soil regulatory criteria. IEMS claim was restricted to area of mud pit.
21	Yuralpa Pad G	2.7	100%	0	No exceedances of soil regulatory criteria. IEMS claim was restricted to area of mud pit.

Notes

¹ IEMS claim obtained from regulatory-based soil remediation cost reported in IEMS 2013, Attachment 35.

² Percentage of mud pit as presented by IEMS in a 22 November 2017 email from Gabriela González Giráldez to Marco Tulio Montañés-Rumayor.

³ Previous soil samples met all numerical regulatory criteria when the industrial criteria were applied on the platform and the sensitive ecosystem or agricultural criteria were applied off the platform, as appropriate.

557. In Mr. MacDonald’s judgement, the sites listed above did not require further soils sampling because the available documentation showed no evidence of soils exceeding the most stringent applicable Ecuadorian regulatory criteria.⁶⁵¹ Most of the claims associated with the sites listed above were limited to mud pits, with “exceedances” reported by IEMS limited to soil samples collected from within mud pit boundaries.

(iii) Mud Pits Excluded from Further Consideration

558. Platforms containing mud pits to be assessed for physical integrity, conformance to the RAOHE performance criteria, and cover material integrity and quality were selected based on: (i) whether mud pits were present at a given site; and (ii) whether or not there was evidence of prior use by Perenco, as based on the timing of mud pit closure (where known)

⁶⁵¹ *Ibid.*, p. 53.

and oil production well installation (where pit closure dates were not available); and (iii) other information provided by the Parties, including discussions with the Parties' representatives in the field. Mr. MacDonald's assessment of those mud pits that were associated with Perenco was provided to the Parties for confirmation.

559. Mr. MacDonald also reviewed documentation presented by IEMS regarding the reworking of wells, which IEMS had alleged may have resulted in residuals that required disposal. There was no record of on-site disposal of these residuals for any of the reworking activities as described in the attached reports; therefore, Mr. MacDonald did not suspect any mud pits of being "re-opened" for such activities. He also reviewed available leachability testing data presented by GSI to determine if prior sampling and data evaluation, having regard to RAOHE Tables 7a/7b, had been adequately conducted. While he considered that the previous testing had some utility, in all cases, additional testing was needed to assess the conditions of the pits.

560. The sites where mud pit testing was not proposed are listed below:⁶⁵²

Table 4.3 – Sites Where Mud Pits Not Further Investigated					
Block	Site	IEMS Mud Pit Claim \$ millions ¹	Oil Well Installation	Mud Pit Closure Date	Rationale
CPUF	Coca 1	0	1/1971	n/a	No mud pits at site
CPUF	Coca 2, CPF	1.3	12/1988	3/2001	Perenco use not identified
CPUF	Coca 4	0	1/1990	6/1997	Perenco use not identified
CPUF	Coca 6	0	10/1989	unknown	Perenco use not identified
CPUF	Coca 8	2.3	8/1991	unknown	Perenco use not identified
CPUF	Coca 9	0	1/1993	n/a	No mud pits at site
CPUF	Coca 10, 16	0	9/1993	unknown	Perenco use not identified
7	Gacela CPF, 1 and 8	0.7	2/1991	unknown	Perenco use not identified
7	Gacela 2	0	6/1992	2/1998	Perenco use not identified
7	Gacela 4	1.3	3/1994	unknown	Perenco use not identified
7	Gacela 5	2	9/1994	unknown	Perenco use not identified

⁶⁵² *Ibid.*, Table 4.3.

Table 4.3 – Sites Where Mud Pits Not Further Investigated					
Block	Site	IEMS Mud Pit Claim \$ millions ¹	Oil Well Installation	Mud Pit Closure Date	Rationale
7	Jaguar 1	0	1/1988	unknown	Perenco use not identified
7	Jaguar 2	8.9	12/1988	unknown	Perenco use not identified
7	Jaguar 3	0	1/1994	1/1994	Perenco use not identified
7	Jaguar CPF, 5 Camp	0	1/1996	7/1996	Perenco use not identified
7	Jaguar 7,8	0	2/1996 6/1996	10/1996	Perenco use not identified
7	Lobo 1	0	2/1989	unknown	Perenco use not identified
7	Mono CPF, 1-5, IW	0	Various 1989-1997	9/1996	Perenco use not identified
7	Mono Sur, 6-9, 11	0	Various 1996-1997	unknown	Perenco use not identified
7	Oso 1, CPF	0	9/1970	unknown	Perenco use not identified
CPUF	Payamino CPF, 1	0	11/1986 (1) 1992 (CPF)	3/2001	Perenco use not identified Pits at the site were used for produced water from CPF, not drilling mud.
CPUF	Payamino 2 & 8	0	5/1987 9/1992	Unknown 8/1993	Perenco use not identified
CPUF	Payamino 3	2.2	8/1987	unknown	Perenco use not identified
CPUF	Payamino 4	10.9	7/1988	unknown	Perenco use not identified
CPUF	Payamino 14, 20, 24		5/1994 6/1994 5/2001	9/1994 Unknown 12/2001	Perenco use not identified
CPUF	Payamino 10	1.7	3/1993	6/1993	Perenco use not identified
CPUF	Payamino 13	0	10/1993	unknown	Perenco use not identified
CPUF	Payamino 15	2.0	12/1993	unknown	Perenco use not identified
CPUF	Payamino 21	0	10/1994	n/a	No mud pits at site (mud disposed at Payamino 16 IW)
CPUF	Payamino 23	0.8	5/1997	8/2000	Perenco use not identified

Table 4.3 – Sites Where Mud Pits Not Further Investigated					
Block	Site	IEMS Mud Pit Claim \$ millions ¹	Oil Well Installation	Mud Pit Closure Date	Rationale
CPUF	Punino 1	1.2	12/1990	unknown	Perenco use not identified
21	Waponi - Nemoca 1	0	12/1999	2/2000	Perenco use not identified
21	Yuralpa Pad D	0	8/2006	n/a	Two existing pits are lined and unused. The pits reportedly contained mud/cuttings that had been removed and transferred to the Yuralpa LF.
Notes					
¹ Perenco's site operations were conducted from 9/2002 – 7/2009.					

(iv) Groundwater Excluded from Further Consideration

561. As instructed by the Tribunal, Mr. MacDonald limited his groundwater sampling activities to those sites where prior testing had been performed by the Parties.⁶⁵³ Additionally, he excluded three sites where testing had been conducted, but in his judgement further testing was not merited (two of these sites were completely omitted from his programme). His reasons for this were as follows:

- (i) The Waponi-Ocatoe site was excluded from further investigation because prior testing by IEMS had identified only the presence of zinc above the applicable TULAS standard (zinc at 1.38 mg/L). Zinc is not an oil field contaminant, and no other media at this site indicated the potential presence of oil field contaminants.
- (ii) The Waponi-Dayuno site was entirely excluded because, although groundwater was sampled previously by IEMS, Perenco never operated on this platform.

⁶⁵³ *Ibid.*, fn. 131: Mr. MacDonald notes that in correspondence dated 14 November 2017, Perenco raised some concerns regarding the groundwater approach, including issues related to both the locations of monitoring wells and the use of filtration. These matters were addressed in his correspondence dated 28 December 2017 (found at Appendix B to his report).

(iii) The Yuralpa Landfill site was tested by IEMS only. GSI had attempted to install a test well at this facility, but experienced refusal prior to encountering groundwater. Mr. MacDonald excluded this site because it was the only groundwater location in Block 21, based on GSI's experience there was a low probability of success, and the work would have necessitated the mobilisation of different drilling equipment, which was not readily available, to the Block.⁶⁵⁴

562. All other sites where groundwater was sampled by the Parties remained in the supplemental programme.

(c) *Outcome of Screening Evaluation*

563. The desktop screening process resulted in a reduction of the number of sites warranting investigation of soils, mud pits, and/or groundwater from 69 to 49 sites. The sites and media that were omitted from further review were associated with IEMS' remediation cost estimates totaling \$119.5 million, or 13.6% of the total regulatory-based claim of \$876 million.

564. Table 4.4 of Mr. MacDonald's report lists the sites and environmental media that were further investigated, as well as the approximate amount of the IEMS regulatory-based claims associated with those facilities.

Platform	Media in Supplemental Investigation			IEMS Remediation Cost Estimate (\$Millions)					% of Total Claim
	Soil	Mud Pit	GW	Soil	Mud	GW ¹	Oil Wells	Total	
Coca 1	■			29.7	0.0	0.0	0.0	29.7	3.39
Coca 2, CPF	■		■	82.1	1.3	4.6	0.0	88.1	10.05
Coca 4	■			3.6	0.0	0.0	0.0	3.6	0.41
Coca 6	■			10.0	0.0	0.0	0.0	10.0	1.14
Coca 7				0.0	0.0	0.0	0.0	0.0	0.00
Coca 8	■			35.9	2.3	0.0	0.0	38.2	4.37
Coca 9	■			23.0	0.0	0.0	0.0	23.0	2.63

⁶⁵⁴ *Ibid.*, p. 56.

Table 4.4 – Sites and Media Included in Ramboll’s Supplemental Investigation²

Platform	Media in Supplemental Investigation			IEMS Remediation Cost Estimate (\$Millions)					% of Total Claim
	Soil	Mud Pit	GW	Soil	Mud	GW ¹	Oil Wells	Total	
Coca 10, 16	■			0.3	0.0	0.0	0.0	0.3	0.03
Coca 11				1.8	0.0	0.0	0.0	1.8	0.21
Coca 12				0.1	0.9	0.0	0.0	1.0	0.12
Coca 13				8.2	0.0	0.0	0.0	8.2	0.93
Coca 15				11.0	0.0	0.0	0.0	11.0	1.25
Coca 18, 19	■	■		29.4	4.0	0.0	0.0	33.4	3.82
Cóndor N 1	■	■		25.3	2.8	0.0	0.5	28.7	3.27
Gacela 1, 8, CPF	■		■	23.2	0.7	4.6	0.0	28.5	3.25
Gacela 2	■		■	17.4	0.0	2.3	0.5	20.2	2.31
Gacela 3				0.0	0.0	0.0	0.5	0.5	0.06
Gacela 4	■			0.0	1.3	0.0	0.0	1.3	0.15
Gacela 5	■			0.0	2.0	0.0	0.0	2.0	0.23
Gacela 6, 9				0.0	0.0	0.0	0.0	0.0	0.00
Jaguar 1	■		■	1.0	0.0	2.3	0.0	3.3	0.38
Jaguar 2	■		■	5.3	8.9	2.3	0.5	17.0	1.94
Jaguar 3	■			12.0	0.0	0.0	0.0	12.0	1.37
Jaguar 5, Camp, CPF	■			0.3	0.0	0.0	0.0	0.3	0.04
Jaguar 7, 8	■			38.6	0.0	0.0	0.5	39.1	4.47
Jaguar 9		■		38.3	0.0	0.0	0.5	38.8	4.43
Lobo 1	■			1.5	0.0	0.0	0.0	1.5	0.17
Lobo 2				0.0	0.0	0.0	0.0	0.0	0.00
Lobo 3, 5, 6, 7		■		0.0	3.6	0.0	0.0	3.6	0.41
Lobo 4	■			0.0	0.0	0.0	0.5	0.5	0.06
Mono 1-5, CPF, IW	■		■	103.7	0.0	2.3	0.0	106	12.11
Mono Sur, 6-9, 11	■			11.5	0.0	0.0	0.0	11.5	1.31
Mono 10, 12				0.0	1.0	0.0	0.0	1.0	0.11
Oso 1, CPF	■			22.6	0.0	0.0	0.0	22.6	2.58
Oso 2				0.0	0.0	0.0	0.0	0.0	0.00
Oso 3-7, 13-14		■		0.0	0.0	0.0	0.0	0.0	0.00
Oso 9, 12, 15-20		■	■	0.0	22.3	2.3	0.0	24.6	2.80
Oso A, 21, 22, 23	■			0.0	0.0	0.0	0.0	0.0	0.00
Payamino 1, CPF	■		■	40.1	0.0	2.3	0.0	42.43	4.83
Payamino 2, 8	■		■	31.9	0.0	2.3	0.0	34.2	3.90

Table 4.4 – Sites and Media Included in Ramboll’s Supplemental Investigation²

Platform	Media in Supplemental Investigation			IEMS Remediation Cost Estimate (\$Millions)					% of Total Claim
	Soil	Mud Pit	GW	Soil	Mud	GW ¹	Oil Wells	Total	
Payamino 3	■			0.0	2.2	0.0	0.0	2.2	0.25
Payamino 4	■		■	34.3	0.0	2.3	0.0	36.6	4.18
Payamino 5				4.0	0.9	0.0	0.0	4.9	0.56
Payamino 6				0.0	0.0	0.0	0.0	0.0	0.00
Payamino 9				0.0	0.0	0.0	0.0	0.0	0.00
Payamino 10	■			0.0	1.7	0.0	0.0	1.7	0.19
Payamino 13			■	0.0	0.0	2.3	0.0	2.3	0.26
Payamino 14, 20, 24	■		■	21.2	10.9	2.3	0.0	34.4	3.93
Payamino 15	■		■	0.0	2.0	2.3	0.0	4.3	0.49
Payamino 16	■			10.5	2.6	0.0	0.0	13.1	1.50
Payamino 18				0.0	0.0	0.0	0.0	0.0	0.00
Payamino 19				0.0	0.0	0.0	0.0	0.0	0.00
Payamino 21	■			2.0	0.0	0.0	0.0	2.0	0.22
Payamino 23	■			0.0	0.8	0.0	0.0	0.8	0.09
Payamino LF	■	■		0.0	26.5	0.0	0.0	26.5	3.02
Punino 1	■			1.4	1.2	0.0	0.0	2.6	0.30
Waponi Dayuno				10.6	0.0	2.3	0.0	12.9	1.47
Waponi Nemoca 1	■			15.1	0.0	0.0	0.0	15.1	1.72
Waponi Ocatoe				0.0	0.0	2.3	0.0	2.3	0.26
Yuralpa Chonta	■	■		0.0	1.1	0.0	0.0	1.1	0.13
Yuralpa Pad A	■	■		1.7	0.0	0.0	0.0	1.7	0.19
Yuralpa Pad B				0.0	0.0	0.0	0.0	0.0	0.00
Yuralpa Pad D	■			7.9	0.0	0.0	0.0	7.9	0.91
Yuralpa Pad E		■		0.0	2.6	0.0	0.0	2.6	0.30
Yuralpa Pad F / CPF	■			0.0	0.0	0.0	0.0	0.0	0.00
Yuralpa Pad G		■		0.0	2.7	0.0	0.0	2.7	0.31
Yuralpa LF		■		0.0	7.8	2.3	0.0	10.1	1.16
Yuralpa Puerto Napo				0.0	0.0	0.0	0.0	0.0	0.00
Yuralpa Sumino 1				0.5	0.0	0.0	0.0	0.5	0.06
Included in Ramboll Investigation	41	12	13	\$642.4	\$76.1	\$34.4	\$3.5	\$756.4	86.4%
Excluded	28	57	56	\$74.5	\$38.1	\$6.9	\$0.0	\$119.5	13.6%
Total	69	69	69	\$716.9	\$114.2	\$41.3	\$3.5	\$875.9	100%

Table 4.4 – Sites and Media Included in Ramboll’s Supplemental Investigation²

Platform	Media in Supplemental Investigation			IEMS Remediation Cost Estimate (\$Millions)					% of Total Claim
	Soil	Mud Pit	GW	Soil	Mud	GW ¹	Oil Wells	Total	

Notes:

¹ The IEMS cost estimates for groundwater remediation provided in Table 35 of its 2013 Expert Report are the low-end groundwater cost estimates (\$2.3 million per site, with those for Coca 2/CPF and Gacela 1/8/CPF doubled to reflect multi-platform site designations). The high-end IEMS estimates for groundwater, with contingencies included, were \$13.5 million per site. These higher values were referenced in IEMS’ reports, but were not included in Table 35, so were not incorporated here.

² Blue-shaded cells represent IEMS cost estimates that have been excluded from further review (refer to Sections 4.2.2 and 4.2.3. of Mr. MacDonald’s report). Dark-shaded rows represent sites that have been excluded from further review (refer to Section 4.2.1 of report).

9. Sampling Results

565. Mr. MacDonald’s site-specific sampling plans were prepared for each site and medium that was retained for consideration after completing the screening. The guiding principles for these plans are described in summary under Section 5.1 of his Report and in greater detail in Appendices D and E.

566. Between 19 September to 15 December 2017, teams were mobilised to Blocks 7 and 21 to implement the site-specific sampling plans under Mr. MacDonald’s direction. The summary of his findings is set out below.

(a) *Mud Pits*

Table 5.1: Summary of Mud Pit Investigation Findings											
Site	Mud Pit #	Exceedances of Leachability Criteria for Lined Pits					Exceedances of Applicable Soil Criteria for Cover Material (Totals Analysis)				
		Ba	TPH	PAH	pH	Cond	Ba	Cd	Ni	TPH	Criteria
Chonta ⁽¹⁾	1								X		Ind
	5	X		Y	X		X		X		Eco
Coca 18, 19 ⁽²⁾	2	X	X	Y							Ind
	3	X		Y							Ind
	4	X			X						Ind
	5	X		X							Ind
	6				X						Eco
Cóndor Norte	1				X						Eco
	2	X					X				Eco
	3						X				Eco
Jaguar 9	1				X		X	X	X		Eco
Lobo 3	1										Ind
	2				X						Ind
Oso 3	1	X					X				Ind
Oso 9 ⁽³⁾	1	X		X							Ag
	3	X	X	Y							Ag
	5	X	X	Y	X						Ag
	6			X	X						Ag
	7			Y	X	X	X				Ag
	8										Ag
	9			X		X					Ag
Oso 9A	Area 1				X						Eco
	Area 2				X		X				Eco
	Area 3				X		X				Eco
	Area 4	X					X				Eco
Oso 9B	Area 1	X			X		X				Eco
	Area 2		X		X					X	Eco
	Area 3				X		X				Eco
Payamino LF	1	X			X		X				Ind
Yuralpa A	1	X	Y	Y	X	X	X				Eco
	2										Ind
	3				X						Ind
Yuralpa E	1				X		X				Ind

Table 5.1: Summary of Mud Pit Investigation Findings											
Site	Mud Pit #	Exceedances of Leachability Criteria for Lined Pits					Exceedances of Applicable Soil Criteria for Cover Material (Totals Analysis)				
		Ba	TPH	PAH	pH	Cond	Ba	Cd	Ni	TPH	Criteria
Yuralpa G	1						X				Ind
	2	X		Y	X		X				Ind
	3				X						Ind
Yuralpa LF	1	X			X		X				Eco
	2	X		X			X		X		Eco
	3	X		Z	X		X				Eco
Subtotals for TCLP Parameters (Exceedance of One Parameter within One Mud Pit)											
% (of 39 Mud Pits)		18	5	13	23	3	19	1	4	1	
		46%	13%	33%	59%	8%	49%	3%	10%	3%	
% (of 12 Sites)		9	3	6	11	2	10	1	3	1	
		75%	25%	50%	92%	17%	83%	8%	25%	8%	
Subtotals for Sites (Exceedance of at least One TCLP Parameter within at least One Mud Pit)											
% (of 39 Mud Pits)		33					21				
		85%					54%				
% (of 12 Sites)		12					10				
		100%					83%				
Notes:											
¹ X = exceeds using TCLP Extraction only; Y = exceeds using TCLP and SPLP; Z = exceeds using SPLP Extraction only											
² All of the above data was generated from testing conducted by Ramboll, except the following:											
<ul style="list-style-type: none"> • At Lobo 3, Mud Pit 1, GSI also conducted testing. Their results were consistent with Ramboll's • At Oso 9, Mud Pits 1, 3, and 6 were tested by GSI only • At Yuralpa Pad A, Mud Pit 1, GSI also conducted testing. They identified only pH and conductivity in the mud pit material in excess of the leachability criteria, and barium in excess of the soil remediation criteria as applied to cover material. 											
³ The above table presents only the results of TCLP testing. Results of the SPLP testing are separately addressed in Section 6.											
⁴ Mud Pits 2, 3, and 4 at Chonta are not associated with Perenco operations.											
⁵ Mud Pit 1 at Coca 18/19 is not associated with Perenco operations.											
⁶ At Lobo 3, two additional samples (LOB03-MP04 and LOB03-MP05) were collected along the southeast fence line due to conflicting records on the alignment of the mud pits at the site. Ramboll's field observation and sampling results suggest that these samples were not collected from mud pits and confirm the alignment of the mud pits.											
⁷ Mud Pits 2 and 4 at Oso 9 are associated with Perenco but were not investigated by Ramboll or the Parties. These two mud pits are likely to contain contamination similar to that found in neighboring Mud Pit 1 and Mud Pits 3 and 5, respectively.											
⁸ Cadmium, chromium, and vanadium were tested but not detected above the most stringent leachability criteria in any of the mud pit material samples.											
⁹ Chromium, lead, and vanadium were not detected above the most stringent applicable soil remediation criteria in any of the soil cover samples.											

567. In general, the following can be concluded from the mud pit investigation:

- (a) Mr. MacDonald concluded that no information was provided that was sufficient to confirm that synthetic or clay liners are present beneath any specific mud pit. Ramboll did not drill through the bottom of the mud pits to determine the presence or absence of liner material, since this would have compromised the units if the liners were present. In some cases, Ramboll did observe torn liner material along some mud pit perimeters but had no information regarding its condition or lateral extent in the rest of the mud pit. Therefore, Mr. MacDonald decided that, without exception, the leachability testing data should be conservatively compared to the standards for unlined mud pits presented in RAOHE Table 7a.
- (b) The current land use in the area of each mud pit was identified as part of Ramboll's site assessment activities. The cover material analytical data were compared to the industrial, agricultural, or sensitive ecosystem/residential criteria in TULAS Table 3, Annex 2, and RAOHE Table 6, as applicable.
- (c) At least one mud pit did not meet the performance criteria at the 12 sites investigated. Thirty-three of the 38 mud pits investigated by the Independent Expert did not meet the performance criteria for unlined mud pits specified in RAOHE (87%) and 14 of the 38 mud pits did not meet the performance criteria for lined pits specified in RAOHE (37%). Contaminants that did not comply with the performance criteria included pH, barium, total PAHs, TPH and conductivity. These mud pits, as well as two additional mud pits located at Oso 9 that were not investigated but are inferred to contain contamination similar to that found in neighbouring mud pits that failed one or more criteria, are considered to require remediation.
- (d) The materials overlying 21 of the 38 investigated mud pits did not meet the soil remediation criteria applicable to soils based on determination of the applicable land use in the area. Contaminants that exceeded the criteria included barium, nickel, cadmium and TPH. In almost all cases (19 of 21 total mud pits), barium was the contaminant of concern that did not meet the criteria. This, in Mr. MacDonald's

opinion, suggests a high probability that the mud pit cover material is inadequate or nonexistent and that the mud pit materials are at or near the ground surface.

- (e) When reviewed in totality, 100% of the sites that were investigated had at least one mud pit that did not comply with the leachability standards published in RAOHE (12/12 sites). In addition, 83% of the sites had at least one mud pit with inadequate cover material (10/12).

568. Mr. MacDonald identified the following site-specific findings as of particular interest:

- (a) In Cóndor Norte, a slope failure was observed immediately adjacent to the mapped limits of the mud pits. Based on field observations, it appears that the slope failure envelope may extend into the mud pit.
- (b) In Coca 18/19, the data suggest that the extent of Mud Pit 6 is greater than the area previously mapped by the Parties.
- (c) In Lobo 3, the locations of the mud pits were not initially clear. Ramboll inspected the area and collected vertical composite samples along both the southwest and southeast edges of the pad to confirm the mud pit locations. It was determined that the mud pits are located along the southwest edge of the pad.
- (d) Oso 9A slopes from the northeast to the southwest and is bound by steep slopes to the north and east. In the northeastern portion of the site, there is evidence of slope failure. Torn black plastic, possibly related to a liner system, was observed in the southwest portion of the site.

(b) Groundwater

569. Between 13 November and 14 December 2017, Ramboll collected samples from 34 permanent monitoring wells installed at 12 sites. The samples were analysed for TPH and metals as described above. The findings are presented in Table 5.2 of Mr. MacDonald's Report.

Table 5.2: Summary of Groundwater Investigation Findings						
Site	Well Location (Proximate to REC#)	Well ID	Lithology	Turbidity	Exceedances of Applicable GW Criteria	
			% Clay	NTU	Ba	TPH
Coca 2, CPF	Adjacent to mud pit (02-335)	COC02-MW01	15.1	2.7	X	X
	Adjacent to formation water pit (CPF-352)	COC02-MW02	14.3	0.0		X
	OW/API Separator discharge; swamp (CPF-354/357)	COC02-MW03	18.9	0.0		X
		COC02-MW04	3.2	0.0		X
		COC02-MW05	7.8	0.0		X
Gacela 1, CPF	West of platform (no REC)	GAC01-MW01	26.2	1.5	X	X
	Spill to creek SW of platform (02-371/1Y8-195/201)	GAC01-MW02	18.2	3.6	X	X
Gacela 2	West of platform and mud pit (no REC)	GAC02-MW01	32.6	13.5		X
	SW of platform and mud pit (02-369/02-422)	GAC02-MW02	65.8	13.3		X
Jaguar 1	NW of platform (no REC)	JAG01-MW01 ³	8.9	1.2		
	West of platform (1-311)	JAG01-MW02	13.9	0.3		X
Jaguar 2	Adjacent to mud pit (2-314/315)	JAG02-MW01	-	13.8		X
	West of mud pit (2-314/315)	JAG02-MW02 ⁴	57.3	1.2		
	NW of platform (2-298)	JAG02-MW03	30.8	7.8		X
Mono 1, CPF	North of platform (112)	MON01-MW01	34.1	0.0	X	X
	NE of platform (111)	MON01-MW02	14.9	0.0		
	East of platform in mud discharge area (105/CPF-400)	MON01-MW03	38.8	0.0	X	X
	South of platform (CPF-486)	MON01-MW04	18.2	4.2	X	X
Oso 9	West of mud pits (9-331/340)	OSO09-MW01	4.9	7.6		
	Adjacent to mud pits 1-9 (9-331/340)	OSO09-MW02	13.9	0.9		X
Payamino 1, CPF	West of fire water pond	PAY01-MW01	13.0	12.6		X
	Catchment area	PAY01-MW02	28.0	7.1		X
	NW of CPF (CPF-166)	PAY01-MW03	16.4	5.4		
Payamino 2 / 8	Swamp NE of mud pit (143 / 2Y8-351/435)	PAY02-MW01	22.7	13.2	X	X
	Swamp NE of mud pit (143 / 2Y8-351/435)	PAY02-MW02	49.3	0.0	X	
	Swamp east of platform (143 / 2Y8-351/435)	PAY02-MW04	50.3	0.0		X
Payamino 4 / Payamino 14/20/24	River access road, NE (04-114)	PAY04-MW01	-	3.1	X	X
	River access road at site corner (04-114)	PAY04-MW02	6.6	0.0	X	X
	Oil-contaminated area NW of Pay-14/20/24 and SW of mud pit	PAY04-MW03	16.5	0.0	X	X

Table 5.2: Summary of Groundwater Investigation Findings						
Site	Well Location (Proximate to REC#)	Well ID	Lithology	Turbidity	Exceedances of Applicable GW Criteria	
			% Clay	NTU	Ba	TPH
	Adjacent to mud pit (no REC)	PAY14-MW01	7.6	13.7		
Payamino 13	SW of platform (No REC)	PAY13-MW01	15.5	0.0		X
	South of platform (No REC)	PAY13-MW02	23.0	12.1	X	X
Payamino 15	East of platform (No REC)	PAY15-MW01	30.4	9.8	X	X
	Adjacent to mud pit (111)	PAY15-MW02	32.8	0.0		
Total Wells with a TPH and/or Barium Exceedance						
% (of 34 wells – includes all)					13	25
					38%	74%
Totals Sites with at least One Well with a TPH and/or Barium Exceedance						
% (of 12 sites – includes all)					7	12
					58%	100%
Notes:						
¹ To assist in well location orientation, Ramboll has provided REC# as identified by one or both Parties.						
² At the time of sample collection, sheens and petroleum odors were observed in the samples collected from the following monitoring wells: COC02-MW01, COC02-MW02, COC02-MW03, and COC02-MW04, GAC01-MW02, JAG02-MW01, MON01-MW01, MW02, MW03, MW04, OSO09-MW02, PAY01-MW01, PAY02-MW01, PAY02-MW02, PAY02-MW04, PAY04-MW03, PAY13-MW01, PAY13-MW02 and PAY15-MW02.						
³ The TPH concentration in sample JAG01-MW01 was at the applicable criteria (325 ug/L).						
⁴ Sample JAG02-MW02 was analyzed for TPH using method TX1005 instead of method US EPA Method 8015. The detection method for this sample (450 ug/L) exceeded the applicable criteria of 325 ug/L.						

570. In general, the following can be concluded:

- (a) Mr. MacDonald considered that Ramboll’s well construction and sampling techniques allowed it to produce non-turbid, unfiltered groundwater samples that accurately represent the chemical quality of groundwater at the sites. In all cases, sampled groundwater was observed to be clear and free of sediments and/or clouding and had a low turbidity (*i.e.*, less than 14 NTU, and in most cases below 10 NTU).
- (b) Ramboll collected soil samples from the water bearing zones at each well to assess the clay content in the screened interval. This sampling was done, in part, to determine if there was some correlation between clay content and turbidity levels, and to address a reference in TULAS with respect to groundwater criteria. While the clay content varied between locations within and across sites, groundwater was produced in all wells and there seems to be little correlation between the clay content and the turbidity levels as determined from well sampling activities. The

relevance of these findings is discussed further in Section 6.1 of Mr. MacDonald's Report.

- (c) Based on Ramboll's sampling results, TPH contamination in groundwater above the TULAS standard is present in all 12 investigated sites, and in 74% of sampled monitoring wells. The maximum observed concentration of TPH was 1915 µg/L at Payamino 2/8, as compared to the TULAS criterion of 325 µg/L. Barium is found at 58% of the sites, and in 38% of the sampled wells. The maximum observed concentration of barium was 4700 µg/L at Gacela 1, as compared to the criterion of 338 µg/L. No other contaminants of concern were identified in the monitoring wells.

(c) *Soils*

571. Between 19 September and 15 December 2017, Ramboll collected and analysed 801 soil samples from 40 sites. These samples were collected from locations intended to delineate areas of known soil contamination exceeding Ecuador's numerical criteria in TULAS (Table 3 of Annex 2) or RAOHE (Table 6) and to address significant data gaps. In general, Mr. MacDonald found that the aggregate exceedances of concentration criteria for soils do not directly correspond to the severity of contamination at a site or the need for site remediation. However, Mr. MacDonald made two key observations which apply to the totality of the soil data:

- (a) The data collected by Ramboll fills data gaps and supplements data previously gathered by the Parties that indicated oilfield related contamination, primarily barium and TPH. It can, in his opinion, be relied upon to estimate remedial footprints.⁶⁵⁵
- (b) Elevated cadmium and vanadium concentrations are found throughout the Blocks. As determined through background evaluations conducted by both the Parties and Ramboll, these concentrations largely appear to Mr. MacDonald to be associated

⁶⁵⁵ *Ibid.*, p. 78.

with natural background conditions.⁶⁵⁶ Particularly for vanadium, the distribution of this metal appears to be both widespread and random, with a wide range of naturally occurring concentrations. There are a few cases where cadmium and vanadium were found at concentrations above the calculated background concentrations. In such instances, delineation sampling of these compounds was conducted.

(i) *Block 7*

572. For Block 7, Ramboll's findings were as follows.⁶⁵⁷
573. **Coca 1:** Soil exceedances in the low-lying swampy area southwest of the platform (REC 330; historical discharge) were delineated by samples at borings COC01-01 through COC01-06. Petroleum odor was noted in subsurface soils at COC01-02 and COC01-05. Neither TPH nor barium were detected above the agricultural criteria in any of the samples. However, vanadium (up to 180 mg/kg) exceeded the regulatory criterion to the southwest portion of this area. In combination with topographical features, the data provides an adequate framework for establishing a remedial footprint.⁶⁵⁸
574. **Coca 2 / CPF:** Within the areas investigated by Ramboll, the prior TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around four main areas:⁶⁵⁹
- (a) TPH in the area southwest of the platform / CPF (REC 40; oil-water separator discharge) was delineated by samples at borings COC02-01 through COC02-03 as TPH did not exceed the applicable criterion in any of the samples.

⁶⁵⁶ *Ibid.*, p. 78.

⁶⁵⁷ *Ibid.*, Section 5.3.3.1.

⁶⁵⁸ *Ibid.*, pp. 78-79.

⁶⁵⁹ *Ibid.*, p. 79.

- (b) TPH in the area north of the former formation water pit (REC 352) was delineated by samples at borings COC02-04 and COC02-05 as TPH did not exceed the applicable criterion in any samples.
 - (c) TPH in the swampy area southeast of the platform / CPF (REC 354; historical discharge to swamp) was delineated by samples at borings COC02-06 through COC02-15 and COC02-18159 as TPH did not exceed the applicable criterion in any of the samples. It should be noted, though, that petroleum odor and staining were noted in subsurface soils at COC02-11 and COC02-14.
 - (d) TPH in the area west of the Coca 2 mud pit (REC 335), where slight petroleum odor was noted during well installation next to the mud pit, was investigated by samples at borings COC02-16 and COC02-17. TPH did not exceed the applicable criterion in any of the samples.
575. **Coca 4:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: Barium in soils in the swampy area east of the platform (REC 244; oil-water separator discharge) were delineated by samples at borings COC04-01 through COC04-04 as barium did not exceed the sensitive ecosystem / residential criterion in any of the samples.⁶⁶⁰
576. **Coca 6:** Within the areas investigated by Ramboll, the prior barium and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around two main areas:⁶⁶¹
- (a) The area southeast of the platform (not associated with a specific REC), which is a relatively flat area topographically higher than the swamp area, was further investigated by samples at borings COC06-01 through COC06-04, primarily to address barium. Other than the vertical delineation sample, barium (up to 1,070 mg/kg) exceeded the sensitive ecosystem / residential criterion in all sampling

⁶⁶⁰ *Ibid.*, pp. 79-80.

⁶⁶¹ *Ibid.*, p. 80.

locations in the area investigated. Vanadium (up to 153 mg/kg) also exceeded the regulatory criterion in the same area.

- (b) A low-lying swampy area (formerly described by GSI as a swale) also southeast of the platform (REC 257; historical discharge from workover activities) was further investigated by samples at borings COC06-05 through COC06-13. Petroleum odor and staining were noted in subsurface soils at COC06-06 and COC06-10. However, TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. Barium (up to 951 mg/kg) exceeded the applicable criterion along the western side of the swamp and at locations along the ridge that borders the swamp to the east. Vanadium (up to 216 mg/kg) also exceeded the applicable criterion around the same areas.

577. **Coca 8:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around two main areas:⁶⁶²

- (a) An area to the northwest of the platform (REC 19; oil-water separator discharge) was further investigated by samples at borings COC08-01 through COC08-04. Barium (1,190 mg/kg) exceeded the agricultural criterion only to the south of the investigated area. Vanadium (up to 208 mg/kg) also exceeded the agricultural criterion in the same area.
- (b) An area to the southwest of the platform (REC 20; oil-water separator discharge) was further investigated by samples at borings COC08-05 through COC08-08. Barium (1,480 mg/kg) exceeded the agricultural criterion only to the north of the investigated area. Nickel (up to 60.4 mg/kg) and vanadium (up to 207 mg/kg) also exceeded the agricultural criteria in the investigated area.

⁶⁶² *Ibid.*, pp. 80-81.

- (c) The swampy area to the south of mud pits 2 through 4 (REC 251) was further investigated by samples at borings COC08-09 through COC08-21. Petroleum odor and staining were encountered in subsurface soils at boring COC08-09. Barium (up to 11,000 mg/kg) exceeded the sensitive ecosystem / residential criterion in the deepest interval sampled and in to the east, south and west of the investigated area. Cadmium (up to 1.12 mg/kg), lead (up to 89.1 mg/kg), nickel (up to 64.9 mg/kg) and vanadium (up to 184 mg/kg) exceeded the applicable criteria in all directions around the swamp.
578. **Coca 9:** Within the areas investigated by Ramboll, the prior vanadium and nickel exceedances were not fully delineated vertically or horizontally. After additional sampling around two main areas:⁶⁶³
- (a) The area northwest of the platform (REC 61; possible discharge from the injection well) was further investigated by samples at borings COC09-01 through COC09-05. Neither vanadium nor nickel exceeded the sensitive ecosystem / residential criteria in any of the samples. Barium (up to 1,880 mg/kg) exceeded the applicable criterion in areas to the north and northwest.
- (b) The area southeast of the platform (REC 60; oil-water separator discharge) was further investigated by samples at borings COC09-06 through COC09-08. Nickel did not exceed the agricultural criterion in any of the samples. Vanadium (up to 172 mg/kg) exceeded the applicable criterion in areas to the east and southeast.
579. **Coca 10 / 16:** Within the areas investigated by Ramboll, the prior barium and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: A swampy area north of the platform (REC 175; oil-water separator discharge) was further investigated by samples at COC10-01 through COC10-03. TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. Barium

⁶⁶³ *Ibid.*, p. 81.

(up to 993 mg/kg) exceeded the applicable criterion along the northern steep edge of this swampy area. Vanadium (up to 154 mg/kg) and nickel (up to 50.1 mg/kg) also exceeded the applicable criteria in the same area.⁶⁶⁴

580. **Coca 18 / 19:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around three main areas:⁶⁶⁵

- (a) Prior impacts to soils near the Coca 18 well (REC 273) were delineated by samples COC18-01 through COC18-03. Barium was not detected above the applicable criterion in any of the samples. However, exceedances of the applicable industrial criterion for vanadium (143 to 175 mg/kg) were found east, south, and west of the Coca 18 well.
- (b) The area southwest of Mud Pit 6 (REC 274) was further investigated by samples at borings COC18-04 through COC18-11. Petroleum odor was encountered at borings COC18-04 and COC18-06. Barium (up to 1580 mg/kg) exceeded the sensitive ecosystem / residential criterion in areas east, south, and west of Mud Pit 6. Vanadium (up to 224 mg/kg) also exceeded the applicable criterion at these same areas. In addition, at certain isolated locations, chromium (up to 88.1 mg/kg) and nickel (up to 52.4 mg/kg) were detected above the applicable criteria.
- (c) Pile 1 (not an identified REC but the project record suggested an area of possible historic disposal of oilfield materials) was further investigated by borings COC18-12 through COC18-14. Barium (up to 6220 mg/kg) was detected at concentrations exceeding the applicable sensitive ecosystem / residential criterion. Vanadium (up to 180 mg/kg) and cadmium (up to 1.35 mg/kg) were also detected above the applicable criteria.

⁶⁶⁴ *Ibid.*, pp. 81-82.

⁶⁶⁵ *Ibid.*, p. 82.

581. **Cóndor Norte:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The landslide area south of the platform (not associated with a specific REC) was further investigated by samples at CON01-01 through CON01-05. Barium (up to 2,140 mg/kg) exceeded the sensitive ecosystem / residential criterion in the deepest interval sampled (borings CON01-01 and CON01-05), and in boring CON01-02. Cadmium (up to 4.97 mg/kg) also exceeded the applicable criterion in all sampling locations. The boundaries of the sloughed materials were defined using a GPS and serve to define the remedial footprint.⁶⁶⁶

582. **Gacela 1 / 8 / CPF:** Within the areas investigated by Ramboll, the prior barium and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around two main areas:⁶⁶⁷

- (a) The swampy area south of the platform (REC 371; historical discharge) was further investigated by samples at borings GAC01-01 through GAC01-11. Petroleum odor and / or staining were encountered in subsurface soils at GAC01-01, GAC01-02, GAC01-04, GAC01-10 and GAC01-11. However, TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. Barium did not exceed the applicable criterion in any of the samples.
- (b) The area southwest of the platform (REC 63; historical discharge) was further investigated by samples at borings GAC01-12 through GAC01-17. Petroleum odor was encountered in subsurface soils at borings GAC01-16. However, neither TPH nor barium exceeded the agricultural criteria in any of the samples.

⁶⁶⁶ *Ibid.*, p. 83.

⁶⁶⁷ *Ibid.*, p. 83.

583. **Gacela 2:** Within the areas investigated by Ramboll, the prior barium and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around two main areas:⁶⁶⁸

(a) The area west and downslope of the platform (which is not associated with a specific REC) was further investigated by samples at borings GAC02-01 through GAC02-04. Barium (up to 1,610 mg/kg) exceeded the sensitive ecosystem / residential criterion in the northeast portion of this area.

(b) The area between the two mud pits on the platform (which is not associated with a specific REC) was further investigated by samples at borings GAC02-05 through GAC02-08. Petroleum odor and staining were encountered in subsurface soils at GAC02-06 and GAC02-07. However, TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. Barium (up to 4,790 mg/kg) exceeded the sensitive ecosystem / residential criterion in this area. The data suggests that it is possible that the two mud pits may be contiguous.

584. **Gacela 4:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: Barium in soils near the Gacela 4 well (REC 304; possible discharge from wellhead) were delineated by samples at borings GAC04-01 through GAC04-04, as barium did not exceed the industrial criterion in any of the samples. Vanadium (up to 135 mg/kg) exceeded the applicable criterion to the northeast and south of this area.⁶⁶⁹

585. **Gacela 5:** Within the areas investigated by Ramboll, the prior lead exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: Lead in soils near the Gacela 5 well (REC 307; possible discharge from wellhead) were delineated by samples at borings GAC05-01 through GAC05-03 as lead did not exceed the

⁶⁶⁸ *Ibid.*, p. 84.

⁶⁶⁹ *Id.*

industrial criterion in any of the samples. Vanadium (up to 138 mg/kg) and chromium (up to 106 mg/kg) exceeded the regulatory criteria to the east portion of this area.⁶⁷⁰

586. **Jaguar 1:** Within the areas investigated by Ramboll, the prior barium, nickel and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around three main areas:⁶⁷¹

- (a) The area northwest of the mud pit and around the two open pits (REC 312) was further investigated by samples at borings JAG01-01 through JAG01-03, JAG01-15 and JAG01-17. Nickel (up to 81.9 mg/kg) exceeded the sensitive ecosystem / residential criterion in all sampling locations. Barium (722 mg/kg at JAG01-03), chromium (up to 127 mg/kg at JAG01-01 through JAG01-03, and JAG01-17) and vanadium (up to 193 mg/kg at all boring locations) also exceeded the corresponding regulatory criteria.
- (b) The area surrounding the valve station (not associated with a specific REC), where a vanadium exceedance was previously detected (GSI sample JA01-3T-01) and historical petroleum impacts were reported by GSI162, was investigated by samples at borings JAG01-08 through JAG01-11. While the samples collected were not analyzed for TPH, no evidence of crude were identified in any of these borings. The samples collected from this area indicated the presence of nickel (up to 40.8 mg/kg) and vanadium (up to 165 mg/kg) above the regulatory criteria.
- (c) The stream bed area and associated swamp (REC 311) was delineated by samples at borings JAG01-04 through JAG01-07, JAG01-12 through JAG01-14 and JAG01-16. Petroleum odor was noted in subsurface soils at JAG01-06. However, neither TPH nor barium exceeded the sensitive ecosystem / residential criteria in any of the samples. At certain isolated locations, chromium (up to

⁶⁷⁰ *Ibid.*, pp. 84-85.

⁶⁷¹ *Ibid.*, p. 85.

88.5 mg/kg), nickel (up to 81.7 mg/kg) and vanadium (up to 183 mg/kg) exceeded the regulatory criteria.

587. **Jaguar 2:** Within the areas investigated by Ramboll, the prior barium, nickel and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around two main areas:⁶⁷²

- (a) The area west of the mud pit (REC 314) was further investigated by samples at borings JAG02-01 through JAG02-05 and JAG02-15 through JAG02-17. Borings JAG02-02 and JAG02-15 through JAG02-17 were advanced in the slope failure area to the northwest of the mud pits. Petroleum odor and / or staining were encountered in subsurface soils at JAG02-02, JAG02-04, JAG02-15 and JAG02-17. Consequently, TPH analysis was added for samples at this site. TPH (up to 1,190 mg/kg) at JAG02-15 and barium (up to 1,100 mg/kg) at JAG02-01, JAG02-15 and JAG02-16 exceeded the sensitive ecosystem / residential criteria in the northern portion of this area. Chromium (up to 114 mg/kg), nickel (up to 220 mg/kg) and vanadium (up to 247 mg/kg) also exceeded the regulatory criteria at all boring locations, whereas lead did not exceed the applicable criteria in any of the samples.
- (b) The area northwest of the platform (REC 298; possible historical spill) was further investigated by samples at borings JAG02-06 through JAG02-14. What appeared to be weathered crude was noted at the surface in several locations within the investigation area. However, TPH was not detected above the sensitive ecosystem / residential criterion in any of the samples. Barium (up to 7,920 mg/kg) and nickel (up to 88.8 mg/kg) exceeded the applicable criteria at several locations to the west, north and northeast. Lead (279 mg/kg) and cadmium (1.76 mg/kg) exceeded the applicable criteria at JAG02-07. Vanadium

⁶⁷² *Ibid.*, pp. 85-86.

(up 204 mg/kg) and chromium (up to 121 mg/kg) also exceeded the applicable criteria at all boring locations.

588. **Jaguar 3:** Within the areas investigated by Ramboll, the prior barium and vanadium exceedances were not fully delineated vertically or horizontally. After additional sampling around two main areas:⁶⁷³

(a) Prior impacts to soil near the Jaguar 3 well (REC 237; possible discharges from wellhead) were further investigated by samples at JAG03-01 through JAG03-03. Barium exceeded the sensitive ecosystem / residential criterion south and west of the Jaguar 3 well. Cadmium (up to 1.54 mg/kg), chromium (up to 168 mg/kg), lead (up to 139 mg/kg), nickel (up to 80.1 mg/kg) and vanadium (up to 213 mg/kg) also exceeded the regulatory criteria in one or more locations south and west of the Jaguar 3 well.

(b) The eastern platform area (not associated with a specific REC) was further investigated by samples at borings JAG03-04 through JAG03-08 to investigate elevated vanadium along the eastern side of the platform. Vanadium (up to 196 mg/kg) exceeded the sensitive ecosystem / residential criterion at all borings. Barium (up to 936 mg/kg) exceeded the regulatory criterion at locations to the east and south sides of this area. Chromium (up to 118 mg/kg) exceeded the applicable criterion at all boring locations, while nickel (45.8 mg/kg) exceeded the regulatory criterion only at JAG03-04, JAG03-06 and JAG03-07.

589. **Jaguar 5 / CPF:** Within the areas investigated by Ramboll, the prior lead and vanadium exceedances were not fully delineated vertically or horizontally. After additional sampling around three main areas:⁶⁷⁴

(a) The area southeast of the platform (not associated with a specific REC) was delineated by samples at borings JAG05-01 through JAG05-03. Lead did not

⁶⁷³ *Ibid.*, pp. 86-87.

⁶⁷⁴ *Ibid.*, p. 87.

exceed the sensitive ecosystem / residential criterion in any of the samples addressing the initial objective of investigating this area given its proximity to residential living quarters. Vanadium (up to 182 mg/kg) and chromium (up to 78.2 mg/kg) also exceeded the regulatory criteria at all boring locations.

(b) Soils near the fuel depot (not associated with a specific REC) were further investigated by samples at boring JAG05-04. Vanadium (up to 175 mg/kg) exceeded the industrial criterion at this location. Chromium (up to 67.3 mg/kg) also exceeded the regulatory criterion at this location.

590. **Jaguar 7 / 8:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: Barium in the stream area east of the platform (not associated with a specific REC, but possibly associated with oil-water separator discharge) was delineated by samples at JAG07-01 through JAG07-03, as it was not detected above the agricultural criterion in any of the samples. Cadmium (up to 1.39 mg/kg) and chromium (up to 65.8 mg/kg) at two different locations and nickel (up to 63.7 mg/kg) at two locations exceeded the regulatory criteria in this area.⁶⁷⁵

591. **Lobo 1:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The area surrounding the mud pit (REC 211) was further investigated by samples at borings LOB01-03, LOB01-04 and LOB01-04A. Petroleum odor was noted in subsurface soils at LOB01-04, so TPH analysis was added at LOB01-04 and LOB01-04A. However, TPH did not exceed the agricultural criterion in any of the samples. Barium (up to 10,600 mg/kg) exceeded the applicable criteria to the south and west portions of this area. Cadmium (up to 2.62 mg/kg), chromium (up to 88.3 mg/kg), lead (up to 212 mg/kg) and nickel (up to 60 mg/kg) also exceeded the regulatory criteria at these same locations.⁶⁷⁶

⁶⁷⁵ *Ibid.*, pp. 87-88.

⁶⁷⁶ *Ibid.*, p. 88.

592. **Lobo 4:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The northeastern area of the platform (not associated with an identified REC) was further investigated by samples at borings LOB04-01 through LOB04-05. Petroleum odor and / or staining were noted in subsurface soils at LOB04-02, LOB04-03, LOB04-04 and LOB04-05. Barium (up to 3,180 mg/kg) exceeded the sensitive ecosystem / residential criteria in the shallowest interval at LOB04-02, and in the deepest intervals sampled in LOB04-01, LOB04-03, and LOB04-05.⁶⁷⁷
593. **Mono 1-5 / CPF:** Within the areas investigated by Ramboll, the prior barium and/or lead exceedances were not fully delineated vertically or horizontally. After additional sampling around three main areas:⁶⁷⁸
- (a) The area north of the platform (not associated with an identified REC; located southwest of API oil/water separator discharge which was observed to overflow during heavy rain events) was further investigated by samples at borings MON01-01 through MON01-04. Petroleum odor was encountered within subsurface soils at MON01-02. Barium (up to 1,400 mg/kg) exceeded the sensitive ecosystem / residential criterion at MON01-03.
 - (b) The area east of the platform (REC 105; former wells/pits) was further investigated by samples at borings MON01-05 through MON01-10. Barium (up to 1,840 mg/kg) exceeded the sensitive ecosystem / residential criterion to the south and lead (up to 161 mg/kg) exceeded the applicable criterion to the north and south. In addition, at certain isolated locations, chromium (78 mg/kg), nickel (57.9 mg/kg) and vanadium (153 mg/kg) were detected above the applicable criteria at MON01-08.
 - (c) The area south of the platform (not associated with an identified REC; reported historical spills from southeastern oil trap) was further investigated by samples

⁶⁷⁷ *Ibid.*, pp. 88-89.

⁶⁷⁸ *Ibid.*, p. 89.

at borings MON01-11 through MON01-23. Petroleum odor was noted in subsurface soils at MON01-11, so TPH analysis was added at this location. TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. Barium (up to 1,280 mg/kg) and lead (up to 88.7 mg/kg) exceeded the applicable criterion in the northern portion of this sampling area. At certain isolated locations, chromium (up to 138 mg/kg), nickel (up to 56.2 mg/kg) and vanadium (up to 183 mg/kg) were also detected above the applicable criteria.

594. **Mono Sur:** Within the areas investigated by Ramboll, the prior barium and lead exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The area to the northeast of the mapped mud pit and in the discharge area of an oil/water separator (not associated with a specific REC) was further investigated by samples at borings MON06-01 through MON01-06. Barium (up to 595 mg/kg) exceeded the sensitive ecosystem / residential criterion to the east, but lead did not exceed the applicable criterion in any of the samples. Chromium (up to 83.1 mg/kg), nickel (up to 46.7 mg/kg) and vanadium (up to 148 mg/kg) were also detected above the applicable criteria at most boring locations.⁶⁷⁹
595. **Oso 1 / CPF:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The storm water management feature south of the platform (not associated with a specific REC) was delineated by samples at borings OSO01-01 through OSO01-06. Barium (up to 3,870 mg/kg) exceeded the industrial criterion at two borings within the feature.⁶⁸⁰
596. **Oso A:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The area west of the platform (REC 250; oil-water separator discharge) was delineated by samples at borings OSOA-01 through OSOA-05. Petroleum odor and / or staining was

⁶⁷⁹ *Ibid.*, pp. 89-90.

⁶⁸⁰ *Ibid.*, p. 90.

encountered in subsurface soils at OSOA-01 and OSOA-02. Consequently, TPH analysis was added for samples at this site. However, neither TPH nor barium exceeded the applicable industrial criteria⁶⁸¹ in any of the samples.

597. **Payamino 1 / CPF:** Within the areas investigated by Ramboll, the prior barium and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around four main areas:⁶⁸²

- (a) Soils on the CPF adjacent to the power oil pump building (area not associated with a specific REC) were delineated by samples at borings PAYCPF-01 through PAYCPF-03. Petroleum odor and staining were noted in subsurface soils at PAYCPF-01 and PAYCPF-02. However, TPH did not exceed the industrial criterion in any of the samples.
- (b) The swampy area furthest to northwest of the CPF (area not associated with a specific REC) was further investigated by samples at borings PAY01-01 through PAY01-05, PAY01-16 and PAY01-17. TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. However, barium (up to 812 mg/kg) exceeded the applicable criterion to the west and northwest. At one location, chromium (up to 69 mg/kg) was also detected above the applicable criterion.
- (c) TPH and barium in the catchment basin (not associated with a specific REC) was delineated by samples at borings PAY01-06 through PAY01-8, PAY01-10 and PAY01-18, generally located outside the top of the catchment area. Petroleum odor, staining and “beads” of product were noted in shallow subsurface soils during drilling of monitoring well PAY01-MW02 within this basin area. However, neither TPH nor barium exceeded the sensitive ecosystem / residential criteria in any of the samples. Vanadium (up to 145 mg/kg) exceeded the applicable criterion at one location. The area adjacent to the concrete pit (REC

⁶⁸¹ *Ibid.*, pp. 90-91.

⁶⁸² *Ibid.*, pp. 91-92.

135) was delineated by samples at borings PAY01-11 through PAY01-15. Petroleum odor and / or staining were encountered in subsurface soils at PAY01-12, PAY01-14 and PAY01-21. However, TPH did not exceed the applicable criterion in any of the samples.

598. **Payamino 2 / 8:** Within the areas investigated by Ramboll, the prior barium and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The swampy area (REC 351) was further investigated by samples at borings PAY02-01 through PAY02-16. What appeared to be weathered crude was observed at the surface northeast of the platform between the platform and swampy area. At PAY02-01 and PAY02-02, petroleum staining was observed at the surface, and petroleum odor, staining and beads of free product were noted in subsurface soils and water at these same locations. Petroleum odor and staining were also noted in subsurface soils at PAY02-04. However, TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. Barium (up to 5,810 mg/kg) exceeded the sensitive ecosystem / residential criterion in the deepest interval sampled and to the south, west, north and northwest of the area investigated. At certain isolated locations, cadmium (up to 1.68 mg/kg), chromium (up to 102 mg/kg), lead (up to 182 mg/kg) and vanadium (up to 144 mg/kg) exceeded the applicable criteria. Generally, the data gathered better defined the limits of soil impacts and make clear that the depth of such impacts is significantly greater than the Parties previously believed.⁶⁸³

599. **Payamino 3:** Within the areas investigated by Ramboll, the prior TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around two main areas:⁶⁸⁴

- (a) Soils on the southern corner of the platform (not associated with a specific REC) were delineated by samples at borings PAY03-01 through PAY03-04. TPH was not detected above the industrial use criterion in any of the samples.

⁶⁸³ *Ibid.*, p. 92.

⁶⁸⁴ *Ibid.*, pp. 92-93.

- (b) A soil stockpile (not associated with a specific REC) was characterized by boring PAY03-05. The sample collected to further characterize this pile was analyzed for TPH and metals. Neither TPH nor metals exceeded the industrial use criteria in any of the samples.
600. **Payamino 4 and 14 / 20 / 24:** Within the areas investigated by Ramboll, the prior barium and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around two main areas:⁶⁸⁵
- (a) The area northeast of the Payamino 4 platform (REC 114; historical spill) was delineated by samples at borings PAY04-07 through PAY04-12. Petroleum odor was encountered in subsurface soils at borings PAY04-09, PAY04-10 and PAY04-12. However, TPH did not exceed the applicable criterion in any of the samples. Barium (up to 5,810 mg/kg) exceeded the industrial criterion at PAY04-12. Cadmium (up to 2.08 mg/kg) and lead (up to 120 mg/kg) also exceeded the applicable criteria at this location. Chromium (up to 153 mg/kg) and vanadium (up to 181 mg/kg) exceeded the applicable criteria at PAY04-10.
- (b) The area southwest of the mud pit (REC 113), where prior sampling by the Parties detected the highest TPH concentrations in soil of any site (124,873 mg/kg), was further investigated by samples at borings PAY04-01 through PAY04-06. What appeared to be weathered crude at the surface and petroleum odor and staining in subsurface soils were encountered at PAY04-01. However, TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. Barium (up to 1,990 mg/kg) exceeded the applicable criterion in areas to the northwest and southwest of the area investigated. Cadmium (up to 4.9 mg/kg) also exceeded the applicable criterion to the south and southwest of the area investigated.

⁶⁸⁵ *Ibid.*, p. 93.

601. **Payamino 10:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: Barium in soils in the southwestern portion of platform area (not associated with a specific REC) was delineated by samples at borings PAY10-01 through PAY10-04172 as barium did not exceed the industrial criterion in any of the samples. Vanadium (up to 181 mg/kg) exceeded the applicable criterion in areas to the northwest and south.⁶⁸⁶
602. **Payamino 15:** Within the areas investigated by Ramboll, the prior vanadium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The area east of the former power oil pump building (not associated with a specific REC) was delineated by samples at borings PAY15-01 through PAY15-03. Vanadium did not exceed the industrial use criterion in any of the samples.⁶⁸⁷
603. **Payamino 16:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: Barium in soils near the Payamino 16 well (not associated with a specific REC) was delineated by samples at borings PAY16-01 through PAY16-03 as barium did not exceed the sensitive ecosystem / residential criterion in any of the samples. However, vanadium (up to 143 mg/kg) exceeded the applicable criterion at all boring locations.⁶⁸⁸
604. **Payamino 21:** Within the areas investigated by Ramboll, the prior TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The area northwest of the diesel tank (REC 221; possible discharge from diesel tank) was delineated by samples at borings PAY21-01 through PAY21-04. TPH did not exceed the industrial criteria in any of the samples.⁶⁸⁹
605. **Payamino 23:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around one

⁶⁸⁶ *Ibid.*, p. 94.

⁶⁸⁷ *Ibid.*, p. 94.

⁶⁸⁸ *Ibid.*, pp. 94-95.

⁶⁸⁹ *Ibid.*, p. 95.

main area: The area east of the platform (REC 234; oil-water separator discharge) was further investigated by samples at borings PAY23-01 through PAY23-07. Petroleum odor and / or staining were noted in subsurface soils at PAY23-01 and PAY23-02. However, TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. Barium (up to 7,500 mg/kg) exceeded the applicable criterion to the south, east and north of the area investigated. Vanadium (up to 155 mg/kg) also exceeded the applicable criterion in all directions around this area. At one isolated location, lead (up to 89.6 mg/kg) was detected above the applicable criterion.⁶⁹⁰

606. **Payamino WTS / LF:** Within the areas investigated by Ramboll, the prior barium and TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around three main areas: TPH and barium in soils in areas north, east and south of the mud pit (REC 305) were delineated by samples at borings PAYWTS-01 through PAYWTS-06 as neither TPH nor barium exceeded the industrial use criteria in any of the samples. However, vanadium (up to 143 mg/kg) exceeded the applicable criterion in all boring locations.⁶⁹¹
607. **Punino:** Within the areas investigated by Ramboll, the prior TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around three main areas: TPH in the area west of the platform (not associated with an identified REC; located near oil-water separator discharge) was delineated by samples at PUN01-01 through PUN01-04 as TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples.⁶⁹²

(ii) Block 21

608. For Block 21, Ramboll's findings were as follows.⁶⁹³

⁶⁹⁰

Id.

⁶⁹¹

Ibid., pp. 95-96.

⁶⁹²

Ibid., p. 96.

⁶⁹³

Ibid., Section 5.3.3.2.

609. **Chonta:** Within the areas investigated by Ramboll, the prior TPH exceedances to the south of the site were not fully delineated vertically or horizontally. After additional sampling around one main area: The soil pile and raised area in the vicinity of Mud Pit 5 (REC 281; allegedly an unclosed mud pit) were further investigated by samples at borings CHON-01 through CHON-03. Petroleum odor and staining were noted in subsurface soils at CHON-02 and CHON-03, so TPH analysis was also performed on samples collected at this site. However, TPH did not exceed the sensitive ecosystem / residential criterion in any of the samples. Barium (5,250 mg/kg) exceeded the applicable criterion at CHON-02. Cadmium (1.54 mg/kg) at CHON-01 and nickel (63.9 mg/kg) at CHON-03 also exceeded the applicable criteria. Previously detected barium appears to be in a limited portion of the soil pile and the sampling results at the other two locations do not appear representative of mud pit material.⁶⁹⁴
610. **Nemoca:** Within the areas investigated by Ramboll, the prior TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: The area southwest of the platform (not associated with an identified REC; located near oil-water separator discharge) was delineated by samples at NEM01-01 through NEM01-05. TPH did not exceed the sensitive ecosystem / residential criterion in any of the Ramboll samples.⁶⁹⁵
611. **Yuralpa A:** Within the areas investigated by Ramboll, the prior barium exceedances were not fully delineated vertically or horizontally. After additional sampling around three main areas: The area southeast of the platform (not associated with a specific REC; located adjacent to an oil-water separator discharge) was further investigated by samples at borings YURA-01 through YURA-05. With the exception of a barium (up to 2,410 mg/kg) exceedance of the applicable criterion to the northeast of the area investigated, the area is largely delineated.⁶⁹⁶

⁶⁹⁴ *Ibid.*, pp. 96-97.

⁶⁹⁵ *Ibid.*, p. 97.

⁶⁹⁶ *Ibid.*, p. 97.

612. **Yuralpa D:** Within the areas investigated by Ramboll, the prior nickel exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: Nickel in soils near the Yuralpa Pad D well (REC 291; possible discharges from wellheads) were delineated by samples at YURD-01 through YURD-04 as nickel was not detected above the industrial use criteria in any of the samples.⁶⁹⁷
613. **Yuralpa CPF:** Within the areas investigated by Ramboll, the prior TPH exceedances were not fully delineated vertically or horizontally. After additional sampling around one main area: Soils beneath a gravel parking area at the Yuralpa CPF (not associated with a specific REC) were further investigated by samples at YURCPF-01 through YURCPF-05. TPH was not detected above the industrial use criterion in any of the samples.⁶⁹⁸

10. Remedial requirements

(a) Conceptual Remedial Plans

614. Mr. MacDonald identified and evaluated potential soil, mud pit and shallow groundwater remedial alternatives with reference to four primary criteria: demonstrability, technical feasibility, regulatory acceptance, and permanence. Considering site-specific characterisation of affected media as well as other environmental conditions, a remedial technology was excluded from further consideration if it:⁶⁹⁹
- (a) Was not generally accepted under TULAS or RAOHE;
 - (b) Was not well-established;
 - (c) Necessitated installation of a new significant, reliable and continuous power source;
 - (d) Was ineffective;

⁶⁹⁷ *Ibid.*, pp. 97-98.

⁶⁹⁸ *Ibid.*, p. 98.

⁶⁹⁹ *Ibid.*, Section 6.3.1.

- (e) Required highly specialised equipment that was not locally available; or
- (f) Would not meet the remedial objectives.

615. Following this screening process, Mr. MacDonald ranked the retained alternatives by considering their short-term effectiveness (*i.e.*, risks to human health and the environment during remedy implementation), long-term effectiveness (*i.e.*, risks to human health and the environment following remedy implementation), implementability (*i.e.*, ease, reliability, and flexibility of implementation considering site constraints) and relative costs. For each criterion, the technologies were scored relative to each other and the cumulative scores were totaled, weighted, and compared to define preferred options (*i.e.*, the alternatives with the highest scores). Mr. MacDonald’s preferred remedial options for each target medium are set out in Table 6.2 to his Report, which is reproduced below:

Table 6.2: Selected Remedial Alternatives	
Nonconforming Media	Retained Remedial Alternatives
Soil (TPH exceedances only)	Ex-situ Treatment (landfarming) ^d Excavation, Treatment and On-Site Containment ^{d,e} Excavation, Treatment and Off-Site Disposal
Soil (metal exceedances with or without TPH exceedances)	Excavation, Treatment and On-Site Containment ^e Excavation, Treatment and Off-Site Disposal
Mud Pits	In-situ Treatment ^f and Capping Mud Pit Rehabilitation/Lining, On-site Disposal and Capping (per RAOHE Article 59) ^g Mud Pit Rehabilitation/Lining, Material Treatment ^h , On-site Disposal and Capping (per RAOHE Article 59) Excavation and Treatment and Off-Site Disposal
Ground water	Pump and treat system ^h Permeable reactive barrier ⁱ
Notes: ^a Ex-situ refers to remedial action following removal at a designated on-site or central area. ^b In-situ refers to remedial action in place, without the need for excavation and transport to a designated on-site or central area. ^c On-site refers to a location within the facility or a nearby facility. Off-site refers to a third-party location outside the facility. ^d This alternative could include consolidation of TPH impacted soils from various sites in a central area and management as a single media. ^e This alternative could include consolidation of nonconforming soils with nonconforming mud pit materials and management of both as a single media. ^f In-situ treatment only refers to liming to adjust pH. ^g For mud pit materials not conforming to the unlined performance criteria but meeting the lined performance criteria. ^h Mud pit treatment could include mixing with reagents such as Portland cement, borrow soils, and/or lime. ⁱ This alternative is only viable at continuously manned sites where there is an existing power source and means for storage and treatment of extracted ground water. ^j The permeable reactive barrier is typically placed in the downgradient side of an affected ground water area. However, given the predicted relatively low potential for contaminant migration for most sites, such a PRB would not be effective in addressing groundwater contamination as the PRB relies on sufficient water flowing through the reactive media. A variation of this alternative would involve placement of reactive media (to oxidize or reduce contaminants) at the base of proposed excavations within such areas where groundwater sampling has identified contamination.	

616. Mr. MacDonald considered that the conceptual remedy selection for soils conforms to paragraph 4.1.3.6 and 4.1.3.7 of TULAS Annex 2, Book VI, while that for mud pits conforms to Articles 52(d)2.3 and 59(b) of RAOHE. These define generally accepted remedial approaches by the Ministry of the Environment in Ecuador and establish specific performance criteria. Further, in defining the conceptual remedial approach the following factors were considered:

- (a) Each site was considered in its entirety, such that the selected remedial plan would address all affected media.
- (b) The remedial approach considered for a specific area considered other remedial activities at the site such that the least number of remedial technologies would be implemented to simplify implementation.
- (c) If water was to be removed (*e.g.*, dewatering of excavation, dewatering of swampy soils), it was assumed that two modular temporary water treatment systems would be used and shared between sites.
- (d) If remedial action was to be implemented in swampy areas requiring dewatering to allow construction in “dry conditions” or to manage surface water, it was assumed that a temporary and reusable dam system would be used.

617. Mr. MacDonald considered that these factors would allow for remedy optimisation and/or reduced implementation costs.

(b) Cost Estimates

618. Mr. MacDonald then developed site-specific cost estimates for the selected conceptual remedial alternative to address affected media at each site using standard engineering methods which incorporated local unit costs, where available.⁷⁰⁰ Remedial cost estimates were developed in general conformance with the USEPA and USACE guidelines. These are detailed in Appendix I to his Report. Mr. MacDonald acknowledged that the accuracy

⁷⁰⁰ *Ibid.*, Section 6.3.3.

of estimates at the conceptual remedy design stage would be expected to be less than that of estimates developed at subsequent design stages, nevertheless, for most sites, he considered that the available data was adequate to develop reasonable estimates of remedial costs for the site-specific remedial plans.⁷⁰¹ Where the data was incomplete (*e.g.*, partial or incomplete horizontal and/or vertical delineation), higher contingencies were used to account for scope uncertainty.

619. The quantities used in the development of the remedial costs were mostly defined based on delineated or inferred horizontal and vertical extents of soil contamination, mapped mud pit dimensions, and projected groundwater impairment. Where contamination was identified but not completely delineated or characterised, the Expert employed “order of magnitude” remedial estimates. For certain remedial activities where quantities (*e.g.*, excavation dewatering volume, reagent quantities required to meet remedial goals, depth of permeable reactive barriers, mud pit configuration), material properties (*e.g.*, water content or density of excavated materials, swell and shrink ratios for materials) or duration of treatment process (*e.g.*, landfarming) could not be fully defined, these factors were assumed based on site-specific conditions and the Expert’s professional experience with similar projects.
620. Unit costs and production rates used in the remedial cost estimates were defined from a combination of: (i) quotes obtained from remedial contractors in Ecuador; (ii) quotes obtained from United States suppliers of materials (*i.e.*, reagents) with experience in Ecuador; (iii) verified unit rates previously obtained by the Parties; and (iv) published remedial unit costs in the United States (*e.g.*, RS Means, RACER) adjusted through the use of location indices. While some local contractors did not provide definitive quotes in the absence of a detailed project scope, site details, and the possibility of a site visit, Mr. MacDonald believed that the unit pricing estimated that he used was adequate for overall

⁷⁰¹ These estimates were based on conditions known at the time of the Report’s writing. With completion of pre-design investigations and the remedial design activities, adjustments to these estimates were possible.

cost projections. The unit pricing used in the cost estimates was inclusive of labor, equipment, materials, and overhead and profit, unless otherwise indicated.

621. In developing the remedial cost estimates, the remedial process was subdivided into major construction tasks, which were further subdivided as appropriate:

- (a) **Pre-Construction Activities:** These include additional pre-design investigation activities to better define remedial quantities and assess the extent and magnitude of groundwater impacts, environmental permitting to allow implementation of the proposed remedial actions and their design. Related Costs were allocated proportionally to the soil, mud pit and groundwater remedial estimates.⁷⁰²
- (b) **Site Preparation:** These include *inter alia* equipment and material mobilization to prepare sites for remedial works. Related costs were allocated proportionally to the soil, mud pit and groundwater remedial estimates.⁷⁰³
- (c) **Ex-Situ Treatment of Soils – Landfarming:** *Ex-situ* soil treatment through landfarming is only applicable to soils affected by TPH and ultimately leads to backfilling of the treated soils and restoration of disturbed areas.⁷⁰⁴
- (d) **Soil Excavation, Treatment and Disposal:** This involves the excavation, treatment and disposal activities in non-mud pit areas. Excavated materials would be treated by stabilisation/solidification (*i.e.*, mixing with reagents such as Portland cement, borrow soils, and/or lime) if impacted by metals (with or without TPH) or TPH alone.⁷⁰⁵
- (e) **Mud Pit Remediation:** There are three potential alternatives depending on the extent of conformance to the RAOHE performance criteria. Specifically, (i) mud pit materials that do not meet the performance criteria for lined mud pits would be

⁷⁰² Independent Expert Report, p. 135.

⁷⁰³ *Ibid.*, p. 135.

⁷⁰⁴ *Id.*

⁷⁰⁵ *Ibid.*, pp. 135-136.

treated and placed in reconstructed lined mud pits, (ii) mud pit materials that only fail to meet the unlined mud pit performance criteria would be placed in reconstructed lined mud pits, and (iii) mud pit materials not conforming to the unlined pH criteria in RAOHE would be treated *in-situ*. In all cases, the integrity of the closed mud pit would need to be ensured through periodic maintenance (mowing) and use of the mud pit area restricted through installation of a perimeter fence if one does not already exist.⁷⁰⁶

- (f) **Groundwater Remediation:** In areas where soil/mud pit and groundwater sampling have identified collocated contamination, groundwater remediation activities are integrated with soil or mud pit remediation activities. In the few cases where there is potential for a higher degree of groundwater contaminant migration, groundwater remediation would consist of installation of a permeable reactive barrier. This passive groundwater treatment system would not require operation and maintenance but would require periodic monitoring to document the effectiveness of the treatment system.⁷⁰⁷
- (g) **Construction Management:** These relate to the oversight and documentation of the remedial action and the reporting of the work performed. Associated costs were allocated proportionally to the soil, mud pit and groundwater remedial estimates.⁷⁰⁸
- (h) **Contingency:** Contingency costs were defined based on how well the scope of the proposed remedy could be defined and ranged from 10% to 30% depending on complexity and certainty. These were allocated proportionally to the soil, mud pit and groundwater remedial estimates.⁷⁰⁹

⁷⁰⁶ *Ibid.*, p. 136.

⁷⁰⁷ *Id.*

⁷⁰⁸ *Id.*

⁷⁰⁹ Independent Expert Report, p. 136.

- (i) **Recurring Costs:** These include long-term maintenance and monitoring costs, applied after remedy implementation. Certain remedies would require periodic physical inspections and site maintenance. For groundwater remedies, annual groundwater monitoring for 10 years to document treatment effectiveness have been considered. While the cap maintenance activities will be required in perpetuity, for estimating purposes, these costs are assumed to span 30 years.⁷¹⁰

622. In addition, based on experience of local contractors that recently conducted remedial work on behalf of Petroamazonas in the region, a labor cost multiplier of three to five was applied to those projects to address health and safety and community relations requirements imposed by Petroamazonas, which affect remedial work productivity and effectiveness. This factor also accounts for the potential for added security necessary for implementation of the work. In the absence of detailed cost breakdowns or defined durations for all construction activities, Ramboll could not reliably determine the degree to which such a factor should be applied in its remedial cost estimations. Ramboll believed that this factor may be partially offset by the applied contingencies and the conservative assumptions used in defining remedial quantities.⁷¹¹ Quantity and costs are set out at Tables 6.3 to 6.10 of the Independent Expert Report.

(c) *Summary of Cost Estimates*

623. Based on Mr. MacDonald's consideration of the conceptual remedial plans and possible viable remediation methods and the associated costs, Mr. MacDonald considered that the estimates of probable remedial costs for the site-specific remedial plans were reasonable.
624. Based on these conceptual remedial plans, Ramboll developed site-specific cost estimates using standard cost estimating methods and in general conformance with the USEPA and USACE guidelines:⁷¹²

⁷¹⁰ *Ibid.*, p. 137.

⁷¹¹ *Id.*

⁷¹² Independent Expert Report, p. 150.

- (a) Remedial quantities were mostly defined based on delineated or inferred horizontal and vertical extents of soil contamination, mapped mud pit dimensions, and degree of predicted groundwater impairment. In cases where impacts were identified but not completely delineated or characterized, order of magnitude remedial estimates were provided.
- (b) For certain remedial quantities or material properties, assumptions were made based on site-specific conditions and professional experience with similar projects.
- (c) Unit costs and production rates used in the remedial cost estimates were defined from a combination of: (a) quotes obtained from remedial contractors in Ecuador; (b) quotes obtained from United States suppliers of materials with experience in Ecuador; (c) verified unit rates previously obtained by the Parties; and (d) published remedial unit costs in the United States (*e.g.*, RS Means, RACER), adjusted using location indexes.
- (d) For complex sites (*e.g.*, presence of underground pipelines, steep slopes, limited access, work within swamps), higher contingencies were applied to account for scope uncertainty.

625. These are set out in Table 6.11 of his Independent Expert Report:

Table 6.11: Summary of Remedial Cost Estimates				
Site	Estimated Remedial Cost			
	Soils	Mud Pits	Groundwater	Total
Coca 01	\$788	-	-	\$788
Coca 02, CPF	\$2,700	-	\$3,001	\$5,701
Coca 04	\$308	-	-	\$308
Coca 06	\$5,223	-	-	\$5,223
Coca 08	\$10,055	-	-	\$10,055
Coca 09	\$805	-	-	\$805
Coca 10, 16	\$781	-	-	\$781
Coca 18, 19	\$406	\$3,123	-	\$3,529
Cóndor Norte	\$6,339	\$2,484	-	\$8,823
Gacela 01, CPF	\$2,103	-	\$1,397	\$3,500
Gacela 02	\$1,575	-	\$597	\$2,172
Gacela 04	\$195	-	-	\$195

Table 6.11: Summary of Remedial Cost Estimates				
Site	Estimated Remedial Cost			
	Soils	Mud Pits	Groundwater	Total
Gacela 05	\$247	-	-	\$247
Jaguar 01	\$3,104	-	\$438	\$3,542
Jaguar 02	\$8,505	-	\$1,173	\$9,678
Jaguar 03	\$5,643	-	-	\$5,643
Jaguar 05, CPF	\$379	-	-	\$379
Jaguar 07, 08	\$323	-	-	\$323
Jaguar 09	-	\$541	-	\$541
Lobo 01	\$1,361	-	-	\$1,361
Lobo 03	-	\$101	-	\$101
Lobo 04	\$717	-	-	\$717
Mono CPF	\$15,773	-	\$5,030	\$20,803
Mono Sur	\$1,281	-	-	\$1,281
Oso 01, CPF	\$186	-	-	\$186
Oso 03	-	\$1,906	-	\$1,906
Oso 09	-	\$5,317	\$3,415	\$8,732
Oso 09A	-	\$2,948	-	\$2,948
Oso 09B	-	\$1,507	-	\$1,507
Oso A	\$228	-	-	\$228
Payamino 01, CPF	\$4,746	-	\$1,404	\$6,150
Payamino 02, 08	\$15,316	-	\$4,343	\$19,659
Payamino 03	\$110 - \$129	-	-	\$110 - \$129
Payamino 04, 14	\$3,411	-	\$1,611	\$5,022
Payamino 10	\$313	-	-	\$313
Payamino 13	-	-	\$1,166	\$1,166
Payamino 15	-	-	\$1,166	\$1,166
Payamino 16	-	-	-	
Payamino 21	\$155	-	-	\$155
Payamino 23	\$1,765	-	-	\$1,765
Payamino WTS	\$1,493	\$2,978	-	\$4,471
Punino	\$121	-	-	\$121
Chonta	\$645	\$1,404	-	\$2,049
Nemoca	\$530	-	-	\$530
Yuralpa A	\$202	\$1,034	-	\$1,236
Yuralpa CPF	\$98	-	-	\$98
Yuralpa D	\$475	-	-	\$475
Yuralpa E	-	\$193	-	\$193
Yuralpa G	-	\$963	-	\$963
Yuralpa LF	-	\$12,217	-	\$12,217
TOTAL	\$98,423	\$36,715	\$24,742	\$159,881

Table 6.11: Summary of Remedial Cost Estimates				
Site	Estimated Remedial Cost			
	Soils	Mud Pits	Groundwater	Total
Notes:				
1. For purposes of this summary table, the higher cost values for any given range for Nemoca, Payamino 21, Punino, Yuralpa CPF, and Yuralpa LF were used.				

11. Opinions Regarding the Technical Findings in the Blocks

626. Mr. MacDonald’s key conclusions and opinions regarding the comprehensive technical findings in the Blocks are as follows:⁷¹³

- (a) The field work conducted by Ramboll significantly enhanced the body of knowledge and technical platform with respect to contamination across the sites in Blocks 7 and 21 and serves as a credible basis to determine unbiased and independent cost estimates.
- (b) The comprehensive mud pit investigation shows that a large percentage of mud pits in the Blocks do not meet the performance standards in RAOHE and require remediation.
- (c) Representative data obtained from all of the investigated platforms in the Blocks shows that groundwater has been impaired by oilfield operations and requires remediation.
- (d) The comprehensive soil investigation adequately defined the extent of oilfield-related impacts at the Blocks that require remediation. The data gathered was sufficient to reasonably define remedial quantities.

⁷¹³ *Ibid.*, Section 7.

- (e) The analytical tools and guiding principles used to define media-specific remedial requirements are consistent with Ecuador's regulations, professional practices, and the Tribunal's direction.
- (f) Remedial options for affected media were systematically evaluated to pre-select locally available, demonstrated, implementable and cost-effective alternatives that conform to generally accepted remedial approaches described in TULAS or RAOHE. The remedial options were then assembled into site-specific conceptual remedial plans to address the affected media. Associated remedial cost estimates were developed using standard cost estimating methods that incorporate unit costs from local contractors, published remedial unit costs adjusted using location indexes.

E. The Parties' Comments

- 627. Following the transmission of Mr. MacDonald's Report to the Parties, the Tribunal permitted the Parties to make two forms of written submissions on the Report, to request certain documents of each other, and to make oral submissions and pose questions to the Expert at a two-day hearing held in The Hague on 11-12 March 2019.
- 628. In relation to the written materials, the Parties were instructed to annotate the Independent Expert Report by providing focused comments on each main part of the Report. Their comments were thus inserted into a "**Consolidated Expert Report.**" In addition, the Parties were invited to file general comments on the Report in a separate written submission not to exceed 30 pages.
- 629. After these documents were filed on 22 February 2019, they were transmitted to Mr. MacDonald for his review. On Day 1 of the Expert Hearing, Mr. MacDonald gave a 90-minute presentation to the Parties and the Tribunal in which he explained his key findings and responded to the Parties' written comments. The Parties were then each given two hours to cross examine him.

630. This was followed by a witness conferencing session wherein Mr. MacDonald was paired first with a representative of IEMS and then with a representative of GSI. Each Party was permitted to put questions to the two experts. On Day 2, the Parties were once again permitted to put questions to Mr. MacDonald and then to make closing submissions on the Independent Expert's work.

1. Ecuador's Observations on the Independent Expert's Findings

631. Ecuador observed that Mr. MacDonald limited himself to a single "data gap filling" sampling campaign, consistent with the Tribunal's mandate.⁷¹⁴ In Ecuador's view, the Independent Expert employed best and current industry practices throughout his field campaign. His Report confirms Ecuador's position that extensive and widespread environmental harm was left behind by Perenco in Blocks 7 and 21, and that Perenco was not a diligent and prudent operator that acted in full compliance with Ecuadorian environmental regulations.⁷¹⁵ Mr. MacDonald has closed significant data gaps and estimated higher remediation volumes and costs for said contamination than Perenco's experts and effectively vindicated Ecuador's position that contamination extends beyond the sampled points and that the use of predictive modelling software (as used by IEMS) to estimate the full extent of contamination in the Blocks was justified.⁷¹⁶

632. Following Mr. MacDonald's findings and conclusions, and on the basis of newly-available data, Ecuador updated its claims for such sites where Mr. MacDonald has confirmed additional remedial volumes and costs compared to its "regulatory case".⁷¹⁷

(a) Soil remediation costs:

- i. Coca 10/16: at least US\$781,000;
- ii. Jaguar 1: at least US\$3,104,000;
- iii. Jaguar 5/CPF: at least US\$379,000;
- iv. Lobo 4: at least US\$717,000;
- v. Oso A: at least US\$228,000;

⁷¹⁴ Ecuador's Comments to the Independent Expert Report dated 22 February 2019, paragraph 4.

⁷¹⁵ *Ibid.*, paragraph 1.

⁷¹⁶ *Ibid.*, paragraph 9.

⁷¹⁷ *Ibid.*, paragraph 31.

- vi. Payamino 23: at least US\$1,765,000; and
- vii. Yuralpa F/CPF: at least US\$98,000.

(b) Groundwater remediation costs:

- i. Mono CPF: at least US\$5,030,000;
- ii. Oso 9: at least US\$3,415,000; and
- iii. Payamino 2/8: at least US\$4,343,000.

633. At the same time, Ecuador argued that Mr. MacDonald did not capture the full extent of the contamination caused by Perenco, and has estimated only the minimum required remedial needs arising out of what it called Perenco’s “reckless operations.”⁷¹⁸ Ecuador’s comments on specific aspects of Mr. MacDonald’s investigation are set out below.

(a) *Soil*

634. Ecuador considers that Mr. MacDonald’s investigation of soil contamination was generally in compliance with the Tribunal’s mandate.⁷¹⁹

635. First, Mr. MacDonald restricted the sampling campaign to previously sampled areas. Insofar as Perenco criticises Mr. MacDonald for sampling outside of his mandate, Ecuador argues that the Tribunal’s instruction that “[t]o the extent that the areas surrounding those points of contamination were not delineated [...] that process of delineation must now occur”⁷²⁰ was complied with when Mr. MacDonald stepped away approximately 10 to 15 metres from the Parties’ samples to collect additional samples in a soil pile a few metres to the east of Perenco’s auxiliary (and contaminated) pits at Coca 18/19.⁷²¹

636. Second, in Ecuador’s opinion, Mr. MacDonald’s reliance on discrete soil samples (of intervals of less than 0.3 m) for delineation purposes allowed him to capture the highest concentrations of contaminants within each sampled interval. This resulted in higher

⁷¹⁸ *Ibid.*, paragraph 4.

⁷¹⁹ *Ibid.*, paragraph 10.

⁷²⁰ *Ibid.*, paragraph 11 & fn. 33, referring to Interim Decision on Counterclaim, paragraph 601.

⁷²¹ *Ibid.*, paragraph 11.

remediation volumes, in contrast to GSI's vertical 1-metre composites which underestimated contamination through dilution.

637. Ecuador observes that Mr. MacDonald adjusted the applicable criteria to account for background metals levels where there were likely natural concentrations of heavy metals. This resulted in the exclusion of hundreds of the Parties' samples as well as Mr. MacDonald's own delineation samples that showed the presence of vanadium and cadmium exceedances above the thresholds specified in RAOHE and TULAS.⁷²²
638. Turning to land use classifications, Ecuador defends Mr. MacDonald's methodology against Perenco's criticisms:
- (a) First, contrary to Perenco's criticism that Mr. MacDonald relied on visual inspections for land use designations, he did not.⁷²³ In any event, Perenco's own experts limited their land use designations assessment to visual inspection.⁷²⁴
 - (b) Second, Mr. MacDonald could not be faulted by Perenco for looking at actual land use when that was Perenco's case all along.⁷²⁵
639. However, Ecuador itself raised a number of criticisms of Mr. MacDonald's soil remediation estimates.
640. First, even though Ecuador acknowledges that Mr. MacDonald's guidelines for land use classification were generally in line with the Tribunal's mandate to apply the more stringent land use designation, Ecuador argues that his classifications for certain locations were too permissive. Ecuador cites as examples the area to the northeast of the platform in Payamino 4 which had been reclassified as "industrial", and the classification of Coca 1 and Gacela 1/8 as "agricultural", even though the Consortium and prior operators acknowledged that

⁷²² *Ibid.*, paragraph 13.

⁷²³ Tr. (2) (MacDonald) (12 March 2019) 392:8-14; Ecuador's Closing Presentation, Slide 15.

⁷²⁴ Tr. (2) (MacDonald) (12 March 2019) 392:15-393:4, referring to page C36 of Appendix C to GSI ER I.

⁷²⁵ Tr. (2) (MacDonald) (12 March 2019) 393:5-19.

areas of water interaction were “sensitive.”⁷²⁶ Ecuador also argues that Lobo 1 should be remediated to a sensitive ecosystem standard, not agricultural, as it had been abandoned by Perenco and had not been operated by Petroamazonas, and this would be in line with Mr. MacDonald’s remediation approach for other platforms which have not been operated since Perenco’s abandonment.

641. Second, Ecuador criticises Mr. MacDonald’s exclusion of three sites where soil exceedances above the applicable regulatory criteria were identified: Lobo 2 samples had barium exceedances, Payamino 5 samples had barium exceedances, and Payamino 19 samples had TPH exceedances.⁷²⁷ Mr. MacDonald also excluded from his investigations seven other sites on the basis that Perenco had not drilled in those sites or Perenco-associated pits were not identified. However, Ecuador argues, it cannot be ruled out that Perenco’s activities had taken place at these sites and they should have been investigated further.⁷²⁸ Ecuador also argues that Mr. MacDonald should at the very least have delineated as orders of magnitude.⁷²⁹
642. Third, the Independent Expert’s soil delineation was incomplete. Complete delineation was only performed at 12 sites. Ecuador points to Mr. MacDonald’s acknowledgement of this point in his Report as well as at Expert Hearing.⁷³⁰ To identify the full extent of vertical and horizontal contamination, sampling should continue until ‘clean soil’ was found; however, 239 out of 804 samples collected by Mr. MacDonald still were not ‘clean’. Mr. MacDonald instead estimated the boundaries of contamination based on existing data and bounding conditions as well as field observations. An example of such incomplete delineation is Coca 8, where Mr. MacDonald’s sampling still found contamination and

⁷²⁶ Ecuador’s Annotations to Section 3.1 of Independent Expert Report, Section 3.1, para 6.

⁷²⁷ Ecuador’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 34 and fn. 88.

⁷²⁸ Ecuador’s Comments to Section 4.2 of Independent Expert Report, paragraph 1, referring to Ecuador’s Comments to the Mud Pit Fact Sheet dated 22 September 2017.

⁷²⁹ Ecuador’s Closing Presentation, Slide 13.

⁷³⁰ Ecuador’s Closing Presentation, Slide 16, referring to Tr. (1) (MacDonald) (11 March 2019) 248:14-16.

where he assumed an average of 3-metre depth for remediation even though he acknowledged that exceedances were found at depths of up to 4.5 metres.⁷³¹

643. Finally, Ecuador criticised Mr. MacDonald’s decision to estimate “orders of magnitude” for remediation when data was insufficient. There was no guarantee that these estimates captured all contamination present in those areas. Once again, Ecuador relied on Coca 8 as an example where there was no reason to believe that Mr. MacDonald’s estimate properly captured all contamination.

(b) *Mud Pits*

644. Ecuador observed that, contrary to Perenco’s contention that it consistently followed good practices with respect to mud pits, the Expert found that the contents of 34 of 38 sampled Perenco-associated mud pits failed to conform with RAOHE criteria. All 12 of the investigated sites had at least one mud pit that did not comply with leachability standards and 11 of those sites also had at least one mud pit with inadequate cover material.⁷³²

645. With respect to Mr. MacDonald’s decision to sample the Oso 9A and 9B off-site pits, which was criticised by Perenco as falling outside of his mandate, Ecuador argued that he was right to do so. Mr. MacDonald’s decision to sample these pits was consistent with his mandate for three reasons: first, said pit area had been previously sampled in 2010 by IEMS; second, Perenco acknowledged having performed workovers at Oso 9 and drilling nearby wells and did not deny having used such pits; and third, GSI referred to sampling conducted by Perenco at the alleged time of the closure of these pits.⁷³³

646. Ecuador asserted that Mr. MacDonald properly verified the conformance of all mud pit leachate samples against the criteria in RAOHE Table 7 through the TCLP leachate test specified by RAOHE. Although Mr. MacDonald also used the SPLP method to “*qualitatively [...] assess the potential for in-situ leaching of detected constituents in mud*

⁷³¹ Ecuador’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 38.

⁷³² *Ibid.*, paragraph 16.

⁷³³ *Ibid.*, paragraph 18.

pit materials”, he did not rely on SPLP results, as GSI “inappropriately” did, to assess compliance with RAOHE.⁷³⁴

647. Ecuador also argued that Mr. MacDonald’s decision to treat all pits as unlined was justified, given that they constitute exposure pathways due to their depth and shallowness of the phreatic level (*i.e.*, shallow groundwater). This was all the more relevant considering the lack of evidence of liners in pits, as Mr. MacDonald pointed out.⁷³⁵ Ecuador recalled that GSI had admitted that it “*didn’t conduct a separate test regarding the presence or absence of synthetic liners.*”⁷³⁶ Even if Perenco had installed liners (which it has not established), there was no certainty that the liners fully extended beneath the pits and remained intact. Indeed, Perenco’s own employees stated that the Consortium was careless when depositing drilling muds such that some liners cracked under the high temperatures.⁷³⁷
648. The liner issue aside, Ecuador had a number of criticisms about Mr. MacDonald’s mud pit investigations.
649. First, Mr. MacDonald excluded from further investigation mud pits in 30 sites which he investigated on the basis that Perenco’s use had not been identified.⁷³⁸ However, there is evidence that drilling mud and/or other wastes may have been generated by Perenco at these sites, which indicates that Perenco must have used these mud pits, or that Perenco failed to demonstrate that these pits are properly closed. These mud pits should, thus, have been further investigated. This was particularly so, Ecuador contended, given Perenco’s practice of building and using unreported pits (as admitted by Mr. Saltos to the *Burlington* tribunal) that were never approved or even known to the Ecuadorian authorities.⁷³⁹

⁷³⁴ *Ibid.*, paragraph 19.

⁷³⁵ *Ibid.*, paragraph 20 & fn. 58.

⁷³⁶ *Ibid.*, paragraph 20 & fn. 59.

⁷³⁷ *Ibid.*, paragraph 20.

⁷³⁸ Ecuador’s Comments to Section 4.2 of Independent Expert Report, paragraph 2, referring to Report’s Table 4.3.

⁷³⁹ Ecuador’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 43.

650. Second, even within the 38 sites that were investigated, it is likely that the concentrations detected in the mud pit contents by Mr. MacDonald were underestimated. Further, given the uncertainty as to the actual dimensions of the pits investigated, these dimensions had to be estimated and Mr. MacDonald had to be cautious when sampling so as “not to penetrate the bottom of any mud pit,”⁷⁴⁰ suggesting that the pits could, in fact, be deeper. In addition, when the depth of the mud pits was not available from the record, Mr. MacDonald assumed a depth of only 3.5 metres based on the average depth provided certain mud pit closure records. The evidence shows that this assumption, however, is insufficient to account for all the content of the pits needing remediation. For example, in Coca 18-19, 4 pits built by Perenco were 4.5 metres deep.

(c) *Groundwater*

651. Ecuador points out that contrary to GSI’s conclusion that there was no groundwater contamination in the Blocks, the groundwater was impaired by oilfield operations above TULAS criteria for TPH and/or barium at all 12 sites investigated by Mr. MacDonald. This confirmed that groundwater was adversely affected by Perenco’s oilfield operations and warrants remediation.

652. Mr. MacDonald’s groundwater sampling campaign – which, Ecuador observed, was monitored by both Parties’ experts – followed the highest industry standards, as confirmed by the fact that its results are consistent throughout the samples collected using different sampling methods (low-flow and RPPS).⁷⁴¹ Mr. MacDonald conducted his sampling through permanent monitoring wells installed in accordance with industry best practices and tested the resulting samples against the TULAS criteria. Ecuador argues that Mr. MacDonald vindicates IEMS’ criticisms of GSI’s tactics to elude confirmation of groundwater impacts in the Blocks.⁷⁴²

⁷⁴⁰ Independent Expert Report, p. 48.

⁷⁴¹ Ecuador’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 22.

⁷⁴² *Ibid.*, paragraph 22.

653. First, Ecuador considers that Mr. MacDonald’s groundwater monitoring well locations complied with the Tribunal’s mandate. In arguing that Mr. MacDonald’s sampling rationale was not be faithful to this mandate, Perenco misunderstands the mandate and the objective pursued. As explained by the Expert, an “*exact duplication of the program previously implemented by the Parties would have provided a poor data set that would not meet the Tribunal’s objectives [and] would also have cost three times as much to execute.*”⁷⁴³ Further, only two monitoring wells, in Payamino 1 and Jaguar 2, are not immediately adjacent to a prior IEMS or GSI monitoring well – and the adjustments of these well locations were justified due to very high concentrations of TPH in soils at Payamino 1 and weathered crude oil at Jaguar 2.⁷⁴⁴ In any event, an impact on groundwater was also identified at both sites in the monitoring wells that were installed in the vicinity of IEMS’ and GSI’s monitoring wells, thus requiring groundwater remediation regardless of the results of the monitoring wells whose location is criticized by Perenco.⁷⁴⁵
654. Second, Ecuador observes that Mr. MacDonald installed 34 state-of-the-art permanent pre-packed screened monitoring wells consistent with current industry practice to “*address the fine-grained subsurface conditions typically encountered in the Oriente Region of Ecuador*” and “*to improve the quality of the sample by reducing its turbidity and ensuring that samples collected from the well were representative of groundwater.*”⁷⁴⁶ Mr. MacDonald also took various precautions to prevent contamination from surface water encroachment. Perenco’s allegation of potential soil contamination encroachment into the

⁷⁴³ *Ibid.*, paragraph 25 and fn. 70, referring to Mr. MacDonald’s 28 December 2017 letter to Perenco, p. 3, E-453.

⁷⁴⁴ *Ibid.*, paragraph 25 and fn. 72: MacDonald’s 28 December 2017 letter to Perenco, p. 4 (PAY01-MW03 and JAG02-MW03 “were installed in areas where the Parties had previously collected soil samples, and where high levels of soil contamination were found by the Parties, but no wells had previously been installed [...]. Evidence of crude oil was also apparent at JAG02-MW03. The lack of groundwater testing data within these two contaminated areas would represent a serious data gap that would limit my ability to assess whether groundwater contamination was present at these two affected sites.”), E-453.

⁷⁴⁵ *Ibid.*, paragraph 25.

⁷⁴⁶ *Ibid.*, paragraph 26 & fns. 74-75, referring to the Independent Expert Report, pp. 66 and 68.

monitoring wells through surface waters flatly contradict GSI's position regarding the impermeability of clay soils in the area.⁷⁴⁷

655. Third, Ecuador also observes that Mr. MacDonald measured hydrocarbons in groundwater samples as per TULAS and duly considered – consistent with IEMS' approach – the sum of the GRO, DRO and ORO concentrations (whereas GSI compared the fractions individually against the TULAS limit).⁷⁴⁸
656. Fourth, Ecuador affirms Mr. MacDonald's decision not to filter groundwater samples which had been obtained using Rigid Porous Polyethylene (RPP) passive samplers and low-flow sampling techniques. Notwithstanding Perenco's objections, Mr. MacDonald's decision not to filter the samples was further corroborated by the similar analytical results obtained for metals in passive and low-flow samples.⁷⁴⁹
657. Fifth, Mr. MacDonald's decision not to exclude groundwater remediation based on soil clay content is supported by TULAS. Ecuadorian regulations do not indicate that groundwater in soils with greater than 25% clay and 10% organic matter should not be remediated.⁷⁵⁰ In any event, there is no available information regarding the organic matter in the samples, hence, the cumulative conditions would not be met. Mr. MacDonald's decision is justified by the fact that he was able to extract groundwater from all monitoring wells, confirming that the presence of clay in soil (even greater than 25%) does not make soils impermeable. This confirms the high probability of that contaminated groundwater is being used for drinking purposes by nearby communities and the need to ensure that such groundwater is properly remediated.⁷⁵¹

⁷⁴⁷ *Ibid.*, paragraph 26.

⁷⁴⁸ *Ibid.*, paragraph 27.

⁷⁴⁹ *Ibid.*, paragraph 28.

⁷⁵⁰ *Ibid.*, paragraph 29.

⁷⁵¹ *Ibid.*, paragraph 29.

658. In its closing submissions, Ecuador asserted that Perenco’s argument, namely, that clay content in soil above 25% would not require remediation,⁷⁵² is based on a misplaced reading of the TULAS regulation which focuses on clay percentage found in each monitoring well as if they were isolated whereas Ecuadorian regulation seeks to protect groundwater throughout all the locations with potentially usable groundwater.⁷⁵³ As Mr. MacDonald testified, clay content can vary significantly over short distances within the same location,⁷⁵⁴ it would not be logical to restore groundwater only in locations with less than 25% clay as those areas would be re-contaminated by the contaminants in the unremediated adjacent areas.⁷⁵⁵
659. Ecuador also defends Mr. MacDonald’s using a laboratory analysis method which Perenco argues could misidentify as TPH naturally occurring substances such as waxy leaves.⁷⁵⁶ First, Mr. MacDonald’s testing method was the same as that used by GSI (which has made no prior complaint of the possibility that waxy organic matter could skew results). Second, Perenco’s comparison between chromatograms of crude oil and dissolved phase organic constituents is not appropriate. Third, Mr. MacDonald’s explanations about the detection of petroleum hydrocarbons in his groundwater samples have been consistent and are supported by substantial evidence.⁷⁵⁷
660. Ecuador’s own criticisms about Mr. MacDonald’s groundwater results are the following: Ecuador points out that the Expert was limited to “*confirm[ing] the presence or absence of contamination.*” The scope of his work was not designed to delineate the full extent of the groundwater impairment in the sites. Hence, in order to determine the “*potential extent of groundwater contamination*”, Mr. MacDonald used a predictive analytical tool. The exercise performed, however, underestimates the full extent of groundwater impacts.⁷⁵⁸ In

⁷⁵² Ecuador’s Closing Presentation, Slide 29; Tr. (2) (MacDonald) (12 March 2019) 402:16-19.

⁷⁵³ Tr. (2) (MacDonald) (12 March 2019) 403:20-404:3.

⁷⁵⁴ Tr. (2) (MacDonald) (12 March 2019) 402:20-22.

⁷⁵⁵ Tr. (2) (MacDonald) (12 March 2019) 403:7-15. See Ecuador’s Closing Presentation, Slide 29.

⁷⁵⁶ Tr. (2) (MacDonald) (12 March 2019) 404:11-14.

⁷⁵⁷ Tr. (2) (MacDonald) (12 March 2019) 404:11-405:12.

⁷⁵⁸ Ecuador’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 46.

Payamino 13, for example, using the Groundwater Predictive Tool, Mr. MacDonald estimated that the identified groundwater contamination could only migrate 1.6m (and based the remediation costs on a plume dimension of only 1.6m). Yet, no identifiable potential source of contamination exists within 1.6m of the impacted monitoring wells, which confirms that the contamination had to migrate from a farther distance and the remediation costs calculated by MacDonald are underestimated. In short, groundwater contamination actually extends beyond the limited plume estimated by Mr. MacDonald.⁷⁵⁹

(d) *Unit Costs*

661. Ecuador considers that Mr. MacDonald's current quantification of remedial costs is the bare minimum. His estimate, which is in the conceptual phase, would be expected to be less accurate than that developed at subsequent design stages for a remediation plan. With the significant data gaps that remain to date, a contingency factor of 10% to 30% is insufficient.⁷⁶⁰
662. That said, Ecuador defends Mr. MacDonald's unit cost estimates as being consistent with local quotes.⁷⁶¹ While Perenco accuses Mr. MacDonald as only considering the US RACER database and asserting that he relied on US-based costs as exhibited in that system, Ecuador points out that Mr. MacDonald has repeatedly stated that he considered local costs and submitted evidence of that.⁷⁶² RACER was only a litmus test. This is confirmed once the Hidrogeocol quote is converted for a direct comparison with Mr. MacDonald's estimate – they are very similar.⁷⁶³
663. Ecuador further asserts that Perenco cannot argue that Mr. MacDonald's unit costs are too high on the basis of the Ecuambiente quote, Petroamazonas' December 2018 contract with Incinerox, or what was declared in Petroamazonas' bond offering in 2006. *First*, the

⁷⁵⁹ Ecuador's Closing Presentation, Slide 27.

⁷⁶⁰ Ecuador's Comments to Section 6.3 of the Independent Expert Report, paragraphs 4 & 7.

⁷⁶¹ Tr. (2) (MacDonald) (12 March 2019) 399:18-19.

⁷⁶² Tr. (2) (MacDonald) (12 March 2019) 399:4-7.

⁷⁶³ Tr. (2) (MacDonald) (12 March 2019) 400:1-4.

Ecuambiente quote is too low. *Second*, the Petroamazonas' contract is not one for remediation. *Third*, the bond offering does not provide sufficient details to allow any reliable conclusions to be drawn from it.⁷⁶⁴

664. Perenco also criticised Mr. MacDonald for not having prepared a bid package to establish local costs. Ecuador points out that GSI also did not prepare a bid package and that did not prevent them from quantifying the alleged remediation costs— this was admitted by Mr. Bianchi during the Expert Hearing.⁷⁶⁵

665. Finally, Ecuador supported Mr. MacDonald's proposed remediation technology for groundwater, which was criticised by Perenco, as being an appropriate choice in the circumstances.⁷⁶⁶

2. Perenco's Observations on the Independent Expert's Findings

666. Perenco asserted that Mr. MacDonald's volume and cost estimates were exaggerated. Perenco argued further that the Independent Expert Report failed to address issues that the Tribunal had directed Mr. MacDonald to study.⁷⁶⁷ For the issues that he did address, he relied on unjustified assumptions instead of on scientific and historical data, erred in his analyses, and disregarded Ecuadorian regulations and the Tribunal's own directions.⁷⁶⁸

667. Despite the Tribunal's instructions, Mr. MacDonald has not investigated the cause of the exceedances, or, where there could be several causes, how to allocate responsibility to Perenco or any other contributor. Thus, Mr. MacDonald's US\$160 million remediation cost cannot be a figure for which Perenco alone should bear responsibility.⁷⁶⁹

⁷⁶⁴ Tr. (2) (MacDonald) (12 March 2019) 487:19-492:16.

⁷⁶⁵ Tr. (2) (MacDonald) (12 March 2019) 399:12-17.

⁷⁶⁶ Tr. (2) (MacDonald) (12 March 2019) 405:21-406:4.

⁷⁶⁷ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 1.

⁷⁶⁸ *Id.*

⁷⁶⁹ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 2.

668. In its submissions on the Tribunal’s Independent Expert Report, Perenco focused on what it identified as nine significant deficiencies that have material financial consequences.⁷⁷⁰ In its closing submissions, Perenco grouped these issues into those relating to (1) soil volumes, (2) mud pits, (3) groundwater and (4) unit costs.⁷⁷¹ Correcting for these errors, Perenco submitted that the overall remediation cost is no more than US\$65 million, of which only US\$25 million can conceivably be allocated to Perenco.⁷⁷²
669. Perenco also observed that while Mr. MacDonald “*carried out work consistent with good standards in many respects*”, he did not have experience in the *Oriente* region and was not a specialist in carrying out such projects in Ecuador.⁷⁷³

(a) *Soil*

(i) *Land use classification*

670. Perenco took issue with Mr. MacDonald’s land use classifications which it asserted was based on “*visual inspection*”⁷⁷⁴ and which is not adequate.
671. First, Mr. MacDonald’s approach is contrary to the Tribunal’s direction that land use classifications “*should be guided by the Ecuadorian authorities’ practice in relation to the Blocks*” and that prior determinations by the Ecuadorian authorities have “*significant probative value.*”⁷⁷⁵
672. Perenco asserted that Ecuadorian authorities have repeatedly accepted the application of “*agricultural*”, not “*sensitive ecosystem*”, criteria in areas surrounding platforms. IEMS conceded this. TULAS further provides that agricultural lands include those “*classified as*

⁷⁷⁰ *Ibid.*, paragraph 3.

⁷⁷¹ See Perenco’s Closing Presentation, Slide 5.

⁷⁷² The Tribunal sets out the Parties’ arguments about causation and double recovery in a separate section III.F below.

⁷⁷³ See Perenco’s Closing Presentation, Slide 6, referring to Tr. (1) (MacDonald) (11 March 2019) 171:9-13.

⁷⁷⁴ Perenco’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 25 and fn. 49, referring to the Independent Expert Report, p. 25.

⁷⁷⁵ *Ibid.*, paragraph 26 and fns. 51-52.

agricultural” even if they contain “*native flora*.”⁷⁷⁶ Despite Mr. MacDonald’s assertions to the contrary, his visual inspection conclusions conflicted with those of the Ecuadorian authorities – two examples being Coca 6 and Mono CPF, where Ramboll chose ‘sensitive ecosystem’ even though Ecuador’s own environmental impact studies acknowledged that areas surrounding the platforms had to be remediated to agricultural standards despite being surrounded by lush secondary forest.⁷⁷⁷

673. Second, Perenco argues that Mr. MacDonald’s land use classifications reveal a lack of proper spatial and temporal observations. Mr. MacDonald appears to have taken the Tribunal’s guideline to apply a more stringent classification in any case of doubt as an excuse to rely on superficial or perfunctory visual observation instead of conducting a thorough investigation into how landowners and residents actually use the land over time. This ignores the full scope of the Tribunal’s directions that land use classifications “*should be reasonable in the circumstances of the particular case*.”⁷⁷⁸
674. Perenco points to three examples which were misclassified as sensitive ecosystem: Coca 10-16, where an area just north of the platform that is within a stand of trees which is actually surrounded by cleared agricultural plantations and a Petroamazonas pit farm; Payamino 10, which is actually characterised by obvious agricultural activity, large swaths of cleared areas and a pit farm which appears to contain approximately 20 pits; and Gacela 04, which is a huge Petroamazonas pipeline right of way (even Ramboll recognises that “operating areas containing other in-use infrastructure” are industrial lands, not ‘sensitive ecosystem’)⁷⁷⁹.
675. Third, Mr. MacDonald also improperly designated “*inactive*” sites as sensitive ecosystem. Perenco argued that the fact that a well is “inactive” indicates that it might be reactivated. The Tribunal held that sensitive ecosystem does not apply to a site that is “expected to be

⁷⁷⁶ *Ibid.*, paragraph 26.

⁷⁷⁷ *Ibid.*, paragraph 27.

⁷⁷⁸ *Ibid.*, paragraph 29 and fn. 59.

⁷⁷⁹ *Ibid.*, paragraph 32 and fn. 62, referring to the Independent Expert Report, p. 38.

operated for many years to come . . . [and] still distant from any ‘posterior use.’”⁷⁸⁰ Yet, that is what Ramboll did for instance at Lobo 4 and Jaguar 7-8, which it called sensitive ecosystem simply because the platforms are currently “inactive.”⁷⁸¹

(ii) *Background calculations*

676. Perenco argued that Mr. MacDonald incorrectly excluded all of GSI’s samples of clean soils to determine background concentrations while relying on IEMS’ equivalent samples.⁷⁸²
677. First, Mr. MacDonald’s exclusion of GSI’s background samples because “many” were “collected in the *immediate vicinity* of certain platforms and proximate to areas investigated for oilfield related impacts” directly contravened TULAS, which specifies that samples should be taken in those areas immediately outside the area under study.⁷⁸³ Proximity should have been a qualifying, not a disqualifying, feature of GSI’s background samples. Even if proximity were a concern, this could not justify a blanket exclusion of all 91 GSI samples; Mr. MacDonald should also have applied the same threshold to IEMS’ samples, some of which were even closer to the areas of study than GSI’s samples were.⁷⁸⁴ In any event, in the six sites that both IEMS and GSI sampled for background, 50% of IEMS’s samples are closer to the platforms than GSI’s samples – it cannot be that all of IEMS’s background samples were uniformly valid whereas GSI’s were not.⁷⁸⁵
678. Second, the fact that Mr. MacDonald adopted GSI’s chromium background data derived from GSI’s samples proves that the samples were not in fact “too close” to platforms. If they had been “too close,” they could not have yielded valid chromium data either.⁷⁸⁶

⁷⁸⁰ *Ibid.*, paragraph 34 and fn. 65, referring to the Interim Decision, paragraph 490 and Perenco’s Annotations to Sections 3.1 and 6.2 of the Independent Expert Report.

⁷⁸¹ *Ibid.*, paragraph 34 and fn. 66.

⁷⁸² *Ibid.*, paragraph 23.

⁷⁸³ *Ibid.*, paragraph 36 and fn. 69.

⁷⁸⁴ *Ibid.*, paragraph 37.

⁷⁸⁵ *Ibid.*, paragraph 39.

⁷⁸⁶ *Ibid.*, paragraph 40.

679. Third, Ramboll’s exclusion of GSI’s background data because GSI “excluded a number of sample concentrations identified as high outliers from their data sets” also makes no sense. GSI’s exclusion of what it considered to be high outlier samples made their background concentrations more conservative. Even if Ramboll considered this approach to be inappropriate, the proper response was to include the outlier samples, not exclude all non-outlier samples. Indeed, Ramboll itself included the GSI outlier samples to run its statistical test and also made exactly this kind of “correction” to the IEMS data, which it corrected to account for “typographical/compilation errors” and non-detect results.⁷⁸⁷
680. Fourth, Ramboll’s disregard of GSI’s background samples in the belief that they are drawn from a different statistical “population” than IEMS’s background samples misapplies a statistical tool.⁷⁸⁸ Perenco argues that what the data reflect is simply the fact that Block 7, comprising more than 200,000 hectares and different geological zones, actually has many subpopulations. Such exists even within IEMS’ own samples.⁷⁸⁹ Mr. MacDonald should not have rejected the GSI samples; even he acknowledged that more background samples are better.⁷⁹⁰

(iii) Delineation

681. Perenco asserted that Mr. MacDonald’s delineations ignored the sites’ topography, active equipment and site features, and its own clean soil samples. Thus, they were inconsistent with the reality of the sites and result in over-estimating contamination.⁷⁹¹
682. First, Mr. MacDonald’s “macro-delineation” approach ignored topography as well as active equipment and site features. For instance, Ramboll’s delineation in Coca 6 included a ridge bordering a drainage swale and assumed that contamination west of the ridge could

⁷⁸⁷ *Ibid.*, paragraph 41.

⁷⁸⁸ *Ibid.*, paragraph 42.

⁷⁸⁹ *Ibid.*, paragraph 45.

⁷⁹⁰ See Perenco’s Closing Presentation, Slide 15.

⁷⁹¹ Perenco’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 47.

somehow have extended all the way up the slope and over onto the top of the ridge.⁷⁹² In Mono CPF, also shown below, Ramboll's defined remediation area included production facilities with a flare and API separator.⁷⁹³

683. Second, Mr. MacDonald's delineation included remediation of areas where Ramboll's samples showed no exceedances or where Ramboll did not even take samples. An example is Coca 02/CPF, where the delineated area included no detected exceedances at all and includes a right-of-way pipeline that Petroamazonas constructed after GSI's and IEMS's sampling campaigns.⁷⁹⁴ Perenco also pointed out that Mr. MacDonald's delineation would require remediation of ballast, which is not soil (*e.g.* in Jaguar 03), remediation of waste disposal cells (*e.g.* Payamino Sanitary Landfill) or remediation of areas with no TPH exceedances (*e.g.* Yuralpa CPF).⁷⁹⁵

(b) *Mud Pits*

684. With respect to mud pits, Perenco argued that Ramboll ignored historical and visual evidence of synthetic liners and as a result applied the wrong regulatory criteria (*i.e.*, the more stringent exceedance requirements for unlined mud pits) and exceeded the Tribunal's mandate and the Parties' due process rights by sampling pits and that the Parties had not previously sampled.⁷⁹⁶
685. Perenco criticised Mr. MacDonald for assuming "without exception" that Perenco's pits were unlined, contrary to the Tribunal's instruction to further investigate whether those pits were closed with impermeable liners and to "ascertain whether the drilling muds were disposed of in a properly constructed sealed pit."⁷⁹⁷

⁷⁹² *Ibid.*, paragraph 48.

⁷⁹³ *Id.*

⁷⁹⁴ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 49.

⁷⁹⁵ *Ibid.*, paragraph 50; Perenco's Annotations to Section 6.2 of the Independent Expert Report.

⁷⁹⁶ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 23.

⁷⁹⁷ *Ibid.*, paragraph 52.

686. First, even though Mr. MacDonald claimed that drilling through the bottom of the mud pits to confirm the existence of liners would have compromised the units if the liners were present, Mr. MacDonald could have manually excavated a shallow portion around the edge of the pit and ascertained the presence or absence of an impermeable liner on the interior side slope of the excavation.⁷⁹⁸
687. Second, even when Ramboll observed visual evidence of liners at some mud pit perimeters, it ignored that evidence because “*it had no information regarding its condition or latent extent*” and “[p]hotographs taken by Perenco at the time of closure of *some* mud pits show that an excavator was typically used to treat the mud pit material in place, which likely would have resulted in the tearing or ripping of any liner material.”⁷⁹⁹ However, rather than treat mud pit material in place, the record shows that Perenco often mixed mud in auxiliary pits before transferring the muds to actual disposal pits, and the excavators were simply used to place mud pit materials inside the pits. This practice would not have *likely* resulted in the tearing or ripping of any liner material. Ramboll fails to consider this evidence at all.⁸⁰⁰
688. Third, Ramboll should have taken into account record evidence showing that a number of Perenco’s pits have impermeable synthetic liners. Contrary to Ramboll’s claim that it was “not provided any direct evidence as to whether liners are present for any specific mud pit,” Perenco had submitted pit closure reports, photographs, and testimony demonstrating that mud pits were lined with impermeable liners.⁸⁰¹ Perenco points to examples such as Oso 9, Coca 19 and Jaguar 9. Accordingly, several pits would meet the regulatory criteria and would not require remediation.

⁷⁹⁸ *Ibid.*, paragraph 53.

⁷⁹⁹ *Ibid.*, paragraph 54 and fns. 105-106, referring to the Independent Expert Report, p. 73 and p. 65, fn. 142.

⁸⁰⁰ *Ibid.*, paragraph 54.

⁸⁰¹ *Ibid.*, paragraph 55.

689. Perenco also criticised Mr. Macdonald for investigating some pits that were outside of his mandate and assuming that other pits contained exceedances without having sampled them.⁸⁰²
690. First, the Tribunal instructed Mr. MacDonald to sample sites which regulatory exceedances had been identified by either or both of the Parties' experts. However, Mr. MacDonald sampled three pits in Oso 9B even though neither GSI nor IEMS went to this site. He also sampled four pits in Oso 9A, even though the only soil sample, which was collected by IEMS, showed no exceedances. Mr. MacDonald also sampled Yuralpa Sanitary Landfill Pit 2 and Yuralpa G Pit 2, even though GSI and IEMS detected no exceedances at these sites and did not gather any samples from these pits. Perenco argues that Ramboll exceeded its mandate as it had investigated Oso 9A, Oso 9B, Oso 9 Pits 2 and 4, Yuralpa Sanitary Landfill Pit and Yuralpa G Pit 2, which were not areas that had been previously investigated or sampled by IEMS or GSI.⁸⁰³ This was contrary to the direction in the Interim Decision on Counterclaim and the mandate identified by Mr. MacDonald in his report⁸⁰⁴ These were not areas that had been previously investigated or sampled by IEMS or GSI.⁸⁰⁵
691. Second, contrary to the Tribunal's instruction, Mr. MacDonald assumed that exceedances existed in two mud pits in Oso 9 simply on the basis that the adjacent pits did not conform to the leachate criteria for lined pits, without having taken any samples from those pits and despite acknowledging that mud pits 2 and 4 were "not investigated by either the Parties or Ramboll."⁸⁰⁶ This assumption is proven erroneous by Ramboll's own sampling which found that Pit 8 in Oso 9 met the performance criteria even though the adjacent Pit 9 did

⁸⁰² *Ibid.*, paragraph 56.

⁸⁰³ See Perenco's Closing Presentation, Slide 21.

⁸⁰⁴ Perenco's Closing Presentation, Slide 21, referring to the Interim Decision on Counterclaim, paragraph 603 & the Independent Expert Report, p. 49.

⁸⁰⁵ See Perenco's Closing Presentation, Slide 21.

⁸⁰⁶ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 59.

not. As a result, these nine Oso pits and two Yuralpa pits should be excluded since they are beyond the Tribunal's mandate and there is no evidence of exceedances.⁸⁰⁷

692. Further, Perenco argued, based on pit closure reports and other contemporaneous documents, that there were liners present in properly closed pits at 18 of the mud pits in five sites.⁸⁰⁸ This implies that Perenco complied with RAOHE criteria at the time of closure. Perenco has also proven that the mud pits, or at least some segment of them, had intact liners at the time of installation and there is no legitimate specific evidence that there is any problem with those.⁸⁰⁹ Perenco also argued that IEMS' field notes either recorded references to Coca 4 and Payamino concrete pits, which were not made by Perenco, or record employees as saying that the pits were lined and they had no reason to think there were any problems with them or that they were leaking.⁸¹⁰ As for the use of excavators, Perenco argued that it is common practice, which even Petroamazonas follows.
693. Third, Perenco argued that Mr. MacDonald's mud pit remediation also suffered from the following technical deficiencies: Ramboll's remediation of mud pit 1 at Yuralpa Pad A, where Ramboll disregarded RAOHE's performance criteria and the pit would require no remediation under the correct criteria (Perenco argued that Table 7b criteria applied)⁸¹¹; Ramboll's disregard of RAOHE's instructions to test leachates for 6 PAHs (and instead applied it to the sum of 16 PAHs)⁸¹²; Ramboll's finding that clean soil cover on pits needs to be remediated even though it contains no exceedances;⁸¹³ and because Ramboll did not have "specific mud pit dimensions" for the particular pits it sampled in Oso 9A and 9B, it

⁸⁰⁷ *Ibid.*, paragraph 59.

⁸⁰⁸ Tr. (2) (MacDonald) (12 March 2019) 427:1-5, referring to Perenco's Closing Presentation, Slide 16.

⁸⁰⁹ Tr. (2) (MacDonald) (12 March 2019) 427:15-20.

⁸¹⁰ Tr. (2) (MacDonald) (12 March 2019) 429:8-13.

⁸¹¹ See Perenco's Annotations to Section 6.2 of Independent Expert Report, pp. 196-197 of the Consolidated Expert Report.

⁸¹² See Perenco's Annotations to Section 6.2 of Independent Expert Report, p. 195 of the Consolidated Expert Report.

⁸¹³ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 60 and fn. 123; see also Perenco's Annotations to Section 5.2 of Independent Expert Report, p. 94 of the Consolidated Expert Report.

designated for remediation two entire pit farms comprising many pits, most of which Ramboll had not even sampled.⁸¹⁴

(c) *Groundwater*

694. With regard to groundwater, Perenco argues that Mr. MacDonald disregarded express TULAS clay content criteria for groundwater samples and failed to recognise that its own lab data shows that purported TPH exceedances were due to natural organic matter, not crude oil.
695. First, Perenco argues that Ramboll disregards TULAS' clay content rules and that TULAS does not apply when clay content is above 25%. TULAS Book VI, Annex 1, Table 5 provides that the "reference quality criteria for groundwater" to which it applies are "soil with clay content between (0-25.0%)." TULAS therefore does not provide specific criteria for aquifers with higher clay and/or organic matter content; this means that soils with a clay content higher than 25% (and an organic matter content of less than 10%) do not need to comply with the TULAS Table 5 criteria and, accordingly, that exceedances of those criteria do not constitute environmental harm if the soil has a clay content above 25%. This was not disputed by IEMS.⁸¹⁵
696. In this regard, Perenco further relies on Mr. Bianchi's explanation given at the Expert Hearing that the clay content rules are applied straightforwardly in Ecuador.⁸¹⁶ Mr. MacDonald's disapproval of the regulatory line drawn in Table 5 is not a valid basis for the Tribunal to deny it and, Perenco argues, the Ecuadorian regulators' decision to only require low barium content in water with less than 25% clay is rational because people do not drink water that has lots of clay or lots of organic material floating in it.⁸¹⁷ It is a compromise as part of the balanced development and balanced environmental approach

⁸¹⁴ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 58.

⁸¹⁵ *Ibid.*, paragraph 62 and fn. 128.

⁸¹⁶ See Perenco's Closing Presentation, Slides 24, referring to Tr. (1) (MacDonald) (11 March 2019) 268:17-269:12.

⁸¹⁷ Tr. (2) (MacDonald) (12 March 2019) 434:1-15.

that Ecuador wants to take. In any event, IEMS' first report and other evidence show that groundwater is actually not the source of drinking water in this area and which may be another reason why this regulation made sense in the way that it was phrased.⁸¹⁸

697. Once groundwater samples with clay content over 25% are excluded, many of Ramboll's monitoring wells show no exceedances.
698. Second, Perenco observes that Mr. MacDonald's groundwater results returned almost ubiquitous TPH "*hits*", even in areas where no TPH exceedances were identified in the surrounding soil, and even in areas where neither IEMS nor GSI had ever encountered TPH in their groundwater sampling. As Mr. MacDonald appeared to acknowledge, these unexplained TPH exceedances are unusual and should have raised a red flag. In fact, the type of test that Ramboll's lab ran uses a method that is not specific to petroleum from crude oil and can misidentify as TPH naturally-occurring substances like waxy leaves. Ramboll's failure to investigate this difference is especially problematic since waxy leaves are common in the Ecuadorian jungle. Had Ramboll examined chromatograms for its samples to determine whether they are really oilfield impacts or natural phenomena, it would have seen that most of them are not crude oil at all.⁸¹⁹
699. Perenco also criticises Mr. MacDonald's modelling tool for groundwater.⁸²⁰ In the swampy terrain and generally low-permeability soils of Blocks 7 and 21, groundwater moves very slowly and cannot transport contaminants over significant distances, even over long time periods. The modeling tool used by Ramboll and the sensitivity analysis conducted should, by design, provide a conservative overestimate of the true plume dimensions. However, Ramboll reached a surprisingly high remediation cost of \$25 million for groundwater. This incongruous result should, again, have prompted further analysis of Ramboll's results. Perenco points out three issues with Mr. MacDonald's groundwater modelling: (i) he used the three-dimensional version of the modelling software, instead of two-dimensional, it

⁸¹⁸ Tr. (2) (MacDonald) (12 March 2019) 434:16-20.

⁸¹⁹ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 64.

⁸²⁰ Perenco's Annotations to Section 6.1 of the Independent Expert Report, p. 145 of the Consolidated Expert Report.

would have predicted far smaller plumes at each site; (ii) his model does not account for biodegradation of contamination over time and thus overestimates the size of the groundwater plume; (iii) for a number of plumes reported by Ramboll, no source of the plume could be identified, which is consistent with other factors that suggest that these plumes are not present and are an artifact of faulty TPH results in some cases.

(d) *Unit Costs*

700. Perenco asserts that Ramboll’s unit costs for remediation do not reflect local costs. Ramboll failed to consider actual costs spent by Petroamazonas itself for comparable remediation work, even though the Tribunal had stated that such costs are the “best guide for estimating comparable remediation works.”⁸²¹ Ramboll’s costs are inflated. Ramboll has failed, contrary to the Tribunal’s directions in the Interim Decision on Counterclaim that quantification must be based on actual Ecuadorian costs.⁸²² Perenco also complains that Ramboll never provided a copy of its quote for groundwater and soil for the Parties’ verification.⁸²³
701. Moreover, for soil in particular, Ramboll’s unit costs bear no relationship to actual costs in Ecuador, as shown in the two quotes that Ramboll belatedly obtained as well as in Petroamazonas’ own public documents. Instead, Ramboll generated its soil remediation numbers through RACER, which provides estimates based on remediation costs in the United States.⁸²⁴ This is in stark contradiction to the costs of Petroamazonas that they have in an actual contract, which were achieved through an appropriate method.
702. First, Ramboll did not analyse evidence of local costs already in the record of this proceeding or explain its basis for rejecting them. As GSI had explained, numerous remediation projects have been completed at oilfield facilities in the *Oriente* region pursuant to the requirements of RAOHE and/or TULAS and subject to review and approval

⁸²¹ Perenco’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 65 and fn. 137.

⁸²² Perenco’s Closing Presentation, Slide 44; referring to Interim Decision on Counterclaim, paragraph 579 and fn. 1156.

⁸²³ Perenco’s Comments to the Independent Expert Report, paragraph 66.

⁸²⁴ Perenco’s Closing Presentation, Slide 48 referring to Mr. MacDonald’s testimony at Tr. (1) (MacDonald) (11 March 2019) 87:21-88:5.

by the Ecuadorian authorities, including projects by Petroecuador and other oilfield operators. At \$410/m.³ Ramboll’s gross unit rate for soil remediation substantially exceeds all of these government-approved remediation projects. Whereas the Tribunal acknowledged that GSI’s conservative bulk cost estimate for soil remediation of \$260/m³ was “much closer” than IEMS’s to actual remediation costs in Ecuador, Ramboll’s figure is inexplicably more than twice as high.

703. Second, Ramboll has ignored actual remediation costs incurred by Petroamazonas, which are readily available in public documents. In December 2018, Petroamazonas signed a contract for remediation works in Blocks 7 and 21, among others, that includes significantly lower unit costs for soil remediation: for instance, \$39/m³ for treatment and disposal of soil with TPH and metals, compared to Ramboll’s \$160/m³. Similarly, in December 2017, Petroamazonas issued a bond offering, according to which “[i]n 2016, Petroamazonas incurred expenses of approximately \$23.1 million for the implementation of Project Amazonia Viva,” which included the remediation of “approximately 364,240 cubic meters of soil[] and 191 sources of pollution” in certain blocks outside Blocks 7 and 21. These figures imply a bulk unit cost of around \$63/m³, while Ramboll’s corresponding bulk unit cost of \$410/m³ is six times higher. The magnitude of these discrepancies between actual, recent, documented costs for work in the Blocks and surrounding areas, on the one hand, and Ramboll’s software-generated black box estimate based on remediation in the United States, on the other, are indicative of the unreliability of Ramboll’s overall approach and the caution with which the Tribunal should treat it.⁸²⁵

704. Third, Ramboll’s quotes from two local contractors, Hidrogeocol Ecuador and Ecuambiente, are also not a reliable guide. Ramboll appears to have received the quotes in late November and December 2018—an entire year after it concluded the second sampling campaign in Ecuador, and barely three weeks before Mr. MacDonald submitted the Report to the Parties. Hidrogeocol’s unit cost for transportation and treatment of soil contaminated with TPH and heavy metals amounts to \$260/m³, six times higher than Petroamazonas’s actual unit cost of \$39/m³ for comparable remediation work. Similarly, Ecuambiente’s unit

⁸²⁵ Perenco’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 69.

cost for transportation and treatment of soils with just TPH is \$56/m³ while Petroamazonas's actual unit cost is \$46/m³ for comparable remediation work. Ramboll does not appear to have obtained a range of quotes from other contractors or to have taken account of the fact that quotes initially provided to foreign companies —especially in a litigation context— are typically higher.⁸²⁶

705. Finally, despite having obtained these inflated quotes, no doubt because they were received so late, Ramboll did not even apply them in calculating its remediation costs. Instead, Ramboll increased certain kinds of unit costs based on no apparent reason other than its unexplained “*professional experience*.” In circumstances where the Tribunal has held that “*the expert shall be guided by Ecuadorian costs*”, that is not an acceptable approach.⁸²⁷
706. Ramboll's remediation unit costs thus do not establish the actual local costs on which remediation must be based, as the Tribunal determined. Instead, the Tribunal should apply the actual costs recently incurred by Petroamazonas itself, which provide the “best guide for estimating comparable remediation works.” Adjusting Ramboll's estimated unit costs to reflect Petroamazonas's actual costs for soil reduces Ramboll's soil unit costs by half. Thus, Ramboll's soil remediation cost falls from \$98 million to \$50 million simply by using local costs, and to approximately \$40 million after all technical corrections (before allocation).⁸²⁸

F. Causation and Double Recovery

707. While Mr. MacDonald was not instructed to investigate causation, in addition to their comments and submissions with respect to Mr. MacDonald's investigations and findings, the Parties addressed this as well as the issue of double recovery in light of the *Burlington* tribunal's decision on Ecuador's environmental counterclaim. The Parties' arguments are set out below.

⁸²⁶ *Ibid.*, paragraph 70.

⁸²⁷ *Ibid.*, paragraph 71.

⁸²⁸ *Ibid.*, paragraph 72.

1. Ecuador's arguments

708. Ecuador submits that the Tribunal's Interim Decision on Counterclaim is clear that the burden of proof is on Perenco.⁸²⁹ Therefore, if there is a regulatory exceedance, Perenco is responsible unless it can prove that some other person or an external event caused harm. Perenco has failed to discharge this burden of proof and therefore should be liable, at the very least, for the contamination confirmed by Mr. MacDonald in Blocks 7 and 21.⁸³⁰
709. First, insofar as alleged contamination caused by operators *prior* to its assuming operations in Blocks 7 and 21, Perenco has failed to prove that the extensive contamination confirmed by Mr. MacDonald was already present in the Blocks when it assumed operations in 2002.⁸³¹
710. Perenco failed to point to documentary evidence confirming its theory that contamination would have been caused by prior operators: (i) Perenco failed to conduct a comprehensive written study of the environmental condition of the Blocks at the time of acquisition; (ii) neither the PSA entered into Perenco and Kerr-McGee nor Perenco's 2002 Biennial Audit suggested major environmental problems at the time; and (iii) even Perenco's 2006 and 2008 superficial and highly selective biennial audits showed a steep decline of the environmental conditions of the Blocks.⁸³²
711. Perenco cannot attribute the contamination to prior operators (which were limited to 23 sites only). Ecuador's responses to Perenco's allegations for five of these sites are as follows: (i) evidence on record shows that the contamination in Payamino 2-8 dates from the time of Perenco's operations; (ii) the exceedance in the swampy area southeast of Coca CPF was associated with discharge of produced water with oil residue from the API separator during Perenco's operations, as confirmed by Mr. MacDonald and acknowledged by Mr. Salto before the *Burlington* tribunal; (iii) 1999 spill in Coca 6 migrated to the

⁸²⁹ Ecuador's Closing Presentation, Slide 5.

⁸³⁰ Ecuador's Comments to the Independent Expert Report dated 22 February 2019, Section 3.

⁸³¹ *Ibid.*, paragraph 50.

⁸³² *Ibid.*, paragraphs 50-53.

southwest of the platform, whilst the area to be remediated identified by Mr. MacDonald is located to the southeast of the platform; (iv) the *Burlington* tribunal held Perenco responsible for the remediation of the Coca 8 pit; and (v) GSI inspected the pit in Payamino 4 and attested that there was no leakage – therefore, any contamination could not be related to this pit.⁸³³

712. With respect to Perenco’s denial of liability for 19 sites based on a “simplistic argument” that the exceedances in these sites mostly related to heavy metals and pit areas and therefore were caused by drilling pre-dating its operatorship, Ecuador argues that this assumption is unsupported.⁸³⁴ For example, Perenco argues that barium exceedances could only arise from original drilling activities. However, Perenco conducted numerous workovers and its admitted practice of transporting drilling muds from one site to another for storage, both of which are likely to have caused the exceedances found.⁸³⁵ In *Yuralpa A*, Perenco itself also drilled in the period 2003-2006 and should know whether its drilling caused contamination on this site.⁸³⁶ There were also numerous unreported oil spills during Perenco’s operations and there is no evidence that these were properly remediated.⁸³⁷ Perenco now accepts that at least part of the contamination in *Jaguar 1* was caused by an unreported spill during the time of its operations and it drilled in *Coca 19* in 2003, where Mr. MacDonald confirmed soil contamination and non-conforming Perenco-associated pits.⁸³⁸
713. Moreover, if Perenco really wanted to identify the cause and timing of the TPH exceedances found, it could have conducted (as it had an ample opportunity to do pre- and post-July 2009) a hydrocarbon fingerprinting analysis or other laboratory forensic

⁸³³ *Ibid.*, paragraph 55.

⁸³⁴ *Ibid.*, paragraph 56.

⁸³⁵ *Id.*

⁸³⁶ *Id.*

⁸³⁷ *Ibid.*, paragraph 57.

⁸³⁸ *Ibid.*, paragraph 58.

technique. At the least, the tests would be able to show whether a particular release was fresh or very dated such that it would be pre- or post-Perenco operations.⁸³⁹

714. Further, Perenco inherited all environmental liability for any pre-existing conditions present in the Blocks.⁸⁴⁰
715. Ecuador submits further that Perenco-associated pits were found to be non-compliant at all of the sites investigated by MacDonald.⁸⁴¹ This finding is unsurprising and confirms that Perenco's poor practices extend to its location, construction, use and management of pits. There can, thus, be no doubt, that these exceedances are attributable to Perenco. Ecuador further argues that Perenco is liable, at the very least, for the complete remediation of all the mud pits investigated by Mr. MacDonald because: (i) Perenco has the burden of proof regarding the placement of proper pits as it would have such records, but has failed to discharge it;⁸⁴² and (ii) there were many more mud pits that Mr. MacDonald should have, but did not, investigate.⁸⁴³
716. Second, with respect to alleged contamination caused by Petroamazonas ("PAM") after it assumed operations in Blocks 7 and 21, Perenco is not able to prove that any contamination identified by Mr. MacDonald is attributable to Petroamazonas. Perenco has referred to only one incident at Mono CPF in 2011 that that would allegedly be the source of the contamination in one of the areas in that site. However, the limited contents of that 2011 spill make their way to the opposite end of the platform due to the terrain gradient (*i.e.*, the northeast and not the southeast of the platform, where the contaminated area confirmed by Mr. MacDonald is located), but it is also chronologically impossible for the contamination delineated by the Expert to result from a 2011 PAM spill, given that, already during their first field campaign in October 2010, IEMS had collected samples showing TPH

⁸³⁹ *Ibid.*, paragraph 60.

⁸⁴⁰ Ecuador's Closing Presentation, Slide 10.

⁸⁴¹ Ecuador's Comments to the Independent Expert Report dated 22 February 2019, paragraph 61.

⁸⁴² Ecuador's Closing Presentation, Slide 18.

⁸⁴³ *Ibid.*, Slide 19.

exceedances in the same area as Mr. MacDonald.⁸⁴⁴ Other than this isolated incident, Perenco's only other claim is that Petroamazonas' new works overtook areas at 9 other sites.⁸⁴⁵

717. In any event, the evidence on record, including the documents recently disclosed by Ecuador, confirms that Petroamazonas neither caused nor contributed to the contamination. *First*, 11 of the sites and all the pits identified for remediation have not been operated or used by Petroamazonas.⁸⁴⁶ *Second*, as Mr. MacDonald performed a gap filling exercise, the contamination he found is the same identified by IEMS (and others, like Walsh and GSI) since 2010. *Third*, none of those who conducted inspections from 2010 to 2017 observed any environmental incidents after July 2009 and Mr. MacDonald's report does not mention any signs of recent contamination observed during Ramboll's investigations.⁸⁴⁷ *Fourth*, documents recently produced by Ecuador confirm that there were no incidents reported during Petroamazonas' operations in 30 sites identified for remediation. For those sites where an incident occurred, those incidents could not be the cause of the harm as they occurred at different locations from Mr. MacDonald's remediation locations and were, in any event, promptly remediated by Petroamazonas.⁸⁴⁸
718. In response to the Tribunal's invitation for comments regarding a possible general discounting factor to account for Petroamazonas' possible contribution to the environmental harm,⁸⁴⁹ Ecuador makes the following two submissions.
719. First, as set out above, Petroamazonas has neither caused nor contributed to the harm identified by Mr. MacDonald, and save for two areas in Coca CPF and Coca 1, none of the areas identified for remediation were overtaken by Petroamazonas' new works.⁸⁵⁰

⁸⁴⁴ Ecuador's Comments to the Independent Expert Report dated 22 February 2019, paragraph 64.

⁸⁴⁵ *Ibid.*, paragraph 63.

⁸⁴⁶ *Ibid.*, paragraphs 66 and 68.

⁸⁴⁷ *Ibid.*, paragraph 70.

⁸⁴⁸ *Ibid.*, paragraph 71.

⁸⁴⁹ Procedural Order No. 17.

⁸⁵⁰ Ecuador's Comments to the Independent Expert Report, paragraph 74.

Perenco's complaint that Ecuador has failed to disclose some of Petroamazonas' spills relates to spills either introduced by Ecuador into the record, outside the scope of the Tribunal's order for document production or were addressed in Ecuador's letter of 11 March 2019 and now also part of the record.⁸⁵¹

720. Second, careful consideration should be given to how the Tribunal determines a discounting factor if nonetheless the Tribunal were still minded to grant it. Ecuador anticipates difficulties and perverse incentives if the Tribunal were to allocate responsibility for groundwater based on the amount of time that each operator ran the Blocks because: (i) this rewards an operator who concealed the existence of contamination for years and tactically seeks to deny liability such that it would be able to share responsibility with the next operator;⁸⁵² (ii) a linear time-based rule would unfairly impose exclusively on Ecuador the burden of the time taken by Mr. MacDonald for completing his report; and (iii) this assumes the same amount of contamination is generated every year regardless of each operator's practices, but the Tribunal cannot assume that Petroamazonas operates under the same low standards employed by Perenco.⁸⁵³
721. Finally, Ecuador confirms that it is not seeking double recovery for the environmental harm in the Blocks. It submits that Mr. MacDonald has not found the "same harm" as the *Burlington* tribunal and Perenco, therefore, remains liable for the additional and/or different remedial areas, volumes and costs. In its submissions, Ecuador provided a site-by-site comparison of areas, depth, volumes and costs to identify overlaps adopting a conservative approach. Its accompanying explanations specific to soil, mud pits and groundwater are as follows.
722. **Soil:** no overlap can exist in relation to (i) sites for which the *Burlington* tribunal did not award any remedial costs; (ii) sites where Mr. MacDonald delineated different areas; (iii) sites or areas where Mr. MacDonald's sampling has confirmed contamination extends beyond or deeper than the *Burlington* tribunal's findings; (iv) sites or areas where the

⁸⁵¹ Ecuador's Closing Presentation, Slide 47-48, Tr. (2) (MacDonald) (12 March 2019) 412:5-18.

⁸⁵² Ecuador's Comments to the Independent Expert Report, paragraph 76.

⁸⁵³ *Ibid.*, paragraph 78.

horizontal and vertical extent of the contamination estimated by Mr. MacDonald and the *Burlington* tribunal are similar, but for which Mr. MacDonald estimates higher remediation costs.

723. **Mud pits:** the *Burlington* tribunal awarded only US\$11,106,050 for the remediation of mud pits at five sites (two of which were not considered by the Expert). Conversely, Mr. MacDonald concluded that (i) additional mud pits warrant remediation, and (ii) higher remediation costs – with respect to those awarded by the *Burlington* tribunal – would be required for remediating mud pits at Cónдор Norte (US\$2,484,000 by Mr. MacDonald v. US\$1,070,000 in *Burlington*) and the Payamino WTS (US\$2,978,000 by Mr. MacDonald v. 2,025,000 in *Burlington*). Hence, Perenco is liable for the higher remediation costs at Cónдор Norte and Payamino WTS (*i.e.*, US\$2,367,000) as well as the full remediation costs estimated for non-compliant mud pits at 11 sites.
724. **Groundwater:** the *Burlington* tribunal awarded only US\$5,040,000 for groundwater remediation at Coca CPF, Payamino 14/20/24 and Payamino 15 (*i.e.*, US\$1,680,000 per site). Conversely, Mr. MacDonald concluded that nine additional sites require groundwater remediation and estimated higher costs for the remediation of Coca 2/CPF (US\$3,001,000 by Mr. MacDonald v. US\$1,680,000 in *Burlington*). Perenco is, therefore, liable for the difference in groundwater remediation costs for Coca 2/CPF (US\$1,321,000) as well as the full remediation costs estimated by Mr. MacDonald for the nine additional sites.
725. Finally, as it pertains to the well abandonment costs claimed by Ecuador for the seven sites in Perenco’s November 2008 Well Site Abandonment Plan that it never carried out (and that PAM has never operated), Ecuador is entitled to any abandonment costs in addition to the US\$929,722 granted by the *Burlington* tribunal.
726. Based on Ecuador’s calculations, therefore, it is entitled to recover US\$130,801,100 from Perenco.⁸⁵⁴

⁸⁵⁴ *Ibid.*, Appendix A.

	POTENTIAL MAXIMUM REMEDATION COSTS SUBJECT TO DOUBLE RECOVERY	POTENTIAL REMEDATION COSTS <u>NOT</u> SUBJECT TO DOUBLE RECOVERY
Soil - Block 7	-15 714 000 USD	80 759 000 USD
Soil - Block 21	-495 900 USD	1 454 100 USD
Mud pits	-8 412 000 USD	28 304 000 USD
Groundwater	-4 457 000 USD	20 284 000 USD
TOTALS	-29 078 900 USD	130 801 100 USD

2. Perenco's arguments

727. In sum, Perenco argues that it cannot be liable at all for harm it did not cause; it cannot be solely liable for harm to which others contributed; and it certainly cannot be presumed to be liable for any conditions observed in the Blocks only years after its departure.⁸⁵⁵ The fact that sampling found exceedances in Blocks 7 and 21 many years after Perenco's investment there was expropriated is not proof that Perenco caused those exceedances, and without proof of causation, there simply is no liability.
728. Perenco argues that the Tribunal decided in its Interim Decision on Counterclaim that the "onus of proof is on a party who makes an allegation" and that it is Ecuador who must disprove that Petroamazonas caused exceedances.⁸⁵⁶ Ecuador's failure to do so cannot be remedied by presuming causation.⁸⁵⁷ Perenco can only be *prima facie* liable for exceedances identified during Perenco's operatorship and can relieve itself of liability by demonstrating that someone else caused the harm. This must mean that Petroamazonas as

⁸⁵⁵ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 14.

⁸⁵⁶ Perenco's Closing Presentation, Slide 59.

⁸⁵⁷ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 8.

the current operator is strictly liable for harm save insofar as it can demonstrate that, in this case, Perenco, caused the harm.

729. There is no more reason to presume that Perenco, as one of several past operators, is liable for conditions identified years after it was ousted than to presume that any other prior operator is liable for them.⁸⁵⁸ It would be unjust to do so when Petroamazonas has extensively developed the Blocks, turned forests into pit farms, dug up soils designated for remediation to make rights-of-way for new pipelines, and experienced dozens of spills that were only recently disclosed and even more which were not.⁸⁵⁹ There are also no inequities on the facts of the case that justifies the shifting of the burden of proof to Perenco.
730. According to Perenco, the adjustment of Ramboll's remediation costs for causation would reduce those costs by almost a third.
731. First, most of the identified exceedances were caused by prior operators: (i) exceedances identified by Ramboll are largely associated with barium which in turn is associated with drilling that occurred prior to Perenco's operatorship – Perenco did not drill wells in many of the sites where soil exceedances were detected, including seven of the eight “inactive” sites that the Tribunal had identified; (ii) at least some of the TPH exceedances also stem from Ecuador's or other operators' tenure, *e.g.* Payamino 2-8, where a major environmental incident occurred during CEPE's operatorship, or Coca 6, where major spills occurred in 1999 and later in 2011; (iii) that is likewise the case for groundwater at sites where Ramboll identified barium exceedances, which can only be causally related to production well drilling, but where Perenco did not drill wells; and incidents that may have led to TPH contamination did not occur during Perenco's operations, *e.g.* Payamino 4-14, where Perenco did not drill wells and no TPH were identified in the 2011-2013 sampling campaigns.⁸⁶⁰

⁸⁵⁸ *Ibid.*, paragraph 11.

⁸⁵⁹ *Ibid.*, paragraph 12.

⁸⁶⁰ *Ibid.*, paragraph 17.

732. Second, for the sites where Perenco may have contributed to the exceedances, there will inevitably be difficulties in allocating liability between Perenco and Ecuador. Perenco submits that the application of a discounting factor based on length of operatorship may be appropriate for both soil and groundwater. Such a discounting factor must, however, take into account the full history of operations at the given site, and cannot begin simply in 2002. The effluxion of time alone means that, for example, for groundwater, more than 70% of the remediation costs must be allocated to Ecuador.⁸⁶¹
733. Third, for mud pit remediation, the Tribunal recognised that Perenco's liability is limited to the contents of the mud pits that Perenco built and used. Perenco cannot be held solely liable, however, for pit cover material (which Ramboll has treated as ordinary soil) that shows near-surface exceedances unrelated to Perenco's drilling of the associated wells.⁸⁶² Perenco further notes that there were mud pits which were already closed by the time of Perenco's operations.⁸⁶³
734. Perenco submits that it is not surprising that Perenco contributed to only a fraction of the issues identified in the Blocks. Environmental standards and practices were different in the 1980s and 1990s than they were during Perenco's operatorship.⁸⁶⁴ Perenco's involvement in the Blocks was comparatively limited, both in time and in nature. Perenco's tenure lasted less than seven years compared to the 49 years that Block 7 and the Coca-Payamino Unified Field have been in operation and 47 years for some areas in Block 21. Petroamazonas has since developed the Blocks far more aggressively and has more than doubled the impact that Perenco could have.⁸⁶⁵
735. Perenco proposes that the following principles of allocation be adopted:
- (a) **Pits:** 100% attributed to Perenco;

⁸⁶¹ *Ibid.*, paragraph 18.

⁸⁶² *Ibid.*, paragraph 19.

⁸⁶³ See Perenco's Closing Presentation, Slides 22.

⁸⁶⁴ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 20.

⁸⁶⁵ *Id.*

- (b) **Groundwater:** allocation by ratio of time;
- (c) **Soil:** in summary, according to the type of soil exceedance, which might be categorized as follows: (i) barium only or barium with other metals (but no TPH); (ii) barium with TPH only (no other metals); (iii) barium, TPH and other metals; (iv) TPH only (no barium, no other metals) or other metals only (no barium, no TPH).⁸⁶⁶

736. The application of these principles would result in remedial costs of US\$25,600,465:⁸⁶⁷

	Ramboll Estimate	With Causation Adjustment	With Technical and Causation Adjustments
Soil	\$98,423,000	\$23,310,662	\$10,468,602
Pits	\$36,715,000	\$36,607,370	\$14,865,533
Groundwater	\$24,742,000	\$5,835,619	\$266,330
Total	\$159,880,000	\$65,753,651	\$25,600,465

737. Perenco submits that this is reasonable and likely high. Its proposed methodology: (i) adjusts soil volumes at only 16 of Ramboll’s 49 sites; (ii) allocates to Perenco 60% of the cost for Payamino 2-8; (iii) allocates to Perenco full responsibility for barium exceedances at sites Perenco drilled, even though Petroamazonas may have done workovers there; (iv) allocates to Perenco full responsibility for mud pits it built or used, even though approved pit closure reports show there was no fault, and even though Petroamazonas may also have used them; (v) allocates to Perenco its share of responsibility for metals-only exceedances, even if there is no barium or TPH to link them to oil operations; and (v) includes a cost

⁸⁶⁶ Perenco’s Table 1 Soil Cost Allocation Methodology, Annotated Report, p. 13.

⁸⁶⁷ See Perenco’s Closing Presentation, Slide 94.

contingency of up to 30%, despite Ramboll having filled gaps with another thousand samples.⁸⁶⁸

738. Perenco submits that this figure of US\$25 million should be further adjusted in light of the Consortium's US\$42 million settlement payment. This payment must be deducted from the total remediation cost to avoid double recovery. This would lead to an award of zero damages if all adjustments are applied.⁸⁶⁹

739. Even if the corrected unit costs allocated to Perenco were to exceed US\$42 million, the Tribunal should order that Ecuador cannot simply offset any such residual remediation cost from the damages it owes to Perenco, but that it must deposit that amount, along with its share of the overall remediation costs, in a remediation fund that Ecuador must use solely for the purpose of remediating the Blocks.⁸⁷⁰ This is the only way to ensure that the Tribunal's objective of protecting the environment is truly achieved, that Ecuador fulfills its promises to use the funds to remediate, and that the entire counterclaims process is not subverted for Ecuador's opportunistic monetary gain, it should not reduce Perenco's damages but be paid into a remediation fund.⁸⁷¹

G. The Tribunal's Analysis

1. The Tribunal's view of the Expert's work

740. As can be seen from the summary of the Parties' submissions, many issues were raised by one Party or the other which bear upon the quantification of damages. The Tribunal considers that these ranged from the important to the irrelevant.⁸⁷² To the extent that the

⁸⁶⁸ Perenco's Closing Presentation, Slide 95.

⁸⁶⁹ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 73.

⁸⁷⁰ *Ibid.*, paragraph 75.

⁸⁷¹ *Id.*

⁸⁷² As an example of the latter, the Tribunal saw no value in Perenco's attempt to diminish the Expert's work by reason of his lack of prior experience in Ecuador. It was the Parties themselves who identified, interviewed, and proposed Mr. MacDonald to the Tribunal. Both Parties were aware of his experience, which is extensive, and includes work in other Latin American countries. The fact that he had not previously worked in Ecuador is of no import or relevance.

Tribunal does not expressly deal with an issue raised by a Party, that does not mean that it has not been considered.

741. To begin, the Tribunal addresses the overall quality and reliability of the Report. The Tribunal is satisfied that Mr. MacDonald and his team from Ramboll acted impartially and independently and with a high level of technical proficiency. Mr. MacDonald began his work by performing an intensive data review exercise in order to familiarise himself with the work previously done by the Parties' experts and with the Tribunal's findings in the Interim Decision on Counterclaim.⁸⁷³ During his testimony at the Expert Hearing, he indicated that he also consulted local advisors and counsel in Ecuador in an effort to fully inform himself of the regulatory regime so as to be able to discharge his mandate.⁸⁷⁴ When it came to estimating remediation costs, Mr. MacDonald engaged a local consultant, Hidrogeocol Ecuador, to assist in obtaining quotations for remedial work.⁸⁷⁵
742. Although the Tribunal addressed the principal issues of Ecuadorian environmental law in the Interim Decision on Counterclaim, certain secondary issues remained to be addressed by the Expert in discharging his mandate. The Tribunal considers that he made reasonable decisions within the framework of Ecuadorian environmental law and administrative practice.

⁸⁷³ Consolidated Expert Report, p. 2: "My findings and opinions are based upon documents provided by the Tribunal and the Parties, as listed in Section 8.0, supplemented by my visits to representative sites in Blocks 7 and 21 during October/November 2016 and again during fieldwork performed in the fall of 2017. I also relied upon various regulatory documents, standards, and scholarly and technical publications that are applicable to this matter. Finally, under my direction, Ramboll generated independent data and performed the relevant technical analyses to close significant data gaps in the investigation of soils and generated a technically valid data set to replace prior groundwater data gathered by the Parties. Under my direction, Ramboll also conducted work needed to document the compliance status of mud pits previously used by Perenco with applicable Ecuadorian regulations."

⁸⁷⁴ Tr. (1) (MacDonald) (11 March 2019) 269:15-19: "...I was not precluded from reading the regulations, interpreting them, nor of having conversations with other consultants in Ecuador, including environmental counsel where I was pushing and probing."

⁸⁷⁵ Tr. (1) (MacDonald) (11 March 2019) 85:19-21.

743. Mr. MacDonald and Ramboll conducted the sampling exercise transparently and considered suggestions made by the Parties' experts and representatives.⁸⁷⁶ The Consolidated Independent Expert Report noted in this regard:

"It is important to note that the Parties have had the opportunity to pose questions and comment on my work throughout this engagement, including before and during the performance of the field campaign. In addition, representatives of the Parties were present during all onsite activities, including the initial exploratory visit to the Blocks as well as during the performance of sample mark-outs and collection of samples from all investigated media. The field program was implemented over a four-month period and issues raised by the Parties during that time were always considered; in certain cases, my approach was adjusted to incorporate expanded information or to address concerns (when these were reasonable and technically valid). It was not always possible to reach full agreement with both Parties, as their commitments to their clients and strategic approaches differed from my own. However, in all cases, a respectful dialogue was established with both Parties, and to my knowledge neither expressed concerns regarding bias for or against either Party in this matter. Relevant correspondence, emails, and other documentation of this dialogue between the Parties and myself or field personnel is included in Appendix B."⁸⁷⁷

744. Mr. MacDonald acknowledged that he did not accept every suggestion from a Party, but that is hardly surprising, given how far apart the Parties' experts were in their own approaches and findings.⁸⁷⁸ Moreover, again unsurprisingly, in a few instances, due to technical considerations, he chose not to precisely replicate a location at a site where one

⁸⁷⁶ Mr. MacDonald noted that: "there was significant communications with the Parties, both legal counsel, as well as their Experts, in advance of the site work. There were frequent briefings with the Parties during the site work, all right, routine written and verbal communications responding to questions and careful consideration of all matters raised by the Parties, with adjustments made where we thought reasonable and appropriate." Tr. (1) (MacDonald) (11 March 2019) 21:21-22:7. See also his Direct Presentation, Slide 4, where he adverted to communications with the Parties before the site work was conducted, frequent briefings with the Parties during the site work, routine written and verbal communications to respond to questions or concerns raised by the Parties, and consideration of all matters raised by the Parties, with adjustments made where reasonable.

⁸⁷⁷ Consolidated Expert Report, Section 1.3.

⁸⁷⁸ *Ibid.*, p. 1: "The underlying technical investigations performed by each Party were based on differing conceptual frameworks, with Ecuador taking a more traditional due diligence approach with Phase II site investigation activities, while Perenco performed follow-up confirmatory, delineation and/or risk assessment studies. Further, in several cases, the Parties interpreted applicable regulations in different ways, conducted their fieldwork and data analysis using inconsistent protocols, and where similar remedial approaches were considered, developed dissimilar cleanup costs. Together, the investigations and evaluations did not provide the Tribunal with an adequate or consistent set of facts that could be used in their deliberations."

or the other of the Parties' experts had taken a particular sample; this was the case in relation to two groundwater monitoring wells (at PAY01-MW03 and PAY04-MW03).⁸⁷⁹

745. The Parties were, as already noted, given an opportunity to make written submissions and insert comments into the Independent Expert Report. They were also given the opportunity to cross-examine Mr. MacDonald on both days of the two-day Expert Hearing. Mr. MacDonald was a careful, credible, knowledgeable and objective expert witness.

746. The Tribunal notes further that the Parties collected "split groundwater samples."⁸⁸⁰ The Parties were thus free to employ their own laboratory analyses to check the Expert's results. Although both Parties have criticisms of the Report (Perenco being more critical of his work than Ecuador), with one significant exception,⁸⁸¹ neither Party challenged the results of the laboratory testing.⁸⁸² The Tribunal therefore considers that the handling of the

⁸⁷⁹ See Consolidated Expert Report, p. 68 – at two sites, the parties had not installed wells at locations- previous placement was not appropriate and adjusted the locations, *i.e.* Pay01-MW03 in REC 66 and JAG02-MW03. See also the letter of 28 December 2017 which states that 65% of groundwater wells were proposed in the immediate vicinity of wells previously installed by one or both Parties. Are located next to wells – 22/34 of the proposed wells. For 12 of 34 locations at nine sites, 5 were placed within site areas that were previously subjected to groundwater testing, but not at the exact locations of prior wells: 4 were located in areas with significant data gaps; 3 were placed near prior wells that had been previously installed within mud pits and to correct for contamination.

⁸⁸⁰ The only qualification to this statement concerns the taking of groundwater samples where it was necessary due to the low flow rate for the splitting of the samples to be done sequentially. Thus, by agreement of the Parties, the Expert took the first sample from a particular groundwater well, the second sample went to IEMS and the third sample went to GSI. See Expert's Direct Presentation, Slide 67.

⁸⁸¹ Perenco alleged that the type of test that Ramboll's laboratory used to detect total petroleum hydrocarbons (TPH; sum of GRO, DRO and MRO), was "not specific to petroleum from crude oil" and "known to misidentify naturally-occurring plant waxes and insoluble paraffin wax, which fall in the same carbon range as petroleum on this analysis" and that there were stark differences between his analysis and what GSI found. The Expert addressed this during his Direct Presentation, starting at Slide 67, which noted that "Neither IEMS nor GSI has made their data available, nor provided necessary detail; thus, cannot comment on what is described as remarkably different results." Both Parties collected split ground water samples as part of Ramboll's 2017 field campaign, but their analytical data from that split sampling was never provided to the Expert by either Party so that the allegedly "stark differences" could be evaluated by him. In addition, the testing method used (EPA Method SW-8015C) was agreed to by both Parties in advance and had been used previously by GSI in its work.

⁸⁸² The Tribunal considers such issues as the Parties' disagreements over Mr. MacDonald's treatment of background criteria, combining (or not) of data sets, use of the "upper predictive limit" method, the "chromatogram issue", the use of inference, predictive tools, macro-delineation, and contingencies to estimate the extent of contamination (and sensitivity analyses to confirm estimates), the merits and demerits of different methods of compositing soil samples, and so on to fall squarely within the province of expertise

samples, from extracting them at site through to transporting them to ALS, and their further analysis in Houston, Texas, was conducted in accordance with best practices and therefore rendered the technical evaluation of the samples valid, accurate and reliable.

747. To be sure, like the Parties, the Tribunal had questions about certain decisions taken by the Independent Expert. This was inevitable, given the manifold uncertainties inherent in estimating a single operator's legal responsibility for its slice of contamination that resulted from oilfield operations conducted in some parts of the Blocks for many years (particularly in Block 7 and the Coca-Payamino unified field).⁸⁸³ The Tribunal's views on the Expert's determination of certain disputed issues is addressed below.
748. In the course of its deliberations, the Tribunal reviewed the Consolidated Independent Expert Report, the Parties' separate written submissions, as well as the testimony and closing submissions given at the Expert Hearing. Most of the questions and objections that the Parties have raised concern technical matters that fall within the Expert's expertise and judgement and the Tribunal considers that it is not appropriate to second-guess his technical determinations. That is why he was appointed in the first place: to provide, in an objective and neutral fashion, the expertise and judgement which the Tribunal considered the Parties' experts had failed to provide.
749. The Tribunal therefore considers that it is necessary for it to deal only with two major sets of issues. The first set of issues concerns how to determine Perenco's share of the responsibility for remediating the contamination in the Blocks (as between Perenco and its predecessors and successor). The second set of issues concerns the scope of the Expert's mandate and whether he acted consistently with it.

and interpretation of results. These are quintessentially technical matters that the Expert dealt with and the Tribunal accepts his views on these matters.

⁸⁸³ Although there had been exploratory drilling in the Yuralpa and Oso fields, Perenco was the first operator to really develop them.

2. Causation and attribution of responsibility

750. Mr. MacDonald’s estimation of the cost of remediating the “total measured contamination”⁸⁸⁴ in Blocks 7 and 21 amounts to US\$159,881.00.⁸⁸⁵ The central question for the Tribunal is how much of this contamination is Perenco’s responsibility.⁸⁸⁶
751. The Tribunal considered that the Expert’s work should be focused on estimating the total measured contamination in the Blocks, leaving it to the Tribunal to decide the issues of causation and the resulting division of responsibility for remediation costs as between Perenco and other operators.⁸⁸⁷
752. The Interim Decision on Counterclaim made the following findings on how Perenco’s responsibility would be fixed:

“While it [the Tribunal] 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.”⁸⁸⁸

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.⁸⁸⁹

⁸⁸⁴ By “total measured contamination”, the Tribunal means that amount of contamination which the Expert defined from prior investigations and his sampling in the Blocks as per the instructions of the Tribunal. Due to the limitations on his mandate, it is not to be taken as a complete estimation of total contamination in the Blocks because there could be contamination that was not detected by either of the Parties’ experts and Mr. MacDonald was restricted to working on the sites that they had examined.

⁸⁸⁵ Independent Expert Report, Table 6.11. Summary of Remedial Cost Estimates.

⁸⁸⁶ Throughout this section of the Award, the Tribunal discusses different operators’ “responsibility.” Of course, the Tribunal only has Perenco and Ecuador before it. It can identify contamination which is attributable to the acts of Perenco’s predecessors, but it lacks jurisdiction to assess damages payable by non-parties to the arbitration.

⁸⁸⁷ Interim Decision on Counterclaim, paragraph 591: “... 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.”

⁸⁸⁸ Interim Decision on Counterclaim, paragraph 372.

⁸⁸⁹ *Ibid.*, paragraph 374.

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.”⁸⁹⁰ [Emphasis added.]

753. In its comments on the Independent Expert Report and at the Expert Hearing, Perenco focused mainly on persuading the Tribunal that other operators are responsible for most of the contamination that has been determined by the Expert. Perenco’s case was that its seven-year operatorship was sandwiched between other operations conducted by other operators for longer periods of time and therefore most of the damage found by the Expert must be attributed to those operators.
754. First, Perenco argued that most of the identified exceedances were attributable to prior operators because barium, which is associated with drilling, was identified and most of the well drilling occurred prior to Perenco’s operatorship. Perenco also argued that at least some of the TPH exceedances stemmed from Ecuador’s or other operators’ tenures, during which major incidents had occurred.⁸⁹¹
755. Second, for sites where it is difficult to allocate liability between Perenco and Ecuador, Perenco submitted that the application of a discounting factor based on length of operatorship may be appropriate, taking into account the full history of operations at a given site.⁸⁹²
756. Third, Perenco accepted its liability with regard to the contents of the mud pits that it had built and used. However, it contended that it cannot be held solely liable for pit cover material that showed near-surface exceedances unrelated to Perenco’s drilling of the

⁸⁹⁰ *Ibid.*, paragraph 379.

⁸⁹¹ Perenco’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 17.

⁸⁹² *Ibid.*, paragraph 18.

associated wells.⁸⁹³ It also denied liability for mud pits which were already closed by the time of Perenco's operations.⁸⁹⁴

757. At paragraph 735 above, the Tribunal has reproduced Perenco's proposed principles for allocating responsibility and they will not be repeated here.⁸⁹⁵
758. Ecuador took a very different view from Perenco, arguing that Perenco was under a duty to maintain the Blocks in good condition, which included remediating any environmental incidents as well as properly locating and constructing and/or closing mud pits.⁸⁹⁶ However, Perenco "ran low-cost operations focused on extracting all the crude it could as fast as possible and at minimum cost, in complete disregard of the environment."⁸⁹⁷ Ecuador argued that Perenco had failed to prove that the contamination (which was a minimum estimate⁸⁹⁸) was caused by prior operators or by Petroamazonas.
759. First, according to Ecuador, contemporaneous documents did not show environmental issues in the Blocks when Perenco took over. They also showed that the conditions of the Blocks declined and incidents occurred during Perenco's operatorship.⁸⁹⁹ Further, Perenco's argument attributing responsibility to other operators based on barium was unsupported⁹⁰⁰ and in any event, could have been caused by Perenco's workovers and transporting of drilling muds for storage.⁹⁰¹ Perenco could have done tests to assess the

⁸⁹³ *Ibid.*, paragraph 19.

⁸⁹⁴ See Perenco's Closing Presentation, Slide 22.

⁸⁹⁵ *Ibid.*, Slide 93.

⁸⁹⁶ Ecuador's Comments to the Independent Expert Report dated 22 February 2019, paragraph 2: "Such extensive contamination obviously came as no surprise to Perenco, given its previously established sub-standard management of the Blocks, the numerous spills and other environmental incidents during its operatorship, its inadequate steps (to the extent undertaken) to remediate these incidents, its practice of concealing (or, at the very least not reporting) such incidents to the authorities, its inadequately located, constructed and/or closed mud pits, and its general failure to properly maintain the Blocks' facilities, including the flowlines, pipelines and tanks containing crude oil."

⁸⁹⁷ *Ibid.*, paragraph 2.

⁸⁹⁸ As Ecuador stated in its comments in the Consolidated Expert Report, p. 22: "MacDonald's conclusions should thus be viewed as the minimum discovered remedial needs."

⁸⁹⁹ Ecuador's Comments to the Independent Expert Report dated 22 February 2019, paragraphs 50-53.

⁹⁰⁰ *Ibid.*, paragraph 56.

⁹⁰¹ *Id.*

timing of TPH exceedances (but it did not do so). In addition, incidents occurring prior to Perenco's operatorship occurred outside Mr. MacDonald's remediation locations.⁹⁰² In any event, Perenco inherited all environmental liability for any pre-existing conditions present in the Blocks.⁹⁰³

760. Ecuador argued further that Perenco also cannot attribute contamination to Petroamazonas because 11 of the sites and all mud pits identified for remediation were not operated or used by Petroamazonas.⁹⁰⁴ Mr. MacDonald's gap-filling exercise confirmed the contamination found by IEMS and there were no new contamination incidents observed either during post-July 2009 inspections or by Ramboll.⁹⁰⁵ Incidents occurring during Petroamazonas' operatorship took place at different locations or were such that they could not have caused the contamination found, and in any event, were promptly remediated.⁹⁰⁶
761. Second, Ecuador submitted that the allocation of responsibility for groundwater based on amount of time of each operatorship would: (i) reward an operator who concealed the existence of contamination for years and tactically seeks to deny liability such that it would be able to share responsibility with the next operator;⁹⁰⁷ (ii) also unfairly impose exclusively on Ecuador the burden of the time taken by Mr. MacDonald to complete his report; and (iii) assume the same amount of contamination is generated every year regardless of each operator's practices, but the Tribunal cannot assume that Petroamazonas operates under the same low standards as Perenco.⁹⁰⁸
762. Third, Ecuador argued that Perenco is liable, at the very least, for the complete remediation of all the mud pits investigated by Mr. MacDonald because: (i) Perenco has the burden of proof regarding the placement of proper pits as it would have such records, but has failed

⁹⁰² Ecuador's Comments to the Independent Expert Report dated 22 February 2019, paragraph 55.

⁹⁰³ Ecuador's Closing Presentation, Slide 10.

⁹⁰⁴ Ecuador's Comments to the Independent Expert Report dated 22 February 2019, paragraphs 66 and 68.

⁹⁰⁵ *Ibid.*, paragraph 70.

⁹⁰⁶ *Ibid.*, paragraph 71.

⁹⁰⁷ *Ibid.*, paragraph 76.

⁹⁰⁸ *Ibid.*, paragraph 78.

to discharge that burden;⁹⁰⁹ and (ii) there were many more mud pits that Mr. MacDonald should have investigated, but did not.⁹¹⁰

(a) *The Tribunal's Findings*

763. The Tribunal considers that, as reflected in Perenco's general approach, there are two temporal aspects to the causation issue. The Tribunal accordingly begins with two fundamental principles.

764. First, the Tribunal agrees with Perenco that it cannot be held responsible for any contamination caused by Petroamazonas after it took over the Blocks in July 2009. As the Interim Decision on Counterclaim stated:

“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.”⁹¹¹

And:

“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.”⁹¹² [Emphasis added.]

765. Second, although Perenco is *prima facie* liable for all contamination in the Blocks, it cannot be held responsible for any contamination that the evidence shows was caused by other operators prior to its assumption of operations in 2002.

⁹⁰⁹ Ecuador's Closing Presentation, Slide 18.

⁹¹⁰ *Ibid.*, Slide 19.

⁹¹¹ Interim Decision on Counterclaim, paragraph 368.

⁹¹² *Ibid.*, paragraph 370.

766. The Tribunal will discuss each in turn.

(b) *The Petroamazonas issue*

767. The Tribunal is alive to the possibility that given the effluxion of time, Petroamazonas could have caused contamination that could be erroneously attributed to Perenco. Insofar as the sampling exercises are concerned, there are two time periods to be considered. First, due to the 15-month period between Perenco's suspension of operations and the beginning of IEMS' first sampling campaign, it is possible that contamination caused by Petroamazonas could have been discovered by the Parties' experts when they sampled the Blocks. Second, it is also possible that the sites that were sampled by the Tribunal's Independent Expert could have been contaminated during the period between the end of the Parties' experts' sampling and the time when Ramboll conducted its sampling activities.

768. This is not an academic issue. During the original hearing on the counterclaim, Perenco directed the Tribunal to examples of Petroamazonas having experienced spills after it took over operations in the Blocks.⁹¹³ In its written submissions on the Independent Expert Report and at the Expert Hearing, Perenco continued to refer to evidence of spills caused by Petroamazonas.⁹¹⁴

769. In the period leading up to the March 2019 Expert Hearing, the Tribunal considered whether a discounting factor of some type, having regard to the two operators' respective tenures in the Blocks, might be appropriate, but it formed no firm view on the matter. In Procedural Order No. 17, issued after the receipt of the Independent Expert Report and in

⁹¹³ See Perenco's Post-Hearing Submission on Counterclaims dated 6 November 2013, fns. 96 and 100, referring to CE-CC-360 regarding Petroamazonas' 2012 spill at Yuralpa Pad E and CE-CC-357 regarding Petroamazonas' 2011 spill at Coca 6.

⁹¹⁴ See Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 12: "It has also experienced dozens of spills that it only very recently disclosed, and even more spills that it did not disclose. For instance, in May 2012, *El Comercio* reported on the 'Fifth Spill of Hydrocarbons in Ecuador this Year,' noting that there had been 'one spill per month in oil Blocks operated by Petroecuador and Petroamazonas,' including in Block 21. Petroamazonas also reported spills that occurred on 1 March 2015 at undisclosed locations in Payamino; on 16 September 2009, in Payamino; and on 4 January 2014 in Oso 9." See also fns. 18 and 20, referring to the following: CE-CC-438 (2011 Spill Report for Coca 6), CE-CC-439 (2011 Investigation Report for Incident in Coca 18-19), CE-CC-440 (2012 Spill Report for Yuralpa Pad E), CE-CC-443 (2016 Investigation Report for Payamino B) and CE-CC-444 (2017 Investigation Report for Oso CPF).

anticipation of the Expert Hearing, the Tribunal invited the Parties to address this issue in their written submissions:

“On the separate issue raised in the correspondence, namely, the question of sorting out issues of causation for those sites which have been successively worked by Perenco and Petroamazonas, the Tribunal has been considering how to attribute liability in such circumstances. It considers that the issue will to some extent be clarified by the production of documents contemplated in this order. Once a fuller picture of Petroamazonas’ possible contribution to any identified contamination is developed, the Tribunal will be in a better position to determine how to proceed. The Tribunal reminds the Parties that the estimation of damages is not a scientific exercise and it might be necessary to employ a general discounting factor in order to arrive at a just and reasonable award. The Parties are encouraged to address this issue in their written submissions.”⁹¹⁵ [Emphasis added.]

770. As a result of the document production exercise, the Parties’ focused written submissions, and the testimony and oral submissions at the Expert Hearing, the Tribunal has arrived at a better understanding as to how to deal with the Petroamazonas issue.
771. Starting with the first period of time, the Tribunal notes that the period of time elapsing between Petroamazonas’ assumption of operations and IEMS’ first sampling campaign was some 15 months.⁹¹⁶ Although it cannot be completely ruled out that some contamination was caused by Petroamazonas prior to IEMS commencing its work (or during the time that it took IEMS and GSI to complete their studies)⁹¹⁷, the Tribunal is satisfied that it is unlikely that one or the other of the Parties’ experts, particularly Perenco’s experts, would have identified any new contamination that they thought occurred *after* Perenco’s operatorship and included it as being caused by Perenco.⁹¹⁸

⁹¹⁵ Procedural Order No. 17, paragraph 15.

⁹¹⁶ IEMS’ work commenced in the fourth quarter of 2010 and although IEMS did not identify all of the areas in respect of which it ultimately claimed contamination was found, it did do a substantial amount of initial sampling during the October – November 2010 period.

⁹¹⁷ See *e.g.* GSI ER I, paragraph 201, noting that the results of their site inspections showing operating deficiencies which in GSI’s opinion pertained to the operating practices of Petroamazonas. See also Saltos WS I, paragraphs 302 and 310 -318.

⁹¹⁸ Ecuador argued that the areas evaluated by the Expert were those that IEMS had evaluated since 2010. “In addition, no recent contamination caused by the current operator has have (sic) been witnessed by any of the actors that have been inspecting the Blocks since 2010 (the Consortium’s experts and representatives

772. With respect to the second period of time (the period of Petroamazonas' operation between the completion of IEMS'/GSI's work and the commencement of Mr. MacDonald's work), the Tribunal notes that the "territorial bounds" of the Independent Expert's sampling exercise were defined principally by IEMS (because GSI viewed its mandate as being mainly one of checking the sites previously sampled by IEMS).⁹¹⁹ Insofar as there might have been supervening contamination caused by Petroamazonas, the Tribunal considers that the risk of attributing any such contamination to Perenco has been substantially reduced by the Independent Expert's circumscribed mandate to sample only at those sites which were previously sampled by the Parties' experts (Perenco's mud pits excepted; see below) and by other steps explained below.
773. Had the Independent Expert been instructed to conduct a *de novo* investigation, he could well have identified contamination caused by Petroamazonas which occurred outside of the sites previously identified by IEMS/GSI. But his restricted mandate reduced the likelihood of that occurring. Since the initial IEMS data were collected within a relatively short period of time after Perenco ceased operations, IEMS' identification of allegedly contaminated sites effectively serves as an "environmental conditions baseline." Any Petroamazonas spills and releases occurring outside of the sites where IEMS and/or GSI sampled were not legally relevant to the Independent Expert's task.
774. The only possibility for the Independent Expert's erroneously capturing more recent contamination by Petroamazonas to Perenco would be if Petroamazonas were to have contaminated a site where exceedances were previously identified by either or both of the

included) nor were reported by MacDonald during his visit in October/November 2016 or during his 4-month field campaign in the fall of 2017. " Consolidated Expert Report, p. 10.

⁹¹⁹ Interim Decision on Counterclaim, paragraph 234: "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.'" The Consolidated Expert Report noted at p. 14: "GSI's primary approach was to either refute the RECs or refine the extent of contamination identified by IEMS (This was not their exclusive effort; GSI also identified additional RECs based on their own field observations and due diligence)."

Parties' experts and the Expert could not differentiate between the new contamination and the old.

775. A safeguard against that possibility was the Tribunal's direction in the Interim Decision on Counterclaim that:

“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.”⁹²⁰

776. The Parties accepted this invitation. The Independent Expert noted that he discussed many issues pertaining to the sampling exercise with Parties' representatives during the process of organising his work and that Party representatives were present when the Independent Expert and/or his team conducted their activities in the Blocks.⁹²¹ An example of the Parties' ability to monitor Ramboll's field work is recounted in the Consolidated Independent Expert Report. The Report noted that when surface soils were to be sampled at the Gacela 02 site, GSI expressed concern about the soils potentially being affected by recent vegetation-control burning activities believed to have been conducted using diesel fuel as an accelerant.⁹²² As a result, Ramboll collected additional samples from the uppermost 10 cm soil interval; Mr. MacDonald reported that the Parties agreed that the results from these samples should satisfy GSI's concern.⁹²³

777. Given this attention to detail, in the Tribunal's view, it is most unlikely that GSI would have failed to point out recent contamination to Ramboll if it had spotted any. There is no indication that they did so.⁹²⁴ The presence of the Parties' own representatives thus served

⁹²⁰ *Ibid.*, paragraph 588. See also paragraph 611(19).

⁹²¹ Consolidated Expert Report, p. 3; Tr. (1) (MacDonald) (11 March 2019), pp. 129, 130 and 131.

⁹²² Consolidated Expert Report, fn. 191.

⁹²³ *Id.*

⁹²⁴ Rather, Perenco and its technical representatives raised various objections on the basis that Ramboll was sampling in locations for which prior work of IEMS and GSI revealed no exceedances or that were already well delineated or choosing locations not confined to sampling locations identified previously by IEMS or GSI, which Perenco alleged to be outside the scope of the Expert's mandate (see the correspondence of 13 September 2017 and 14 November 2017). Perenco also objected to Ecuador's attempt to have Ramboll consider locations where there was “visual evidence” of potential contamination (see its letter of 14

to further reduce the possibility that any contamination caused by Petroamazonas since the time of IEMS' and GSI's sampling campaigns will be wrongly attributed to Perenco.

778. Nevertheless, because an undetected layering of spills cannot be ruled out, the Tribunal took a further step in agreeing with Perenco that Petroamazonas' spill reports and related documents should be produced to Perenco. This would enable the Parties to cross-check the sites identified in those documents against the sites identified by the Independent Expert to see whether any of the contamination he had identified could have been caused by Petroamazonas.
779. The Tribunal found Perenco's initial request for the production of documents to be overly broad in that it asked the Tribunal to:

“...direct Ecuador to immediately produce all relevant documentation pertaining to the environmental condition of the Blocks post-July 2009. Based on information in the record and publicly available information, that documentation should include annual environmental reports, bi-annual environmental audits, internal monitoring reports, oil spill reporting records, work orders issued by Petroamazonas to contractors assessing, mitigating, managing, or remediating potential environmental impacts in the Blocks, and any transactional documents with new operators describing the environmental conditions in the Blocks post-July 2009.”⁹²⁵

780. The Tribunal decided that while this request was properly motivated and made timeously, it should be more narrowly focused on whether Petroamazonas caused any spills *at the particular sites identified by the Independent Expert as requiring remediation*. It was unnecessary to require production of documents relating to any sites which were excluded from his investigation⁹²⁶ or where the Independent Expert did not find contamination

November 2017). The Tribunal notes Ramboll's letter of 28 December 2017 in response to Perenco's letter of 14 November 2017, where the Expert noted that there had been consistent dialogue with the Parties throughout the scoping and implementation process related to field activities and that the Parties' technical representatives were present when the locations of the monitoring wells and other testing locations were field-marked in August, as well as throughout the entire sampling programme, including during the groundwater monitoring well installations, which commenced in mid-September 2017.

⁹²⁵ Procedural Order No. 17, paragraph 2.

⁹²⁶ See the Consolidated Expert Report, section 4.2, Site Screening, which lists in Table 4.1, Sites Omitted from Ramboll's Investigation, in Table 4.2, Sites Where Soils Not Further Investigated, and in Table 4.3, Sites

because the rest of the Blocks fell outside of his mandate. Procedural Order No. 17 therefore directed that:

“... as contemplated in Ecuador’s offer quoted above at paragraph 11 [of Procedural Order No. 17], only documents relating to those sites are relevant for the purpose of the estimation of damages. The Tribunal believes that Perenco is entitled to have access to such documents and it would not be unduly burdensome for Ecuador to produce them on a rolling basis.”⁹²⁷

781. After the order was issued, starting on 29 January 2019, Ecuador began to produce responsive documents, namely, annual environmental reports of Blocks 7 and 21 as well as spill and clean-up reports for sites identified by the Tribunal’s Expert as requiring remediation.⁹²⁸ Ecuador informed the Tribunal that within two weeks of the order, it had provided some 120 documents relating to environmental incidents during Petroamazonas’ operatorship of the two Blocks.⁹²⁹ By letter dated 7 February 2019, Ecuador stated that it produced 214 responsive documents to Perenco (and that this had been acknowledged by Perenco on 5 February 2019⁹³⁰)⁹³¹; and on 12 February 2019, Ecuador provided additional

Where Mud Pits Not Further Investigated, and section 4.2.4, which listed groundwater excluded from further consideration.

⁹²⁷ Procedural Order No. 17, paragraph 14.

⁹²⁸ See Ecuador's letter of 29 January 2019, p. 1.

⁹²⁹ See Ecuador's letter of 31 January 2019, p. 1. “Ecuador informs the Tribunal that it produced additional documents (including the Petroamazonas' Resolution No. 099-PAM-EP-CON-2017 mentioned by Perenco in its 25 January 2019 letter) today. A reasonable search for additional potentially responsive documents is still ongoing Ecuador will produce any additional responsive documents (if any) without delay.”

⁹³⁰ See Perenco's letter of 5 February 2019: “Unfortunately, although on January 29 and 31, 2019 Ecuador produced 214 documents, this production is neither complete nor satisfactory. Ecuador has produced annual environmental reports for Blocks 7 and 21, as well as some spill and clean-up records of incidents that occurred since 2009. However, it has not produced: (i) any biannual reports for Blocks 7 and 21, (ii) reports of other environmental incidents that occurred post-July 2009 at the sites Mr. MacDonald has identified for remediation, or (iii) work orders issued by Petroamazonas to contractors assessing, mitigating, managing or remediating potential environmental impacts at relevant sites, and that would contain information on the remediation costs that Petroamazonas has actually incurred to address environmental impacts at relevant sites. For the reasons Perenco has already explained, and the Tribunal acknowledged in Procedural Order No. 17, this information is critical to ensure that Perenco is not being held liable for the acts of its successor – especially when that successor is Ecuador, the counterclaimant here. Ecuador's belated and incomplete production is highly prejudicial to Perenco and grossly unfair. Ecuador must forthwith make a more complete production.”

⁹³¹ Ecuador's letter of 7 February 2019, p. 1, responded to Perenco's complaints: “In spite of acknowledging having already received 214 responsive documents from Ecuador on very short notice, Perenco qualifies

documents to Perenco.⁹³² Ecuador's comments in the Consolidated Independent Expert Report note that it produced some 2500 responsive documents to Perenco.⁹³³

782. Although Perenco complained about the extent of Ecuador's compliance with the Tribunal's order⁹³⁴, it did not place much emphasis on such complaints.⁹³⁵ Both Parties have been represented in this arbitration by capable counsel and the Tribunal is loath to find that Ecuador did not produce the relevant Petroamazonas documents pertaining to spill incidents in the areas of concern to the Expert. It proceeds on the basis that Ecuador duly complied with the terms of Procedural Order No. 17.

783. The Tribunal has taken further note of the fact that at the Expert Hearing, Perenco did not direct the Independent Expert to many of the Petroamazonas spill reports.⁹³⁶ This suggests that the documentary evidence produced to Perenco was not as supportive of its contention

Ecuador's 'production [as being] neither complete nor satisfactory' in a misguided effort to discourage the Tribunal from allowing the introduction of records of workovers performed by Perenco. Yet, Ecuador has complied (and continues to undertake its best reasonable efforts to comply) with PO 17." Ecuador added: "Ecuador commenced disclosing responsive documents to Perenco, on a rolling basis, on 29 January 2019 (i.e., only 14 days after PO 17) by producing a first back of some 100 post-July 2009 spill clean-up reports. Subsequently, on 31 January 2019 Ecuador disclosed over 100 documents (including annual environmental audits for Block 7 and 21 since 2010). In sum, Ecuador has produced over 200 documents within two weeks from the Tribunal's order." Finally, Ecuador responded to Perenco's complaint that it was not providing reports for relevant sites: "Ecuador can confirm that there are no records of any spills during Petroamazonas' operations at 24 sites. There are, therefore, no additional spill reports to be disclosed." Finally, Ecuador indicated that Petroamazonas had recently advised that it identified additional responsive documents including the biennial audits conducted at Blocks seven and 21 which Ecuador would promptly disclose as soon as they were retrieved.

⁹³² See Ecuador's letter of 12 February 2019, which stated: "Ecuador hereby informs the Tribunal that it has produced additional documents to Perenco today."

⁹³³ Consolidated Expert Report, p. 250.

⁹³⁴ See Perenco's letter of 5 February 2019 quoted above. In addition, Perenco's 22 February 2019 submission stated at paragraph 12: "Ecuador's eleventh-hour document production leaves a picture that is far too incomplete to adequately depict ten-years' worth of [Petroamazonas'] operations' environmental impacts."

⁹³⁵ See Perenco's Closing Presentation, Slides 81 and 84 regarding its allegation that Ecuador failed to disclose certain environmental incidents and Ecuador's representation that Lobo 4 had not been operated after 2009.

⁹³⁶ The main example being a Petroamazonas spill at Coca 6. See Tr. (1) (MacDonald) (11 March 2019) 173-175, Mr. Friedman's cross-examination of Mr. MacDonald with respect to the spill at Coca 6.

that a substantial amount of the contamination identified by Mr. MacDonald should be attributed to Petroamazonas' activities as Perenco had hoped.⁹³⁷

784. There seems to be a good reason for this: having regard to the documentary evidence produced by Ecuador, it appears that 35 spills and releases were reported to have occurred in the relevant areas since July 2009.⁹³⁸ They were mainly small quantity spills or releases that were remediated or occurred within secondary containment. More important for the Tribunal's determination is that *26 of the 35 spills evidently occurred away from areas identified by Mr. MacDonald as contaminated or at sites where his conceptual remediation plan addresses only mud pits that were constructed and used by Perenco*. Further, five of the spills occurred at sites where the remediation plan addresses elevated metal concentrations (*e.g.*, barium). Moreover, there is no mention in the Independent Expert Report of any recent spills witnessed at sites where Ramboll tested. This led Ecuador to assert that while the Expert observed crude oil in swampy areas at some sites (*e.g.*, Coca 2 and Payamino 2/8), he did not observe conditions that would indicate recent releases.⁹³⁹
785. In sum, in relation to what might be called the 'Petroamazonas temporal issue', given the totality of the circumstances (including the Independent Expert's restricted mandate, his and his team's consultations with the Parties' experts and counsel throughout his sampling activities, and the spill reports and other documents produced by Ecuador), the Tribunal has concluded that the use of a generally applicable discounting factor based *exclusively* upon a split between the length of time that Perenco and Petroamazonas' operated in the Blocks would, by itself, be too crude a method of allocating responsibility and insufficiently connected to the record evidence. The Tribunal concluded that a closer look

⁹³⁷ Although counsel argued in favour of a discounting factor with respect to soil and groundwater remediation costs based on the relative length of time of Petroamazonas and Perenco in the operation of the Blocks, it pointed to little evidence drawn from the spill reports and other documents produced to it to prove that any of the contamination that had been estimated by Mr. MacDonald was attributable to Petroamazonas. Tr. (1) (MacDonald) (11 March 2019) 173-176, 222-223; Tr. (2) (MacDonald) (12 March 2019) 460.

⁹³⁸ E-460.

⁹³⁹ Consolidated Expert Report, p. 10, point 7: "The areas evaluated by MacDonald were those that IEMS had evaluated since 2010. In addition, no recent contamination caused by the current operator has have been [*sic*] witnessed by any of the actors that have been inspecting the Blocks since 2010 (the Consortium's experts and representatives included) nor were reported by MacDonald during his visit in October/November 2016 or during his 4-month field campaign in the fall of 2017."

at the sites where contamination was found was required before using any discounting factor based on, for example, the respective length of the two operators' tenures.

(c) *Contamination caused by prior operators*

786. The second temporal issue, namely, the possibility of Perenco being wrongly held accountable for contamination caused by prior operators is, in the Tribunal's view, a much more significant and difficult issue.
787. Resolving this issue is complicated by the fact that Perenco's documentary evidence of its own evaluation of the Blocks' condition in 2002 was non-existent. Mr. Wilfrido Saltos testified that an evaluation of the Blocks was performed when Perenco acquired its interests, but when requested, Perenco was unable to produce any written audit of the Blocks prepared by or for it in order to ascertain their condition at the time of acquisition.⁹⁴⁰ The most it could show was that it obtained a representation and warranty from the seller, Kerr-McGee, that the latter had complied with all applicable Ecuadorian laws relating to the environment, with the exception of certain matters listed in two schedules to the contracts.⁹⁴¹ One of the schedules, Schedule 3.9(a), was admitted into the record earlier in this proceeding.⁹⁴²
788. The Tribunal considered Schedule 3.9(a) to be of some assistance to ascertaining the state of the Blocks' environmental condition in 2002. It noted:

“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. 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. Schedule 3.9

⁹⁴⁰ Interim Decision on Counterclaim, paragraphs 386-388.

⁹⁴¹ *Ibid.*, paragraphs 392-393.

⁹⁴² *Ibid.*, paragraph 394.

(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."⁹⁴³
[Emphasis added.]

789. Schedule 3.9 (a) was thus one helpful piece of evidence, a starting point, but hardly dispositive of the question of the Blocks' environmental condition.
790. The other schedule, Schedule 3.9(b), which listed all wells in the Contract Area and a description of their status, was not included in Perenco's redacted version of the Purchase and Sale Agreement produced earlier in the counterclaim proceeding. The Tribunal considered that this should be produced in the next phase of this proceeding because it might shed additional light on the condition of the Blocks in 2002.⁹⁴⁴ Schedule 3.9(b) was duly produced by Perenco, but it only lists the status of each well in the Blocks at the time of acquisition and provides no additional insight into their environmental condition.⁹⁴⁵
791. The Tribunal also considered that if the Parties were unable to settle this part of the case on the basis of the Interim Decision on Counterclaim's findings and the Tribunal had to proceed to this phase of the proceeding, it would be helpful to examine DINAPA-CSA-1602001-20001697 of September 2001, if a copy of that letter could be located, because it set 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.⁹⁴⁶ This was duly submitted by Ecuador as E-445. Regrettably, it did not advance matters. A comparison of DINAPA's 4 September 2001 inspection letter to Schedule 3.9(a) shows that the Schedule essentially reproduces it.
792. The Tribunal recalls its prior discussion of the evidence as to the environmental conditions of the Blocks at the time of Perenco's acquisition of its interests in the Production Sharing Contracts:

⁹⁴³ *Ibid.*, paragraph 398.

⁹⁴⁴ *Ibid.*, paragraph 399.

⁹⁴⁵ CE-CC-432, produced under cover of Perenco's letter dated 25 January 2019. The schedule listed some 50 producing wells, 10 shut-in wells, three P & A wells ("plugged and abandoned"), one TA well ("temporarily abandoned") and three water disposal wells in Block 7; and two plugged and abandoned wells, seven temporarily abandoned wells, and one testing well in Block 21.

⁹⁴⁶ Interim Decision on Counterclaim, paragraph 397.

“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 conditions of the two Blocks at the time that Perenco acquired its interests from Kerr-McGee.”⁹⁴⁷

793. The Interim Decision on Counterclaim reviewed evidence of prior contamination which was submitted by Perenco.⁹⁴⁸ Perenco returned to some of this evidence during its closing submissions in the latest phase of this proceeding.⁹⁴⁹ It also made the important point that Ecuadorian environmental law has become more rigorous over time.⁹⁵⁰
794. Drilling in the Coca-Payamino unified field dates back to 1971, with successive operators CEPE and BP, *Petroproducción*, Oryx, then *Petroproducción* again, and then Kerr-McGee, all preceding Perenco’s entry into that field some 30 years after CEPE and BP first conducted exploratory drilling.⁹⁵¹
795. In Block 7, CEPE and BP, Kerr-McGee and *Petroproducción*, then Kerr-McGee, all operated prior to Perenco. Unsurprisingly, more wells were drilled by the preceding operators in the Coca-Payamino unified field and Block 7 (Oso excepted) than by Perenco itself.⁹⁵²

⁹⁴⁷ *Ibid.*, paragraph 380.

⁹⁴⁸ *Ibid.*, paragraphs 405 and footnotes 926, 927 and 934.

⁹⁴⁹ Perenco's Closing Presentation, Slides 61-67.

⁹⁵⁰ Tr. (2) (MacDonald) (12 March 2019) 513:17-514:3: “You are being confronted with old legacy liabilities, for the most part, things that happened a long time ago under a different regulatory regime. They might not have even been violations of the environmental regulations at the time, but, nevertheless, they occurred on the State's watch or at a time when operations were for the State's benefit, and Perenco had no role in it. Perenco was not even in the picture.”

⁹⁵¹ GSI prepared a Table in Appendix B.4 to its first expert report which listed on a site by site basis, the drilling of certain wells (Payamino 02-08, Mono CPF/Mono 1-5/1W, Payamino 1, Gacela 01-08, Coca 18-19, Coca 01, Coca 04, Coca 06, Coca 08, Coca CPF, Gacela 02, Jaguar 02, Jaguar 07-08, Mono Sur / Mono 6-9, 11, Payamino 04, and Yuralpa Pad A) by Perenco's predecessors and the effects of such drilling.

⁹⁵² Perenco’s Closing Presentation, Slide 4. GSI ER I, paragraph 160: “Of the 95 wells completed in the CPUF and Block 7 areas by 2009, 68 (71%) were drilled prior to 2002. Consequently, soil impacts related to drilling

796. In Block 21, which does not have as long a history as Block 7⁹⁵³ (Perenco itself characterised Block 21 as a “greenfield development project” because there was “no oil producing infrastructure”⁹⁵⁴), Kerr-McGee preceded Perenco.⁹⁵⁵ Indeed, of the 77 wells listed in Schedule 3.9(b) to the Kerr-McGee Purchase and Sale Agreement, only nine were located in Block 21 and none of them were operating at the time of acquisition.⁹⁵⁶ Insofar as the wells at the Yuralpa field in Block 21 are concerned, Perenco drilled the lion’s share of those wells⁹⁵⁷ until Petroamazonas began operations.⁹⁵⁸
797. It appears that some 84 spills and releases were reported to have occurred prior to September 2002, of which four were not specifically tied to a site but only to Block 7 or an oilfield (*e.g.*, Coca, Mono-Jaguar, Payamino).⁹⁵⁹ GSI also used a somewhat lower number;

activities at those pre-2002 sites would be associated with prior operators, not the Consortium. Indeed, available information indicates that some wells drilled prior to 1990 were completed without use of mud/cuttings pits, resulting in discharge of excess drilling mud and cuttings to the surrounding area.”

⁹⁵³ It appears that Yuralpa 1 was drilled in 1972 by Texaco. See GSI ER I Appendix B.4. The next wells to be drilled were Yuralpa Centro 1 (October 1997), Dayuno 1 (September-October 1987), Sumino (an injection well) (May 1998), Yuralpa Centro 2 (April 1999), Nemoca (December 1999), and Waponi and Ocatoe (both in August 2000).

⁹⁵⁴ In its Revised Memorial dated 5 August 2011, Perenco asserted at paragraph 42: “Block 21 is a 155,000 hectare plot several hundred kilometers east of Quito. LC WS ¶ 4. At the time Perenco acquired its interest in Ecuador, Block 21 was literally a greenfield development project: there was no oil producing infrastructure.”

⁹⁵⁵ Perenco's Closing Presentation, Slide 3.

⁹⁵⁶ CE-CC-432. The wells are Yuralpa-1, Dayuno-1, Yuralpa C-1, Chonta-1, Sumino-1, Yuralpa C-2, Nemoca-1, Waponi-1, and Ocatoe-1. The first two were ‘plugged and abandoned’ and all of the rest were ‘temporarily abandoned’.

⁹⁵⁷ See GSI ER I Appendix B.4, pp. 4-5.

⁹⁵⁸ Perenco noted, at paragraphs 45-47 of its Revised Memorial, dated 5 August 2011, that: Block 21 was essentially a “greenfield development project” because there was no there was “no oil producing infrastructure.” Perenco stated: “by the end of the first quarter of 2004, the Consortium had brought production from zero to close to 22,000 barrels a day.” However, due to a “technical setback [which] caused a drop in the production of Block 21’s most productive wells which, at the time, had been producing approximately 12,000 barrels per day... Perenco was forced to drill additional wells that were not originally contemplated and to commit additional capital to restore production.” “Consequently, by the end of the first quarter of 2006 – when Ecuador enacted Law 42 – the Consortium had invested \$197 million in Block 21... It had drilled over 25 production wells, as opposed to the 12 originally contemplated, and was producing nearly 16,000 barrels per day.”

⁹⁵⁹ See Appendix B of GSI ER I and the 1998 Grizzle Report. See also summary table from Perenco Ecuador to DINAPA, Technical Report – Environmental Characterization of Platform Payamino 2-8 (“Walsh Report”), and Records of Petroamazonas’ post-July 2009 spills (provided by Ecuador as Exhibit E-460 submitted with its comments on the Report by the Tribunal’s Expert on February 22, 2019).

it included with its first expert report in 2012 as Appendix B.3, which identified 55 “pre-Perenco” spills and releases.⁹⁶⁰ A brief description of the nature and quality of the release and any recovered product was included in the summary table. At 11 of these sites, the reported releases were more than 20 barrels, and some of these releases were reportedly significant (*i.e.*, 150 barrels at Coca 8 and 110 barrels at Gacela 6). However, GSI did not provide details on, among other things, where the releases took place within a given site, what media was affected (*e.g.*, soil, surface water), how the affected media were addressed (if at all), or provide the supporting documents used by it in order to create its summary table.

798. That said, the Tribunal accepts the thrust of Perenco’s position that there had to be pre-existing contamination because there is evidence to support the findings that: (i) the Ecuadorian legal framework governing the environmental aspects of oilfield operations was less rigorous than RAOHE and TULAS (the former promulgated in 1995 and then amended in 2001 and the latter promulgated in 2003⁹⁶¹); and (ii) at least some operators’ practices were conducted to that less rigorous standard in the 1980s and 90s.
799. For example, an internal environmental assessment report on the Coca-Payamino field prepared for Oryx in 1994 by Patrick Grizzle and Nancy Sahr (when Oryx took over operations in that field), was troubling. In addition to identifying various practices which needed improvement, the report noted:

“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.”⁹⁶² [Emphasis added.]

800. The 1994 report unfortunately contained no results of sampling and analysis. The authors thought from a visual inspection that the contamination was “minimal”, but added that: “as

⁹⁶⁰ GSI ER I, Appendix B.3.

⁹⁶¹ Interim Decision on Counterclaim, pp. iii-iv.

⁹⁶² *Ibid.*, paragraph 383, quoting Exhibit E-261, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated May 1994, p. 6.

this study did not include sampling and analysis, no confirmation of contamination levels can be made.”⁹⁶³ In the Tribunal’s view, it is more likely than not that *Petroproducción* and other operators at the time caused damage, but there is little in the way of hard information as to the extent of the contamination that might have resulted from the laxity in environmental practices at that time. As the Tribunal previously noted when it discussed the issue in the Interim Decision on Counterclaim, visual inspections are important, but in and of themselves are not sufficient to identify and determine the extent of contamination.⁹⁶⁴

801. There is some evidence that some of the spills identified in 1994 at least were remediated. The March 1996 Internal Environmental Audit of Oryx Ecuador Operations, also performed by Mr. Grizzle and Ms. Sahr, which followed up on a 1995 audit, noted that:

“Several environmental issues were noted during the audit. Several of these were noted in the 1995 Audit and some have been corrected or partially corrected.”⁹⁶⁵ [Emphasis added.]

⁹⁶³ *Ibid.*, paragraph 382, quoting Exhibit E-261, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated May 1994, p. 4.

⁹⁶⁴ *Ibid.*, paragraph 409: “... 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. 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.” Perenco itself pointed this out, at paragraph 266 of its Rejoinder on Counterclaims, when commenting on the various audits performed when Oryx was the operator, specifically in relation to the Jungal swamp/Payamino 2-8 contamination: “Comments in later audits that the area affected by a subsequent 1991 spill by Petroproducción ‘has been revegetated and is doing well’ would not establish that this was due to remediation, whether of the 1991 spill or the 1987 incident. Today, the *Jungal* swamp is still heavily vegetated, appears to be doing well to the naked eye, and shows no obvious signs of contamination, yet both IEMS and GSI have confirmed TPH and barium exceedances in that location.” There is also evidence of crude oil both on the slope leading to the swamp and within the swamp itself.

⁹⁶⁵ E-262, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field, dated May 1994, p. 4. The 1998 report noted further improvement: “Several general environmental issues were noted during the audit. Several of these were noted in the previous audits and most have been corrected or partially corrected. In general, better environmental practices were noted in the 1998 as compared with the 1997 audit.” E-264, Environmental Assessment of Oryx Ecuador Energy Company, Coca-Payamino Field dated 22-23 June 1998, p. 1.

802. The 1998 Grizzle report, commissioned at a time when Oryx was negotiating to take over the operation of the Coca-Payamino field, followed the same format and general content of the previous years' reports. The report essentially provided a photographic snapshot of conditions at 27 sites. It generally shows that, other than a single spill at Coca 6, historical events can be described as small quantity spills or releases that seemed to result from poor operation and maintenance practices (*e.g.*, leaky valves and flanges, damaged secondary containment systems, overflowing oil/water separators, overfilling of diesel tanks). The most significant and largest quantity of spills were observed within the CPFs (Coca CPF and Payamino CPF) and not the platforms.⁹⁶⁶ In the end, the 1998 Grizzle report did not seek to identify the specific releases, to estimate quantities, or to ascertain when the releases occurred.

803. The Interim Decision on Counterclaim noted that:

“... 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 employee) 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 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.”⁹⁶⁷ [Emphasis added.]

804. It is not in dispute between the Parties that in the period leading up to Perenco's suspension of operations in July 2009, most of the production wells in the Block 7 and the Coca-Payamino field (excluding Oso) were drilled before Perenco arrived in Ecuador. In its Closing Presentation, Perenco listed 57 wells that pre-dated its operatorship of Block 21. (In contrast, it listed 15 wells for which it appeared to take responsibility in that Block.⁹⁶⁸)

⁹⁶⁶ The Tribunal itself noted in its Interim Decision on Counterclaim, at paragraph 405, that the record evidence indicated “some problems with the Coca-Payamino Field and the Oso 1 platform” which predated Perenco's operatorship.

⁹⁶⁷ Interim Decision on Counterclaim, paragraph 385 [footnote references omitted].

⁹⁶⁸ Perenco's Closing Presentation, Slide 4.

805. Given the Grizzle-Sahr reports, in particular, the comments on *Petroproducción's* backsliding (quoted in paragraph 385 of the Interim Decision on Counterclaim just noted) and various other pieces of evidence pertaining to wells that were drilled before Perenco's operatorship, the Tribunal is reluctant to rely upon the Purchase and Sale Agreement's schedules as constituting an exhaustive and definitive statement of the Blocks' environmental condition. The Tribunal cannot but note however that Perenco should have better inspected and documented the conditions of the Blocks before signing the SPA and its schedules. It is due to its neglect that the schedules do not provide an exhaustive and definitive statement of the Blocks' condition in 2002.
806. The 1998 Grizzle-Sahr report neatly illustrates the challenge facing the Tribunal in differentiating between contamination in the Blocks which is plainly legally irrelevant and that which *might* be legally relevant to the present exercise. The 1998 report observed that there had been a release at Coca 6. But that release occurred in an area that is some distance away from the area at Coca 6 that is included in Mr. MacDonald's conceptual remedial plan and hence no question of Perenco's liability arises.⁹⁶⁹ However, the Grizzle-Sahr report also identified three sites where reported releases might have contributed to contamination in areas which the Independent Expert identified as warranting remediation. Given the annual inspections and recommendation made therein, and Grizzle and Sahr's noting that some progress had been made in dealing with matters identified in previous reports, it is possible that Kerr-McGee took steps to remediate these incidents prior to its selling its interests in the Blocks to Perenco, but there is insufficient evidence on the record for the Tribunal to be satisfied on this point. The Tribunal therefore proceeds on the basis that some of the contamination at the following three sites predated Perenco's operatorship:
- Coca 2/CPF - Oil releases from the API separator that discharged to the swampy area to the southeast of the facility.
 - Payamino 1/CPF - The presence of historical facility pits with several thousand barrels of crude to the west of the CPF, which could have potentially overflowed to the north, towards the catchment area and the swampy area to the north/northwest of the facility.

⁹⁶⁹ CE-CC-21; Appendix K of GSI ER I; Ecuador's Closing Submissions, p. 2.

– Payamino 23 – Spills were observed behind the power oil system and at the north entrance and an open reserve pit was still in place to the south of the power oil facility.⁹⁷⁰

807. This shows the potential for the layering of contamination by different operators. This situation militates in favour of allocating responsibility based on the length of tenure or based on some other weighting factor.
808. In the end, the Tribunal is satisfied that the contemporaneous documentary evidence indicates that there was contamination caused by operators in the Blocks in the decades preceding the period of Perenco’s operatorship. The visual inspections recorded in the various reports just quoted identified a variety of different shortcomings and in some instances Grizzle and Sahr gave “poor housekeeping” marks for various wells.⁹⁷¹ It is sufficient for the Tribunal to know that there were extensive drilling operations in the Coca-Payamino field and other parts of Block 7 and a few wells were drilled in Block 21 before Perenco arrived and that there is contemporaneous documentary evidence showing that at

⁹⁷⁰ In respect of the first two of these sites, the Tribunal considers that the substantial majority of the contamination found by the Expert was caused by Perenco’s predecessors.

⁹⁷¹ Following a May 1994 audit, Grizzle and Sahr concluded that the following sites suffered from poor housekeeping which “infers inferior operating procedures reflected by obvious debris, minimal or no maintenance of equipment and buildings, numerous operational spills, and inadequate vegetation and erosion control” (p. 12) (only those sites delineated by Mr. MacDonald are listed here): Payamino 4, Payamino 10, Payamino 13, Payamino 15, Payamino 16, Payamino and Coca CPF (but the report says that the level of contamination was minor, see p. 44), and Coca 8. See E-261.

Following a 11-14 March 1996 inspection, Grizzle and Sahr noted that the poor housekeeping at Payamino 10 had been corrected (p. 9) whereas this still persisted at Payamino 16 (p. 11). Their report also noted that Jaguar 7’s sewage system was “extremely poor” and there were poor storage practices (p. 6). More generally, the report considered that the practice of discharging of sewage into a stream had to be reconsidered, not just for Mono 3, but as a whole, in order to protect the health of people on location and those living along the streams (p. 6). See E-262.

The copy of Grizzle and Sahr’s 6-9 June 1997 report provided to the Tribunal appears to have been truncated and does not discuss specific sites. See E-263.

After the 22-23 June 1998 internal environmental audit, Grizzle and Sahr did not refer to housekeeping conditions, but instead noted the various issues and steps required with respect to various sites. Generally, the following sites were noted as requiring or still requiring remediation (mostly affected soil): Lobo 1 facility, Jaguar 2, Jaguar 3, Jaguar 7, Mono 1, Mono 5, Gacela 1/8, Gacela 2, Gacela 4, Gacela 5, Gacela CPF (once again, only those sites delineated by Mr. MacDonald have been set out here).

that time there was a relative laxity when it came to conducting drilling operations and other oilfield activities in an environmentally-protective manner.

809. Perenco has also directed the Tribunal to other evidence of spills prior to its assumption of the operatorship of the two Blocks. The Tribunal accepts Perenco's contention that certain contaminants, in particular, barium (with or without other metals (*i.e.* cadmium, chromium, lead, nickel and/or vanadium)), should be taken to be associated with the installation of production wells. Given the documentary evidence showing substantial drilling of such wells prior to 2002, it follows that barium exceedances at those sites have been shown by Perenco, on a preponderance of evidence, to have resulted from the actions of its predecessors. Given the location of those wells, together with the mud pits constructed and used by Perenco's predecessors, and the Tribunal has been able to exclude liability, either wholly or partially, for different parts of the various sites investigated.
810. The Tribunal recognises that in attempting to "unscramble the contamination egg", it is dealing with knowns and unknowns.⁹⁷² Notwithstanding the work conducted by the Parties' experts and supplemented by the Tribunal's Independent Expert, this exercise is not one of scientific certainty. But, as noted above at paragraph 69, the estimation of damages is not a science and a court or tribunal must work with the evidence before it.
811. To be clear: before using a time-based weighting system in respect to a particular site, areas within the site that could be clearly designated as "non-Perenco" or "Perenco" were segregated and placed in the corresponding "bucket" of responsibility. In addition, where other criteria could be used, these were applied in lieu of the time-weighted approach. But sometimes it has been necessary to allocate responsibility between successive operators. So far as prior operators are concerned, the time of first well drilling at a specific site is used as the starting point and July 2009, when Perenco ceased operations in the Blocks, is used as the end date (with the exception of sites where the 'Petroamazonas temporal issue'

⁹⁷² As the Expert's Direct Presentation made clear, at Slide 18, data gaps can exist even after multiple sampling events and therefore inferences are typically applied to complement analytical results.

applies).⁹⁷³ This tends to bias in favour of Perenco, and therefore is a conservative estimate of its responsibility, because it does not consider the possibility of later contaminant release dates and the fact that some fields were drilled but not heavily exploited until Perenco arrived (*i.e.*, Oso and Yuralpa).⁹⁷⁴ As for any allocation as between Perenco and Petroamazonas, to the limited extent that it is used (for the reasons previously given), the time-weighted system uses July 2019 as the end date. This is relevant only for a few sites for groundwater (Coca 2/CPF, Gacela 1/CPF and Payamino 1/CPF) and therefore assumes much less importance than the system used for Perenco and prior operators.

3. Did the Independent Expert act within his mandate?

812. Turning to the second set of issues, virtually all of them are bound up with the exercise of technical judgement and expertise. Nevertheless, the Tribunal considers that the following questions pertaining to the Independent Expert's mandate should be addressed.

813. Specifically, did the Independent Expert:

Adhere to the Tribunal's restrictions on site sampling?

Follow the Tribunal's instructions on establishing the land-use criteria?

Exceed his mandate with respect to mud pits by resolving to apply RAOHE Table 7(a) to all mud pits?

Exceed his mandate with respect to groundwater monitoring by resolving to apply TULAS to groundwater samples taken from wells installed in sites where the clay content exceeded 25%?

⁹⁷³ See paragraph 785 above.

⁹⁷⁴ Consolidated Expert Report, pp. 24-25: "The first petroleum exploration activities within Block 7 and the CPUF reportedly occurred in the early 1970s, when Texaco drilled exploratory oil wells at the Coca 1, C6ndor 1, and Zorro 1 platforms. British Petroleum (BP) also constructed an exploratory well at Oso 1 in 1970. Oil extraction activities do not appear to have occurred until approximately December 1985 when BP began developing the area under a service contract..." As for Block 21, "Texaco began oil exploration activities in Block 21 during the early 1970s at the Yuralpa 1 platform. Further activities were not conducted within the Block until March 1995, when Oryx conducted further exploratory environmental impact and seismic studies. When Perenco began operating at Block 21 in 2002, it contained a small number of wells (approximately nine) and Central Processing Facilities (CPFs). Upon the July 2009 takeover of the operations, operations within Block 21 had increased substantially."

Adhere to the Tribunal's instruction that when estimating costs of any remediation for which Perenco is liable, the Expert shall be guided by Ecuadorian costs?⁹⁷⁵

(a) *The Independent Expert's sampling mandate*

814. The Tribunal recalls that Mr. MacDonald was instructed to review the work performed by the Parties' experts and to sample at those sites where either or both of the Parties' experts had found evidence of contamination. The Tribunal reasoned that:

"590. ... 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."⁹⁷⁶

...

592. ... 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."⁹⁷⁷

815. In addition, the Tribunal observed:

"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."⁹⁷⁸

816. Mr. MacDonald was thus instructed not to perform a *de novo* study of the environmental condition of the two Blocks. The Tribunal recognised that this instruction meant that there would almost certainly be contamination in the two Blocks which was not captured either by the Parties' experts or by the Tribunal's Independent Expert:

⁹⁷⁵ Such issues as the interpretation of chromatograms, calculation of background values and 'order of magnitude' issues are considered to fall within his sphere of expertise and competence.

⁹⁷⁶ Interim Decision on Counterclaim, paragraph 590.

⁹⁷⁷ *Ibid.*, paragraph 592.

⁹⁷⁸ *Ibid.*, paragraph 596.

“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. As Ecuador pointed out, GSI accepted that it confined its investigation to seeking to invalidate RECs identified by IEMS. 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. 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.”⁹⁷⁹ [Emphasis added.]

817. Two other points warrant mention. First, as noted above, Mr. MacDonald was instructed not to consider the allocation of responsibility to Perenco for its share of the contamination which he determined to exist in the relevant sites. Secondly, he was also instructed to perform his work without regard to the determinations made by the *Burlington* tribunal.⁹⁸⁰

(b) *Did the Expert exceed his mandate in conducting sampling at sites that were not sampled by either of the Parties’ experts?*

818. Perenco complained that certain sites which the Expert decided to sample had not been found to be contaminated by either of the Parties’ experts. The Expert moreover assumed that certain mud pits contained exceedances without his having sampled them.⁹⁸¹ Perenco therefore submitted that the Tribunal must exclude these sites (pits at Oso 9A, Oso 9 B, Oso 9, Pits 2, 4, Yuralpa SL pit, and Yuralpa G, pit 2⁹⁸²) from the total measured contamination in Blocks 7 and 21.⁹⁸³

⁹⁷⁹

Id.

⁹⁸⁰

Expert’s Direct Presentation, Slide 3.

⁹⁸¹

Perenco’s Comments to the Independent Expert Report dated 22 February 2019, paragraphs 56-57.

⁹⁸²

Perenco’s Closing Presentation, Slide 21.

⁹⁸³

By “total measurable contamination” the Tribunal refers to the Expert’s estimation of the total contamination in those areas of the Blocks which were previously identified by one or the other of the Parties’ experts and then sampled and further delineated by the Expert. Due to the Expert’s restricted mandate, this is not to be taken as a firm estimate of all of the potential contamination in the two Blocks.

819. During his opening presentation to the Parties and the Tribunal on 11 March 2019, at which he reviewed his work and responded to the Parties' written comments, Mr. MacDonald began by summarising the "mandates that guided the scope of work."⁹⁸⁴ The first two points on his slide stated:

"Investigation of soil and groundwater was restricted to areas already sampled by the Parties.

Investigation of mud pits was limited to those known to have been used by Perenco."⁹⁸⁵

820. Mr. MacDonald thus differentiated between sampling of soils and groundwater, on the one hand, and sampling of mud pits, on the other. Having regard to the Interim Decision on Counterclaim as a whole, the Tribunal considers that this was a not unreasonable interpretation of the Tribunal's directions. With respect to the first point on Mr. MacDonald's slide, at paragraph 590 of the Interim Decision, the Tribunal stated: "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...."⁹⁸⁶

821. With respect to mud pits, the Interim Decision on Counterclaim was clear in expressing the Tribunal's intention that Perenco would be liable for any exceedances found in mud pits that Perenco had used. When the general instructions were developed in the Interim Decision on Counterclaim (assuming an expert might have to be appointed), it appeared to the Tribunal that the principal difference between the Parties in respect of mud pits was not the *number* of mud pits that Perenco had used, but rather of that universe of pits, *how many were lined as opposed to unlined?* This can be seen in the discussion in paragraph 502 of the Interim Decision on Counterclaim:

"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

⁹⁸⁴ Expert's Direct Presentation, 11 March 2019, p. 1.

⁹⁸⁵ Tr. (1) (MacDonald) (11 March 2019) 20.

⁹⁸⁶ Interim Decision on Counterclaim, paragraph 590.

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.”⁹⁸⁷ [Emphasis added.]

822. To be clear, Perenco did *not* complain that the Independent Expert sampled mud pits that had been used by other operators.⁹⁸⁸ Perenco did not take issue with the Consolidated Independent Expert Report’s statement that:

“Per the Tribunal, the condition of non-Perenco pits, either those constructed before September 2002 or after July 2009, were not relevant to the claim and were excluded from Ramboll’s assessment.”⁹⁸⁹

823. The Consolidated Independent Expert Report moreover explicitly notes that Mr. MacDonald limited his sampling to the pits that the Parties’ representatives *agreed* had been used by Perenco.⁹⁹⁰ Perenco’s grievance is that the Independent Expert either sampled mud pits admittedly used by Perenco but which had not been previously sampled by the Parties’ experts⁹⁹¹ or that he did not sample certain pits used by Perenco, but rather only inferred contamination of such pits.⁹⁹²
824. It was not the Tribunal’s intention that Perenco would be able to avoid liability for any exceedances determined by the Independent Expert for mud pits which Perenco had used. From the Tribunal’s perspective, the key objectives insofar as mud pits were concerned

⁹⁸⁷ *Ibid.*, paragraph 502.

⁹⁸⁸ The Notes to Table 5.1 indicate instances where mud pits were identified as being associated with non-Perenco operations and therefore were not sampled. See notes 4 and 5.

⁹⁸⁹ Consolidated Expert Report, “Mud pits” p. 237, second bullet.

⁹⁹⁰ *Ibid.*, Section 7.1. “Mud Pits”, second paragraph: “Per the Tribunal, the condition of non-Perenco pits, either those constructed before September 2002 or after July 2009, were not relevant to the claim and were excluded from Ramboll’s assessment. The mud pits considered in our work were therefore limited to those that the Parties agreed were associated with prior Perenco operations. All of the Perenco mud pit areas were inspected, and almost all were sampled. ...”

⁹⁹¹ *Ibid.*, p. 93: “At Oso 9A and 9B, however, Ramboll designates for remediation 7 mud pits even though neither IEMS nor GSI found evidence of exceedances in these sites. Consequently, these areas were beyond the scope of Ramboll’s investigation.”

⁹⁹² *Ibid.*, pp. 93-94: “...Ramboll’s own sampling disproves the assumption that adjacent pits have similar contents: Ramboll found that pit 8 in Oso 9 met the performance criteria even though the adjacent pit 9 did not.”

were twofold: (i) to have Mr. MacDonald ‘get to the bottom’ of the lined/unlined pit dispute between the Parties; and (ii) to ensure that Perenco would *not* be held liable for pits constructed by prior operators which it did not use. This was made clear at 604 of the Interim Decision on Counterclaim:

“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.”⁹⁹³ [Emphasis added.]

825. As part of his planning process, Mr. MacDonald provided a list of mud pits to the Parties for their comment.⁹⁹⁴ Included on that list were Oso 9A and Oso 9B.⁹⁹⁵ (Perenco’s use of both of these sites had been noted in GSI’s 2012 expert report.⁹⁹⁶) As for the Yuralpa sanitary landfill pit and Yuralpa G, pit 2, the history of Block 21’s development is clear: As reflected in GSI’s list of wells drilled in Yuralpa, with the exception of three wells drilled by Texaco (Yuralpa 1) and Oryx (Yuralpa Centro 1 and 2), the Yuralpa field was developed by Perenco.⁹⁹⁷ As for Oso 9, pits 2, 4, these pits were not sampled by Mr. MacDonald, but they were situated within a large mud pit area and the pits surrounding these two (pits 1, 3, and 6⁹⁹⁸) were sampled. All of those sampled pits showed regulatory exceedances. The estimation of contamination at these two pits resulted from Mr.

⁹⁹³ Interim Decision on Counterclaim, paragraph 604.

⁹⁹⁴ This correspondence was supplemented by discussions with Party representatives. Mr. MacDonald commented: “... I think the pit – I’ll call it the “Pit mandate” – was through available information and attempts, very strong attempts, to affirm with the Parties that no one had an objection.” Tr. (1) (MacDonald) (11 March 2019) 132:16-19.

⁹⁹⁵ During the Expert Hearing, Mr. MacDonald noted that he had sent an email or a letter regarding the sampling of Oso 9A and 9B. “It was clear to us from representations made in the field that those areas received mud pit materials from Perenco.” Tr. (1) (MacDonald) (11 March 2019) 130:15-17.

⁹⁹⁶ GSI ER I, Appendix L.54 “Compilation of Site-Specific Information for Oso 09, 12, 15, 16, 17, 18, 19 and 20 Well Platform, Block 7”, pp. 4 & 9.

⁹⁹⁷ GSI took samples / see Tr. (1) (MacDonald) (11 March 2019) 132.

⁹⁹⁸ GSI ER II Appendix B.4, Well List, p. 4.

MacDonald's drawing an inference from the regulatory exceedances which he had confirmed at the surrounding pits.⁹⁹⁹

826. The Tribunal understood from its mandate discussions with the Independent Expert at the outset of his work that he considered sampling roughly half of Perenco's pits and inferring from the results of that sampling estimates of contamination in the balance of the pits. In the end, Mr. MacDonald did far more sampling than inferring:

“The mud pits considered in our work were therefore limited to those that the Parties agreed were associated with prior Perenco operations. All of the Perenco mud pit areas were inspected, and almost all were sampled.”¹⁰⁰⁰ [Emphasis added.]

827. Given what the Tribunal stipulated in the Interim Decision on Counterclaim, specifically its stated intention to have all mud pits used by Perenco assessed, the Tribunal does not consider that Mr. MacDonald's reasons for deciding to sample or assign responsibility by means of the limited use of inference to the mud pits listed above at paragraph 818 to be unreasonable. It holds therefore that he did not step outside of his mandate.

(c) Did the Expert exceed his mandate in not conducting sampling at sites that were sampled by either of the Parties' experts?

828. While Perenco raised many objections that would, if accepted, have significantly narrowed the scope of contamination found by the Expert, Ecuador raised a different set of issues focusing on Mr. MacDonald's inability or failure, as the case may be, to sample certain sites which were sampled by one or the other of the Parties' experts.
829. Ecuador pointed out that the Expert did not sample every site where contamination was found by one or the other of the Parties' experts. For example, IEMS investigated the groundwater situation at the Yuralpa landfill (“Yuralpa LF”), but Ramboll was not able to

⁹⁹⁹ Independent Expert Report, Table 5.1: “Mud Pits 2 and 4 at Oso 9 are associated with Perenco but were not investigated by Ramboll or the Parties. The contents of these two mud pits are likely of similar quality as that found in neighbouring Mud Pit 1 and Mud Pits 3 and 5, respectively.”

¹⁰⁰⁰ *Id.*, Section 7.1.

sample this site due to logistical difficulties.¹⁰⁰¹ Ecuador argued that since at least one well at every site has a detected exceedance of TPH and/or barium, it would be reasonable to assume that the groundwater at Yuralpa LF would be equally affected.¹⁰⁰² Ecuador noted further that Perenco also installed wells at Yuralpa B and used mud pits at that site. Due to an oversight, Ramboll did not investigate the Perenco mud pits at that site.¹⁰⁰³ Given that Mr. MacDonald found that 87% of the mud pits constructed or used by Perenco did not conform to the performance criteria of RAOHE, Ecuador argued that it was reasonable to assume that the mud pits at this site would also not have met the standards prescribed by RAOHE.¹⁰⁰⁴ Finally, during the Expert Hearing, Ecuador referred to evidence that Perenco had disposed of mud pit materials generated at other sites at Payamino 16.¹⁰⁰⁵ Again, considering that 85% of the Perenco mud pits did not conform to RAOHE's performance criteria, Ecuador argued that it is reasonable to assume that the mud pits at this site would also not have conformed to RAOHE.¹⁰⁰⁶

830. The Tribunal has given due consideration to this concern and believes that it is fair, in view of the above circumstances, to adjust upward by US\$7.7 million the damages estimated by Mr. MacDonald and found by the Tribunal to be allocable to Perenco.
831. A related issue is Ecuador's attempt to have the Tribunal increase the damages because of the fact that Perenco performed certain workovers of production wells that had been drilled by its predecessors. Ecuador contended that just as the initial drilling of the production wells would have generated wastes, so too would the workovers. In the period leading up to the Expert Hearing, the Tribunal agreed with Ecuador's request that Perenco produce its workover reports.¹⁰⁰⁷

¹⁰⁰¹ Independent Expert Report, Section 4.2.4.

¹⁰⁰² Consolidated Expert Report, p. 239, paragraph 7.

¹⁰⁰³ Tr. (1) (MacDonald) (11 March 2019) 30:12-22.

¹⁰⁰⁴ Tr. (2) (MacDonald) (12 March 2019) 395:2-10.

¹⁰⁰⁵ *Burlington* Decision on Counterclaims.

¹⁰⁰⁶ Tr. (2) (MacDonald) (12 March 2019) 397:8-18.

¹⁰⁰⁷ Ecuador's request was set out in its letter of 22 January 2019, p. 2; this request was granted by the Tribunal in its letter dated 8 February 2019.

832. This issue was raised relatively late in the proceedings. Perenco objected to this on the grounds that even though seven years ago Perenco produced some evidence about workovers that it had performed, Ecuador was now seeking to expand the record on that historical point, while continuing to withhold the same kind of information about its own operations that actually was relevant to the Tribunal’s decision at this stage, *i.e.* records of Petroamazonas’ post-July 2009 records of workovers that it had been ordered to produce.¹⁰⁰⁸ (The Tribunal has already expressed its disagreement with Perenco’s characterisation of Ecuador’s alleged failure to comply with Procedural Order No. 17.)
833. In the end, the Independent Expert agreed with Perenco that the issue had been raised relatively recently and that the workover reports that he had received early on in his work were relatively few in quantity. It was only in the last phase of the counterclaim proceeding that he was given more documentation relating to workovers.¹⁰⁰⁹ From his review of the documentation, although Mr. MacDonald agreed with counsel for Ecuador that workovers typically would generate residues¹⁰¹⁰, based on the information before him (which indicated the use of drilling fluids, but not what chemical additives were used, nor whether barium sulphate was used), he was unable reasonably to estimate Perenco’s potential contribution at sites where workovers were performed.
834. This is an exercise of technical judgement and the Tribunal declines to second-guess the Independent Expert on this determination. Ecuador’s workover claim is therefore rejected.

(d) The land-use debate

835. During his visits to the Blocks, Mr. MacDonald examined the Napo River Basin and the dominant features of the Blocks which he then briefly described in his Report:

“... I observed that local topographic conditions of the platforms varied significantly, with some located in hilly regions steep-sloped gullies, others within swampy lowlands, and still others within agricultural settings. Almost all sites, however, were surrounded by rainforest of

¹⁰⁰⁸ Perenco’s letter to the Tribunal dated 5 February 2019.

¹⁰⁰⁹ Tr. (2) (MacDonald) (12 March 2019) 307.

¹⁰¹⁰ Tr. (1) (MacDonald) (11 March 2019) 133:8-137:21; Tr. (2) (MacDonald) (12 March 2019) 310:15-315:14.

varying ecological value (e.g., primary and secondary forests; forests with evidence of concurrent agricultural use). As described further... while some portions of this forest are designated as having special significance, this entire rainforest ecosystem is considered to be environmentally sensitive and to have intrinsic value, regardless of whether it is pristine.”¹⁰¹¹

836. Both Parties objected to certain land-use designations employed by the Independent Expert. Leaving aside a few other objections to his designations, the main issue of dispute between the Parties on this aspect of the Report was that Ecuador considered that certain sites that the Independent Expert designated as “agricultural” should have been designated as “sensitive ecosystem” and that that two water bodies should have been classified as sensitive ecosystem areas rather than agricultural.¹⁰¹² Perenco considered that certain sites that the Independent Expert designated as “sensitive ecosystem” should have been considered “agricultural.” It is not necessary to repeat the objections in detail; they are set out above at paragraph 670 *et seq* above.
837. The approach to be taken by the Independent Expert was set out in the Interim Decision on Counterclaim at paragraph 495, under the heading: “Conclusion on land-use criteria”:

“491. ... 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, the report of a clean-up of a spill at Payamino 19 in June 2009, 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, and, most significantly, in the environmental impact studies commissioned by Ecuador in 2010.

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, the January 2008 Ministry-approved remediation plan for a spill in the Gacela-Payamino flow line in October 2007, and in the environmental impact studies commissioned by Ecuador in 2010. In the present proceeding, IEMS itself accepted that the areas

¹⁰¹¹ Consolidated Expert Report, p. 24.

¹⁰¹² *Ibid.*, p. 10. Ecuador also argued that the Expert failed to fully capture the extent of contamination in the tested areas.

surrounding Coca 6, Coca 8, Lobo 3, Lobo 1, Oso 9, Mono CPF, and Payamino CPF were primarily used for agricultural purposes.

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 Areas *and others* identified in the corresponding Environmental Study.” GSI’s initial approach was to restrict the use of the sensitive ecosystem criterion to those areas alone. 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”.

(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.¹⁰¹³ [Emphasis added.]

838. This was repeated in a summary form in the Tribunal’s Interim Decision on Counterclaim at paragraph 611(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.”¹⁰¹⁴

¹⁰¹³ Interim Decision on Counterclaim, paragraphs 491-495 [fn. references omitted.]

¹⁰¹⁴ *Ibid.*, paragraph 611(15).

839. In these instructions, the Tribunal wished to give the Independent Expert a degree of latitude to determine what was appropriate in the circumstances of a specific case. If the Ecuadorian authorities had previously made certain land-use determinations, those were to be given “significant probative value”, but the Tribunal did not intend by this indication to hold that any such prior determinations would be dispositive of the question in specific cases and that the Independent Expert could not use his own judgement given the specific characteristics of a particular site. (Otherwise, the Tribunal would have used words to the effect that “the Ecuadorian authorities’ prior land-use determinations shall govern”.)
840. It is important to recall that having sampled the sites, the Independent Expert was then to delineate the extent of contamination (because IEMS’ mapping methodology had been rejected and because the Tribunal had doubts about GSI’s delineations). Thus, the issue of land-use criteria would arise only once Ramboll had identified the location and type of contamination and delineated its extent. Many of the determinations were not black and white; Mr. MacDonald noted, for example, that TULAS defined agricultural land as including lands that “maintain a habitat for permanent and transient species, in addition to native flora.”¹⁰¹⁵ Thus, reasonable people can differ as to when or whether a particular site that exhibited agricultural characteristics could also have a part thereof which could be considered to be sensitive ecosystem. In the Interim Decision on Counterclaim, the Tribunal recognised that there could be cases of doubt where a site could be considered to fall under either of two designations and directed that in such circumstances, the more stringent designation should be applied. The intention was that the Independent Expert should bear in mind how a particular site had been treated by the authorities in the past, but if for some reason he considered that a more stringent land-use designation should apply, he could so determine. At the same time, however, the Independent Expert was not obliged to default to the sensitive ecosystem designation as Ecuador’s submissions seemed to imply. Thus, in some instances, Mr. MacDonald adopted a land-use classification which was favourable to Perenco’s position (which Ecuador considered to be insufficiently

¹⁰¹⁵ TULAS Book VI, Annex 2, §2.50, cited at Expert’s Direct Presentation, Slide 8.

stringent), and in other instances he adopted a classification which was favourable to Ecuador's position (and contested by Perenco as being unduly stringent).¹⁰¹⁶

841. Mr. MacDonald and his team surveyed the situation in the two Blocks, studied the record of this counterclaim, including prior filings with the Ecuadorian authorities, and consulted Ministry of Agriculture maps. After conducting the sampling activities, they plotted the delineated areas of contamination on some 51 sites (using aerial photographs). The Tribunal considers that it is not in a better position to make these site-by-site land-use determinations and therefore declines to interfere with them.

(e) Mud pits

842. The issue of mud pits is more of a technical issue than a mandate issue, but in view of the amount of time spent on the issue during the course of this counterclaim, the Tribunal deems it appropriate to discuss the Independent Expert's decision to apply RAOHE Table 7(a) to all of Perenco's mud pits.

843. The Tribunal has already adverted to the "lined/unlined mud pit" controversy. Perenco's historical practice with respect to mud pits was not well-documented. Earlier in this arbitration, after being ordered to produce documents pertaining to the design and construction of mud pits, Perenco stated that it: "...does not have a specific written policy for the construction, cleaning, monitoring, testing, and closing of pits."¹⁰¹⁷ Perenco relied primarily on Mr. Saltos' testimony and a note of interviews of former employees of Perenco prepared by IEMS as well as some photographic evidence to show that liners were used in some pits. However, the Tribunal was also mindful of a statement made by a former Perenco employee to the effect that even when such liners were laid down, the wastes were not deposited properly.¹⁰¹⁸ For this reason, the Tribunal found that the evidence "was mixed and not fully supportive of Perenco's position because one former employee stated that

¹⁰¹⁶ In his presentation on Day 2 of the Expert Hearing, Mr. MacDonald reacted to both Party's critiques of his designations (dealing with Ecuador's criticism at Slides 7-11 and Perenco's at Slides 39-46.)

¹⁰¹⁷ Interim Decision on Counterclaim, paragraph 501, quoting Perenco's response to Request #12, 18 January 2013.

¹⁰¹⁸ *Ibid.*, paragraph 501.

undue care was taken in depositing drilling muds such that the liners cracked under the high temperatures.”¹⁰¹⁹ This raised the possibility that even if Perenco lined some pits, the way in which it prepared the pits, mixed the muds, or deposited them in the pits could damage any liners that might have been laid down.

844. Moreover, earlier in the Counterclaim proceeding, Perenco’s experts treated all of Perenco’s mud pits as if they had been “sealed” (essentially equating mud pits with no impermeable liner laid down prior to depositing the mud, but which were said to be lined with clay, with pits with impermeable liners). The Tribunal disapproved of this approach:

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. 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.¹⁰²⁰

845. The existence of liners capable of acting as an impermeable barrier between the muds and the surrounding soil (and potentially groundwater) is of pivotal importance because RAOHE prescribes two different standards in its Table 7. A stricter standard for the treatment of the muds is applied to unlined pits than that applied to pits which have been lined with an impermeable barrier.

846. Thus, the Independent Expert was instructed to satisfy himself as to the state of the mud pits that Perenco used or constructed. The Tribunal advised that “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.”¹⁰²¹

¹⁰¹⁹ *Id.*

¹⁰²⁰ *Ibid.*, paragraph 503.

¹⁰²¹ *Ibid.*, paragraph 611 (16).

847. Mr. MacDonald and his team examined the mud pits that had been used by Perenco. Among other things, the mud pits were “visually inspected to assess the physical integrity of the mud pits, identify the presence of any distinct soil cover layer, and determine whether there was evidence of any synthetic mud pit liner material.”¹⁰²² At footnote 180 of his Report, the Independent Expert commented:

“The Parties have not provided any direct evidence as to whether liners are present for any specific mud pit. As part of Ramboll’s investigation, borings were designed to terminate above the suspected bottom of the mud pit to avoid puncturing any potential liners (if present) and creating a vertical migration pathway for contamination. Photographs taken by Perenco at the time of closure of some mud pits show that an excavator was typically used to treat the mud pit material in place, which likely would have resulted in the tearing or ripping of any liner material that might have been present. Therefore, Ramboll has conservatively assumed that none of the pits are lined or that any liner is likely not intact.”¹⁰²³
[Emphasis added.]

848. He restated this finding in the comments following Table 5.1, the summary table on mud pits findings:

“No information was provided sufficient to confirm that synthetic or clay liners are present beneath any specific mud pit. It should be clarified that Ramboll did not drill through the bottom of the mud pits to determine the presence or absence of liner material, since this would have compromised the units if the liners were present. In some cases, Ramboll did observe torn liner material along some mud pit perimeters, but had no information regarding its condition or lateral extent in the rest of the mud pit. Therefore, without exception, the leachability testing data was conservatively compared to the standards for unlined mud pits presented in RAOHE Table 7a.”¹⁰²⁴ [Emphasis added.]

849. Thus, in the end, Mr. MacDonald was not persuaded that there was sufficient evidence of competent impermeable liners (*i.e.*, liners that, if actually installed prior to disposing of muds, had maintained their integrity) such as to justify applying the less strict standard

¹⁰²² Consolidated Expert Report, Section 5.2.1.

¹⁰²³ *Ibid.*, fn. 142.

¹⁰²⁴ Independent Expert Report, first bullet after Table 5.1.

expressed in RAOHE Table 7(b).¹⁰²⁵ In his Opening Direct Presentation at the Expert Hearing, Mr. MacDonald stated that like GSI, Ramboll also observed portions of liner material on the ground surface around some mud pits, but such material “was observed in only at 8 of the 38 inspected Perenco mud pits (21%), with geogrid observed near the surface of the pits in an additional three mud pits (likely as part of the cover material).”¹⁰²⁶ The closure reports and photographic evidence to which Perenco referred Mr. MacDonald during the Expert Hearing raised questions in his mind. He testified that in two of the three pit closure reports that he had been able to review, even though it appeared that plastic liners had been laid down, Perenco itself had tested the pit contents against the more stringent Table 7(a) of RAOHE rather than the standard applicable to lined pits.¹⁰²⁷ He noted further that the photos showed that an excavator was operating within the pit (in order to mix the mud) and opined that this would imperil the integrity of any liner. He observed further that there were gouging markings on the side of the pits which indicated that the excavator was using a bucket with teeth which could cause damage to any liner that had been laid down.¹⁰²⁸

850. Notwithstanding Perenco’s cross-examination of Mr. MacDonald on the point, given the absence of a written protocol and detailed pit closure reports, as well as the limited photographic evidence of closure practices, together with the Expert and his team’s inspection of the sites, the Tribunal considers that Mr. MacDonald was entitled to determine that the more stringent standards should be applied. The Tribunal recalls in this regard its prior instruction that: “In any case of doubt, the more environmentally protective

¹⁰²⁵ During the Expert Hearing, Mr. MacDonald testified: “We only had three mud pit closure reports; Coca 19, Jaguar 9, and Yuralpa landfill. That we looked at. They have pictures. They have some description, they are in Spanish, but I can read Spanish. José reads it better than I do. And —but nonetheless, in no instance did the reports describe or show treatment of mud pit materials outside of the mud pits. They show the contrary. Two of the three sites, there is damage to the liners shown in the photos, and if two of the three sites the Contractor for Perenco compared the mud pit testing results, the performance criteria for unlined pits. Okay. So, there's no record and no evidence of competent liners that we've been provided with.” Tr. (1) (MacDonald) (11 March 2019) 81:2-8.

¹⁰²⁶ Expert's Direct Presentation, Slide 82.

¹⁰²⁷ Expert’s Direct Presentation, Slide 79; Tr. (1) (MacDonald) (11 March 2019) 81:2-8, 19-21.

¹⁰²⁸ Expert’s Direct Presentation, Slide 81; Tr. (1) (MacDonald) (11 March 2019) 81:22-82:6.

standard in Table 7(a) applies.”¹⁰²⁹ Therefore, the Tribunal leaves the Expert’s approach undisturbed.

(f) *Groundwater sampling*

851. The Independent Expert was instructed as follows:

“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.”¹⁰³⁰

852. Between 13 November and 14 December 2017, Ramboll collected samples from 34 permanent monitoring wells installed at 12 sites. The samples were analysed for TPH and metals. The results of the laboratory testing are set out in Table 5.2 of the Report. In summary terms, the Expert found:

“Based on Ramboll’s sampling results, TPH contamination in groundwater above the TULAS standard is present in all 12 investigated sites, and in 74% of sampled monitoring wells. The maximum observed concentration of TPH was 1915 µg/L at Payamino 2/8, as compared to the TULAS criterion of 325 µg/L. Barium is found at 58% of the sites, and in 38% of the sampled wells. The maximum observed concentration of barium was 4700 µg/L at Gacela 1, as compared to the criterion of 338 µg/L. No other contaminants of concern were identified in the monitoring wells.”¹⁰³¹

853. Ecuador had no substantial criticisms of the Independent Expert’s work in this regard.¹⁰³² There appears to be no suggestion by Perenco that Mr. MacDonald sampled at sites not

¹⁰²⁹ Interim Decision on Counterclaim, paragraph 611(16).

¹⁰³⁰ *Ibid.*, paragraph 611(17).

¹⁰³¹ Consolidated Expert Report, third bullet after Table 5.2.

¹⁰³² *Ibid.*, p. 51: “As MacDonald correctly points out at Section 3.2.3 (at p. 43), RAOHE does not specify numerical cleanup standards for groundwater. He thus appropriately proceeded to compare the groundwater Maximum Permissible Limits from TULAS Book VI, Annex 1, Table 5 to the groundwater concentrations determined for barium, cadmium, chromium, copper, lead, nickel, zinc, and TPH. This is precisely what IEMS and GSI did as part of their investigations.”

sampled by IEMS or GSI (although he did acknowledge that due to technical considerations, two wells [PAY01-MW03 and JAG02-MW-3] were advanced within areas of high levels of soil contamination).¹⁰³³

854. However, Perenco took issue with Mr. MacDonald's application of TULAS' Table 5 groundwater criteria to soils with a clay content greater than 25%, "even though TULAS specifically excludes such soils from these criteria."¹⁰³⁴ Perenco argued that if a soil contained a clay content of greater than 25%, the regulation simply did not apply. During the Expert Hearing, counsel for Perenco cross-examined Mr. MacDonald on the point and during the expert witness conferencing session he also elicited testimony from GSI's Mr. Bianchi to this effect.¹⁰³⁵ Mr. MacDonald disagreed with Mr. Bianchi on this point.¹⁰³⁶
855. The Tribunal sees both sides to this disputed point and the result is a closer call than for the preceding issues. It is odd that the table specifies a clay percentage at all and for that reason Perenco's argument is hardly implausible. But TULAS does not go on to state that if the clay content of the soil is greater than 25%, there is no need to investigate and/or remediate the groundwater for contaminants. In this sense, the Tribunal can see the logic of the position taken by the Independent Expert.
856. In the end, the Tribunal has decided to accept Mr. MacDonald's approach for the following two reasons.

¹⁰³³ E-453.

¹⁰³⁴ Consolidated Expert Report, p. 58.

¹⁰³⁵ Tr. (1) (MacDonald) (11 March 2019) 269:3-12: "one thing that is very clear in Ecuador, and it's not that different in other countries in the region, when the regulations state something, you stick to that regulation. And if it says 25 percent clay —I don't know the word in English —"*fiscalizar*"— you can't be regulated when you're not falling within the regulation. It just doesn't apply. So, in the case when clay is greater than 25 percent, the regulation doesn't apply, and it says that. It applies when it's less than 25 percent." See also Perenco's Closing Presentation, Tr. (2) (MacDonald) (12 March 2019) 433-434.

¹⁰³⁶ Tr. (1) (MacDonald) (11 March 2019) 269:13-270:4: "This is one we might just have to disagree about, which is okay. But, again, we were —I was not precluded from reading the regulations, interpreting then, nor of having conversations with other consultants in Ecuador, including environmental counsel where I was pushing and probing. It's no different than the TPH issue. It's very clear, for example, in RAOHE, that there is absolute freedom to suggest alternative analysis under those regulations, and I interpret TULAS to be no different. So, again, I think we have a different view on this one."

857. First, the Independent Expert’s summary of groundwater investigation findings (Table 5.2) lists the lithology, in terms of percentage of clay, of each site and it shows variability in such percentages at a site. For example, Mono 1, CPF records a clay content of 34.1% to the north of the platform, 14.9% to the northeast of the platform, 38.8% to the east of the platform in the mud discharge area and 18.2% to the south of the platform.¹⁰³⁷ The Tribunal sees force in the point made by Ecuador that the clay content of soils can vary, sometimes substantially, at a particular site and it makes little sense to exclude groundwater contamination manifesting itself in wells drilled in soils containing more than 25% clay content when there are neighbouring wells drilled in soil that contains less than 25% clay content that also manifest contamination.¹⁰³⁸ The Tribunal shares Ecuador’s concern that variability in clay content could lead to ineffective remediation if the 25% “cutoff rule” contended for were to be applied.
858. Second, and related to the point just made, Mr. MacDonald pointed out at the Expert Hearing that the permanent wells installed by Ramboll were able to capture groundwater irrespective of the clay content of the soil.¹⁰³⁹ In his words:
- “There’s evidence of groundwater impairment at all wells. We meet the definition of groundwater. There is no narrative in TULAS that says there isn’t some remedial obligation if you have more than 25 percent clay, for example. So, that’s what we did.”¹⁰⁴⁰
859. The Tribunal takes from his testimony that TULAS sets standards for the protection of groundwater, not clay, and if the water extracted from a well (irrespective of the percentage

¹⁰³⁷ Consolidated Expert Report, Table 5.2, p. 99.

¹⁰³⁸ Tr. (2) (MacDonald) (12 March 2019) 403:7-19.

¹⁰³⁹ Tr. (1) (MacDonald) (11 March 2019) 70:14-18: “water encountered by Ramboll at all sampling locations meets the definition of “groundwater” by TULAS, subsurface water that is located in the saturated zone where all pore space filled with water at or above the atmospheric pressure.”

¹⁰⁴⁰ Tr. (1) (MacDonald) (11 March 2019) 71:14-19. In response to Perenco’s contention that the groundwater samples had been misinterpreted and the chromatograms really showed plant wax, the Expert noted: “...for those wells where it believed we weren’t —the findings weren’t reflective of petroleum, in each and every well the groundwater had changed, it had odors, in some cases we had petroleum droplets, in some cases there was weathered crude in areas where we put the monitoring wells.” Tr. (1) (MacDonald) (11 March 2019) 77:17-22.

of clay content of the soil from which the groundwater was drawn) is contaminated, the TULAS standards should apply.¹⁰⁴¹

860. Therefore, the Tribunal leaves the Independent Expert's approach undisturbed.¹⁰⁴²

(g) *Did the Expert adhere to the Tribunal's instruction that when estimating costs of any remediation for which Perenco is liable, "he shall be guided by Ecuadorian costs"?*

861. Perenco asserted that, in contravention of the Tribunal's instructions, Ramboll's unit costs for remediation do not reflect local costs.¹⁰⁴³ It complained that Ramboll never provided a copy of its quotes for the Parties' verification¹⁰⁴⁴ but instead generated its soil remediation numbers through a database (the "RACER" database) developed in the United States.¹⁰⁴⁵ These numbers, Perenco argued, substantially exceeded GSI's unit costs, which themselves had been based on the upper range of actual local costs.¹⁰⁴⁶

862. Perenco also asserted that Ramboll's two quotes from two local contractors, Hidrogeocol Ecuador and Ecuambiente, were obtained belatedly in the process of the Expert's finalising his report and were not reliable guides. Hidrogeocol's unit cost for transportation and treatment of soil contaminated with TPH and heavy metals amounted to \$260/m³, six times higher than Petroamazonas' actual unit cost of \$39/m³ for comparable remediation work.¹⁰⁴⁷ Similarly, Ecuambiente's unit cost for transportation and treatment of soils with just TPH was \$56/m³, while Petroamazonas' actual unit cost was \$46/m³ for comparable

¹⁰⁴¹ Expert's Direct Presentation, Slide 64; Tr. (1) (MacDonald) (11 March 2019) 70-71.

¹⁰⁴² As noted previously, it was contended that the Expert's groundwater samples were starkly different from the results obtained by IEMS and GSI, But Mr. MacDonald pointed out in his Direct Presentation, Slide 68, that: "Neither IEMS nor GSI has made their data available, nor provided details; thus, cannot comment on what is described as remarkably different results."

¹⁰⁴³ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 65 and fn. 137; Perenco's Closing Presentatino, Slide 45.

¹⁰⁴⁴ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 66.

¹⁰⁴⁵ Perenco's Closing Presentation, Slide 48 referring to Mr. MacDonald's testimony at Tr. (1) (MacDonald) (11 March 2019) 87:21-88:5.

¹⁰⁴⁶ Tr. (2) (MacDonald) (12 March 2019) 504:3-21; Perenco's Rebuttal Presentation, p. 2.

¹⁰⁴⁷ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 70, contrasting Independent Expert Report, Appendix 19.C with CE-CC-451.

remediation work.¹⁰⁴⁸ In Perenco’s view, the Expert did not appear to have obtained a range of quotes from other contractors nor to have taken account of the fact that quotes provided to foreign companies —especially in the context of litigation— are typically higher.¹⁰⁴⁹

863. Perenco submitted, therefore, that the Tribunal should apply the actual costs recently incurred by Petroamazonas itself, which provide the “best guide for estimating comparable remediation works.”¹⁰⁵⁰ These were available from Petroamazonas’ own public documents and they showed, in Perenco’s submission, that remediation works in Blocks 7 and 21 were substantially lower than Ramboll’s estimates, *e.g.* \$39/m³ for treatment and disposal of soil with TPH and metals, as compared to Ramboll’s estimate of \$160/m³.¹⁰⁵¹

864. In sum, Perenco’s criticism of the Independent Expert’s approach to unit costs was that even though Ramboll claimed that RACER was used only as a reference,¹⁰⁵² it had actually relied on RACER estimates rather than the belatedly obtained local quotes from Hidrogeocol or Ecuambiente (which were also exaggerated, given the litigation context) or more appropriately, Petroamazonas’ costs, as evidenced by publicly-available documents.¹⁰⁵³

865. The Tribunal considers it useful to set out Mr. MacDonald’s explanation of Ramboll’s costs “solicitation process.”¹⁰⁵⁴ The first part of his explanation referred to various criticisms made by Perenco and addressed them in turn:

Belated solicitation of quotes¹⁰⁵⁵: “So, one here is that we appear to receive the quotes in late November and December [of 2018]. ... but the actual quote —what we’ll call ‘solicitation process,’ began much earlier in the year.

1048 *Id.*

1049 Perenco’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 70.

1050 *Ibid.*, paragraph 72, referring to Interim Decision on Counterclaim, paragraph 579.

1051 Perenco’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 69, contrasting Independent Expert Report, Appendix 19.C and Appendix 19.B with CE-CC-451.

1052 Perenco’s Closing Presentation, Slide 49.

1053 *Id.*

1054 Tr. (1) (MacDonald) (11 March 2019) 84:18.

1055 For ease of reading, the Tribunal has inserted subject titles into this extract of the transcript.

What was in the Expert Report was simply the most recent communication that we had. It was not to suggest that that was the date we got some information and in two weeks' time we put it all together. ... So, our solicitation process began, really, in the first quarter of 2018 and, again, the December quotes are simply the latest versions after many revisions and clarifications between folks that we reached out to in Ecuador.

Too few quotes: Ramboll does not appear to have obtained a range of quotes from other contractors. Actually, that's not true. That quote or cost information were solicited from seven contractors in Ecuador and actually total of 11. Four didn't have an interest. But there were communications with several and I'll explain in a minute how we did this, taking into account quotes provided to foreign companies are higher."¹⁰⁵⁶

866. Mr. MacDonald then discussed the safeguards that Ramboll took in an attempt to ensure that higher quotes would not be provided either due to its being a foreign company or because the quotes were being used in the context of litigation and therefore might be inflated:

“... we solicited and utilized a consultant in Ecuador, Hidrogeocol. ... they're consultants, and they oversee remedial work and believed that them asking for certain things would be faster, more effective than us because they are local.

They know each other, and we think generally that proved true.

The other thing is that these quotes, you know, in a litigation context, are typically higher. We required Hidrogeocol to sign a nondisclosure agreement, so details of the Project, identity of the, I mean—sure, people know what's going on in eastern Amazon, sure, to some degree, but we addressed this by just this factor.

So, he was talking to them on a local level, not in the context of litigation, not in the context of a U.S. entity, you know, per se, to try to get as true as information as possible. And, well, we did—it was an iterative process and we certainly, over time, incorporated them into our remedial cost estimation.”¹⁰⁵⁷ [Emphasis added.]

867. Mr. MacDonald then explained how RACER was used in Ramboll's cost estimation process:

“We used RACER. RACER is a database which contains information on many, many projects, 1500 or so from global locations.

¹⁰⁵⁶ Tr. (1) (MacDonald) (11 March 2019) 84:14-15, 17-19-85:1, 4-18.

¹⁰⁵⁷ Tr. (1) (MacDonald) (11 March 2019) 85:20-21, 86:2-21.

And the idea actually—for full disclosure, the U.S. Air Force developed this database... And over time it became a global database, inputting information from other companies' similar projects. And we use RACER as a bit of a litmus test, confirmation resource, and particularly when there are variations between costs from local contractors, the only costs that had some component of—I'll call it "RACER thinking" related to the treatment, transportation, disposal of soils. ...

In particular, and that was because we've seen a wide range of costs coming out of Ecuador, and we wanted to see how it felt, sort of looked within the context of RACER as a sort of a litmus test and a lot of folks think that the estimates within RACER often come within 10 percent of actual remediation costs.

Now, I'm not saying that holds true in each and every case, but it is actual experiences companies have had in different places in the world; so why not look at it? It was a supplemental reference, but most all of our costs came from this iterative process of getting actual unit cost pricing from local contractors in Ecuador."¹⁰⁵⁸ [Emphasis added.]

868. Given the above explanations, the Tribunal accepts that what looked from a reading of the Independent Expert Report at first blush to be a last-minute push to find some remedial cost estimates, was in fact the culmination of a more deliberative process that had gone on for roughly eight months with the intermediation of a local Ecuadorian firm subject to non-disclosure obligations. It further accepts Mr. MacDonald's view that the "use of RACER does not negate the fact that [Ramboll's] costs are very heavy Ecuador-oriented"¹⁰⁵⁹ and that RACER was used as a "confirmatory tool."¹⁰⁶⁰ The Tribunal notes that Perenco has argued that Ramboll's estimated costs were higher than the numbers provided in the Ecuambiente quote¹⁰⁶¹ but as Mr. MacDonald testified, the unit pricing Ramboll received "came out of Ecuador"¹⁰⁶², but was too low for the conceptual remediation plan that he and his team developed and therefore the estimates were adjusted upwards.¹⁰⁶³ The Tribunal accepts that this as a proper exercise of Mr. MacDonald's professional judgement.

¹⁰⁵⁸ Tr. (1) (MacDonald) (11 March 2019) 87:1-88:5.

¹⁰⁵⁹ Tr. (1) (MacDonald) (11 March 2019) 205:1-2.

¹⁰⁶⁰ Tr. (1) (MacDonald) (11 March 2019) 204:16-17.

¹⁰⁶¹ See Perenco's Closing Presentation, Slide 46.

¹⁰⁶² Tr. (1) (MacDonald) (11 March 2019) 202:10.

¹⁰⁶³ Tr. (1) (MacDonald) (11 March 2019) 203:21-22; 209:21-210:2.

869. Finally, with respect to its argument that the Tribunal should apply Petroamazonas' costs, Perenco relied on Petroamazonas' 2018 Incinerox waste management contract (and a statement in its 2017 bond offering from which Perenco calculated the cost of the remediation that Petroamazonas had performed), asserting that these are valid prices given that they were obtained through "an open proposal and bid process"¹⁰⁶⁴ which is "a good way to get low prices"¹⁰⁶⁵. In its closing submissions, Perenco highlighted the following text from these documents:

2018 Petroamazonas Contract

"Clause Five: Scope of the Work.-

5.3 - Treatment and/or final disposal of the removed waste, owing, for that purpose, to comply with the environmental legal requirements applicable to waste managers and all applicable environmental regulations."¹⁰⁶⁶

Petroamazonas' 2017 Bond Offering

"On July 1, 2013, Petroamazonas' board established Project Amazonia Viva, which was later approved by the Ministry of the Environment on June 3, 2014. This project seeks to eliminate sources of pollution and remediate contaminated soils, which resulted from exploration and production activities predating Petroamazonas' own operations. Currently, the project encompasses elimination and remediation efforts in exploration blocks 11 (Bermejo), 56 (Lago Agrio), 57 (Shushufindi Libertador), 58 (Cuyabeno), 60 (Sacha), and 61 (Auca), which are carried out in accordance with the Public Policy on Comprehensive Reparation and existing environmental regulations, under the supervision and monitoring of the Ministry of the Environment. For the period ending December 31, 2016, approximately 364,240 cubic meters of soil were remediated and 191 sources of pollution were eliminated as part of Project Amazonia Viva. As a result, Petroamazonas was able to recover approximately 4,959 barrels of crude oil during the 2016 period. To date, Petroamazonas has remediated approximately 732,956 cubic meters of soil and eliminated 520 sources of pollution since the implementation of Project Amazonia Viva in 2014.

In 2016, Petroamazonas incurred expenses of approximately U.S.\$23.1 million for the implementation of Project Amazonia Viva. For 2017, Petroamazonas has an annual budget of U.S.\$26.6 million for such project. As of October 2017, Petroamazonas has invested approximately U.S.\$19.4 million in this project."¹⁰⁶⁷ [Perenco's emphasis]

¹⁰⁶⁴ Tr. (2) (MacDonald) (12 March 2019) 504:20-21.

¹⁰⁶⁵ Tr. (2) (MacDonald) (12 March 2019) 505:1-2.

¹⁰⁶⁶ CE-CC-451, Section 5.3; see Perenco's Closing Presentation, Slide 53.

¹⁰⁶⁷ CE-CC-446, p. 86; see Perenco's Closing Presentation, Slide 56.

870. The Tribunal has carefully considered the Incinerox contract issue, in particular, because it is related to Petroamazonas' own remediation efforts in the Blocks and therefore seems to be highly relevant.
871. At the Expert Hearing, Mr. MacDonald pointed out that there was “significant variability” in the unit costs provided to Petroamazonas. For example, while Perenco pointed to a contractor who evidently provided soil remediation services for TPH and metals at a cost of US\$39.06/m³, a different Petroamazonas contract carried a price of US\$455.88/m³, *some 12 times higher*, for remediation services.¹⁰⁶⁸ Mr. MacDonald noted further that the scope in the Incinerox contractual documents did not identify the specific remedial technologies that would be employed. Therefore, he was skeptical of the suggestion that there really was true comparability between the Incinerox contract's services and what he contemplated should be done:

“...We've seen a couple of these RFPs. I cite two of them here, for soil remediation of petroleum and metals, \$39 a cubic meter to \$455 a cubic meter. Our unit pricing was 160, \$150-160 a cubic meter. And —but the scope in Petroamazonas' contract documents did not identify specific remedial technologies. So, you have to know more in order to determine whether there's a valid comparison. So, and it doesn't mean that our unit cost pricing is unreasonable. We believe that it's not.”¹⁰⁶⁹ [Emphasis added.]

And:

“it's not clear specifically whether if some treatments contemplated what is it and where is it embedded in these costs. So, I think we're very confident in the unit pricing that we've developed for treatment, transportation, and disposal. What's also clear in Ecuador is that the kinds of materials and the contamination at these sites do require treatment. It's not a direct excavate, transport, dispose. So, there's a treatment component and that has to be carefully understood and clear. And at least from my initial glance of this, it wasn't entirely clear whether treatment was contemplated or not.”¹⁰⁷⁰ [Emphasis added.]

¹⁰⁶⁸ Expert's Direct Presentation, Slide 91.

¹⁰⁶⁹ Tr. (1) (MacDonald) (11 March 2019) 90:3-13.

¹⁰⁷⁰ Ibid., 245:12-246:3; see also Ecuador's Closing Submissions, p. 23.

872. The Tribunal shares the Independent Expert’s doubts that the services contemplated by the Incinerox-Petroamazonas contract are comparable in scope and sophistication to what is required to implement his remediation plan.
873. The Tribunal notes further Mr. MacDonald’s concern that the reverse auction process employed by Petroamazonas serves to bring costs down but “it’s not guaranteeing that there isn’t some effect ... of work quality.”¹⁰⁷¹ Perenco itself adverted to this in its closing submissions and it is an important point, in the Tribunal’s view.¹⁰⁷²
874. Mr. MacDonald moreover did not believe that it could be assumed that Petroamazonas’ costs are reflective of local costs in general. He testified in this regard at the hearing:

“Now, here's the thing with Petroamazonas, and, yes, they do some of their own remedial work; right? Whether it's spills, releases, other things, and they are doing it themselves; ... so, they themselves might provide things like security, and community relations, and areas for equipment storage, and all the infrastructure, and borrowed materials and, I mean, various other things that might go into a remediation project, but that's different than a potentially then a third-party implementing remedial work on behalf of a responsible party.

So there is no basis for us to assume at this stage that if any remedial work is done that is done by Petroamazonas. I don't know that, as opposed to a third-party contractor. And I suspect that—but, again, I don't know, but they would have to be very dedicated resources, so I didn't see here that it was our job to try to handicap our costs assuming that Petroamazonas would implement any remedial work at the end as opposed to a third party...¹⁰⁷³ [Emphasis added.]

875. In the end, the Tribunal is satisfied that Mr. MacDonald’s costs are usable, reasonable and consistent with the Tribunal’s prior direction that local unit costs be employed.

¹⁰⁷¹ Tr. (1) (MacDonald) (11 March 2019) 284:6-11.

¹⁰⁷² Tr. (2) (MacDonald) (12 March 2019) 505:1-4: The reverse auction process, “Mr. MacDonald acknowledges, is a good way to get low prices, although he doesn’t like that it could have negative consequences if vendors don’t comply with their obligations.”

¹⁰⁷³ Tr. (1) (MacDonald) (11 March 2019) 89:2-90:1.

4. The Tribunal's quantification of the damages payable by Perenco

876. Having reflected on the evidence and the Parties' submissions, the Tribunal began by seeking to focus on the "knowns" of the contamination identified by the Independent Expert. Contamination associated with Perenco's mud pits and wells were first addressed. As for the other forms of contamination, the Tribunal focused on: (i) the type of contamination; (ii) where the contamination was located; (iii) whether the substances detected were associated with drilling or with ongoing oilfield operations; (iv) whether any of the wells where the contamination was found were drilled by Perenco; (v) how long a platform had been used before Perenco arrived on the scene; (vi) whether there was record evidence showing spills or other contamination at the site prior to, or during, Perenco's operatorship; and (vii) whether, in the case of groundwater contamination, the groundwater monitoring well at which the contamination was detected was proximate to contamination or a site feature (*e.g.*, mud pit, formation water pit) which had already been attributed to either a predecessor or to Perenco.¹⁰⁷⁴ The Tribunal also took note of instances where Perenco accepted partial or full responsibility for contamination at a particular site or area of a site.
877. If a site was one which was contaminated by barium and the well had been drilled by a Perenco predecessor, the Tribunal decided that contamination should not be attributed to Perenco. For example, Lobo 01 was drilled in February 1989; 100% of the remediation costs (\$1.361 m) was allocated to the 'Perenco predecessors' responsibility bucket'.
878. Conversely, if an incident of contamination was indubitably tied to Perenco's operations (Perenco-drilled wells and mud pits being the leading examples), or one for which Perenco accepted partial or full responsibility (*e.g.*, Mono CPF, where Perenco accepted responsibility for "some costs" for an oil spill in 2008¹⁰⁷⁵), the estimated remediation costs associated therewith were included in 'Perenco's responsibility bucket'. For example, the Jaguar 9 production wells were drilled by Perenco in July 2004. The \$541,000 for soil

¹⁰⁷⁴ Some groundwater contamination was attributed to a likely source (say a mud pit). If it was non-Perenco, then all remedial responsibilities were assigned the predecessor(s) (*e.g.*, Coca-2-MW1), and if Perenco's, then all remedial responsibilities were assigned to Perenco (*e.g.*, Oso 9).

¹⁰⁷⁵ Annex 1 to Perenco's Comments to the Independent Expert Report dated 22 February 2019, p. 15.

remediation found by the Independent Expert was allocated entirely to Perenco's responsibility bucket.

879. Likewise, the mud pits at Oso 9, 10-12, 15-20 give rise to a \$5.317 million remediation cost and a groundwater remediation cost of \$3.415 million. Both were allocated to Perenco. The Tribunal reasoned in this regard that groundwater impairment areas adjacent to mud pits or former formation water pits were more likely than not to be associated with those structures and were therefore attributed to the entities that constructed or used them.¹⁰⁷⁶ (The Tribunal also considered that in some cases it could not discount contributions by Petroamazonas to groundwater impairment (*e.g.* the API separator at Coca 2/CPF, Gacela 1/CPF and Payamino 1/CPF). Hence for groundwater impairment remediation costs, in those cases, the Tribunal not only allocated costs as between Perenco and its predecessors, but also included Petroamazonas in the time-weighted allocation.)
880. As noted above at paragraph 877, the Tribunal also considered the type of contaminant. Barium was associated with well drilling and allowed the Tribunal to allocate barium exceedances to the category of the drilling operator (*i.e.*, Perenco or its predecessors). Where the environmental media were affected by TPH, the Tribunal considered that this was a result of an operational release of crude oil. Such operational releases could occur before, during, or after Perenco's operatorship.
881. Thus, for certain issues, particularly in the areas of soil and groundwater contamination, the time-based allocation method was also employed. Given that contamination can occur from ongoing operational mishaps and mix with contamination caused by previous operators, allocating responsibility based on time of operations is, in the Tribunal's view, an appropriate method to deal with the uncertainty.
882. As a result of this exercise, the Tribunal considered that responsibility could fall within five combinations of persons responsible therefor:

¹⁰⁷⁶ An example going in the opposite direction is Coca 2. The impairment north of the formation water pit and west of the mud pit was fully attributed to predecessors.

- (i) Instances where the contamination identified by the Independent Expert was attributable to Perenco's predecessors only (for example at sites where exceedances of barium alone or with other metals were associated with well drilling conducted by a prior operator);
- (ii) instances where the contamination was attributable to Perenco (for example where exceedances of barium alone or with other metals was associated with well drilling by Perenco or in the case of Perenco's mud pits);
- (iii) instances where the contamination was attributable to Perenco, its predecessors and its successor (for example, where each used a particular operational structure (*e.g.*, an API separator) at a site where groundwater impairment was found);
- (iv) instances where the contamination was attributable to Perenco and its predecessors, but not to Petroamazonas (due to the limitations on the Independent Expert's sampling discussed above which lessened the chances of post-Perenco contamination being found); and
- (v) instances where the contamination was attributable to Perenco and Petroamazonas (due to the fact that the site was developed by Perenco and Petroamazonas continued operations there).

883. In the latter three combinations, in some instances, the Tribunal allocated the costs of remediation as between Perenco and another party or parties based on record evidence of timing of well drilling and/or mud pit construction and use, spills or other incidents, and taking into consideration Perenco's express assumption of responsibility (but not being bound by any limitations contained therein). In other cases, the time-weighted approach was employed when the record evidence could not be used to discern between Perenco's predecessors' activities and those of Perenco.

884. For example, with respect to Jaguar 01, which was drilled from November 1987 to January 1988 and operated by Perenco's predecessors before Perenco arrived on the scene, in Annex 1 to Perenco's comments on the Independent Expert's Report, Perenco assumed responsibility for "some costs" for soil and groundwater remediation.¹⁰⁷⁷ The Tribunal has fixed responsibility on Perenco for the impact of TPH contamination around the valve station, which had resulted from an oil spill reported in 2005-06, as well as partial

¹⁰⁷⁷ Annex 1 to Perenco's Comments to the Independent Expert Report dated 22 February 2019, pp. 2 & 5 (based on Ramboll's Estimated Costs).

responsibility for the swampy area downslope of the valve station. In this case, the Tribunal has allocated US\$1.997 million to Perenco's predecessors and US\$1.107 million to Perenco. (The latter figure does not include US\$438,000 for remediation of TPH detected in groundwater which the Tribunal attributes to a release in 2005/06, during Perenco's operatorship.)

885. Similarly, in Jaguar 02, drilled in January 1994 and taken out of service in 2000, and therefore only operated by Perenco's predecessors, there was a pre-existing non-Perenco mud pit which experienced a slope failure. This was not attributed to Perenco. Contamination in the barium and other metals-affected areas northeast of the platform, west of the mud pit, and along the northern stream was also attributed to Perenco's predecessors. For the areas with surficial crude resulting from the spill in 2006, Perenco was considered wholly responsible. In Annex 1 of Perenco's comments on the Report, Perenco assumed responsibility for "some costs" associated with soil remediation due to an oil spill "of unknown date" and "some costs" for groundwater remediation.¹⁰⁷⁸ In the result, a small part of the responsibility was allocated to Perenco (US\$196,000 for Perenco versus US\$8.308 million to its predecessors).
886. In cases of likely layering of contamination by successive operators, the Tribunal employed a time-based allocation of remedial costs based on Perenco's length of operatorship as a percentage of (i) its predecessors' operatorships, (ii) Petroamazonas' operatorship, or (iii) both. The timeframe selected to allocate responsibility as between Perenco and its predecessors assumed that releases to the environment began at the time of the first production well installation and continued through to July 2009. For affected areas that could be attributed to CPF operations, the initial release was assumed to have occurred when the CPF was constructed. In this respect, the allocation of responsibility to Perenco is conservative, because it does not consider the possibility of later contaminant release dates and the fact that not all of the oil fields were actively exploited by prior operators after the date of first production well installation.

¹⁰⁷⁸ *Ibid.*, p. 2.

887. Time-weighted sharing was used for soil contamination (when the record evidence could not be used to allocate costs, as noted in paragraph 883 above), and groundwater impairment. For example, with respect to the Gacela 02/CPF, for the groundwater impairment downstream of the API separator, the Tribunal considered it appropriate to allocate some responsibility to Petroamazonas due to its continued use of the separator. For the groundwater impairment to the southeast of the facility, the soil samples were collected shortly after Perenco's tenure came to an end and responsibility therefor is allocated as between Perenco and its predecessors. As a result, Perenco was assigned US\$452,530 in remedial costs, its predecessors were assigned US\$458,990, and Petroamazonas was assigned US\$485,480 in remediation costs.
888. The approach taken by the Tribunal, as just described, had been applied to each site and the results of this process are set out in Annex A to this Award which sets forth the Tribunal's findings in tabular form for: (i) sites where Perenco used mud pits and/installed crude oil production wells; (ii) sites where responsibility for soil remediation is allocated between prior operators and Perenco; (iii) groundwater sites where responsibility is allocated between prior operators, Perenco, and Perenco's successor; and (iv) certain other sites that the Tribunal has accepted give rise to responsibility on Perenco's part.
889. Applying the foregoing approaches, the remedial responsibilities estimated by Mr. MacDonald in the Independent Expert Report were allocated as follows (prior to further adjustment):

A. Mud pits and Perenco-installed wells

The total remedial estimate of **US\$50,017,000** is associated with sites where Perenco used mud pits or installed production wells.

Of this sum:

US\$49,604,320 is attributed to Perenco,

US\$114,080 is attributable to Perenco's predecessors, and

US\$298,600 is attributable to Perenco's successor.

B. Other soil remediation

For sites operated by Perenco where it did not use mud pits or install production wells, total remedial costs for soils amount to **US\$88,538,000**.

Of this sum:

Applying the time-based allocation method, **US\$27,522,810** is attributed to Perenco, and

US\$61,015,190 is attributable to Perenco's predecessors.

C. Groundwater

Total remedial costs for groundwater amount to **US\$21,326,000**.

Of this sum:

Applying the time-based allocation method, **US\$8,856,760** is attributed to Perenco:

US\$11,250,680 is attributable to Perenco's predecessors, and

US\$1,218,550 is attributable to Perenco's successor.

The total attributed to Perenco before adjustment is **US\$85,938,890**.

D. Adjustment

The Tribunal has found that it must make an upward adjustment to this figure to account for certain sites identified by Ecuador which the Expert overlooked or was unable to sample. It has thus added the sum of US\$7.7 million for remediation of mud pits at Payamino 16 and Yuralpa B, and the remediation of groundwater at the Yuralpa landfill.

This brings the total to **US\$93,638,890**.

5. Effect of the *Burlington* award

890. The Tribunal turns to the issue of how to deal with the *Burlington* award. It will be recalled that that tribunal left it to the present Tribunal to sort out the question of potential double-recovery of damages.¹⁰⁷⁹

¹⁰⁷⁹ The Tribunal noted at paragraph 1086 of its Decision on Counterclaims: "As of the date of the present Decision, the *Perenco* tribunal has issued no decision yet on the counterclaims before it. Therefore, this

891. In the latest phase of this proceeding Ecuador has not disputed that there is a substantial territorial overlap between the contamination to be remediated as estimated by Mr. MacDonald and that estimated by the *Burlington* tribunal.¹⁰⁸⁰ It is evident, however, that Mr. MacDonald identified for remediation larger areas and additional volumes of soil contamination, additional mud pits and additional sites with groundwater contamination, and used higher in-country remediation costs than the *Burlington* tribunal estimated.¹⁰⁸¹ Ecuador argued that Mr. MacDonald thus did not find the same harm as the *Burlington* tribunal and Perenco remained liable for the additional and/or different remedial areas, volumes and costs.¹⁰⁸²

892. Ecuador therefore proposed a framework based on a site-by-site comparison of areas, depths, volumes and costs between identified by Mr. MacDonald and the *Burlington* tribunal.¹⁰⁸³ In case of any uncertainty, Ecuador stated that it had assumed there was an overlap and gave credit to Perenco. Under the framework, on Ecuador's analysis, Perenco was liable for US\$130,801,100.¹⁰⁸⁴

- (a) **Soils:** Perenco was liable for the additional remedial volumes and costs for the following: (i) sites for which the *Burlington* tribunal did not award any remedial costs; (ii) sites where Mr. MacDonald delineated different areas; sites or areas where Mr. MacDonald's sampling concluded that contamination extended beyond or deeper than the *Burlington* tribunal's findings; (iii) sites or areas where the horizontal and vertical extent of the contamination estimated by Mr. MacDonald and the *Burlington* tribunal were similar, but in respect of which Mr. MacDonald estimated higher remediation costs.¹⁰⁸⁵

Tribunal lacks the necessary information or basis to adopt any specific measures – to fashion its decision, to borrow Ecuador's phrase – to prevent double recovery, a task that it must leave to the *Perenco* tribunal as the one deciding in second place. This being said, this Tribunal nonetheless states that, as a matter of principle, the present Decision cannot serve and may not be used to compensate Ecuador twice for the same damage.”

¹⁰⁸⁰ Ecuador's Cover Submissions dated 22 February 2019, paragraph 80.

¹⁰⁸¹ *Id.*

¹⁰⁸² *Id.*

¹⁰⁸³ *Ibid.*, paragraph 81 and Appendix A.

¹⁰⁸⁴ Appendix A to Ecuador's Cover Submissions dated 22 February 2019.

¹⁰⁸⁵ Ecuador's Cover Submissions dated 22 February 2019, paragraph 82.

- (b) **Mud pits:** Perenco was liable for the higher remediation costs at Cónдор Norte and the Payamino WTS as well as the full remediation costs estimated for non-compliant mud pits at 11 sites, for a total of US\$ 28,304,000.¹⁰⁸⁶
- (c) **Groundwater:** Perenco was liable for the nine additional sites identified by Mr. MacDonald as requiring groundwater remediation and the estimated higher costs for the remediation of Coca 2/CPF.¹⁰⁸⁷

893. In addition, Ecuador argued that it was entitled to abandonment costs in addition to the US\$929,722 granted by the *Burlington* tribunal for the seven sites listed in Perenco’s November 2008 Well Site Abandonment Plan that was never carried out and which sites Petroamazonas never operated.¹⁰⁸⁸

894. Perenco’s argument on this point in essence was that the *Burlington* payment pursuant to the Settlement Agreement “irrevocably, fully and finally paid and discharged, and satisfied” all of the Consortium’s obligations and liabilities related to Ecuador’s counterclaims.¹⁰⁸⁹ If that argument was not accepted, at the very least, in Perenco’s submission, that amount paid must be set off from any remediation costs that this Tribunal might award to Ecuador in this proceeding.¹⁰⁹⁰ Perenco argued that Ecuador did not dispute this.¹⁰⁹¹ Applying its proposed corrections to Mr. MacDonald’s findings, which would result in damages lower than what Ecuador had already received in full satisfaction of its counterclaims, the Tribunal should enter an award of zero counterclaims damages.¹⁰⁹²

895. The Tribunal obviously has charted a different course from that proposed by either Party. It has not estimated damages of US\$130,801,100 payable to Ecuador by Perenco, nor has it agreed with Perenco’s ‘zero counterclaims damages’ contention.

¹⁰⁸⁶ *Ibid.*, paragraph 83.

¹⁰⁸⁷ *Ibid.*, paragraph 84.

¹⁰⁸⁸ *Ibid.*, paragraph 85.

¹⁰⁸⁹ Perenco’s Comments to the Independent Expert Report dated 22 February 2019, paragraph 74, and referring to CE-CC-431, Annex 3, p. 4, paragraph 2.

¹⁰⁹⁰ *Ibid.*, paragraph 74, and referring to CE-CC-431, Annex 3, p. 3, WHEREAS (5).

¹⁰⁹¹ *Ibid.*, paragraph 74.

¹⁰⁹² *Id.*

896. By the time of the Expert Hearing, Ecuador was acknowledging that a substantial overlap environmental damages existed between the US\$39,199,373 awarded by *Burlington* and what Mr. MacDonald has found. (At the Expert Hearing, Ecuador indicated that the maximum amount subject to double-recovery was US\$29,078,900.)¹⁰⁹³ Mindful of the *Burlington* tribunal’s statement that “as a matter of principle, the present Decision cannot serve and may not be used to compensate Ecuador twice for the same damage”¹⁰⁹⁴, the Tribunal has thought long and hard about how to protect against double recovery.
897. The two tribunals have addressed the issues in significantly different ways, both substantively, in terms of their findings on Ecuadorian law, and technically, in terms of evaluating the expert evidence of contamination in the Blocks. The *Burlington* tribunal relied upon IEMS’ and GSI’s sampling as augmented by the tribunal’s site visit to the Blocks. The present Tribunal had doubts about the work of both side’s experts and opted to make the main findings on Ecuadorian law that would allow the Parties the possibility to negotiate a settlement and if they were unable to do so, the Tribunal indicated its intention to appoint an independent expert.
898. No disrespect at all is intended to the distinguished members of the *Burlington* tribunal, each of whom the present Tribunal holds in high regard, by the present Tribunal’s deciding that Mr. MacDonald was better situated than that tribunal to estimate the extent of contamination. The work performed by Mr. MacDonald and his team from Ramboll is more likely to have comprehensively and accurately analysed the work of IEMS/GSI (both their strengths and weaknesses) than the *Burlington* tribunal was able to do. After thoroughly reviewing that work and designing a further sampling campaign in consultation with the Parties, Mr. MacDonald was, in the present Tribunal’s view, in a far better position to capture and delineate the extent of the contamination in the areas of the Blocks that he was permitted to measure. Hence, the Tribunal has decided to treat the US\$39,199,373 awarded by the *Burlington* tribunal, and paid by Burlington in its settlement, as a down

¹⁰⁹³ See Appendix A to Ecuador’s Comments to the Independent Expert Report dated 22 February 2019, “Totals.”

¹⁰⁹⁴ *Burlington* Decision on Counterclaims, paragraph 1086.

payment towards the total amount of damages that the present Tribunal has determined are payable by Perenco, the actual operator of the Consortium.

899. The grand total after adjustments of US\$93,638,890 stated above at paragraph 889 is thus further adjusted by crediting to Perenco the prior payment of US\$39,199,373 to arrive at a figure of US\$54,439,517 which Perenco shall pay to Ecuador.

6. Direction on Ecuador's use of the proceeds

900. Perenco argued that any damages awarded to Ecuador should not be used to offset the damages owed to Perenco. The Tribunal should instead order that Ecuador deposit that amount into a remediation fund that Ecuador must use solely for the purpose of remediating the Blocks.¹⁰⁹⁵ This, according to Perenco, was the only way to ensure that the Tribunal's objective of protecting the environment was truly achieved and that Ecuador fulfilled its promises to use the funds to remediate, and that the entire counterclaims process is not subverted for Ecuador's opportunistic monetary gain.¹⁰⁹⁶ Perenco noted that Ecuador had no objection to such an order and all that a remediation fund would do would be to hold it to its word.¹⁰⁹⁷
901. On this point, Ecuador's Attorney-General confirmed at the Expert Hearing Ecuador's prior statement during the earlier counterclaims phase that "any damages that will be granted to Ecuador for the counterclaims would be devoted to the restoration of the ecosystems and Ecuador wouldn't have any problem whatsoever if the Tribunal felt an order to this point should be made, an order saying that any damages that would be granted to Ecuador shall be devoted to the full restoration of the ecosystems as provided for in the Constitution of Ecuador."¹⁰⁹⁸

¹⁰⁹⁵ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 75.

¹⁰⁹⁶ Perenco's Comments to the Independent Expert Report dated 22 February 2019, paragraph 75; Tr. (2) (MacDonald) (12 March 2019) 468.

¹⁰⁹⁷ Tr. (2) (MacDonald) (12 March 2019) 470.

¹⁰⁹⁸ Tr. (2) (MacDonald) (12 March 2019) 375:2-13.

902. The Tribunal has reflected on the Parties' submissions. Insofar as Perenco's request for two separate awards of damages being made, one in favour of each Party, with the counterclaims damages to be paid into a remediation fund, the Tribunal observes that making an order that would require continued monitoring of Ecuador's remediation activities would be inconsistent with the Tribunal's role under the ICSID Convention. Subject only to the limited procedures contemplated in Articles 49-51 of the Convention, upon issuing its Award, the Tribunal is *functus officio*.
903. The Tribunal moreover believes that it is in both Parties' interests to bring this lengthy proceeding to an end and thereby allow both to move forward. For that reason, the Tribunal has decided to issue a single Award which specifies the damages owed by each Party to the other, together with awards of costs associated therewith.
904. At the same time, the Tribunal expresses its firm expectation, based on solemn representations made by both counsel for Ecuador and the Attorney General himself, which the Tribunal has accepted, that the proceeds of the damages award made in favour of Ecuador in the environmental counterclaim will be devoted to remediation of the Blocks. The State has made plain its interest in remediating the contamination caused by oilfield operations in the *Oriente* region of Ecuador. The Tribunal therefore states its clear expectation that the monies payable to Ecuador will be devoted to this important task and will not remain in the State's general revenues.

IV. DAMAGES CLAIMED IN RELATION TO THE INFRASTRUCTURE COUNTERCLAIM

905. The Tribunal now turns to consider the infrastructure counterclaim. A number of points need to be made in respect of this counterclaim:
- (a) Ecuador raised exactly the same infrastructure counterclaim in the *Burlington* arbitration as it has in this case against Perenco.¹⁰⁹⁹

¹⁰⁹⁹ See Resp. PHB CC, paragraphs 118 & 122: Declaring "that Claimant is liable towards Ecuador for the costs required to remedy the poor state of the infrastructure of Blocks 7 and 21 left behind by Perenco, given

- (b) Both counterclaims are based on the alleged breaches of the identical provisions in the PSCs for Blocks 7 and 21¹¹⁰⁰, and of Ecuadorian law.¹¹⁰¹
- (c) As can be seen in Annex B to this Award, the witnesses in respect of both infrastructure counterclaims appear to be almost identical.
- (d) The *Burlington* tribunal held a site visit which this Tribunal did not.¹¹⁰²
- (e) The amount claimed in both counterclaims was virtually identical.¹¹⁰³
- (f) Having visited the premises and heard from witnesses, the *Burlington* tribunal awarded Ecuador the sum of US\$2,577,119 itemized as follows:¹¹⁰⁴
 - (i) US\$503,572.76 for the Gacela T-104 and Payamino-tanks, as well as minor repairs to the pipelines;
 - (ii) US\$1,462,553.43 for repairs related to pipelines and fluid lines; and
 - (iii) US\$561,900 for Block 7 engines and US\$49,093.58 for new vehicles.

Claimant's breach of [the Contract and Ecuadorian law]" and Ordering "Claimant to pay damages for its failure to return the Blocks' infrastructure in good condition to Ecuador, in an amount quantified at US\$17,231,458.85." c.f. *Burlington* Decision on Counterclaims, paragraph 53: Declaring "(ii) That Burlington is liable towards Ecuador for the costs required to remedy the poor state of the infrastructure of Blocks 7 and 21 left behind by Burlington" and Ordering "(iv) Burlington to pay damages for its failure to return the Blocks' infrastructure in good condition to Ecuador in an amount quantified at US\$17,417,765.42 with interest at an adequate commercial interest rate from the date of disbursement thereof until the date of the Award."

¹¹⁰⁰ See paragraphs 892 & 908 of *Burlington* Decision on Counterclaims, where both Ecuador and Burlington refer to Clause 5.1.8 of the Block 7 PSC and to Clause 5.1.7 of the Block 21 PSC.

¹¹⁰¹ See Resp. PHB CC, paragraph 102: "Perenco's low-cost operations breached Articles 5.1.7 and 5.1.8 of Block 7 and 21 [Participation Contracts] which required it to use equipment and technology in accordance with the best standards and practices of the international oil industry. Regardless of whether Perenco's no-investment policy was in breach of its contractual obligations, the Hearing confirmed that Perenco returned the Blocks' infrastructure to Ecuador in appalling condition exceeding normal wear and tear in breach of the 'obligation de résultat' in Articles 5.1.22 and 18.6 of Block 7 [Participation Contract] (Articles 5.1.21 and 18.6 of Block 21 [Participation Contract]) and Article 29 of the [Ecuadorian Hydrocarbons Law No. 2967] ..." c.f. *Burlington*, Decision on Counterclaims, paragraphs 891-892: "Ecuador argues that, under both the PSCs and Ecuadorian law, the Consortium was under a dual obligation (i) to construct, maintain and replace the infrastructure on Blocks 7 and 21 in accordance with industry standards and (ii) upon contract termination, to return the Blocks to the State in good working condition. According to Ecuador, the Consortium breached both obligations and Burlington is accordingly liable for the remedial costs" and "Ecuador contends that ... Article 29 of the Hydrocarbons Law, incorporated by reference in the PSCs, also provides for an obligation to turn over the infrastructure to the State 'in good condition'."

¹¹⁰² See *Burlington* Decision on Counterclaims, paragraphs 18-27.

¹¹⁰³ See note 1099 above.

¹¹⁰⁴ See *Burlington* Decision on Counterclaims, paragraph 1074.

- (g) The *Burlington* case has now been completed with an award of 7 February 2017.¹¹⁰⁵
- (h) Ecuador, while initially seeking annulment of the damages awarded against it in favour of Burlington and also of the decision on its environmental counter-claim, did not seek annulment of the damages awarded to it in respect of the infrastructure counterclaim.¹¹⁰⁶
- (i) Ecuador and Burlington thereafter entered into the Settlement Agreement pursuant to which the application for annulment of the *Burlington* award was withdrawn.¹¹⁰⁷
- (j) This Tribunal has already ruled that it will not dismiss the infrastructure counterclaim or the environmental counterclaim on the grounds of *res judicata*.¹¹⁰⁸

906. Accordingly, this Tribunal will have to consider the infrastructure claim, but must take into account that another tribunal has already ruled on it and awarded damages in respect of it. That tribunal not only heard virtually the same evidence about the same breaches and considered the same allegations as to damage, but personally observed the climatic and other conditions when it conducted its site visit.¹¹⁰⁹

907. What is more, as noted above, Ecuador did not seek the annulment of the part of the *Burlington* award relating to infrastructure,¹¹¹⁰ so it must be assumed for present purposes

¹¹⁰⁵ *Burlington* award.

¹¹⁰⁶ Ecuador's Application for Annulment dated 13 February 2017, E-426, paragraph 64, setting out the specific grounds for Ecuador's Annulment Application

"... with respect to Ecuador's claims, the Tribunal manifestly exceeded its powers and failed to state its reasons when it decided that the strict liability regime of the 2008 Constitution has no retroactive effect ..., the Tribunal manifestly exceeded its powers and failed to state its reasons when it decided that the relevant permissible limits are not those applicable to sensitive ecosystems..., the Tribunal failed to state its reasons for failing to perform vertical delineation..., and the Tribunal exceeded its powers and failed to state its reasons upon which its consecutive findings are made when it decided on the apportionment of liability between Burlington and others."

¹¹⁰⁷ CA-CC-121, *Burlington* Order of the Secretary-General Taking Note of the Discontinuance of the Proceeding.

¹¹⁰⁸ Decision on Perenco's First Dismissal Application, paragraphs 47-51.

¹¹⁰⁹ See paragraphs 905 1(b), 905 1(c), and 905 1(d) above.

¹¹¹⁰ See paragraph 905 1(h) above.

that it was content with such an award. Ecuador has rightly stated that it cannot benefit from double recovery, so in many respects this Tribunal's task is largely duplicative.¹¹¹¹

908. It is necessary at the outset to pay careful regard to what the *Burlington* tribunal said in paragraphs 1080 to 1086 of its Decision on Counterclaims which are set out below:¹¹¹²

“1080. As a final matter, the Tribunal must address the issue of double recovery. As mentioned in paragraph 70 above, Burlington has called the Tribunal's attention to the potential risk of double recovery in respect to the Respondent's counterclaims since Ecuador “made a full claim for the alleged environmental harm in each of the Burlington and Perenco cases.” Burlington requests that the Tribunal address the “potentially pernicious consequences” deriving from that risk so that “if the dispositive part of either of the Awards on counterclaims provides for any compensation, Ecuador would be prevented from enforcing the second award for the extent that it has already been compensated by the first”.

1081. The Tribunal notes that there is no dispute between the Parties on the issue of double recovery. More specifically, first, there is no question that Ecuador claims compensation for the same damages in these and in the parallel *Perenco* proceedings. For Burlington, Ecuador is “twice seeking 100% recovery of precisely the same alleged damages for precisely the same alleged injury on precisely the same legal and factual bases.” Ecuador, for its part, does not deny that it seeks compensation for the same harm in both cases, although it distinguishes the two arbitrations in various ways, stating for instance that the arguments or the evidence in both cases are not “exactly the same”. Ecuador actually relies on the joint and several liability of the Consortium partners to justify its claim against Burlington although only Perenco operated the blocks.

1082. Second, it is also common ground that claiming compensation for the same damage in parallel proceedings creates a risk of double recovery.

¹¹¹¹ See Response, paragraph 110: “Ecuador has always agreed to avoid double recovery in relation to its counterclaims, as stated in numerous occasions throughout both this and the Burlington arbitration. Ecuador's latest undertaking was made in the context of the Burlington Settlement, whereby it accepted that ‘*Ecuador no tiene derecho a recibir y no procurará una doble compensación en relación con los mismos montos y daños ambientales y de infraestructura, constantes en la Decisión sobre las Reconvenções en contra de Burlington*’.” See also fn. 158: “Hearing on Counterclaims, Transcript (ENG), D8:P2426:L12-P2428:L8 (Arbitrator Kaplan, Silva Romero) (“ARBITRATOR KAPLAN: So if [Ecuador] were to recover something in this one less than your full claim, then you would seek the balance in the other one; is that right? MR. SILVA ROMERO: I think we have the duty to inform the Burlington Tribunal about the damages we would obtain in the Perenco Tribunal, indeed. Yes, sir.”); Burlington 2014 Hearing on Counterclaims, Transcript (ENG), D7:P2341:L13-1 (Opening, Silva Romero) (“The second comment I am specifically instructed to make today is that we don't want the Burlington Tribunal to have any concern regarding double recovery. This is not what Ecuador is looking for. Ecuador is simply looking for the restoration of the ecosystems in Blocks 7 and 21”, **E-440**. See also, *Burlington* Decision on Counterclaims, ¶ 70, **CA-CC-59**.”

¹¹¹² *Burlington* Decision on Counterclaims [footnotes omitted].

In this context, Ecuador submits that whichever Tribunal issues the later award on Ecuador's counterclaims can readily address the risk and thus Burlington's fear of "pernicious consequences" is misplaced:

"Ecuador ... adds that its counterclaims will not result in '*pernicious consequences*'. If Claimant alludes to the issue of double recovery, the prohibition thereof exclusively applies when a party has already been indemnified by a third party. In addition, Claimant cannot pretend to ignore that any second award in the present cases against the Consortium members '*could be fashioned in such a way as to prevent double recovery*'. International law, Ecuadorian law and international decisions offer numerous mechanisms for preventing double recovery, including by taking into account the monetary relief granted by any prior award".

1083. Third, there is common ground between the Parties that a creditor can only be compensated once for a given harm, and rightly so, as a number of arbitral tribunals have acknowledged that the "prohibition of double recovery for the same loss is a well-established principle."

1084. Fourth, the Tribunal takes note that, prior to the end of the Hearing on counterclaims, counsel for Ecuador clearly stated that Ecuador does not seek double recovery in its claims against the Consortium members:

"The second comment I am specifically instructed to make today is that we don't want the Burlington tribunal to have any concern regarding double recovery. That is not what Ecuador is looking for."

1085. The Tribunal takes due notice of Ecuador's representations, which are in line with the general principle prohibiting double recovery.

1086. As of the date of the present Decision, the *Perenco* tribunal has issued no decision yet on the counterclaims before it. Therefore, this Tribunal lacks the necessary information or basis to adopt any specific measures – *to fashion its decision*, to borrow Ecuador's phrase – to prevent double recovery, a task that it must leave to the *Perenco* Tribunal as the one deciding in second place. This being said, this Tribunal nonetheless states that as a matter of principle, the present Decision cannot serve and may not be used to compensate Ecuador twice for the same damage." (Emphasis on the original)

909. Nevertheless, consistent with the Tribunal's independent duty to consider the case presented to it, the Tribunal will briefly explain its views.
910. The Tribunal bases its determination of the counterclaim on two major considerations.
911. The first is that it is satisfied that in the declining years of the Blocks *Perenco* would, on the balance of probabilities, have been less concerned about maintaining the facilities than

hitherto.¹¹¹³ Accordingly, it would not surprise the Tribunal that there were in fact some breaches of the obligations in the PSCs set out below.

912. On the other hand, the Tribunal is conscious of the challenging conditions of operating in the Amazon rainforest and the predisposition towards rust and corrosion in that climate.¹¹¹⁴ The Tribunal is also conscious that the Blocks had been operated both before and after Perenco's tenure of the Blocks.¹¹¹⁵

A. Legal Position

913. It is not disputed that certain clauses of the PSCs cover the Consortium's obligations with respect to the infrastructure of the Blocks not only during the operation of Blocks 7 and 21, but also upon the termination of the PSCs.¹¹¹⁶
914. Clause 5.1.8 of the PSC for Block 7 and clause 5.1.7 of the PSC for Block 21 required the Consortium to use qualified personnel and suitable equipment and technology during the operation of the blocks.
915. Clause 5.1.8 reads as follows:¹¹¹⁷

“5.1 Obligations of the Contractor: ...
... ”

¹¹¹³ See also paragraph 252 above: “*In the Tribunal's view, it is a given that the Consortium's thinking would have been dominated by the looming contract expiry. The Tribunal believes that the sharply rising price of oil leading up to October 2007 would have induced Perenco to seek to drill as many wells as were economically possible in the Oso field in the time remaining in that Contract. According to Mr. Crick, in the absence of a contract extension, Perenco would have stopped drilling in Block 7 in August of 2009 in order to ensure an adequate payback on the new wells. Mr. Crick estimates that Perenco could have drilled 24 wells per year in Block 7. The Tribunal agrees and accepts Mr. Crick's production profiles.*”

¹¹¹⁴ Interim Decision on Counterclaim, paragraph 408.

¹¹¹⁵ The comments made with respect to Ecuador's claim for environmental damages are likewise applicable to the infrastructure claim. See Interim Decision on Counterclaim, paragraphs 490, 589, 591, 597 and 598.

¹¹¹⁶ See Ecuador's Counter-Memorial on Liability and Counterclaims, paragraphs 916, 918-919, referring to Clauses 5.1.7 and 5.1.21 of the Block 21 Participation Contract and Clauses 5.1.8 and 5.1.22 of the Block 7 Participation Contract as well as Clauses 18.6 of the two Participation Contracts and Article 29 of the Hydrocarbons Law, incorporated by reference into the Participation Contracts. *C.f.* Perenco's Counter-Memorial on Counterclaims, paragraphs 516 and 524-525, referring to the same clauses and provision.

¹¹¹⁷ CE-CC-028.

5.1.8 Employ qualified personnel, as well as equipment, machinery, materials and technology, in accordance with the generally accepted norms and practices of the international petroleum industry.”

916. Clause 5.1.7 similarly provides:¹¹¹⁸

“5.1 Obligations of the Contractor: ...

...

5.1.7 To use personnel, equipment, machinery, materials, and technology in accordance with the best standards and practices generally accepted in the international hydrocarbon industry.”

917. Upon termination of the PSCs, clauses 5.1.22 and 18.6 of the PSC for Block 7 and clauses 5.1.21 and 18.6 of the PSC for Block 21, provide that the Consortium shall return the wells together with all equipment, tools, machinery, installations (acquired for and during the term of the PSCs) to Petroecuador in good condition except for normal wear and tear, and at no cost. These provisions provide precisely as follows:

Block 7 PSC¹¹¹⁹

“5.1.22 Upon termination of this Contract, deliver the wells, property, installations, equipment and infrastructure works related to this Contract to PETROECUADOR, at no cost and in good condition, in accordance with the provisions of Article twenty-nine (29) of the Hydrocarbons Law.”

“**18.6** Upon the term of this Contract, either due to expiration of the Exploitation Period or for any other reason during the same Period, the Contractor shall deliver to PETROECUADOR, without cost and in good condition, the wells which were in production and, in good condition except for normal wear, all equipment, tools, machinery, installations and other items which were acquired for purposes of this Contract.”

Block 21 PSC¹¹²⁰

“**5.1.21** Upon termination of the Contract, the Contractor shall deliver to PETROECUADOR, at no cost and in good condition, the wells, property, facilities, and equipment that were required for the purpose of the Contract in accordance with article 29 of the Law on Hydrocarbons.”

¹¹¹⁸ CE-CC-013.

¹¹¹⁹ CE-CC-028.

¹¹²⁰ CE-CC-013.

“18.6 Upon termination of this Contract at the end of the Exploitation Period or for any other cause occurring during the same Period, the Contractor shall deliver to PETROECUADOR, at no cost and in good production conditions, the wells that are active at such time as well as, in good condition except for normal wear and tear, all other equipment, tools, machinery, facilities, and other movable and immovable property acquired for the purposes of this Contract.”

918. It is also necessary to refer to Article 29 of the Hydrocarbon Law noted above which states:

“[U]pon termination of an exploration and exploitation contract, due to expiration of its term or for any other reason arising during the exploitation period, the contractor or associate must turn over to PETROECUADOR, at no cost and in a good state of production, the oil wells that are in activity at the time; as well as, in good condition, all equipment, tools, machinery, installations, and other real or personal property that were acquired to fulfil the contract’s purposes [...]”¹¹²¹

919. With regard to the obligation to comply with the generally accepted international petroleum industry’s practices, it is important to note that Article 10 of RAOHE provides that the contractor “*shall apply, at least*” the API standard “*and any other rule or standard of the petroleum industry.*”¹¹²²

“Norms and Standards:

In hydrocarbon operations, PETROECUADOR and contractor shall apply, at least, the practices recommended by the American Petroleum Institute “API” particularly the following: “Exploration and Production standards” and “Manual of Petroleum Measurement standards” and any other rule or standard of the petroleum industry.”

920. Furthermore, RAOHE does provide for specific standards in relation to infrastructure and contains several references to the API standards. It is not disputed between the Parties that the API standards combine preventative as well as predictive maintenance techniques.¹¹²³

¹¹²¹ EL-90 (Unofficial translation from the Spanish original).

¹¹²² EL-148.

¹¹²³ Perenco’s Counter-Memorial on Counterclaims, paras 519-521 *c.f.* Ecuador’s Reply on Counterclaims, paragraph 456.

921. As the *Burlington* tribunal noted, and as has occurred in the present case, both Parties challenge the credibility or relevance of each other’s witnesses and experts. The Tribunal bears in mind that the witnesses gave evidence relating to matters occurring some years previously and in those circumstances, just like the *Burlington* tribunal,¹¹²⁴ the Tribunal places more reliance on contemporary documents which may assist regarding the determination of the state of the infrastructure as of the date of takeover.
922. An important part of Perenco’s defence to the infrastructure counterclaim was its reliance on two contemporaneous reports prepared by SGS in 2009 and 2010 (“**SGS Reports**”).¹¹²⁵ Both of these reports assess the condition of the infrastructure, which included the equipment facilities and other assets of both Blocks 7 and 21 according to five categories ranging from very good to very bad. These reports concluded that the significant majority of the infrastructure is considered to be in good or very good condition. This report seems to tie up with Ecuador’s claim for compensation in *Burlington* with respect to only 3 tanks (out of 89) and 3 pumps (out of 16).¹¹²⁶
923. It is true that Ecuador invites the Tribunal to place little reliance on the SGS Reports on the grounds that they are no more than inventories of assets.¹¹²⁷ The Tribunal disagrees as it places considerable reliance on the SGS Reports, especially where other evidence is lacking.

¹¹²⁴ See *e.g.* *Burlington* Decision on Counterclaims, paragraphs 933-936.

¹¹²⁵ CE-CC-217; CE-CC-240.

¹¹²⁶ Ecuador withdrew its claim for the purchase of 5 power oil pumps as those had not been acquired yet, see Ecuador’s Reply on Counterclaims, para 519.

See CE-CC-348 (total number of tanks). Regarding Ecuador’s claim with respect to tanks in the present case, see Montenegro WSI, para 23, bullet point 6: only tank repaired was the Payamino T-102 tank; Ecuador’s Reply on Counterclaims, paras 521, 529: T-104 tank of Gacela CPF has been repaired, and emergency repairs carried out Payamino T-102 tank and the Yuralpa T-400 tank.

The Tribunal notes that Ecuador in its Resp. PHB CC, paragraph 112 seeks to explain that it is complaining that “*at least 12 tanks were returned in poor condition ..., not 3 as wrongly alleged by Perenco.*”

Regarding its claim with respect to pumps, see CE-CC-217, Amortizables B7 and Amortizables B21 (total number of pumps). Ecuador’s claim is for (i) a new transfer and horizontal multistage pumps in the Oso and Gacela fields (Montenegro WSII, Annex 3, p. 4); (ii) repairs to two power oil pumps in the Coca field (Luna WS III, para 153; Luna WS III, Annexes 77-78; Ecuador’s Reply on Counterclaims, paragraph 519).

¹¹²⁷ See Ecuador’s Reply on Counterclaims, paragraphs 489, 491, 496. See also Luna WS III, paragraph 69.

924. Another important point to bear in mind as mentioned earlier, is that Petroamazonas expanded its operations and increased drilling and production on both Blocks from at least January 2010 onwards.¹¹²⁸ As the *Burlington* tribunal remarked, and with which this Tribunal agrees, “*this expansion and increase in production would entail a need to improve the existing infrastructure.*”¹¹²⁹ Ecuador has submitted before both tribunals that none of the amounts it is claiming is associated with the expansion of production in the Blocks. However, one thing is clear and that is that evidence of Petroamazonas’ expansion activities do make it difficult to establish the facts as they were when the Consortium left the Blocks. The Tribunal needs to keep this in mind throughout.
925. At the end of the hearing on the counterclaims and after closing submissions thereon, the Tribunal, after careful deliberation, formed the view that Ecuador’s claims in relation to the infrastructure counterclaim were excessive in value. The Tribunal formed the view that there were some breaches of the obligations, which sounded in damages, but in the light of all the evidence presented, the Tribunal was of the view that the damages were in the region of approximately US\$2 million.
926. The Tribunal has read the *Burlington* award and finds itself in general agreement with the items of breach found by that tribunal regarding the infrastructure counterclaim. The *Burlington* tribunal considered the various items of that counterclaim in great detail and as their conclusions to a great extent accord with this Tribunal’s view of the matter, no useful purpose can be served by a detailed recitation of evidence (virtually identical in both cases) and of the arguments relating to each head of claim. However, the Tribunal will set out briefly its reasoning and conclusions with regard to the disputed items.

¹¹²⁸ See Perenco’s Counter-Memorial on Counterclaims, *e.g.* paragraphs 31, 376, 512 describing costs being claimed that are allegedly associated with Ecuador/Petroamazonas’ expansion of the Blocks *c.f.* Ecuador’s Reply on Counterclaims, Section 4.4.3, denying that it has included the costs associated with Petroamazonas’ expansion of Block 7 but not denying that there are current plans for expansion in Block 7.

¹¹²⁹ *Burlington* Decision on Counterclaims, paragraph 937.

B. Tanks

927. Ecuador contends that the Consortium's practices of purchasing storage tanks which were substandard and of recycled parts of old tanks from several fields to build "new" tanks was not in line with international standards and requirements.¹¹³⁰ Like the *Burlington* tribunal, this Tribunal is not satisfied that Ecuador has substantiated that the Consortium failed to construct or maintain tanks in accordance with industry standards and practices.
928. This Tribunal too relies upon the evidence of Dr. Egan that all the tanks were manufactured in accordance with API 650.¹¹³¹ There is evidence that the tanks were regularly inspected and records kept,¹¹³² that there was monitoring of corrosion of the tanks according to API 653, that there was an effective cathodic protection programme in place,¹¹³³ that plans had been devised to repair the large tanks in the blocks and that the Consortium kept Ecuador apprised of tank repairs.¹¹³⁴ This Tribunal also agrees that the fact that Ecuador limits its comments to a small percentage of the tanks and claims damages with respect to only 12 of them, is some indication that the Consortium's maintenance plan was, on the whole, adequate.
929. The Tribunal also notes Dr. Egan's point that inspections were carried out by Petroamazonas between one and three years after the takeover of the Blocks and that the type of corrosion identified by Petroamazonas was one that could occur quite quickly.¹¹³⁵ This conclusion leads to some doubt as to whether the corrosion found was in fact due to insufficient maintenance by the Consortium and the Tribunal bears in mind that the burden of proof is on Ecuador. The Tribunal cannot be satisfied that the damage to the tanks, the subject of complaint, was caused by the Consortium's operations. It seems to the Tribunal more likely than not, that the tanks' condition deteriorated since Petroamazonas took

¹¹³⁰ Ecuador's Reply on Counterclaims, paragraphs 500 and 501.

¹¹³¹ Intertek I, paragraph 107.

¹¹³² *Ibid.*, paragraph 117.

¹¹³³ *Ibid.*, paragraph 116.

¹¹³⁴ *Ibid.*, paragraph 119, referring to CE-CC-087, pp. 3-5.

¹¹³⁵ Intertek II, paragraphs 79-81, referring to Luna WS III, paragraph 65, discussing "homogenous" and "localized" types of corrosion.

control of the Blocks and this negates any liability on the part of the consortium. Accordingly, the Tribunal too is satisfied that Ecuador has not established that the Consortium breached its obligations to construct and maintain tanks according to industry standards.

930. Further, in addition to constructing and maintaining the tanks Ecuador alleges that the Consortium returned certain tanks in a condition that is not consistent with normal wear and tear.¹¹³⁶ In its Post-Hearing Brief, Ecuador states that it seeks damages in relation to “at least 12 tanks [that were] returned in poor condition ..., not 3 as wrongly alleged by Perenco.”¹¹³⁷ The Tribunal has reviewed the record and while, as noted above, Ecuador did comment on the alleged poor condition of 12 tanks, it has only provided details about the repairs works and costs for three specific tanks and so the Tribunal will briefly consider these three.

1. Gacela T-104 Tank

931. The documents provided show that this tank was inspected in 2010, 2011 and 2012.¹¹³⁸ An inspection in December 2010 discovered some problems with the roof and found a high level of oxidation.¹¹³⁹ The 2011 inspection showed that the corrosive processes had worsened and it was concluded that a “*complete replacement*” of the roof was “*required.*”¹¹⁴⁰
932. When it had been inspected in December 2008 and again in April 2009, just months before the Consortium suspended operations, the roof was still in sufficiently good condition.¹¹⁴¹ Dr. Egan asserts that Ecuador failed to explain how the issues at the time of the inspections conducted between December 2010 and February 2012 were attributable to the Consortium. The issues complained of were only documented as “*new situations*” one and

¹¹³⁶ See generally Ecuador’s Reply on Counterclaims, Section 4.3.2.1.

¹¹³⁷ Resp. PHB CC, paragraph 112.

¹¹³⁸ Luna WS III, Annexes 55 to 57.

¹¹³⁹ *Ibid.*, Annex 55.

¹¹⁴⁰ *Ibid.*, Annex 56, pp. 6 and 7 (English translation).

¹¹⁴¹ CE-CC-164; CE-CC-341.

a half years later, in December 2010.¹¹⁴² Dr. Egan also argued that it was entirely possible that the minimal corrosion identified in April 2009 rapidly progressed and became visible in December 2010; in fact, the December 2010 inspection indicated that the hole in the roof was “*new*.”¹¹⁴³

933. Dr. Egan extrapolated from this that it was also in good condition in July 2009.¹¹⁴⁴
934. Contrary to the *Burlington* tribunal’s finding, this Tribunal was persuaded by Dr. Egan’s analysis given the close timing of the April 2009 inspection. While there may have been some incipient corrosion, the bulk of it appears to have occurred after the Consortium left the Block. The Tribunal believes that it is far more likely than not that the cause of the corrosion found cannot be attributable to the Consortium’s operations.
935. The Tribunal can see no reason why Ecuador should be reimbursed for the costs that it claims.

2. Payamino T-102 Tank

936. Ecuador contends that inspections of this tank took place between 2010 and 2011 and to establish this it has provided a contract signed between Petroamazonas and Conduto to perform the repairs on tank T102 – mainly involving cleaning and painting the tank, both internally and externally.¹¹⁴⁵ What is significant is that this document does not contain any description of the state of the tank at that time.
937. There is, however, documentary evidence prior to July 2009 which is contained in a document prepared by the Consortium in April 2008 in which it set out the basis for the bidding process to repair the Coca and Payamino tanks.¹¹⁴⁶ This document establishes that in March 2008 this tank required further inspection and repair, but was not in a critical

¹¹⁴² Intertek II, paragraph 88, referring to Luna WS III, Annex 55.

¹¹⁴³ *Ibid.*, paragraph 89.

¹¹⁴⁴ *Ibid.*, paragraph 88.

¹¹⁴⁵ Montenegro WS 3, Annex 5.

¹¹⁴⁶ Solís WS 2, Annex 34.

condition at that time. The document stated that this tank should be cleaned and painted.¹¹⁴⁷ The Consortium did develop a project plan with a proposed start date in October 2009 with the duration of some two months to conduct the necessary repairs, but by that time the Consortium was no longer operating the Blocks.¹¹⁴⁸

938. However, the point remains that had the Consortium continued to operate the Blocks they would have incurred the expense for which it had planned and in those circumstances the Tribunal can see no reason why Perenco should not bear the cost of these repairs which it would have borne if events had taken a different course.
939. Ecuador has claimed US\$322,960.42, which it has clarified to be on account of the emergency repairs carried out on several fluid lines and pipelines, the Payamino T-102 tank, the Yuralpa T-400 tank, the Jaguar and Yuralpa camps, *etc.*¹¹⁴⁹ The Tribunal agrees with the *Burlington* tribunal that Ecuador has not fully justified the claims for other repairs and improvements which are set out in Annex 3 to Mr. Montenegro's 2nd Witness Statement. The Tribunal further agrees with the *Burlington* tribunal that the amount recoverable under this head of claim should be reduced to US\$210,130.76 which is the sum referable for the repairs made to this tank and pipelines.¹¹⁵⁰

3. Yuralpa T-400 Tank

940. In July 2009, the SGS Report described the condition of this tank as good or very good.¹¹⁵¹
941. In relation to this tank, two inspections were carried out in March 2011. The first inspection suggested substantial repairs to the interior of the tank and identified certain problems which did not pose an immediate risk to the mechanical construction and integrity of the

¹¹⁴⁷ Solís WS2, Annex 34, pp. 15-17 in the English translation.

¹¹⁴⁸ Intertek ER II, paragraph 93, referring to CE-CC-343.

¹¹⁴⁹ Ecuador's Reply on Counterclaims, paragraph 529.

¹¹⁵⁰ The Tribunal notes that the *Burlington* tribunal subtracted all items that manifestly do not relate to repairs done to Payamino Tank T-102 or pipelines, such as, inter alia, improvements done to the Jaguar camp's dining room and kitchen, or replacement of floors in the Yuralpa offices. (see fn. 1982 of Counterclaims Decision). The Tribunal agrees with this approach.

¹¹⁵¹ CE-CC-217

tank.¹¹⁵² The second report found that there was no evidence of any problems that might put the mechanical construction and integrity at risk.¹¹⁵³ It is also fair to point out that all references to this tank in the SGS Reports indicate that the tanks were in good or very good condition.¹¹⁵⁴

942. However, the biggest problem is that the first inspection which identified a defective condition of this tank dates from March 2011 which is some two years after the Consortium had ceased operations. Bearing in mind that the SGS Report in June 2009 describes the condition of the components of this tank in favourable terms, the Tribunal considers that Ecuador has failed to establish that any damage to this equipment and costs incurred relating to the condition of this equipment were caused by the Consortium. Consequently, this claim is dismissed.

C. **Claims relating to fluid lines and pipelines**

943. The *Burlington* tribunal addressed this matter in great detail between paragraphs 965 and 1006 of its Decision on Counterclaims. This Tribunal has considered these paragraphs carefully and has considered all the documents referred to therein, which were also submitted in this proceeding. This Tribunal agrees with the discussion and analysis conducted by the *Burlington* tribunal and can see no useful purpose in setting out this somewhat technical matter all over again.
944. The claim under this head is US\$1,667,655.83. This is based on Mr. Luna's evidence, but the Tribunal notes, as did the *Burlington* tribunal, that in his last witness statement he assessed this claim at US\$1,462,553.43 broken down in five component parts set out in paragraph 1005 of the *Burlington* Decision on Counterclaims.¹¹⁵⁵ Bearing in mind that Ecuador is not seeking the replacement of the pipeline system, but has limited its claims to the cost of two inspections and urgent and necessary repairs as set out in the paragraph just

¹¹⁵² Luna WS III, Annex 52.

¹¹⁵³ *Ibid.*, Annex 53.

¹¹⁵⁴ CE-CC-217, SGS inventories of Blocks 7 and 21, July 2009.

¹¹⁵⁵ See Luna WS III, paragraphs 163-169.

referred to, this Tribunal agrees that Ecuador should be compensated in the sum of US\$1,462,553.43.

D. Claims related to generator engines

945. This claim relates to various power generator engines in Blocks 7 and 21 which, it is alleged, were in a very bad state when the Consortium abandoned the blocks. Ecuador's claim focuses on Wartsila engines 2, 3 and 4 in Block 21 and on all 27 Caterpillar engines in Block 7. Ecuador's allegation is that the Consortium failed to conduct proper overhauls of these machines and further that it used harmful crude-diesel fuel mix in the Block 7 engines which caused damage to them. The claim here is based on the costs of overhauls, reduced engine life and the purchase of a new alternator for Wartsila engine 4. The total cost claimed hereunder is US\$6,540,010.57 of which US\$4,744,733.75 relates to Block 21 and US\$1,795,276.18 relates to Block 7.
946. As to the claim in relation to overhauls it is not in dispute that engines require preventative maintenance which includes monitoring, testing and overhauls. However, having considered the evidence and in particular Mr. Luna's witness statements and Dr. Egan's expert report as well as the Consortium's maintenance records, this Tribunal agrees with the *Burlington* tribunal's reasoning - as set out between paragraphs 1021 and 1026 of the *Burlington* Decision on Counterclaims-, that Ecuador has failed to provide sufficient evidence of any alleged failure to perform timely overhauls to its generator engines or to prove that such failure increased the maintenance costs or reduced the useful life of the engines. Consequently, this claim is denied.
947. Ecuador also contends that damage was caused by the use of a crude-diesel fuel blend. This apparently was a cheaper diesel crude mix and Ecuador submits that the effect of this mix was disastrous on the engines. There is no dispute that the Consortium did use a crude-diesel fuel blend in Block 7, but Perenco contends that this was not an unreasonable choice

and it was one which had government approval and, in any event, had no lasting impact on the engines.¹¹⁵⁶

948. It is not contested that the Consortium decided to stop using this blend after approximately seven months. Mr. d'Argentré claimed that this was due to cost issues, but the Tribunal is not satisfied that cost was the sole reason and is entitled to infer that this was due, at least in part, because the blend was not properly working.
949. It is true that the Ministry of Mines and Petroleum knew of the practice of using this blend and that there was no opposition to it.¹¹⁵⁷ Nevertheless, the Tribunal considers that the responsibility for the good condition of the equipment still lay with the Consortium. The documents provided to the Tribunal show that the use of the blend could lead to higher maintenance costs and affect engine life. Further, as has been stated, the Consortium itself discontinued the use of this blend.
950. For the above reasons and for those also stated in the *Burlington* Decision on Counterclaims on this issue, the Tribunal is satisfied that the use of the blend did affect the condition of the engines.
951. Ecuador claims a total of US\$1,795,276.80 in connection with engines in Block 7 with US\$1,123,800¹¹⁵⁸ for the reduction in the engines' useful life, which Ecuador estimates to be a reduction of 30% in useful life,¹¹⁵⁹ due to a lack of regular maintenance and the use of the crude diesel blend. However, as this Tribunal has already rejected Ecuador's contention that the Consortium's alleged lack of regular maintenance reduced engine life and as Ecuador has not satisfactorily established what proportion of the reduction in useful life can be attributed to the use of the blend, the Tribunal is left in somewhat of a quandary. The *Burlington* tribunal, in the exercise of its discretionary powers in matters of quantifying damages, thought it appropriate to grant Ecuador half of the amount claimed for reduction

¹¹⁵⁶ Perenco's Counter-Memorial on Counterclaims, paragraphs 567-572.

¹¹⁵⁷ d'Argentré's WS III, paragraph 59, referring to Exh CE-CC-146.

¹¹⁵⁸ Ecuador's Supplemental Memorial on Counterclaims, paragraph 411.

¹¹⁵⁹ Ecuador's Reply on Counterclaims, paragraph 526.

of the useful life of Block 7 engines and thus granted a sum of US\$561,900.¹¹⁶⁰ This Tribunal is not bound to exercise its discretion in exactly the same way but considers it to be a reasonable sum and will grant US\$561,900 under this head of claim.

E. Claims related to pumps, electrical systems, IT equipment, and road maintenance

1. Pumps

952. Ecuador alleges that the Consortium operated with too few pumps, and that those that were used were obsolete, did no preventative or predicted maintenance, had no or not sufficient back-up systems and lacked the necessary stock of spare parts.¹¹⁶¹ It alleges that when Petroamazonas took over the Blocks it had to purchase new pumps to replace the ones currently in place. However, there is no evidence that it ever replaced the pumps and at that time it had performed overhaul on pumps 2 and 4 of Coco CPF which it claimed costs of US\$33,662.45.¹¹⁶²
953. This claim is unsustainable because for some time after taking over the Blocks Ecuador was still operating the pumps that it now claims are obsolete but for two pumps in Coca CPF. In relation to these two pumps Ecuador did perform overhauls at the cost set out above which is claimed here. As the *Burlington* tribunal remarked, the fact that 158 of 160 pumps were present in the Blocks when control passed to Petroamazonas in July 2009 and had not been overhauled or replaced after the takeover led that tribunal to infer that these pumps were not in the dire condition that Ecuador alleges.¹¹⁶³ Having considered the matter afresh, this Tribunal agrees with the *Burlington* tribunal.

¹¹⁶⁰ *Burlington* Decision on Counterclaims, paragraph 1039.

¹¹⁶¹ Luna WS III, paragraphs 123-129.

¹¹⁶² See Ecuador's Reply on Counterclaims, paragraph 519, referring to Luna WS III, Annex 78.

¹¹⁶³ *Burlington* Decision on Counterclaims, paragraph 1044.

954. As for the two pumps which were overhauled, the report upon which Ecuador relies is dated September 2012, which was three years after Petroamazonas took over.¹¹⁶⁴ This is of no assistance to the Tribunal in assessing the state of the pumps in July 2009.

955. This claim is dismissed.

2. Electrical systems

956. Similarly as the *Burlington* tribunal,¹¹⁶⁵ the Tribunal dismisses the claim on the grounds of absence of proof that the expenses related to the purchase of the new variators were caused by the Consortium's improper maintenance or by bad condition beyond normal wear of the electrical system of the Blocks in July 2009.

3. IT equipment and software

957. The claim under this head is that the Consortium did not have proper maintenance software in accordance with industry standards. Accordingly, when Petroamazonas took over, it incurred costs in order to upgrade the technology used in its offices and implemented "Maximo" which was a new computerised maintenance management system (CMMS). Mr. Luna quantified this claim at US\$151,601.96 which included the purchase of computers, cameras and the cost of hiring personnel to implement the system.¹¹⁶⁶ If one excludes the purchase of computers, Ecuador quantifies this claim at US \$81,384.96.¹¹⁶⁷

958. This claim for US\$151,601.96 is not sustainable. The Consortium had another management software in place, the SAP system, which was characterized by Dr. Egan as an "*internationally recognized management system*"¹¹⁶⁸ which is "*comprehensive*"¹¹⁶⁹ and complying with industry standards.

¹¹⁶⁴ Luna WS III, Annex 79.

¹¹⁶⁵ *Burlington* Decision on Counterclaims, paragraphs 1049-1051.

¹¹⁶⁶ Ecuador's Supplemental Memorial on Counterclaims, paragraph 414.

¹¹⁶⁷ *Id.*

¹¹⁶⁸ Intertek ER I, paragraph 48.

¹¹⁶⁹ *Ibid.*, paragraph 51.

959. Ecuador does not dispute this, but contends that the Consortium did not give nor offer access to the SAP maintenance data when it left the Blocks and thus Petroamazonas had to purchase the Maximo system from scratch.¹¹⁷⁰ While the *Burlington* tribunal placed reliance on a letter written by the Consortium to Petroamazonas on 23 July 2009 to “propose a technical meeting to ensure an orderly post-takeover transition”, the letter was in fact referring to the transition of employees and contractors and not specifically the system. In all the circumstances, the Tribunal awards the sum of US\$81,384.96.

F. Road maintenance and vehicles

960. Ecuador seeks to recover the amounts which it spent on the purchase of new vehicles (US\$98,107.16) and road maintenance (US\$381,127.64).¹¹⁷¹ The Tribunal notes that Ecuador has not put forward any documentary evidence showing the need to repair or replace specific vehicles. However, it notes that the SGS Reports do identify two vehicles, both Toyota Land Cruisers, that were either in “very bad” or “good” but damaged condition.¹¹⁷² The *Burlington* tribunal took the view that as Ecuador was claiming the cost of purchasing four similar vehicles for US\$98,187.16, that tribunal should grant Ecuador half this claim, namely US\$49,093.58. In this Tribunal’s opinion, the fact that Ecuador has not put forward any documentary evidence supporting the need to repair or replace specific vehicles is sufficient for this claim to be dismissed. Accordingly, this Tribunal will not follow the *Burlington* tribunal which granted half the claim, namely, US\$49,093.58.

961. The claim in respect of roads and road maintenance is dismissed for lack of proof that these expenses were caused by the Consortium’s negligence.

¹¹⁷⁰ Luna WS III, paragraph 45, responding to Mr. d’Argentré’s WS III, paragraph 36: “Ecuador omits the fact that the Consortium was willing to transfer all of its maintenance records in an orderly fashion.”

¹¹⁷¹ E-211.

¹¹⁷² CE-CC-217, CE-CC-240.

G. Other claims

962. Ecuador also seeks compensation for other repairs and the upgrade of facilities, the purchase of back-up equipment, spare parts and materials to bring the Blocks' operation into line with industry standards. These works include the reconditioning of wells, the refurbishment of camps and a new communication tower in Gacela CPF.¹¹⁷³
963. The Tribunal finds these claims have not been sufficiently particularised or proven by Ecuador. The Tribunal is satisfied that the infrastructure of the Blocks was generally in proper condition and that Ecuador's expansion plan and increases in production were likely to require improvements to existing equipment and facilities in any event. Accordingly, these additional claims are rejected.

H. Conclusion on the Damages Regarding the Infrastructure Counterclaim

964. For the reasons set out above, the Tribunal concludes that it will grant a total of US\$2,315,969.15 in respect of Ecuador's infrastructure counterclaims itemised as follows:
- (a) US\$210,130.76 for the Payamino T-102 tank;
 - (b) US\$1,462,553.43 for repairs related to pipelines and fluid lines;
 - (c) US\$ 561,900 for generator engines; and
 - (d) US\$81,384.96 for IT equipment and software.
965. The Tribunal now turns to the issue of double recovery. There is no dispute between the Parties that Ecuador can only recover this sum or receive the benefit of it once.¹¹⁷⁴
966. As Burlington and Ecuador have settled their differences by the payment in full of the *Burlington* award which included US\$2,577,119 for Ecuador's infrastructure counterclaim (in other words, a deduction was made from Burlington's damages) it cannot be right for this Tribunal to award the same or part of the same sum twice. Therefore, consistent with

¹¹⁷³ See *e.g.* Montenegro WS III, paragraph 7; see also E-211.

¹¹⁷⁴ See paragraph 907 above. Further, see generally Perenco's First and Second Dismissal Applications.

the agreement of Ecuador not to seek double recovery, this Tribunal concludes that because the *Burlington* infrastructure damages are higher than the sum awarded by this Tribunal, Ecuador has been made whole on the infrastructure counterclaim, and this sum shall not be included as part of Ecuador’s counterclaim damages.

V. COSTS

967. As the procedural history of this arbitration shows clearly, these proceedings have been lengthy, complex, multi-faceted, hard fought and very expensive. The Parties filed their Submissions on Costs on 19 April 2019 and their Reply Submissions on Costs on 10 May 2019.

968. Perenco claims the total sum of US\$57,923,332¹¹⁷⁵ in respect of its legal costs and other expenses in this arbitration as set out in the Claimant’s updated Schedule of Costs and Fees annexed to its 10 May 2019 Reply Submission on Costs.¹¹⁷⁶

Phase	Legal Fees	Expert Fees	Costs	Total
Request for Arbitration, Provisional Measures, Jurisdiction	\$4,922,728	\$225,986	\$1,045,017	\$6,193,731
Liability, Motion for Reconsideration	\$6,619,023	\$1,736,450	\$1,551,189	\$9,906,662
Quantum	\$7,029,649	\$5,115,861	\$1,161,750	\$13,307,260
Principal Claims	\$18,571,400	\$7,078,297	\$3,757,956	\$29,407,653
Counterclaims	\$11,881,356	\$9,178,588	\$3,005,809	\$24,065,753

¹¹⁷⁵ This amount excludes ICSID advance payments totalling US\$4,799,900.00.

¹¹⁷⁶ Perenco in its Submission on Costs, dated 19 April 2019, originally claimed its total costs and fees of US\$57,920,021.

969. Ecuador claims the total sum of US\$31,620,369.27¹¹⁷⁷ in respect of its legal costs and other expenses in this arbitration, and a total sum of US\$49,629.76 in respect of Petroecuador’s legal costs and other expenses in this arbitration. The detailed breakdown is set out in Annex A to its 19 April 2019 Costs Submission.

PHASE	LEGAL FEES (INCLUDING PGE)	EXPERT FEES AND COSTS	COSTS	TOTAL
<i>Request for Arbitration, Provisional Measures, Jurisdiction</i>	US\$ 2,787,393.80	US\$ 33,237.91	US\$ 232,697.14	US\$ 3,053,328.85
<i>Liability, Motion for Reconsideration</i>	US\$ 4,212,798.50	US\$ 1,058,867.79	US\$ 480,065.83	US\$ 5,751,732.12
<i>Quantum</i>	US\$ 3,911,825.68	US\$ 3,672,886.85	US\$ 589,201.20	US\$ 8,173,913.73
Principal Claims	US\$ 10,912,017.98	US\$ 4,764,992.55	US\$ 1,301,964.17	US\$ 16,978,974.70
Counterclaims	US\$ 5,284,433.84	US\$ 3,859,326.13	US\$ 991,719.98	US\$ 10,135,479.95

970. Both sides claimed their costs on the assumption they will be the prevailing party.

971. The starting point of any consideration for costs is Article 61(2) of the ICSID Convention which empowers the Tribunal to “except as the parties otherwise agree, assess the expenses incurred by the parties in connection with the proceedings, and decide how and by whom those expenses, the fees and expenses of the members of the Tribunal and the charges for the use of the facilities of the Centre shall be paid.” The Tribunal has had to consider not only Perenco’s Treaty claims but also claims of both Parties under the Participation Contracts, Ecuador’s claims being in the form of counterclaims.

¹¹⁷⁷ This amount includes ICSID advance payments of US\$4,500,000.00 and a PCA filing fee of US\$5,914.62. It excludes Ecuador’s final advance payment to ICSID of US\$300,000 which was received after the submissions on costs. Ecuador has made ICSID advance payments totalling US\$4,800,000.00.

972. The Participation Contracts provide that each Party shall incur the fees of the Arbitrator which they appointed, share half of the fees of the Presiding Arbitrator, and pay all the expenses incurred in the arbitration as determined by the Tribunal.
973. In its submissions, Perenco states that: “The Blocks 7 and 21 Participation Contracts provide a method of allocating costs that, with some exceptions, is generally consistent with the default rule under the ICSID Convention by giving the Tribunal discretion of allocating costs, except for arbitrator fees and costs of ICSID facilities.”¹¹⁷⁸ It however states that “[t]he contract claims . . . added few incremental costs to the Treaty claim” and that “[i]t is therefore not sensible to allocate the arbitrators’ fees . . . according to the Participation Contracts.”¹¹⁷⁹ Ecuador agrees.¹¹⁸⁰ In light of the Parties’ agreement, the Tribunal will not apply the Participation Contracts’ approach to the allocation of arbitrators’ fees.
974. The Tribunal considers that tribunals usually take into account three factors in determining issues of costs.
- i. First, the parties’ success on their respective claims or counterclaims;
 - ii. Second, their procedural conduct throughout the arbitration; and
 - iii. Third, the reasonableness of the costs actually claimed by them.
975. It is well established that arbitrators in ICSID cases have a wide discretion and there is no rebuttable assumption as there is in other rules that costs should follow the event.
976. There are a number of features in this case which, it is argued by one Party or the other, have had an impact on the costs of these proceedings and which the Tribunal should take into account. The Tribunal will consider each in turn and give its decision as to whether

¹¹⁷⁸ Perenco’s Submission on Costs, paragraph 6.

¹¹⁷⁹ *Ibid.*

¹¹⁸⁰ Ecuador’s Reply Submission on Costs, paragraph 2.

each has any merit and if so, whether it has a bearing on the award of the costs of these proceedings.

A. Ecuador declined to abide by the Tribunal’s Decision on Provisional Measures

977. Perenco submits that Ecuador’s decision not to abide by the Tribunal’s Decision on Provisional Measures, dated 8 May 2009, vastly altered the face of this arbitration and added to its complexity, length and expense.¹¹⁸¹

978. In paragraph 695 of its Decision on Liability, the Tribunal noted that:

“The Tribunal recommended what it considered to be a reasonable way to protect both Parties’ rights pending a final determination of their dispute. Regrettably, this was not possible in the circumstances. Perenco is correct to point out that had the State stayed its hand in relation to the *coactivas*, the dispute would not have been aggravated in the way in which it was.”¹¹⁸²

979. Now that the case is at its end, the Tribunal, having reviewed the history of this dispute in the course of the final deliberations conducted in relation to the making of this Award, can go further. At the time when, despite the provisional measures, the Respondent threatened to proceed with the *coactivas*, the Tribunal made clear to Ecuador that the Tribunal “*must necessarily take a serious view of any failure to comply*”¹¹⁸³ with its provisional measures determination. The Tribunal had given careful consideration to a means that would allow the Parties to continue with the arbitration without threatening the underpinnings of their contractual relationship and aggravating their dispute. The escrow account, which Perenco proposed and the Tribunal considered could reasonably do the job of protecting the Respondent’s fiscal interests, would have had all contested Law 42 dues paid into an account and made payable to Ecuador if it prevailed on the merits. Regrettably, Ecuador

¹¹⁸¹ Perenco’s Submission on Costs, paragraphs 3, 21-25.

¹¹⁸² Decision on Liability, paragraph 695.

¹¹⁸³ *Ibid.*, paragraph 158, quoting from the Tribunal’s letter of 27 February 2009 communicating its regret concerning the stance adopted by Ecuador with regard to Provisional Measures (Exhibit CE-204).

did not see fit to agree the escrow arrangement and instead commenced the *coactivas*.¹¹⁸⁴ This led to a series of events culminating in the total breakdown in the Parties' relationship.

980. Irrespective of Ecuador's reasons for not complying with the Tribunal's Decision on Provisional Measures, the fact of the matter is that its refusal changed the nature of this arbitration to the detriment of Perenco. Had Ecuador complied, this arbitration would likely have been quite different;

- (a) Perenco would likely still be operating both Blocks;
- (b) With no *coactivas*, there likely would have been no suspension of operations, and hence no declaration of *caducidad*;
- (c) The right to operate Block 7 would likely have been extended in a new contractual form on mutually acceptable terms;
- (d) The Law 42 damages claim would have been relatively straightforward;
- (e) The accounting evidence would have been far more straightforward;
- (f) Both the liability and quantum phases would have been shorter and less expensive;
- (g) There might well not have been a counterclaim as the post-termination provisions of the Participation Contracts would not have been engaged; as the continuing operator, Perenco would have had a commercial incentive to re-invest in infrastructure maintenance and environmental protection; had it not done so, Ecuador had sufficient contractual and statutory remedies to enforce the same;
- (h) This arbitration would not have lasted 11 years;
- (i) There would have been no need for over 50 submissions and seven hearings;
and
- (j) The total cost to both Parties would have been greatly reduced.

¹¹⁸⁴ *Ibid.*, paragraph 170.

981. In the light of all of the above, the Tribunal considers that it is appropriate to take into account Ecuador's conduct in this arbitration when considering the overall issue of who should pay how much to whom.

B. Ecuador's objections to jurisdiction

1. The joining of Petroecuador to the proceedings

982. Perenco instituted these proceedings not only against Ecuador but also against Petroecuador. However, the Tribunal found that it had no competence over Petroecuador.¹¹⁸⁵ Petroecuador claims as the reimbursement of the costs of its legal representation and expenses incurred US\$49,629.76 in respect of this arbitration, with simple interest at a commercially reasonable rate from the date they were incurred until payment.¹¹⁸⁶

983. This sum is reasonable to the Tribunal and it will accordingly order Perenco to pay Petroecuador US\$49,629.76, together with simple interest at an annual rate of 3% which shall accrue from 30 June 2011 (the date of dispatch of the Tribunal's Decision on Jurisdiction), until the date of full and final payment.

2. Objections to jurisdiction

984. Ecuador also raised objections to the Tribunal's jurisdiction to hear the claims. The Tribunal found it necessary to deal with the jurisdictional issues in two steps (issuing the Decision on Jurisdiction and then, after further evidence and submissions, the Decision on Liability). The Tribunal does not consider the objections to be frivolous and Ecuador's interest in having the Tribunal determine whether the principal claim could proceed was fully understandable. Nevertheless, ultimately Perenco prevailed on almost all jurisdictional issues except for the one relating to Petroecuador and the one relating to the claim regarding the declaration of *caducidad* in respect of Block 7 Contract. This will be taken into account in the award of costs.

¹¹⁸⁵ Decision on Jurisdiction, paragraph 242(3).

¹¹⁸⁶ Ecuador's and Petroecuador's Submission on Costs, paragraphs 8 and 41(a).

C. Perenco received less than claimed

985. Ecuador suggests that the Tribunal can take into account the fact that Perenco’s claim was “grossly inflated.”¹¹⁸⁷ It is true that Perenco claimed US\$1.423 billion (as of 18 April 2016, following some downward adjustments from US\$1.698 billion) and ultimately was awarded US\$448,820,400. The Tribunal notes that it is not uncommon for an award to be for a sum less than that claimed. The issue for the Tribunal is whether Perenco’s claim was unreasonably inflated.
986. The principal reason for the lower award of damages is that the Tribunal could not agree with Perenco’s contention that the damages should be calculated on the basis that that the Block 7 Participation Contract would have been extended. The decision to award damages only for the loss of opportunity of that possible extension led to a significant reduction in the amount payable to Perenco.
987. As for the calculation of the damages prior to the declaration of *caducidad*, in the end, the Tribunal took a different approach from that suggested by Professor Kalt, but it did not conclude that his approach and analysis were frivolous. The Tribunal decided to adopt the ‘layering’ approach which led to a lesser sum. Professor Kalt’s views were not absurd nor fanciful. The Tribunal simply decided that a different approach led to a more appropriate but still substantial figure for damages.
988. For its part, Ecuador’s quantum experts were instructed to base their assessment of damages on certain assumptions (not accepted by the Tribunal) that, with certain notable exceptions (such as the ‘layering’ approach to valuing damages resulting from different breaches occurring at different times, the ‘true-up’ and the Waterfall Chart), prevented their written reports prepared during the quantum phase of the proceeding from truly assisting the Tribunal. Based on these instructions, Professor Dow and his team came up with the surprising result that Perenco suffered no loss and in fact was indebted to Ecuador. No disrespect is intended to Brattle by the making of this observation. The problem was that during the initial part of the quantum phase, Brattle acted on instructions which did not

¹¹⁸⁷ Ecuador’s Reply Submission on Costs, paragraph 5.

comport with the essential facts as found by the Tribunal, with predictable results in terms of the persuasiveness of their initial estimates of damages. In the end though, the Tribunal's view is that both Parties' experts provided helpful assistance to it.

989. Ecuador submitted a motion for reconsideration of the Tribunal's Decision on Liability which was dismissed by the Tribunal¹¹⁸⁸ and Ecuador should bear Perenco's costs relating thereto. Perenco has not specified them separately but they have been included as part of the "Costs on Liability and Motion for Reconsideration." They are included in the sum awarded by the Tribunal to Perenco for its costs relating to the principal claim.

990. In view of the above, the Tribunal believes that Perenco is entitled to reimbursement of its costs in successfully pursuing its claims against Ecuador. However, the Tribunal is of the view that the reimbursement should be reduced to a reasonable level of these costs, taking into account in particular that not all expert evidence assisted the Tribunal in reaching its decision. Therefore, out of total costs of US\$29,407,653 that Perenco incurred in relation to its "Principal Claims", the Tribunal decides that Ecuador shall reimburse Perenco US\$23 million.

D. Ecuador's counterclaims against Burlington and Perenco

991. Burlington and Perenco were the joint and several contractors for both Blocks 7 and 21. They were referred to as "the Consortium" and Perenco managed the Blocks on behalf of the Consortium.

992. Both Burlington and Perenco commenced treaty claims against Ecuador (under different treaties) and contract claims under the same Participation Contracts. Burlington's Request for Arbitration was dated 21 April 2008 and Perenco's was dated 30 April 2008. Burlington, however, withdrew its contract claims on 6 November 2009.¹¹⁸⁹

¹¹⁸⁸ See Decision on Reconsideration.

¹¹⁸⁹ *Burlington Resources, Inc. v. Republic of Ecuador*, ICSID Case No. ARB/08/5, Decision on Jurisdiction, 2 June 2010, paragraphs 76-80.

993. In each of the arbitrations, Ecuador filed counterclaims seeking substantial compensation for environmental damage to parts of the Amazon rainforest affected by the works of, in effect, Perenco, as well as damages for the alleged failure to return the Blocks' infrastructure in reasonable condition as required by the Participation Contracts. Ecuador raised its counterclaims against Burlington on 17 January 2011 and then on 5 December 2011 raised the same counterclaims against Perenco.
994. The counterclaims raise three issues: (i) the question of duplication of proceedings; (ii) the initial estimation of the extent of the environmental damage; and (iii) the proportionality of what has actually been awarded to that which was initially claimed.

1. Duplication of proceedings

995. On 24 June 2011, counsel for Perenco wrote to the Respondent's counsel suggesting that considerable sums could be saved by Ecuador if it maintained counterclaims just in the *Burlington* proceedings, and went on to suggest ways in which this could be achieved.
996. On 29 June 2011, the Respondent rejected this suggestion, relying on the fact that both Burlington and Perenco had thought fit to institute their own proceedings and thus two counterclaims was the consequence. Perenco accepted this position; it did not see fit to oppose the Perenco counterclaim on admissibility¹¹⁹⁰ or jurisdictional grounds and for some six years the Burlington and Perenco counterclaims proceeded along separate paths.
997. The issue thus arises whether Ecuador has unreasonably complicated these proceedings and thereby exacerbated the costs and delay by claiming the same damage from both Burlington and Perenco in two distinct arbitration proceedings. The counterclaim brought by Ecuador could have been maintained against Burlington alone or against Perenco alone. If the former, Perenco would be liable to compensate Burlington for 50% of any damages so proved as a joint and several co-contractor. If the latter, Burlington would be liable to compensate Perenco for 50% of any damages so proved as a joint and several co-contractor.

¹¹⁹⁰ That is, at least up to two applications, dated 18 April 2017 and 30 January 2018, respectively, to dismiss the counterclaim on grounds of *res judicata*.

998. Has Ecuador attempted to have two bites of the same cherry?
999. The costs of the *Burlington* counterclaim hearing were substantial and led to an award in Ecuador's favour in the sum of almost US\$42 million against a stated claim of US\$2,797,007,091.42.¹¹⁹¹ The same claims were made against Perenco and, as will be seen above, has led to an Award in favour of Ecuador in the sum of US\$93,683,890 from which the amount of US\$39,199,373 awarded in the *Burlington* Decision on Counterclaims and paid by Burlington, has to be deducted, so as to avoid double recovery.¹¹⁹²
1000. Accordingly, the Tribunal needs to decide whether the counterclaims against Perenco has added to the costs because it could have only been dealt with in the *Burlington* proceedings.
1001. There is no doubt that the launching of two counterclaims based on the same subject-matter was calculated to increase Ecuador's overall chances of success. But as the Tribunal observed earlier, parallel investment treaty arbitral proceedings brought by claimants (sometimes in tandem with commercial claims concerning the same facts) have been found not to be abusive even if there might be an element seeking two bites of the same cherry.¹¹⁹³
1002. Indeed, to the extent that the counterclaims issues were the same in the two proceedings, the real question is why Ecuador would counterclaim against Burlington at all, given that Perenco was the operator, the party with first-hand knowledge of the operations, and therefore the actual (as opposed to the nominal) author of some of the contamination that the Tribunal's Independent Expert has found in the oilfields.
1003. If Ecuador had acted with a view to seeking relief in the most efficient way, Burlington would have been spared the costs of defending itself against the claims made against the actions of the Consortium's operator. But that ultimately plays no role in the assessment of costs in this proceeding. For the reasons just stated, Ecuador logically should have

¹¹⁹¹ *Burlington* award, in particular the Decision on Counterclaims, paragraph 52(iii), which is an integral part of the *Burlington* award.

¹¹⁹² The remaining sum awarded by the *Burlington* tribunal has been treated as negating any further award of damages for the infrastructure counterclaim.

¹¹⁹³ The *CME* and *Lauder* cases being a leading example.

proceeded against Perenco, not Burlington, and any costs thrown away in the *Burlington* arbitration are not relevant to assigning responsibility for costs in the present proceeding.

1004. The Tribunal has already held, by a majority, that under Ecuadorian and international law, Ecuador had a right to make counterclaims against both members of the Consortium and in its view, the exercise of that right by Ecuador was not abusive. This view was evidently shared by the *Burlington* tribunal, because it made no attempt to hold that its award on damages in favour of Ecuador had the effect of putting all extant counterclaims to an end. To the contrary, as already discussed, that tribunal left it to this Tribunal, as the later-in-time tribunal, to sort out the issue of double recovery.
1005. The Tribunal considers that launching the counterclaims in two proceedings was not necessary because as shown above it would have been possible to have them pursued just in one proceeding. But Ecuador stood on its rights, as it was entitled to do, and resisted Perenco's attempts to have the counterclaims consolidated.
1006. The Tribunal concludes that the maintenance of two counterclaims was an attempt (successful as it turned out) to have two bites at the cherry. It was an inefficient, costly and time-consuming way of obtaining a decision. But Ecuador had the right to commence two proceedings and no objection was taken by Perenco until it was far too late in the process.

2. The estimation of environmental damage

1007. As has been seen, the counterclaims against Perenco had a lengthy history. At the end of the hearing on the counterclaims, the Tribunal found that it was not prepared to accept the findings of either side's principal environmental experts and ordered an independent report by the Tribunal's Independent Expert, Mr. MacDonald, which led to an Award eventually in favour of Ecuador. Based upon the evidence then before it, the Tribunal believed that there would be contamination for which Perenco would be held liable¹¹⁹⁴, and the amount of damages awarded has turned out to be substantial.

¹¹⁹⁴ Interim Decision on Counterclaim, paragraph 582.

1008. The Tribunal has not lost sight of the fact that Perenco initially argued that the environmental counterclaims should be rejected “in its entirety and ... costs [awarded] in its favour. . . [together with] such other and further relief as the Tribunal deemed just and proper.”¹¹⁹⁵
1009. At the same time, also as anticipated by the Tribunal¹¹⁹⁶, the sum awarded by the Tribunal is nowhere near what Ecuador originally claimed in the proceeding (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)).¹¹⁹⁷
1010. Given that Ecuador’s counterclaims were for a sum well in excess of US\$2.5 billion, Perenco had to take this very seriously indeed. The environmental counterclaim was heralded by exaggerated allegations of an environmental catastrophe. It was based on criteria that were divorced from the actual Ecuadorian legislative framework and using inflated *ex-country* remedial costs.
1011. At the same time, Perenco did itself no favours by seeking the dismissal of the counterclaim “*in its entirety*” and acknowledging only in the most grudging manner a minor environmental liability. While Ecuador’s experts could be accused of “gold-bricking” the claim, Perenco’s experts could be accused of “lead-bricking” it, finding at every turn an opportunity to ignore or reduce potential liability.
1012. In short, neither side’s principal environmental expert gained the confidence of the Tribunal.¹¹⁹⁸ For that reason, the Tribunal will direct that each side will bear the costs of its own environmental experts.

¹¹⁹⁵ *Ibid.*, paragraph 43.

¹¹⁹⁶ *Ibid.*, paragraph 593.

¹¹⁹⁷ *Ibid.*, paragraph 36.

¹¹⁹⁸ With the exception of Dr. Rouhani whose expert testimony the Tribunal found useful.

1013. At the end of the first counterclaims hearing, while it was not able fully to rely on Ecuador's evidence, the Tribunal considered that there was almost certainly some contamination for which Perenco would be responsible. Moreover, certain evidence of Perenco's own making was a matter of concern to the Tribunal.¹¹⁹⁹ For this reason, the Tribunal encouraged the Parties to settle the environmental counterclaim based on the findings of fact and law that it had made in the Interim Decision on Counterclaim, while holding out the prospect that if they were unable to agree a settlement, an independent expert would be appointed. In the end, Ecuador benefited from this decision by being able to rely upon the Independent Expert's subsequent findings.¹²⁰⁰
1014. Given that Ecuador ultimately prevailed on the environmental counterclaim, albeit with a much smaller award of damages than originally sought, it will be awarded a portion of its costs. The Award does not include Ecuador's expert fees and costs as its environmental expert reports did not assist the Tribunal in its task and it had to appoint the Independent Expert.

3. Disproportionality between what was claimed and what was awarded

1015. The *Burlington* tribunal awarded Ecuador the sum of US\$41,776,492.77 in respect of its counterclaims.¹²⁰¹ This Tribunal has awarded US\$93,683,890 for the environmental counterclaim (and has held that the *Burlington* tribunal's award of infrastructure damages

¹¹⁹⁹ The May 2010 "Jungal Memorandum": prepared by Perenco regarding the characterisation of the environmental issues in Payamino 2-8, when Perenco and a landowner but not the Ecuadorian authorities, had knowledge of the condition of a contaminated swampy area, and company officials debated what to do, being the leading example. The Interim Decision on Counterclaim, at paragraph 438, recounted the options set out in the memorandum:

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").

The memorandum added: "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."

Quoted in the Interim Decision on Counterclaim, at paragraph 439.

¹²⁰⁰ Even then, Ecuador persisted in characterising the situation in the Blocks as an environmental catastrophe, a characterisation which Perenco took exception to, and rightly so, in the Tribunal's view.

¹²⁰¹ See *Burlington* Decision on Counterclaims, paragraph 1099.B.

has already fully compensated Ecuador). There is accordingly a substantial mismatch between the amount claimed by Ecuador and the amount actually recovered. In the Tribunal's view, the counterclaims were overstated, in particular the environmental counterclaim, which was based upon a number of incorrect assumptions. The Tribunal is satisfied that the huge amount claimed by Ecuador in its counterclaims has added substantially to the costs of these proceedings. As has been noted above, the counterclaims would likely not have been raised had the Decision on Provisional Measures been honoured by Ecuador.

1016. Perenco's two Applications for Dismissal of Ecuador's Counterclaims failed¹²⁰² and there is no reason why Perenco should not bear the costs relating thereto. They have not been specified by Ecuador separately but rather included in its costs relating to counterclaims. They are part of the costs which Perenco has to reimburse Ecuador in connection with the counterclaims.

1017. In view of the above considerations relating to the counterclaims and taking into account the outcome on the counterclaims reached, the Tribunal decides that Perenco shall reimburse Ecuador for the latter's costs incurred in relation to the counterclaims the amount of US\$6,276,153.

E. Comments on Ecuador's costs submissions

1018. Finally, the Tribunal was somewhat surprised by the nature, tone and content of Ecuador's submissions on costs. Their analysis of these proceedings is in the opinion of the Tribunal not realistic.

1019. To state that Ecuador is in effect the prevailing party in this arbitration is simply untenable. Ecuador's submission that it is in fact the successful party and indeed the injured party in these proceedings is not accepted given the Tribunal's previous findings on the overall outcome of the proceeding.

¹²⁰² See Decision on Perenco's First Dismissal Application and this Award, paragraph 514, above.

F. Costs of the Proceeding

1020. The costs of these proceedings, which have been paid out of the advances made by the Parties, are as follows:

(a) Arbitrators fees and expenses	US\$ 2,720,449.19
(b) Environmental expert's fees and expenses ¹²⁰³	US\$5,205,011.95
(c) ICSID's administrative fees	US\$324,000.00
(d) Direct expenses (estimated) ¹²⁰⁴	US\$1,254,592.59
TOTAL:	US\$9,504,053.73

1021. The Tribunal, taking into account that Perenco prevailed on its principal claim, while Ecuador was successful with its counterclaims, and in the exercise of its discretion, decides that the costs of the proceedings, including those of the Tribunal's Independent Expert, shall be borne equally by the Parties.

¹²⁰³ This amount includes the estimated cost of US\$10,000 for the removal of the investigation derived waste. The final waste disposal costs will be calculated once all the waste is weighed and disposed of pursuant to Ecuadorian law. The Tribunal has directed the Independent Expert to finalise arrangements with its local subcontractor to urgently dispose of such waste.

¹²⁰⁴ ICSID will provide a detailed final statement of the case account to the Parties. The remaining balance will be reimbursed to the Parties in proportion to the payments that they advanced to ICSID.

VI. DECISION

1022. The Tribunal incorporates by reference into this Award the Decision on Jurisdiction dated 30 June 2011, the Decision on Remaining Issues of Jurisdiction and on Liability dated 12 September 2014, the Decision on Ecuador's Reconsideration Motion dated 10 April 2015, the Interim Decision on the Environmental Counterclaim dated 11 August 2015, and the decisions on Perenco's two requests for dismissal of the Respondent's counterclaims dated 18 August 2017 and 30 July 2018.

1023. For the reasons set forth above, the Tribunal decides as follows:

- (a) For the breaches of its obligations under the Participation Contracts and the Treaty, the Republic of Ecuador shall pay to Perenco Ecuador Limited the amount of US\$448,820,400.00, comprising the net present values as of 2007 and 2010 plus prejudgment interest to 27 September 2019. To that amount, post-award interest will accrue at a rate of LIBOR for three-month borrowing plus two percent, compounded annually. Post-award interest will accrue from 1 December 2019 until the date of full and final payment;
- (b) Perenco Ecuador Limited shall pay to the Republic of Ecuador the costs of restoring the environment in areas within Blocks 7 and 21 and remedying the infrastructure in these two Blocks in the amount of US\$54,439,517.00. To that amount, post-award interest will accrue at a rate of LIBOR for three-month borrowing plus two percent, compounded annually. Post-award interest will accrue from 1 December 2019, until the date of full and final payment;
- (c) The Republic of Ecuador shall pay to Perenco Ecuador Limited the amount of US\$23,000,000.00 as contribution to Claimant's legal fees and costs related to the principal claim, together with simple interest at an annual rate of three percent, which shall accrue from 1 December 2019 until the date of full and final payment;
- (d) Perenco Ecuador Limited shall pay to the Republic of Ecuador the amount of US\$6,276,153.00 as contribution to Ecuador's legal fees and costs related to the

counterclaims, together with simple interest at an annual rate of three percent, which shall accrue from 1 December 2019 until the date of full and final payment;

- (e) Perenco Ecuador Limited shall pay to Petroecuador the amount of US\$49,629.76 in respect of the latter's legal fees and costs, together with simple interest at an annual rate of three percent which shall accrue from 30 June 2011 (the date of dispatch of the Tribunal's Decision on Jurisdiction) until the date of full and final payment;
- (f) The ICSID costs (including the Tribunal's fees and expenses) shall be borne equally by both Parties;
- (g) The costs of the Tribunal's Independent Expert shall be borne equally by both Parties;
and
- (f) All other claims of the Parties and requests for relief are dismissed.

[signed]
Judge Peter Tomka
President of the Tribunal
23 September 2019

[signed]
Mr. Neil Kaplan, C.B.E., Q.C., S.B.S.
Arbitrator
16 September 2019

[signed]
Mr. J. Christopher Thomas, Q.C.
Arbitrator
10 September 2019

ANNEX A

Table 1. Allocation of Remedial Responsibilities - Sites Where Perenco Used Mud Pits and/or Installed Crude Oil Production Wells

Site	Remedial Costs for Perenco Mud Pits	Remedial Costs for Soils			Remedial Costs for Groundwater	Total Allocation of Remedial Costs				Notes/Comments
		Predecessors	Perenco	Successors		Predecessors	Perenco	Successors	Total	
Coca 18/19	\$ 3,123.00	\$ 114.08	\$ 291.92	\$ -	\$ -	\$ 114.08	\$ 3,414.92	\$ -	\$ 3,529.00	Soils around the Coca 18 well installed by Kerr McGee are affected by barium only. Thus, this affected area is not attributable to Perenco.
Condor N 1	\$ 2,484.00	\$ -	\$ 6,339.00	\$ -	\$ -	\$ -	\$ 8,823.00	\$ -	\$ 8,823.00	
Jaguar 9	\$ 541.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 541.00	\$ -	\$ 541.00	
Lobo 3, 5, 6, 7	\$ 101.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 101.00	\$ -	\$ 101.00	
Oso 3-8, 13, 14	\$ 1,906.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,906.00	\$ -	\$ 1,906.00	
Oso 9, 12, 15-20	\$ 5,317.00	\$ -	\$ -	\$ -	\$ 3,415.00	\$ -	\$ 8,732.00	\$ -	\$ 8,732.00	
Oso 9A	\$ 2,948.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,948.00	\$ -	\$ 2,948.00	
Oso 9B	\$ 1,507.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,507.00	\$ -	\$ 1,507.00	
Oso A, 21, 23	\$ -	\$ -	\$ 228.00	\$ -	\$ -	\$ -	\$ 228.00	\$ -	\$ 228.00	Perenco installed 4 of the 16 wells (OSO-A 21, OSO-A 23, 22H and 22st). Based on the naming convention, all other wells (OSO-A 45, OSO-A 43, OSO-A 41, OSO-A 39, OSO-A 30, OSO-A 24, OSO-A 33, OSO-A 28, OSO-A 27, OSO-A 25, OSO-A 26, OSO-A 29, OSO-A 35) appear to have been installed after Perenco. Thus, the soil exceedances are attributed to Perenco given their detection shortly after Perenco's operatorship ended.
Payamino 16	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	See note 3.
Payamino WTS	\$ 2,978.00	\$ -	\$ 1,194.40	\$ 298.60	\$ -	\$ -	\$ 4,172.40	\$ 298.60	\$ 4,471.00	Based on photographic documentation in the project record, there appears to be a post-Perenco use of a soil cell at the site (about 1/5 of the total area). 1/5 of the soil remedial costs are allocated to Perenco's successor and 4/5 to Perenco.
Yuralpa - Chonta	\$ 1,404.00	\$ -	\$ 645.00	\$ -	\$ -	\$ -	\$ 2,049.00	\$ -	\$ 2,049.00	
Yuralpa - LF	\$ 12,217.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 12,217.00	\$ -	\$ 12,217.00	See note 4.
Yuralpa Pad A	\$ 1,034.00	\$ -	\$ 202.00	\$ -	\$ -	\$ -	\$ 1,236.00	\$ -	\$ 1,236.00	
Yuralpa Pad B	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	See note 5.
Yuralpa Pad D	\$ -	\$ -	\$ 475.00	\$ -	\$ -	\$ -	\$ 475.00	\$ -	\$ 475.00	Contamination detected in 2010. Two of the five wells were installed after 2009. Thhe soil exceedances are attributed to Perenco given their detection shortly after Perenco's operatorship ended.
Yuralpa Pad E	\$ 193.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 193.00	\$ -	\$ 193.00	
Yuralpa Pad F, CPF	\$ -	\$ -	\$ 98.00	\$ -	\$ -	\$ -	\$ 98.00	\$ -	\$ 98.00	
Yuralpa Pad G	\$ 963.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 963.00	\$ -	\$ 963.00	
TOTAL	\$ 36,716.00	\$ 114.08	\$ 9,473.32	\$ 298.60	\$ 3,415.00	\$ 114.08	\$ 49,604.32	\$ 298.60	\$ 50,017.00	

Notes

1. All costs in thousands of USD.
2. For these sites, allocated costs for soil and groundwater are provided and not included in Tables 2 and 3.
3. During the March 2019 hearing, Ecuador provided evidence indicating that Perenco had transferred to and disposed of mud pit materials from other sites at Payamino 16. Perenco did not dispute this. Considering that 85% of the Perenco mud pits did not conform to the performance criteria of RAOHE, the Tribunal considers it more likely than not that the mud pits at this site would not have conformed to RAOHE considering that Perenco's site operations did not differ during its tenure. The estimated remedial cost and allocation of responsibilities for mud pits at Payamino 16 is set out in Table 4.
4. Ecuador investigated groundwater at the Yuralpa Landfill, but the Independent Expert did not investigate groundwater at this site for logistical reasons. Considering that at least one well at every site has a detected exceedance of TPH and/or barium, it is reasonable to assume that groundwater at Yuralpa LF would be similarly affected considering that Perenco's site operations did not differ during its tenure. The estimated remedial cost and allocation of responsibilities for groundwater at the Yuralpa Landfill is set out in Table 4.
5. Perenco installed wells at Yuralpa B and used the mud pits at the site. Due to an oversight, Ramboll did not investigate the Perenco mud pits at this site. Considering that 85% of the Perenco mud pits did not conform to the performance criteria of RAOHE the Tribunal considers it more likely than not that the mud pits at this site would also not have conformed to RAOHE considering that Perenco's site operations did not differ during its tenure. The estimated remedial cost and allocation of responsibilities for mud pits at Yuralpa B are set out in Table 4.
6. Where necessary, clarifications on allocation are provided in the comments/notes.

Table 2. Allocation of Remedial Responsibilities - Sites with Affected Soil

Site	Time-based Allocation of Remedial Costs for Soil			Total	Notes/Comments
	Reference Date ²	Predecessors	Perenco		
Coca 01	Jan-71	\$ 644.73	\$ 143.27	\$ 788.00	
Coca 02, CPF	Dec-88	\$ 2,266.68	\$ 433.32	\$ 2,700.00	The barium-affected area east of the non-Perenco mud pit is attributed to Perenco's predecessors. In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for one of the three remaining affected areas.
Coca 04	Jan-90	\$ 308.00	\$ -	\$ 308.00	The two barium-affected areas east of the platform are attributed to Perenco's predecessors.
Coca 06	Oct-89	\$ 4,319.08	\$ 903.92	\$ 5,223.00	The two barium-affected areas southeast of the platform and upslope of the adjoining swampy area are attributed to Perenco's predecessors.
Coca 08	Oct-89	\$ 10,055.00	\$ -	\$ 10,055.00	The barium and other metals affected areas west and south of the platform are attributed to Perenco's predecessors.
Coca 09	Jan-93	\$ 805.00	\$ -	\$ 805.00	The barium-affected area northwest of the platform is attributed to Perenco's predecessors.
Coca 10, 16	Mar-91	\$ 482.26	\$ 298.74	\$ 781.00	In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the affected area.
Gacela 01, CPF	Feb-91 - Jun-95	\$ 1,572.51	\$ 530.49	\$ 2,103.00	The barium-affected area adjacent to the southwest part of the platform is attributed to Perenco's predecessors. Perenco's contribution to the area with barium exceedances to the southeast of the platform could not be discounted as groundwater in this area is affected by TPH and TPH was detected in soils. In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the remaining four affected areas.
Gacela 02	Jun-92	\$ 1,336.21	\$ 238.79	\$ 1,575.00	The barium-affected area southwest of the platform is attributed to Perenco's predecessors. See note 4.
Gacela 04	Mar-94	\$ 195.00	\$ -	\$ 195.00	The barium-affected area near the wellhead is attributed to Perenco's predecessors.
Gacela 05	Sep-94	\$ 130.18	\$ 116.82	\$ 247.00	In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the affected area.
Jaguar 01	Jan-88	\$ 1,997.01	\$ 1,106.99	\$ 3,104.00	In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed full responsibility for the impact of TPH around the valve station, which were the result of an oil spill that reportedly occurred in 2005-2006, and partial responsibility for the swampy area downslope of the valve station. In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the three affected areas.
Jaguar 02	Dec-88	\$ 8,308.40	\$ 196.60	\$ 8,505.00	The barium (and other metals) affected areas northeast of the platform, west of the mud pit, and along the northern stream are attributed to Perenco's predecessors. For the areas with surficial crude resulting from a spill in 2006 (during Perenco's tenure), Perenco is entirely responsible. In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for two of the three remaining affected areas.
Jaguar 03	Jan-94	\$ 3,604.24	\$ 2,038.76	\$ 5,643.00	The barium-affected ballast material is attributed to Perenco's predecessors. Perenco's contribution to the underlying isolated areas of isolated metal exceedances could not be discounted. In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the affected area. See note 4.
Jaguar 05, CPF	Jan-96	\$ 182.48	\$ 196.52	\$ 379.00	In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the two affected areas.
Jaguar 07, 08	Feb-96	\$ 323.00	\$ -	\$ 323.00	The barium and nickel-affected area is attributed to Perenco's predecessors. See note 4.
Lobo 01	Feb-89	\$ 1,361.00	\$ -	\$ 1,361.00	The barium (and other metals)-affected area is attributed to Perenco's predecessors.
Lobo 04	Dec-00	\$ 717.00	\$ -	\$ 717.00	The barium-affected area is attributed to Perenco's predecessors. See note 4.
Mono CPF	Jan-89 - Feb-96	\$ 8,312.80	\$ 7,460.20	\$ 15,773.00	In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the impact of TPH in the swampy area, which were the result of an oil spill that reportedly occurred in 2008. This area is also affected by barium. Perenco's contribution to the two areas with metals exceedances to the north and east of the CPF could not be discounted as groundwater in these areas is affected by TPH and TPH was detected in soils. Since production well installation dates span from 1989 to 1996, a weighted average date was used for the time-based allocation of remedial costs.
Mono Sur	Sep-96	\$ 580.45	\$ 700.55	\$ 1,281.00	
Oso 01, CPF	Sep-70	\$ 186.00	\$ -	\$ 186.00	The barium-affected area is attributed to Perenco's predecessors.

Table 2. Allocation of Remedial Responsibilities - Sites with Affected Soil

Site	Time-based Allocation of Remedial Costs for Soil			Total	Notes/Comments
	Reference Date ²	Predecessors	Perenco		
Payamino 01, CPF	Nov-86 - Dec-91	\$ 3,521.12	\$ 1,224.88	\$ 4,746.00	The barium and TPH-affected area within the former concrete pit are attributed to Perenco's predecessors as this feature was closed in 1997. The TPH affected area next to the power oil pump building is attributed to Perenco as the soil samples in the stained area were collected shortly after Perenco's operatorship. In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the other two affected areas.
Payamino 02, 08	May-87 - Sep-92	\$ 6,126.40	\$ 9,189.60	\$ 15,316.00	During the March 2019 hearing, Perenco indicated in its closing submissions that it would assume 60% of the responsibility for Payamino 2/8.
Payamino 03	Aug-87	\$ -	\$ 129.00	\$ 129.00	The TPH-affected soil pile on the southern side of the platform is attributed to Perenco as this stockpile was first identified shortly after Perenco's operatorship. In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the affected area.
Payamino 04, 14, 20, 24	Jul-88 - May-01	\$ 2,404.72	\$ 1,006.28	\$ 3,411.00	The date of the reported spill to the northeast of the Payamino 4 platform could not be confirmed. The two barium-affected areas in Payamino 14 are attributed to Perenco's predecessors. Historical aerial photography suggests that the area to the southwest of the Payamino 4 platform was disturbed between 1989 and 1990 and between 2003 and 2013 and the initial sampling of this area was performed in 2012; thus, the time-based allocation for this area considers a duration of 21 years (2013-1990). Since production well installation dates span from 1988 to 1994, a weighted average date was used for the time-based allocation of remedial costs for all other areas.
Payamino 10	Mar-93	\$ 313.00	\$ -	\$ 313.00	The barium-affected area is attributed to Perenco's predecessors.
Payamino 13	Oct-93	\$ -	\$ -	\$ -	
Payamino 15	Dec-93	\$ -	\$ -	\$ -	
Payamino 16	Nov-93	\$ -	\$ -	\$ -	
Payamino 21	Oct-94	\$ -	\$ 155.00	\$ 155.00	The TPH-affected area next to the power oil pump building is fully attributed to Perenco as the soil samples in the stained area were collected shortly after Perenco's operatorship. In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the affected area.
Payamino 23	May-97	\$ 743.93	\$ 1,021.07	\$ 1,765.00	For the affected area next to the non-Perenco mud pit there was a slope failure. In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the affected area.
Punino	Dec-90	\$ 75.46	\$ 45.54	\$ 121.00	In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the affected area.
Nemoca	Dec-99	\$ 143.54	\$ 386.46	\$ 530.00	In Annex I to Perenco's comments on the Independent Expert's Report, Perenco assumed partial responsibility for the affected areas.
TOTAL		\$ 61,015.19	\$ 27,522.81	\$ 88,538.00	

Notes

1. All costs in thousands of USD.
2. Time-based allocation assumes that releases to the environment that resulted in impact on soils at the time of the first production well installation and continued through 2009. For affected areas that could be attributed to CPF operations, the initial release was assumed to have occurred when the CPF was constructed.
3. Contributions to the affected areas from Perenco's successor were considered unlikely as (a) review of the evidence of Petroamazonas' spills and releases indicate that such releases were generally small, were addressed promptly and/or occurred away from areas identified by the Independent Expert as warranting remediation; (b) during implementation of Ramboll's site investigation activities, no evidence of recent releases was observed; and (c) the soil samples collected shortly after Perenco's operatorship serve as an environmental conditions baseline that largely exculpates Perenco's successor.
4. The comments/notes section indicate when exceptions to the allocation principles are applicable or to define responsible parties, particularly where multiple affected areas exist at a site.

Table 3. Allocation of Remedial Responsibilities - Sites with Affected Groundwater

Site	Time-based Allocation of Remedial Costs for Groundwater				Total ²	Notes/Comments
	Reference Date ³	Predecessors	Perenco	Successors		
Coca 02, CPF	Dec-88	\$ 2,436.00	\$ 232.65	\$ 332.35	\$ 3,001.00	The affected areas of groundwater next to the non-Perenco mud pit and the pre-Perenco formation water pit are attributed to Perenco's predecessors. In the swampy area to the southeast of the CPF, potential contributions by Petroamazonas to groundwater from continued use of the API separator cannot be discounted.
Gacela 01, CPF	Feb-91 - Jun-95	\$ 458.99	\$ 452.53	\$ 485.48	\$ 1,397.00	In the affected area of groundwater downstream of the API separator at Gacela 1/CPF, potential contributions by Petroamazonas to groundwater from continued use of the API separator cannot be discounted. For the groundwater to the southeast of the facility, the soil samples were collected shortly after Perenco's tenure and limit responsibility to Perenco and its predecessors.
Gacela 02	Jun-92	\$ 352.61	\$ 244.39	\$ -	\$ 597.00	
Jaguar 1	Jan-88	\$ -	\$ 438.00	\$ -	\$ 438.00	Perenco accepted full responsibility for the release associated with the valve box area in 2005/2006 (Annex I of its 22 Feb 2018 letter), which is the likely source of TPH in the swamp downslope.
Jaguar 2	Dec-88	\$ 586.50	\$ 586.50	\$ -	\$ 1,173.00	The affected area of groundwater next to the non-Perenco mud pit is attributed to Perenco's predecessors. For groundwater in areas with surficial crude resulting from a spill in 2006 (during Perenco's tenure), Perenco is considered entirely responsible.
Mono CPF	Jan-89 - Feb-96	\$ 2,650.95	\$ 2,379.05	\$ -	\$ 5,030.00	
Payamino 01, CPF	Nov-86 - Dec-91	\$ 604.25	\$ 399.03	\$ 400.72	\$ 1,404.00	In the affected area of groundwater impairment adjacent to the stream to the northwest of the Payamino 1/CPF, potential contributions by Petroamazonas to groundwater resulting from its continued use of the CPF cannot be discounted. For the affected area of groundwater in the catchment area to the west of the CPF, the soil samples were collected shortly after Perenco's tenure and limit responsibility to Perenco and its predecessors.
Payamino 02/08	May-87 - Sep-92	\$ 1,737.20	\$ 2,605.80	\$ -	\$ 4,343.00	During the March 2019 hearing, Perenco indicated in its closing materials that it would assume 60% of the responsibility for Payamino 2/8.
Payamino 04	Jul-88 - May-01	\$ 1,112.43	\$ 498.57	\$ -	\$ 1,611.00	The date of the reported spill to the northeast of the Payamino 4 platform could not be confirmed. Historical aerial photography suggests that the area to the southwest of the Payamino 4 platform was disturbed between 1989 and 1990 and between 2003 and 2013 and the initial sampling of this area was performed in 2012; thus, the time-based allocation for this area considers a duration of 21 years (2013-1990). Since production well installation dates span from 1988 to 1994, a weighted average date was used for the time-based allocation of remedial costs for the area northeast of the platform.
Payamino 13	Oct-93	\$ 655.88	\$ 510.13	\$ -	\$ 1,166.00	
Payamino 15	Dec-93	\$ 655.88	\$ 510.13	\$ -	\$ 1,166.00	
TOTAL		\$ 11,250.68	\$ 8,856.76	\$ 1,218.55	\$ 21,326.00	

Notes

1. All costs in thousands of USD.
2. Affected groundwater was identified at Oso 9 and the remedial estimate amounted to \$3.415. Since Perenco installed production wells and used mud pits at Oso 9, the allocation of responsibility for this site is provided in Table 1.
3. Time-based allocation assumes that releases to the environment that resulted in groundwater impairment began at the time of the first production well installation and continued through 2009. For affected areas that could be attributed to CPF operations, the initial release was assumed to have occurred when the CPF was constructed.
4. Contributions from Perenco's successor were only considered for areas where releases could be the result of ongoing use of specific features associated with CPFs (e.g., affected areas downgradient from an API separator discharge).
5. Clarifications on allocation are provided in the comments/notes when exceptions to the allocation principles were applicable or to define responsible parties, particularly where multiple affected areas exist at a site.

Table 4. Remedial Estimates and Allocation of Remedial Responsibilities - Additional Sites

Site	Affected Media	Quantity	Units	Remedial Estimate		Allocation of Remedial Costs			Notes/Comments
				Low	High	Predecessors	Perenco	Successors	
Payamino 16	Mud Pits	\$ 4,300	m3	\$ 1,075	\$ 1,709	\$ 215 - 342	\$ 860 - 1367	\$ -	See notes 2 and 4.
Yuralpa B	Mud Pits	\$ 30,800	m3	\$ 3,004	\$ 8,972	\$ 451 - 1346	\$ 2553 - 7626	\$ -	See notes 3 and 4.
Yuralpa LF	Groundwater	\$ 11,670	m2	\$ 1,166	\$ 1,990	\$ -	\$ 1166 - 1990	\$ -	See notes 5 and 6.
	TOTAL			\$ 5,245	\$ 12,671	\$ 666 - 1688	\$ 4579 - 10983	\$ -	

Notes

1. All costs in thousands of USD.
2. Oryx installed a well and closed a mud pit at the site in 1993. Th evidence is that mud pit material was disposed in 5 of 6 mud pits at Payamino 16. Perenco did not dispute this at the March 2019 hearing. In the absence of any data to indicate which RAOHE leachability criteria is not met (i.e., unlined or lined mud pits), a range of remedial costs was estimated. The estimated costs have been allocated 80% (Perenco) and 20% (non-Perenco).
3. During the March 2019 hearing, Ecuador noted that Perenco had installed wells at Yuralpa B and mud pit sampling should have been performed; Perenco did not dispute this. Perenco installed six of the seven wells at this site. The mud pit area has been estimated from available aerial photographs and in the absence of any data to indicate which RAOHE leachability criteria is not met (i.e., unlined or lined mud pits), a range of remedial costs was estimated. The allocation of this estimated cost has been based on the number of wells installed by Perenco (85%) versus non-Perenco (15%).
4. A range of remedial costs was estimated for mud pits. The low estimate considers that the mud pit does not conform to RAOHE's performance criteria for unlined pits, such that the remedy would consist of excavation of the mud pit material, lining of the mud pit and placement of the untreated material in the lined mud pit. The high cost estimate considers that the mud pit does not conform to RAOHE's performance criteria for lined pits, such that the remedy would consist of excavation of the mud pit material, treatment of the excavated materials, lining of the mud pit and placement of the treated material in the lined mud pit.
5. The well location at Yuralpa LF sampled by IEMS is over 40m from the mud pit disposal area, where leachability testing indicated barium exceedances above the lined mud pit criteria. The high reasonable prediction of groundwater contaminant migration from other sites indicates the potential for barium to migrate such distances.
6. A range of costs was estimated for groundwater remediation based on the surface area of mud pits to be remediated. The low estimate is based on the order of magnitude estimate, while the high estimate integrates the groundwater remedy (placement of reactive media for treatment of TPH impacted groundwater) with the remedy of the mud pits. The assumed affected groundwater at this site is fully attributed to Perenco, who constructed and used the mud pits.

Table 5. Summary of Allocations of Remedial Responsibilities

Site	Time-based Allocation of Remedial Costs				Total ²	Notes/Comments
	Non-Perenco	Only Perenco	Perenco's Share	Predecessors'/ Successors' Share		
Coca 01	\$ -	\$ -	\$ 143.27	\$ 644.73	\$ 788	
Coca 02, CPF	\$ 3,408.80	\$ -	\$ 665.97	\$ 1,626.23	\$ 5,701	
Coca 04	\$ 308.00	\$ -	\$ -	\$ -	\$ 308	
Coca 06	\$ 2,679.11	\$ -	\$ 903.92	\$ 1,639.97	\$ 5,223	
Coca 08	\$ 10,055.00	\$ -	\$ -	\$ -	\$ 10,055	
Coca 09	\$ 805.00	\$ -	\$ -	\$ -	\$ 805	
Coca 10, 16	\$ -	\$ -	\$ 298.74	\$ 482.26	\$ 781	
Coca 18/19	\$ 114.08	\$ 3,414.92	\$ -	\$ -	\$ 3,529	
Condor N 1	\$ -	\$ 8,823.00	\$ -	\$ -	\$ 8,823	
Gacela 01, CPF	\$ 1,034.45	\$ -	\$ 983.02	\$ 1,482.54	\$ 3,500	
Gacela 02	\$ 991.67	\$ -	\$ 483.18	\$ 697.16	\$ 2,172	
Gacela 04	\$ 195.00	\$ -	\$ -	\$ -	\$ 195	
Gacela 05	\$ -	\$ -	\$ 116.82	\$ 130.18	\$ 247	
Jaguar 01	\$ -	\$ 580.92	\$ 964.07	\$ 1,997.01	\$ 3,542	
Jaguar 02	\$ 8,894.90	\$ 783.10	\$ -	\$ -	\$ 9,678	
Jaguar 03	\$ 1,128.60	\$ -	\$ 2,038.76	\$ 2,475.64	\$ 5,643	
Jaguar 05, CPF	\$ -	\$ -	\$ 196.52	\$ 182.48	\$ 379	
Jaguar 07, 08	\$ 323.00	\$ -	\$ -	\$ -	\$ 323	
Jaguar 9	\$ -	\$ 541.00	\$ -	\$ -	\$ 541	
Lobo 01	\$ 1,361.00	\$ -	\$ -	\$ -	\$ 1,361	
Lobo 3, 5, 6, 7	\$ -	\$ 101.00	\$ -	\$ -	\$ 101	
Lobo 04	\$ 717.00	\$ -	\$ -	\$ -	\$ 717	
Mono CPF	\$ -	\$ -	\$ 9,839.26	\$ 10,963.74	\$ 20,803	
Mono Sur	\$ -	\$ -	\$ 700.55	\$ 580.45	\$ 1,281	
Oso 01, CPF	\$ 186.00	\$ -	\$ -	\$ -	\$ 186	
Oso 3-8, 13, 14	\$ -	\$ 1,906.00	\$ -	\$ -	\$ 1,906	
Oso 9, 12, 15-20	\$ -	\$ 8,732.00	\$ -	\$ -	\$ 8,732	
Oso 9A	\$ -	\$ 2,948.00	\$ -	\$ -	\$ 2,948	
Oso 9B	\$ -	\$ 1,507.00	\$ -	\$ -	\$ 1,507	
Oso A, 21, 23	\$ -	\$ 228.00	\$ -	\$ -	\$ 228	
Payamino 01, CPF	\$ 1,690.69	\$ 16.10	\$ 1,607.81	\$ 2,835.40	\$ 6,150	
Payamino 02, 08	\$ -	\$ -	\$ 11,795.40	\$ 7,863.60	\$ 19,659	
Payamino 03	\$ -	\$ 129.00	\$ -	\$ -	\$ 129	
Payamino 04, 14, 20, 24	\$ 220.20	\$ -	\$ 1,504.84	\$ 3,296.96	\$ 5,022	
Payamino 10	\$ 313.00	\$ -	\$ -	\$ -	\$ 313	
Payamino 13	\$ -	\$ -	\$ 510.13	\$ 655.88	\$ 1,166	
Payamino 15	\$ -	\$ -	\$ 510.13	\$ 655.88	\$ 1,166	
Payamino 16	\$ -	\$ -	\$ -	\$ -	\$ -	See note 2.
Payamino 21	\$ -	\$ 155.00	\$ -	\$ -	\$ 155	

Table 5. Summary of Allocations of Remedial Responsibilities

Site	Time-based Allocation of Remedial Costs				Total ²	Notes/Comments
	Non-Perenco	Only Perenco	Perenco's Share	Predecessors'/ Successors' Share		
Payamino 23	\$ -	\$ -	\$ 1,021.07	\$ 743.93	\$ 1,765	
Payamino WTS	\$ -	\$ 2,978.00	\$ 1,194.40	\$ 298.60	\$ 4,471	
Punino	\$ -	\$ -	\$ 45.54	\$ 75.46	\$ 121	
Nemoca	\$ -	\$ -	\$ 386.46	\$ 143.54	\$ 530	
Yuralpa - Chonta	\$ -	\$ 2,049.00	\$ -	\$ -	\$ 2,049	
Yuralpa - LF	\$ -	\$ 12,217.00	\$ -	\$ -	\$ 12,217	See note 2.
Yuralpa Pad A	\$ -	\$ 1,236.00	\$ -	\$ -	\$ 1,236	
Yuralpa Pad B	\$ -	\$ -	\$ -	\$ -	\$ -	See note 2.
Yuralpa Pad D	\$ -	\$ 475.00	\$ -	\$ -	\$ 475	
Yuralpa Pad E	\$ -	\$ 193.00	\$ -	\$ -	\$ 193	
Yuralpa Pad F, CPF	\$ -	\$ 98.00	\$ -	\$ -	\$ 98	
Yuralpa Pad G	\$ -	\$ 963.00	\$ -	\$ -	\$ 963	
TOTAL	\$ 34,425.50	\$ 50,074.04	\$ 35,909.85	\$ 39,471.62	\$ 159,881	

Notes

1. All costs in thousands of USD.
2. Estimated remedial cost and allocation of responsibilities for groundwater at Yuralpa Landfill and mud pits at both Payamino 16 and Yuralpa B are not included in this table and are provided in Table 4.

ANNEX B

SCHEDULE OF WITNESSES AND EXPERTS FOR INFRASTRUCTURE COUNTERCLAIM

<p><i>Burlington v. Ecuador</i> <u><i>Ecuador’s witnesses for infrastructure claim</i></u></p> <ul style="list-style-type: none"> ▪ Mr. Pablo Alberto Luna Hermosa¹²⁰⁵ <i>Petroamazonas</i> ▪ Mr. Manuel Solís¹²⁰⁶ <i>Petroamazonas</i> ▪ Mr. Marco Puente¹²⁰⁷ <i>Petroamazonas</i> ▪ <u>Mr. Diego Montenegro¹²⁰⁸</u> <i>Petroamazonas</i> <p><u><i>Burlington’s witnesses and experts for infrastructure claim</i></u></p> <ul style="list-style-type: none"> ▪ Mr. Wilfrido Saltos¹²⁰⁹ <i>Perenco Ecuador Limited</i> ▪ Mr. Eric d’Argentré¹²¹⁰ 	<p><i>Perenco v. Ecuador</i> <u><i>Ecuador’s witnesses for infrastructure claim</i></u></p> <ul style="list-style-type: none"> ▪ Mr. Pablo Alberto Luna Hermosa¹²¹³ <i>Petroamazonas</i> ▪ Mr. Manuel Solís¹²¹⁴ <i>Petroamazonas</i> ▪ Mr. Marco Puente¹²¹⁵ <i>Petroamazonas</i> ▪ <u>Mr. Diego Montenegro¹²¹⁶</u> <i>Petroamazonas</i> <p><u><i>Perenco’s witnesses and experts for infrastructure claim</i></u></p> <ul style="list-style-type: none"> ▪ Mr. Wilfrido Saltos¹²¹⁷ <i>Perenco Ecuador Limited</i> ▪ Mr. Eric d’Argentré¹²¹⁸
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¹²⁰⁵ See paragraph 893 of *Burlington* Decision on Counterclaims: Burlington’s expert Intertek and Ecuador’s witness, Mr. Pablo Luna, explain in detail the contents of these standards with respect to building, maintaining and replacing upstream infrastructure in the hydrocarbon industry.

¹²⁰⁶ See paragraph 894 of *Burlington* Decision on Counterclaims: Ecuador submits that the Consortium breached its obligation to invest in, maintain and return the infrastructure in good condition and in accordance with industry standards, by following a “run to failure” maintenance strategy. According to Mr. Solís, Perenco’s maintenance policy was driven by an “obsession [...] with reducing costs and making only the most indispensable minimum investments”, which “translated into a lack of operational safety.”

¹²⁰⁷ See *Burlington* Decision on Counterclaims, fn. 1895: “Reply, ¶ 486, referring to: Puente WS1, ¶ 19.”

¹²⁰⁸ See *Burlington* Decision on Counterclaims, paragraph 937 & fn. 1943: “R-PHB, ¶ 993, in reliance of testimony from Messrs. Montenegro and Luna, in particular Montenegro WS3, ¶ 19....”

¹²⁰⁹ See *Burlington* Decision on Counterclaims, paragraph 12.

¹²¹⁰ See *Burlington* Decision on Counterclaims, paragraph 913 & fn. 1908; paragraph 916: “All this evidence was further corroborated at the Hearing, during which Mr. D’Argentré explained how the equipment used in both Blocks was subject to ‘intensive oversight’ by the Government during the entire duration of the Consortium’s operations.”

¹²¹³ See Ecuador’s Counter-Memorial on Liability and Counterclaims, paragraph 915.

¹²¹⁴ *Id.*

¹²¹⁵ See e.g. Ecuador’s Reply on Counterclaims, paragraph 492, referring to Mr. Marco Puente’s testimony.

¹²¹⁶ See Resp. CM Counter-Memorial on Liability and Counterclaims, paragraph 915.

¹²¹⁷ See Cl. PHB on CC, paragraph 112.

¹²¹⁸ See Perenco’s Counter-Memorial on Counterclaims, paragraph 532.

<ul style="list-style-type: none"> ▪ <i>Perenco Ecuador Limited</i> Dr. Geoffrey R. Egan¹²¹¹ <i>Intertek</i> ▪ Mr. Alex Martinez¹²¹² <i>Burlington Resources Peru Ltd</i> 	<ul style="list-style-type: none"> ▪ <i>Perenco Ecuador Limited</i> Dr. Geoffrey R. Egan¹²¹⁹ <i>Intertek</i> ▪ Mr. Alex Martínez¹²²⁰ <i>Burlington Resources Peru Ltd</i>
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¹²¹¹ *Ibid.*, paragraph 902- Ecuador seeking to dismiss the relevance and reliability of Dr. Egan’s testimony.

¹²¹² See *Burlington* Decision on Counterclaims, paragraph 12.

¹²¹⁹ See Perenco’s Counter-Memorial on Counterclaims, paragraph 518.

¹²²⁰ See Perenco’s Post-Hearing Submission on Counterclaims, paragraph 112.