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Factual Record for Submission SEM-03-003
Lake Chapala II

Prepared pursuant to Article 15 of the North American Agreement on Environmental Cooperation

Commission for Environmental Cooperation

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Acronyms, abbreviations, and definitions

Acronyms and abbreviations

CEA-Jalisco	State Water Commission of Jalisco (*Comisión Estatal de Aguas de Jalisco*)
CEC	Commission for Environmental Cooperation
CECA	Ecological Criteria for Water Quality (*Criterios Ecológicos de Calidad del Agua*)
COBA	Clay-Organic-Bacteria Aggregate
Conagua	National Water Commission (*Comisión Nacional del Agua*)
DOF	Official Gazette of the Federation (*Diario Oficial de la Federación*)
IMTA	Mexican Institute of Water Technology (*Instituto Mexicano de Tecnológia del Agua*)
INE	National Institute of Ecology (*Instituto Nacional de Ecología*)
Inegi	National Institute of Statistics and Geography (*Instituto Nacional de Estadística y Geografía*)
Internal Regulation of Conagua	Internal Regulation of the National Water Commission (*Reglamento Interior de la Comisión Nacional del Agua*)
Internal Regulation of Semarnat	Internal Regulation of the Ministry of the Environment and Natural Resources (*Reglamento Interior de la Secretaría de Medio Ambiente y Recursos Naturales*)
JPAC	Joint Public Advisory Committee
LAN	National Waters Act (*Ley de Aguas Nacionales*)
LGEEPA	Ecological Balance and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*)
NAAEC	North American Agreement on Environmental Cooperation
NOM	Mexican Official Standard (*Norma Oficial Mexicana*)
NOM-001-SEMARNAT-1996	Mexican Official Standard NOM-001-SEMARNAT-1996 [formerly NOM-001-ECOL-1996], establishing the maximum allowable limits for pollutants in wastewater discharges into national waters and lands
PND	National Development Plan
Profepa	Office of the Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección al Ambiente*)
RETC	Mexico's Pollutant Release and Transfer Register (*Registro de Emisiones y Transferencias de Contaminantes*)
RLAN	Regulation of the National Waters Act (*Reglamento de la Ley de Aguas Nacionales*)
RNMCA	National Water Quality Monitoring Network
Semades	Ministry of the Environment and Sustainable Development of Jalisco (*Secretaría de Medio Ambiente para el Desarrollo Sustentable de Jalisco*)
Semarnat	Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*, formerly *Secretaría de Medio Ambiente, Recursos Naturales y Pesca*—Semarnap)

SNIARN	National Environmental and Natural Resource Information System
UCAJ	Legal Affairs Coordination Unit (*Unidad Coordinadora de Asuntos Jurídicos*—Semarnat)
Ucpast	Civic Participation and Transparency Coordination Unit (*Unidad Coordinadora de Participación Social y Transparencia*—Semarnat)
ZMG	Guadalajara Metropolitan Area (*Zona metropolitana de Guadalajara*)

Definitions

Agreement	The North American Agreement on Environmental Cooperation
Arcediano Project	A project for construction of a water supply dam whose wall was to be located on the Santiago River. The left abutment of the dam was to be in the municipality of Guadalajara and the right abutment will be in the municipality of Ixtlahuacán del Río, in the vicinity of the community of Arcediano.
Area of interest	Lake Chapala and the Santiago and Verde River basins in the State of Jalisco
Infomex-Federal	Public information request system of the Federal Institute of Access to Information and Personal Data Protection (*Instituto Federal de Acceso a la Información y Protección de Datos Personales*)
Infomex-Jalisco	Public information request system of the Federal Institute of Access to Information of the State of Jalisco (*Instituto Federal de Acceso a la Información del estado de Jalisco*)
Notification	SEM-03-003 (*Lake Chapala II*), Article 15(1) Notification (18 May 2005)
The Parties	The governments of Canada, Mexico, and the United States
The Party	The government of Mexico
Response	SEM-03-003 (*Lake Chapala II*), Party Response (31 March 2004)
Secretariat	The Secretariat of the CEC
Submission	SEM-03-003 (*Lake Chapala II*), Article 14(1) submission (23 May 2003)
Submitters	Fundación Lerma-Chapala-Santiago-Pacífico, A.C. Sociedad Amigos del Lago de Chapala, A.C. Instituto de Derecho Ambiental, A.C. Comité Pro-Defensa de Arcediano, A.C. Amigos de la Barranca, A.C. Ciudadanos por el Medio Ambiente, A.C. AMCRESP, A.C. Red Ciudadana, A.C. Estela Cervantes Rodrigo Saldaña

Units of Measurement, Elements and Chemical Substances, and Abbreviations used in the Factual Record

BOD_5	Biochemical oxygen demand (the amount of dissolved oxygen aerobic organisms require over five days to break down organic material)
COD	Chemical oxygen demand (the mass of oxygen in mg/L required to oxidize organic compounds in a sample of water to carbon dioxide)

CN	Cyanide
^{o}C	Degrees Centigrade (Celsius)
DO	Dissolved oxygen
DS	Dissolved solids (soluble particulate matter)
EC_{50}	Percentage of dilution of the original sample at which half the population of organisms dies
gC/m^2	Grams of carbon fixed by plants and other organisms per square meter/Measure of primary productivity of a biological system
g/person-day	Pollution load measured in grams per person per day
H_3PO_4	Orthophosphates. Phosphates presented in the form of "ortho" are produced by natural processes and are found in wastewater effluents
$K_2Cr_2O_7$	Potassium dichromate. Inorganic reagent used in analyses as an oxidizing agent
km	Kilometers
L	Liters
L/s	Liters per second
m	Meters
m.a.s.l.	Meters above sea level
μm	Micrometers (microns)
μS/cm	Micro Siemens per centimeter—measure of specific conductivity, provides an indirect measure of the content of dissolved solids (salts) in water
mg Chl*a*/m^3	Milligrams of chlorophyll-a per cubic meter. This is a measure of primary productivity that determines the concentration of chlorophyll-a in autotrophic organisms per cubic meter of water.
mg N/L	Milligrams of nitrogen per liter (bound as NH_4^- or NO_3^-)
mg O_2/L	Milligrams of oxygen per liter (free oxygen, either dissolved or gaseous)
mg/L	Milligrams per liter
mg/L $CaCO_3$	Milligrams per liter of calcium carbonate (test of water hardness)
Mm^3	Million cubic meters
mL	Milliliters
MPN/100 mL	Most probable number per 100 milliliters
ND	No data
NH_4^+	Ammonium ion
Ni	Nickel
NO_3^-	Nitrate ion. Nitrates are the form of nitrogen most essential to plants as nutrients. In excess, together with phosphates, nitrates can accelerate eutrophication of water bodies, which deleteriously affects the quantity of dissolved oxygen necessary for marine animal life, and cause toxic levels for some organisms.
NTU	Nephelometric turbidity units. This is water turbidity measured from intensity of light dispersed at 90 degrees.

O&G	Oils and grease
pH	Potential of hydrogen ions (H^+) measuring the acidity or basicity of a substance to interact with other chemical species in a solution
Pb	Lead
SS	Settleable solids. These are solid particles or nonsoluble molecules in water that will precipitate with time (measured in mL/L)
t	Metric tonnes
TKN	Total Kjeldahl Nitrogen—sum of organic nitrogen, ammonia (NH_3) and ammonium ion (NH_4^+) in chemical analysis of soil, water, or wastewater effluent
TP	Total phosphorous. Phosphorous stimulates growth of plankton, which is a source of nourishment for fish. In general and other factors considered, the presence of phosphates in elevated quantities may cause an excess of algae that may end with oxygen availability for the remaining aquatic organisms.
TDS	Total dissolved solids (expressed in mg/L)—particles smaller than 2 micrometers (μm) in diameter
temp.	Temperature
TSS	Total suspended solids (expressed in mg/L)—particles larger than 2 micrometers (μm) in diameter that are permanently suspended in water
TU	Toxicity unit: $TU=100/EC_{50}$
Zn	Zinc

Note: The Secretariat consulted the following publications for development of this table: Secofi, Official Mexican Standard NOM-008-SCFI General System of Measurement, published in the Official Gazette of the Federation (*Diario Oficial de la Federación*) on 27 November 2002; Environmental Protection Agency, "Monitoring and Assessment Water Quality— Volunteer Monitoring," <http://goo.gl/NvNlg> (viewed 21 March 2012), and M. Allaby, *Macmillan Dictionary of the Environment*, Palgrave Macmillan, 1988.

Glossary

Following is a description of certain terms used in factual record SEM-03-003 (*Lake Chapala II*)

Term	Description	Reference
eutrophication	Enrichment of waters by inorganic plant nutrients.	C.F. Mason, *Biology of Freshwater Pollution*, 3rd ed. (Harlow, Essex, UK: Longman Scientific & Technical, 1991) at 93
hydrological region	An extent of land defined in terms of its morphological, orographic, and hydrological characteristics, in which the watershed is considered to be the basic unit for the management of water resources, for the purpose of grouping together and systematizing quantitative and qualitative information, analysis, diagnostic data, programs, and actions in relation to the occurrence of water as well as its exploitation, use, or enjoyment. Normally, a hydrological region is made up of one or more watersheds. The boundaries of a hydrological region are in general distinct from political divisions into states, the Federal District, and municipalities. One or more hydrological regions make up a hydrological-administrative region. In total, there are 37 hydrological regions in Mexico.	LAN Art. 3, para. XVI (a); Inegi, "Regiones Hidrológicas," 2011, <http://goo.gl/1rbVl> (viewed 21 March 2012)
Hydrological Region 12 Lerma-Santiago	The hydrological region encompassing an area of 132,916 km^2 and comprising 58 watersheds located in the states of Mexico, Michoacán, Guanajuato, Jalisco, Aguascalientes, Zacatecas, and Nayarit. The State of Jalisco comprises the Bajo Lerma, Alto Santiago, and Bajo Santiago subregions. For further reference, please consult Figure 4.	Conagua, "Estadísticas del Agua en México, edición 2010," <http://goo.gl/nR3BF> (viewed 21 March 2012)
hydrological-administrative region	An extent of land defined in terms of hydrological criteria, made up of one or more hydrological regions, in which the watershed is considered to be the basic unit for the management of water resources and the municipality represents, and it is as in other legal instruments, the smallest unit of administrative management in the country. In total, there are 13 hydrological-administrative regions in Mexico.	LAN Art. 3, para. XVI(b); Conagua, "Regiones Hidrológicas administrativas," <http://goo.gl/6Qsk6> (viewed 21 March 2012)
Lerma-Chapala watershed	A portion of the Lerma-Chapala-Santiago-Pacífico watershed comprising an area of 59,948 km^2 (3% of the nation's territory), including portions of the states of Guanajuato (44%), Jalisco (13%), Mexico (10%), Michoacán (28%), and Querétaro (5%), with a total of 159 municipalities.	Conagua, "Consejo de Cuenca Lerma-Chapala," <http://goo.gl/js3pW> (viewed 21 March 2012)

Lerma-Chapala Watershed Council	Watershed council acting within the area of the Lerma-Chapala watershed, founded 28 January 1993. Its predecessor was the advisory council set up by decision of Conagua on 8 December 1992, the scope of whose activities is contained within the Lerma-Chapala watershed.	Conagua, "Consejo de Cuenca Lerma-Chapala," <http://goo.gl/js3pW> (viewed 21 March 2012)
Lerma-Chapala-Santiago-Pacífico watershed	The hydrological system made up of the Lerma River, Lake Chapala, and Santiago River basins and comprising an area of 190,438 km^2, which represents 13 percent of the area of Mexico.	Conagua, "Programa Nacional Hidráulico 2001-2006," <http://goo.gl/J4bV5> (viewed 21 March 2012)
Lerma-Santiago-Pacífico Watershed Authority	Water authority headquartered in the city of Guadalajara, Jalisco, that is charged with the administration of Hydrological Region VIII, Lerma-Santiago-Pacífico, and comprising the municipalities listed in Article Eleventh Transitory of the Internal Regulation of Conagua.	Internal Regulation of Conagua, Art. 11 Transitory, para. VIII; Decision determining the territorial jurisdiction of the watershed authorities of the National Water Commission, DOF, 12 December 2007
Region VIII, Lerma-Santiago-Pacífico	One of the 13 hydrological-administrative regions, administered by the Lerma-Santiago-Pacífico Watershed Authority. For further reference, see Figure 4.	Internal Regulation of Conagua, Art. 6, para. VIII, and Art. 11 Transitory, para. VIII
oligotrophic	Refers to environments that offer little to sustain life, with low nutrient content and low plant growth	C.F. Mason, *Biology of Freshwater Pollution*, 3rd ed. (Harlow, Essex, UK: Longman Scientific & Technical, 1991) at 93
watershed authority	A specialized and autonomous technical, administrative and legal unit reporting directly to Conagua. In the area of watersheds, hydrological regions, and hydrological-administrative regions, Conagua exercises water-related authority through the watershed authorities. Due to their specialized nature and the specific powers vested in them by the LAN, the watershed authorities act with executive, technical, and administrative autonomy in the exercise of their duties and in the management of the assets and resources assigned to them. Each watershed authority is headed by a director general who is directly subordinate to the director general of Conagua and whose duties include but are not limited to directing and legally representing the watershed authority, issuing acts of authority, issuing concessions for basic public water supply and other uses, and issuing effluent discharge permits, among others.	LAN Arts. 3, para. XXXIX, 12 *bis*, 12 *bis* 1, and 12 *bis* 2

watershed council	Multi-stakeholder body of mixed integration that operates as a forum for the coordination, consensus building, support, consultation and advising between Conagua and the agencies of the federal, state and municipal governments, on the one hand, and the representatives of water users and civic organizations in the respective watershed or hydrological region on the other.	LAN, Article 3, paragraph XV
watershed or basin	An extent of land normally delimited by a water parting or continental divide, where water occurs in various forms and is stored or flows towards an exit point, which may be the ocean or another inland receiving body, through a hydrographic system of watercourses converging into one main watercourse; alternately, a watershed is an extent of land on which the waters form a unit that is autonomous or differentiated from others, even if the waters do not drain into the ocean. The watershed, together with the aquifers, constitutes the unit of management of water resources. The watershed is, in turn, made up of subwatersheds, which are made up of microwatersheds.	LAN Art. 3, para. XVI

Notes of clarification

Due to the length of some of the Internet addresses referred to in this document, Google Shortener <http://goo.gl/> was used to abbreviate the URLs. In each case, the functionality of the corresponding link was checked and the viewing date was specified.

Maps and figures within this factual record were produced from publicly available sources, are not to scale, and are for illustrative purposes only.

1. Executive Summary

1. Articles 14 and 15 of the North American Agreement on Environmental Cooperation (the "NAAEC" or the "Agreement") provide for a process allowing any person or nongovernmental organization to file a submission asserting that a Party to the NAAEC is failing to effectively enforce its environmental law. The Secretariat of the Commission for Environmental Cooperation (the "Secretariat")[1] initially considers submissions to determine whether they meet the criteria contained in NAAEC Article 14(1). When the Secretariat finds that a submission meets these criteria, it then determines, pursuant to the provisions of NAAEC Article 14(2), whether the submission merits a response from the concerned Party. In light of any response from the concerned Party, and in accordance with NAAEC, the Secretariat may notify the Council that the matter warrants the development of a factual record, providing its reasons for such recommendation in accordance with Article 15(1). Where the Secretariat decides to the contrary it then proceeds no further with the submission.[2]

2. On 23 May 2003, the following filed a submission with the Secretariat of the CEC in accordance with NAAEC Article 14(1):[3] Fundación Lerma-Chapala-Santiago-Pacífico, A.C.; Sociedad Amigos del Lago de Chapala, A.C.; Instituto de Derecho Ambiental, A.C.; Comité Pro-Defensa de Arcediano, A.C.; Amigos de la Barranca, A.C.; Ciudadanos por el Medio Ambiente, A.C.; AMCRESP, A.C.; Red Ciudadana, A.C.; Estela Cervantes and Rodrigo Saldaña (together, the "Submitters"), represented by Raquel Gutiérrez Nájera and Yolanda García del Ángel. In submission SEM-03-003 (*Lake Chapala II*) (the "Submission"),[4] the Submitters assert that Mexico (the "Party") is failing to effectively enforce its environmental law with respect to the management of water resources in the Lerma-Chapala-Santiago-Pacífico watershed, resulting in serious environmental degradation and water imbalance in the watershed, as well as the risk that Lake Chapala and the habitat it provides for migratory birds could disappear.

3. Specifically, the Submitters assert that Mexico is failing to guarantee effective civic participation in environmental policy with respect to decisions relating to the watershed.[5] Furthermore, the Submitters assert that the Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat) is failing to enforce Article 133 of the General Ecological Balance and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA) since it is not conducting systematic and ongoing monitoring of water quality in the Santiago River, which the Submitters assert has consequences for the health of the area's residents.[6] The Submitters maintain that Semarnat is failing to apply criteria for the sustainable use of water and aquatic ecosystems pursuant to LGEEPA Article 88 by allowing the construction of the Arcediano dam on the Santiago River.[7] The Submitters further maintain that the National Water Commission (*Comisión Nacional del Agua*—Conagua) is delegating decisions related to water use and distribution in the area to the Lerma-Chapala Watershed Council and, therefore, contends that it is failing to effectively enforce those provisions of the National Waters Act (*Ley de Aguas Nacionales*—LAN) that grant Conagua water-related authority and decision-making responsibility.[8]

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1. The Commission for Environmental Cooperation (CEC) was created in 1994 under the North American Agreement on Environmental Cooperation (NAAEC) concluded by Canada, Mexico and the United States (the "Parties"). The CEC comprises a Council, a Secretariat and a Joint Public Advisory Committee (JPAC).
2. Full details regarding the various stages of the process as well as previous Secretariat determinations and factual records can be found on the CEC website at <http://www.cec.org/citizen/>.
3. SEM-03-003 (*Lake Chapala II*), Article 14(1) Submission (23 May 2003), <http://goo.gl/g2pTT> (viewed 21 March 2012). See also Appendix 2. Note: page numbers of the submission referred to in this Factual Record correspond to the original Spanish version of the submission.
4. On 9 December 1997, the Secretariat received submission SEM-97-007 (*Lake Chapala*), which was terminated by a determination pursuant to Article 15(1) dated 14 July 2000, <http://goo.gl/uz4GQ> (viewed 21 March 2012). On submission SEM-97-007 the submitters alleged that authorities were failing to enforce environmental laws, concerning a citizens' complaint (*denuncia popular*) with a view to declare a state of "environmental emergency" in the Lake Chapala ecosystem.
5. Submission, *supra* note 3 at 8.
6. *Ibid.* at 12.
7. *Ibid.* at 9.
8. *Idem.*

4. On 19 December 2003, the Secretariat determined that the Submission met all the admissibility requirements of NAAEC Article 14(1) and requested a Party response to the submission in accordance with Article 14(2).[9] On 31 March 2004, Mexico filed a response to submission SEM-03-003 (*Lake Chapala II*) pursuant to NAAEC Article 14(3) (the "Response").[10]

5. Mexico asserts that it has enforced LGEEPA Article 88, paragraph I, in connection with the application of criteria for the sustainable use of water and aquatic ecosystems to the Arcediano Project[11] and discusses the scope of the geographical area of concern in the Submission.[12] Mexico explains that civic participation under LGEEPA Articles 18 and 157 is guaranteed through various fora and activities for the development of environmental planning instruments, and describes these instruments at different planning levels.[13] Mexico also provides examples of public consultations and meetings that have been held in the area relevant to the Submission.[14] Mexico responds that it has enforced a systematic monitoring of water quality as set forth in LGEEPA Article 133 through the National Water Quality Monitoring Network.[15] Mexico asserts that there are examples of inspection and enforcement activities conducted along the Santiago River[16] and states that construction of wastewater treatment plants is under consideration in the State of Jalisco.[17] Mexico further explains that the watershed councils play a role in coordination and consensus-building during the decision-making process, but denies any delegation of authority to the watershed councils by Conagua.[18]

6. On 18 May 2005, after reviewing submission SEM-03-003 in light of the Response, the Secretariat notified the CEC Council (the "Council") that it considered the Submission warranted the development of a factual record.[19] On 30 May 2008, by means of Resolution 08-01, the Council decided unanimously to instruct the Secretariat to develop a factual record with respect to submission SEM-03-003.[20]

7. In accordance with Council Resolution 08-01, this factual record presents relevant factual information relating to the assertions and to the provisions of environmental law listed below:

   (i) The effective enforcement of LGEEPA Articles 5, paragraph XI, and 133, with respect to the preservation of the quality of national waters as well as the systematic and ongoing monitoring of water quality in Lake Chapala and in the Santiago and Verde River basins, up to the projected site of the Arcediano dam wall.[21] It should be noted that LGEEPA Article 5, paragraph XI, establishes Semarnat's authority acting through Conagua to preserve and protect the quality of national waters in the area of interest. Relevant factual information is presented on enforcement actions of the above provisions by Mexico;

   (ii) The effective enforcement of LGEEPA Articles 5, paragraph XVI, 18, and 157 in regard to guarantees of effective public participation in the design of environmental policy instruments in Mexico;

   (iii) The effective enforcement of LGEEPA Article 78 concerning the formulation of ecological restoration programs; and,

   (iv) The effective enforcement of LGEEPA Articles 161 and 170 and LAN Article 9, paragraphs I and XIII,[22] concerning inspection and vigilant

9. SEM-03-003 (*Lake Chapala II*), Determination pursuant to Article 14(1)(2) (19 December 2003), <http://goo.gl/8kjLW> (viewed 21 March 2012).
10. SEM-03-003 (*Lake Chapala II*), Party Response pursuant to Article 14(3) (31 March 2004), <http://goo.gl/PsnrR> (viewed 21 March 2012).
11. *Ibid*. at 56-57.
12. *Ibid*. at 26-27.
13. *Ibid*. at 39-54.
14. *Ibid*. at 50-55.
15. *Ibid*. at 58-60.
16. *Ibid*. at 60-62.
17. *Ibid*. at 63.
18. *Ibid*. at 65-68.
19. SEM-03-003 (*Lake Chapala II*), Notification pursuant to Article 15(1) (18 May 2005), <http://goo.gl/9UhMA> (viewed 21 March 2012).
20. SEM-03-003 (*Lake Chapala II*), Council Resolution 08-01 (30 May 2008), <http://goo.gl/JsWd3> (viewed 21 March 2012).
21. Regarding to the scope of this factual record, see *infra* Section 4.
22. According to Council Resolution 08-01, the Secretariat only includes provisions which main object is water quality.

monitoring as well as the application of safety measures.

8. Pursuant to NAAEC Article 15(5), on 28 May 2012, the Secretariat submitted the draft factual record for submission SEM-03-003 (*Lake Chapala II*) to Council, the date from which the Parties had 45 days to provide any comments regarding the accuracy of this draft.[23]

9. On 31 July 2012, Canada provided comments to the draft factual record; Mexico and the United States provided their comments on 1 August 2012. In accordance with Article 15(6) of the Agreement,[24] the Secretariat incorporated, as appropriate, these comments in the final version of the factual record and submitted it to the Council on 9 October 2012 for its vote pursuant to Article 15(7) of the Agreement.[25]

2. Summary of the Submission

10. The Submitters assert that Mexico is failing to effectively enforce its environmental law in connection with the management of water resources in the Lerma-Chapala-Santiago-Pacífico watershed.[26] The Submitters assert that this enforcement failure is causing serious environmental degradation and water imbalance in the watershed as well as the risk that Lake Chapala could disappear along with the habitat that it provides for migratory birds.[27] The Submitters cite the pollution of the Santiago River,[28] which allegedly has serious negative impacts on the health of the residents of Juanacatlán,[29] and also cite the low water level in Lake Chapala,[30] which is allegedly jeopardizing the habitat of the White Pelican.[31]

11. The Submitters further assert that Mexico is failing to effectively enforce LGEEPA Article 133, which requires the authorities to conduct "systematic and ongoing monitoring of water quality"[32] and LGEEPA Article 5, paragraph XI, with respect to the asserted failure to implement actions towards the restoration of the watershed.[33] The Submitters cite as an example of water quality deterioration the situation experienced by the residents of the community of Juanacatlán, with respect to which, the Submitters assert, both Semarnat and Conagua "have been totally negligent and insensitive."[34] The Submitters insist that despite their complaints about the pollution of the Santiago River, the authorities are not conducting systematic and ongoing monitoring of water quality.[35] The Submitters assert that they have filed complaints regarding the water quality problems generated by municipal and industrial wastewater discharges and the consequences thereof for residents' health.[36]

12. Concerning effective civic participation in the Lerma-Chapala watershed council, the Submitters assert that Mexico is failing to effectively enforce LGEEPA Article 18, which provides for the participation of social groups in the development of programs whose purpose is the preservation and restoration of ecological balance and environmental protection.[37] The Submitters assert that the Party is failing to guarantee effective civic participation in environmental policy during meetings of

23. "The Secretariat shall submit a draft factual record to the Council. Any Party may provide comments on the accuracy of the draft within 45 days thereafter."
24. "The Secretariat shall incorporate, as appropriate, any such comments in the final factual record and submit it to the Council."
25. "The Council may, by a two-thirds vote, make the final factual record publicly available, normally within 60 days following its submission."
26. Submission, *supra* note 3 at 1.
27. *Idem.*
28. *Ibid.* at 7 and 12 and Appendix XXV.
29. *Ibid.* at 7.
30. *Ibid.* at 3.
31. *Ibid.* at 6-7 and Appendix XXIV.
32. Ecological Balance and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA), published in the Official Gazette of the Federation (*Diario Oficial de la Federación*—DOF), 28 January 1988, Art. 133.
33. Submission, *supra* note 3 at 8.
34. *Ibid.* at 12.
35. *Idem.*
36. *Ibid.* at 6-7.
37. *Ibid.* at 8.

the Lerma-Chapala watershed council in which they participated.[38] According to the Submitters, the solutions they proposed in the context of conservation, preservation, and restoration programs for the watershed, only resulted in "an endless series of drafts" which were never implemented.[39]

13. The Submitters moreover assert that Mexico is failing to effectively enforce LGEEPA Articles 161 and 170, and LAN Article 9, paragraphs I and XIII, with respect to use of authority to conduct inspection and "vigilant monitoring" of water quality.[40] The Submitters maintain the alleged "absence of authority"[41] and the lack of "legal acts" for the conservation, sustainable management, preservation, and use of water in the Lerma-Chapala-Santiago-Pacífico watershed.[42] The Submitters further maintain that Conagua is delegating decisions about water use and distribution in the area to the Lerma-Chapala watershed council, thereby failing to effectively enforce those provisions of the LAN that vest in Conagua the authority and responsibility to make such decisions.[43] According to the Submitters, in Mexico, decisions on water management and distribution in a watershed are usually made by the watershed councils and are not subject to review, because watershed councils are not considered "authorities" under the LAN by Conagua.[44]

14. The Submitters further assert that Mexico is failing to effectively enforce LGEEPA Articles 88, 89, 90, and 91.[45] The Submitters contend that Mexico is failing to exercise its powers in the sense that relevant authorities are not applying the criteria for the management, protection, and sustainable enjoyment of water and aquatic ecosystems.[46] The Submitters cite as an example the Arcediano dam project planned for the Huentitán gorge on the Santiago River (the "Arcediano Project" as defined in the Environmental Impact Statement for the Arcediano dam project).[47] The Submitters assert that Mexico is moving ahead with construction of a dam that would use water from the Santiago and Verde Rivers "without prior restoration of ecological balance."[48] The Submitters also maintain there was alleged failure to enforce LGEEPA Article 78 with respect to the development of ecological restoration programs,[49] and assert that, despite having been consulted with respect to preparation of programs for the conservation, preservation and restoration of the watershed, no such programs were ultimately developed and implemented.[50]

3. Summary of Mexico's Response[51]

15. Mexico opines on the Submission's territorial scope and posits that it overstates the land area affected, stating that the Submission erroneously cites the whole of the Lerma-Chapala-Santiago-Pacífico watershed, whereas—according to Mexico—the facts stated by the Submitters are concentrated primarily in the areas of Lake Chapala, Arcediano, and Juanacatlán, including the part corresponding to the Santiago and Verde Rivers; an area which also according to Mexico encompasses only the Lerma-Chapala watershed (Lerma subregion) in the State of Jalisco.[52]

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38. *Idem*.
39. *Idem*.
40. *Ibid.* at 7.
41. *Ibid.* at 9.
42. *Ibid.* at 13.
43. *Ibid.* at 10.
44. *Ibid.* at 4, 5, 13.
45. *Ibid.* at 7, 9.
46. *Ibid.* at 12.
47. *Ibid.* at 9. See also, "Arcediano Project" in the List of Definitions, *supra*.
48. Submission, *supra* note 3 at 12.
49. *Ibid.* at 7.
50. *Ibid.* at 8.
51. For issues addressing the alleged inadmissibility of the submission, see Response, *supra* note 10 at 3-18.
52. Response, *supra* note 10 at 26.

16. Following is a summary of central questions addressed by Mexico in its Response, including: systematic and ongoing monitoring of water quality; civic participation; operation of the watershed councils; criteria for the sustainable use of water and aquatic ecosystems, and inspection and vigilant monitoring.[53] Also, below is outlined, as applicable, information related to the Arcediano project.[54]

3.1 Systematic and ongoing monitoring of water quality

17. Concerning the assertions of a failure to effectively enforce LGEEPA Article 133, Mexico responds that Conagua has, since 1974, been operating the National Water Quality Monitoring Network (*Red Nacional de Monitoreo de la Calidad del Agua*—RNMCA) which purpose is "to provide a system of up-to-date, reliable information serving to measure, analyze, and assess water quality at sites of national interest [...]"[55] Mexico states that the RNMCA currently operates 912 monitoring sites throughout the country and that, in the case of the Santiago River, it operates twelve sites, five of which are located in the portion of the river corresponding to the State of Jalisco.[56] The Party states that the five water quality monitoring sites on the Santiago River are located at:

    a. Santiago River-Cuitzeo-Ocotlán;

    b. Santiago River-Poncitlán Bridge;

    c. Santiago River-Corona Diversion Dam;

    d. Santiago River-El Salto-Juanacatlán/right bank of La Aurora Canal; and,

    e. Santiago River-Guadalupe Bridge.[57]

18. Mexico states that the information generated by the RNMCA "is fundamental to water quality administration, which means the planning of activities with the specific goals of controlling, maintaining, and improving the quality of the resource in an aquatic system, with the aim of preserving the balance between water abstraction and the use of the system as a receiving body."[58] The Party further explains that the 912 RNMCA monitoring sites are divided into the following components:

    a. a Primary Network, which generates descriptive, long-term information on the country's most important bodies of water;

    b. a Secondary Network, which generates information to support pollution regulation and control activities;

    c. Special Studies, which is an *ad hoc* component arising from the need for specific data to support the components of the RNMCA; and,

    d. a Groundwater Reference Network, which generates descriptive, long-term information on groundwater hydrogeology.[59]

19. Mexico states that the data generated by water quality monitoring are evaluated each year and indicates that it has plans to conduct evaluations every six months until real-time monitoring can be implemented.[60] In light of the foregoing, Mexico maintains that it is complying with its legal obligation to carry out systematic and ongoing monitoring of water quality.[61]

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53. Regarding the scope of this factual record, see *infra* Section 4.
54. No summary of the Party Response is provided regarding those assertions that are not relevant to the environmental law in question (e.g., the declaration of a forestry zone, the possible impact on the Arcediano Bridge, the public consultation on the Arcediano Project, and matters relating to water distribution).
55. Response, *supra* note 10 at 58.
56. *Ibid.* at 59.
57. *Ibid.* at note 57.
58. *Ibid.* at 59.
59. *Ibid.* at 59-60.
60. *Ibid.* at 60.
61. *Idem.*

3.2 Civic participation

20. Concerning the assertion of a failure to effectively enforce LGEEPA Articles 18 and 157 regarding the obligation to guarantee effective civic participation in environmental planning and programming, Mexico asserts that the Submitters have at their disposal "various fora, means, and activities for public participation in the development of programs and instruments for environmental planning, implementation, and assessment."[62] The Party maintains that civic participation in environmental matters is enabled by the democratic planning system established in the Constitution, with specific reference to the following instruments:[63]

    a. National Development Plan (*Plan Nacional de Desarrollo*—PND);[64]

    b. National Environment and Natural Resources Program (*Programa Nacional de Medio Ambiente y Recursos Naturales*);[65]

    c. National Water Program (*Programa Nacional Hidráulico*);[66]

    d. regional water programs;[67] and,

    e. Region VIII, Lerma-Santiago-Pacífico Water Program.[68]

21. Mexico states that the National Development Plan 2001-2006 is "the master instrument guiding the entire federal public administration, constituting the basic planning instrument of the federal executive over a six-year horizon, and presenting the principles, goals, and strategies that will guide activities over the coming years."[69] The Party states that the PND development process includes consultation with civil society through direct mail and Internet surveys, and public consultations where a total of 174,865 persons participated and presented a total of 379,525 proposals that were considered in the elaboration of the PND.[70] Once the PND is established, Mexico notes there is a second level of planning through the sectoral programs, in this case the National Environment and Natural Resources Program, which "specifies the goals, strategies, and policy to be implemented in the area of environment and sustainable development." Having gathered information through 125 public consultation meetings[71] Mexico states that:

> [...] the PND and the National Environment and Natural Resources Program are not, strictly speaking, finalized instruments, but stages in a process serving to structure civic initiatives, achieve concrete objectives, and orient the country toward a long-term vision.[72]

22. Mexico states that the third level of planning takes place through the National Water Program.[73] This program was developed with the broad participation of users, local authorities, non-governmental organizations and citizens, generally through two consultation bodies: the watershed councils and their auxiliary organs, and the Water Advisory Council (*Consejo Consultivo del Agua*).[74] During the development of the National Water Program, consultation forums were held with experts, and a process was carried out in which public comment was received via mail and the Internet.[75] Mexico also reports that in order to develop the National Water Program, it held a total of 1,463 public consultation meetings between 1998 and 2001. The meetings were among watershed councils, assemblies of users, follow-up and evaluation groups, specialized task forces, watershed commissions,

62. *Ibid.* at 39.
63. *Ibid.* at 40-49. Although included in the response, pursuant to Council Resolution 08-01, information concerning public participation in the Arcediano Project is excluded from this list.
64. Response, *supra* note 10 at 40-42.
65. *Ibid.* at 42-43.
66. *Ibid.* at 43-47.
67. *Ibid.* at 47-48.
68. *Ibid.* at 48-49.
69. *Ibid.* at 40 (note 45).
70. *Ibid.* at 40-42.
71. *Ibid.* at 42.
72. *Ibid.* at 43.
73. *Ibid.* at 44.
74. *Ibid.* at 45.
75. *Ibid.* at 43-47.

watershed committees, and technical committees for underground waters.[76]

23. The National Water Program provides the basis for the next level of planning: hydraulic regional programs. Regional programs are developed out of information gathered during consultations for the National Water Program. The function of Regional programs is to organize the scope of hydraulic policy and allow for a diagnosis of the current situation at the regional level in terms of water availability and water quality, use, end-use, users' requirements and investment portfolio.[77] At this point, the main purpose for the Water Program for Region VIII, Lerma-Santiago-Pacífico's is to establish a rational use of water that can support the sustainable development of the Region. It presents a diagnosis of the current situation and future water needs, and describes the obstacles faced by each of the subregions. To address every problem identified, a goal of impact reduction or elimination is established, such as "making progress on the comprehensive cleanup of watersheds, starting with those where pollution is causing negative impacts on health, the economy, and the environment."[78] Mexico notes that due to the large size of Region VIII, it is divided following a watersheds criterion, the basic unit of national planning and regionalization. Thus, Region VIII is divided into three subregions: Lerma, Santiago, and Pacífico.[79] The Response states that for each subregion, a specific study was performed to determine the appropriate actions, with particular emphasis on the structures required to meet water requirements of users, to preserve sources of supply, and to contribute to the promotion of economic and social development of the Region during the 2001-2025 period.[80]

24. Mexico, taking into account the above, notes in its Response that participation of civil society in environmental matters, including planning, execution, assessment and vigilant monitoring of environmental policy has been promoted and guaranteed.[81]

3.3 Operation of the watershed councils

25. Concerning the assertion of an alleged failure to enforce LAN Article 4 in relation to the exercise of authority and in connection with the delegation of decision-making powers over water administration to the watershed councils, Mexico asserts that the watershed councils, although part of Conagua are not water authorities as such; but rather auxiliary units intended to facilitate consensus-building and coordination, and they function to assist Conagua in the planning, programming, management, control, supervision, and assessment of the work to be performed.[82] The Party indicates that the watershed councils are a form of region-by-region organization dealing with one or several watersheds, and allowing Conagua to administer water with the participation of its users.[83] Likewise, it notes that decisions of the watershed councils are not binding except insofar as the authorities adopt these decisions.[84]

26. Mexico notes that the Regulation to the National Waters Act (*Reglamento de la Ley de Aguas Nacionales*—RLAN) provides that the watershed councils are empowered to coordinate—along with Conagua—water use priorities and responses to situations of emergency, scarcity, overexploitation, water pollution or damages to assets under Conagua's jurisdiction. Moreover, watershed councils may form work committees for the purpose of analyzing and providing solutions and recommendations in matters concerning water administration.[85]

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76. *Ibid*. at 44-45.
77. *Ibid*. at 48.
78. *Ibid*. at 48-49.
79. *Ibid*. at 48.
80. *Ibid*. at 49.
81. *Ibid*. at 55.
82. *Ibid*. at 65-66.
83. *Idem.*
84. Response, *supra* note 10 at 66.
85. *Ibid*. at 66-67.

3.4 Criteria for the sustainable use of water and aquatic ecosystems

27. Concerning the assertion of an alleged failure to effectively enforce LGEEPA Article 88, paragraph I, in connection with the application of criteria for the sustainable use of water and aquatic ecosystems, Mexico notes that it has applied such criteria, for example when a draft order declaring the Oblatos-Huentitán Gorge on the Santiago River a natural protected area was ruled invalid because, the Party asserts, the category of natural protected area proposed by the municipality of Guadalajara was not within municipal jurisdiction under Article 45 of the Ecological Balance and Environmental Protection Act of the State of Jalisco.[86]

28. Mexico asserts in its Response that it has enforced the criteria in LGEEPA Articles 88 and 89 with regard to the Arcediano project.[87] Mexico asserts that the intended location of the Arcediano project was defined on the Santiago River in order to preserve the Verde River, which is—according to the Party—in better condition now,[88] and that the Arcediano project would reduce an estimated volume of 200 million cubic meters per year of water extracted from Lake Chapala, resulting in the overall recovery of the lake.[89] According to Mexico, due to contamination levels in the Santiago and Verde rivers caused by untreated municipal and industrial wastewater discharges, Semarnat established as a condition to the environmental impact authorization for the Arcediano project, control of contamination sources by means of collection, channeling, and treatment of all wastewater from the surrounding localities.[90] Mexico asserts that Semarnat also established, as other conditions to the environmental impact authorization, that the Arcediano site be gradually cleared in order to allow the displacement of wild fauna;[91] that a natural protected area be created adjacent to the Arcediano project;[92] that the ecological water flow is ensured during construction and operation of Arcediano;[93] and, that flora and fauna rescue, transplant, reforestation and site restoration be implemented.[94] In addition, Mexico reported that water treatment works associated with the Arcediano project were to be conducted by the government of the State of Jalisco, through the State Water Commission of Jalisco (*Comisión Estatal del Agua de Jalisco*—CEA-Jalisco), a decentralized body of the State of Jalisco. These activities included treatment plants in Agua Prieta, Santa María Tequepexpan, El Ahogado, Coyula, Coyula-*Lixiviados* (leachates), and Puente Grande.[95] In addition, CEA-Jalisco considered the construction of a collector tunnel for the San Gaspar, Osorio, and San Andrés basins as well as a drinking water treatment plant.[96]

29. The Response notes that Jalisco has 73 wastewater treatment plants currently operating.[97] Mexico states that conclusion of a coordination agreement between the federal executive and the Jalisco executive is contributing to cleanup of the watershed, since the agreement provides for the construction of three new wastewater treatment plants in Atotonilco El Alto, Tototlán, and Cuitzeo.[98] Furthermore, it anticipates the rehabilitation of the existing plants at Poncitlán, Atequiza, El Salto, and Juanacatlán, which will improve the quality of 122 L/s of treatment as well as contributing an additional 108 L/s of capacity which was, according to Mexico, to have concluded by the end of calendar year 2004 and which should contribute to the

86. *Ibid*. at 56.
87. *Ibid*. at 18-19, 31-32.
88. *Ibid*. at 25, 57.
89. *Ibid*. at 36.
90. *Ibid*. at 57.
91. *Ibid*. at 25.
92. *Ibid*. at 20.
93. *Ibid*. at 20-21.
94. *Ibid*. at 21-25.
95. *Ibid*. at 36, 57.
96. *Ibid*. at 57. Note: The wastewater treatment plants that were eventually retained in the treatment plan for the Guadalajara metropolitan area are: El Ahogado, which will treat wastewater from Santa María Tequepexpan, and Agua Prieta, which will receive the wastewater destined for the Coyula plant through a collecting tunnel. The wastewater from Puente Grande will be pumped to the El Salto plant. Conagua, CEA-Jalisco and Government of the State of Jalisco, "Programa Integral de Saneamiento y Abastecimiento para la Zona Conurbada de Guadalajara," Macromedia Flash format, 23 August 2007.
97. *Ibid*. at 63.
98. Response, *supra* note 10 at 58.

cleanup of the Lerma-Chapala and Alto Santiago watershed.[99]

30. The Response also refers to a comprehensive cleanup program for the Lerma-Chapala-Santiago-Pacífico watershed that will include, as one of its components, the implementation of a complementary cleanup program at an estimated cost of 1.2 billion pesos, in addition to 23 watershed cleanup investment proposals for 2004–2005.[100]

3.5 Inspection and vigilant monitoring

31. Concerning the assertion of an alleged failure to effectively enforce LAN Article 9, paragraph XIII, relating to the performance of acts of inspection and vigilant monitoring of water quality, Mexico asserts that the 2002–2006 Regional Water Program for Region VIII, Lerma-Santiago-Pacífico, allocated a budget of 7.2 million pesos for measurement and inspection visits related to water quality control in the states of Guanajuato, Jalisco, and Querétaro.[101]

32. Mexico states that in the period 2001–2003, 635 inspection visits were made to users of national waters and national receiving bodies of water located in the State of Jalisco.[102] As regards the enforcement of Mexican Official Standard NOM-001-SEMARNAT-1996, *Establishing maximum allowable limits for pollutants in wastewater discharges into national waters and property*, Mexico notes that from 2000–2001, it audited 25 users of wastewater receiving bodies engaging in industrial, commercial, and service activities.[103] The latter audit found that three of the users complied with discharge quality standards while the remaining 22 exceeded the maximum allowable limits established by the standard, and that administrative proceedings leading to the application of sanctions were instituted as a result of this audit and were pending resolution at the time of the response.[104]

33. According to Mexico, the branch Office of the Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección al Ambiente*—Profepa) in Jalisco also carried out inspections and vigilant monitoring actions through the State of Jalisco, with a total of 125 site visits between 1998 and 2003 in the municipalities of Zapotlán El Grande, El Salto, Zapotlanejo, Tonalá, Tequila, Ixtlahuacán de los Membrillos, Amatitán, and Ocotlán.[105]

4. Scope of the factual record

34. This section describes the scope of the factual record for submission SEM-03-003 (*Lake Chapala II*), filed with the CEC Secretariat on 23 May 2003.

35. Council Resolution 08-01 reads as follows:

> Instruction to the Secretariat of the Commission for Environmental Cooperation regarding the assertion that Mexico is failing to enforce Articles 1, 2, 5, 18, 78, 79, 80, 83, 88, 89, 133, 157, 161, 162, 163, 164, 165, 167, 168, 169 and 170 of the General Law on Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*) and 3 of its Environmental Impact Regulations (*Reglamento en materia de impacto Ambiental*) [*sic*]; 1, 2, 3, 4, 7 and 9 of the National Water Law (*Ley de Aguas Nacionales*) and 2 of its Regulations; as well as Article 44 of the Internal Regulations of the Secretariat of the Environment and Natural Resources (*Reglamento Interior de la Secretaría de Medio Ambiente y Recursos Naturales*) (SEM 03-003).
>
> THE COUNCIL:
>
> SUPPORTIVE of the process provided for in Articles 14 and 15 of the North American Agreement on Environmental Cooperation (NAAEC) regard-

99. *Ibid*. at 35 and 58.
100. *Ibid.* at 63.
101. *Ibid.* at 73.
102. *Ibid*., at Table IV.1. Inspection visits conducted in 2001–2003.
103. *Ibid*. at 74.
104. *Idem*.
105. *Idem*. The response indicates that Profepa conducted such actions "in industries with effluents into the Santiago River."

ing submissions on enforcement matters and preparation of factual records;

CONSIDERING the submission filed on 23 May 2003, by the Fundación Lerma-Chapala-Santiago-Pacífico A.C., Sociedad Amigos del Lago de Chapala A.C., Instituto de Derecho Ambiental, A.C., residents of the community of Juanacatlán, Jalisco, Comité Pro-Defensa de Arcediano A.C., Amigos de la Barranca, A.C., Ciudadanos por el Medio Ambiente, A.C., AMCRESP, A.C., and Red Ciudadana, A.C., and the response provided by Mexico on 30 March 2004;

HAVING REVIEWED the notification of 15 May 2005, submitted to the Council by the Secretariat, recommending the development of a factual record with respect to the submission;

MINDFUL that Mexico notified the Secretariat, in accordance with Article 14(3) of NAAEC, that there were three administrative proceedings, one of which has since been closed, and one judicial proceeding pending resolution;

ALSO MINDFUL that Mexico notified the Secretariat that it considers that the subject of water distribution should not be the subject of a submission as it is not environmental law as defined by Article 45(2) of NAAEC;

FURTHER CONSIDERING that it was clarified to the Secretariat in the Party's response that the Lerma-Chapala-Santiago-Pacífico basin comprises an area of 190,438 km^2 and represents 13 percent of Mexican territory, which does not coincide with the area covered by the allegations of the submission, since those allegations address the Lerma-Chapala watershed (Lerma subregion), corresponding to one part of the basin located in the State of Jalisco;

HEREBY UNANIMOUSLY

INSTRUCTS the Secretariat to develop a factual record in accordance with the above-noted considerations, as well as Article 15 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation*, except in the following ongoing proceedings: 120/2003 (*Guadalupe Lara Lara*), 41/2004 (*Sociedad Cooperativa de Producción Insurgentes de la Isla de Mezcala, S.C.L.*) and 67/2004 (*Guadalupe Lara Lara*);

REQUESTS the Secretariat to describe actions undertaken by Mexico in compliance with the regulations cited in the title of this decision, but to refrain from including any form of assessment of the effectiveness of the Party's policies or legislation;

FURTHER REQUESTS that the Secretariat limit the factual record to the area containing the Arcediano dam, within the Lerma-Chapala watershed (Lerma subregion) in the State of Jalisco, as identified in the Submission;

ALSO REQUESTS the Secretariat to refrain from consideration of legislation, or provisions thereof, primarily addressing issues of water distribution;

DIRECTS the Secretariat to provide the Parties with its overall work plan for gathering relevant facts and with the opportunity to comment on that plan; and,

FURTHER DIRECTS the Secretariat to consider, in developing a factual record in respect of allegations that the Party is failing to enforce the aforementioned sections of its law, the relevant facts since the entry into force of the NAAEC on 1 January 1994. Facts prior to 1 January 1994 may be included if necessary for the development of the history presented in the factual record and if directly related to the submission.

36. In following Council Resolution 08-01, this factual record thus presents information relevant to the following issues:

(i) The effective enforcement of LGEEPA Articles 5, paragraph XI, and 133, with respect to the preservation of the quality of national waters as well as the systematic and ongoing monitoring of water quality in Lake Chapala, and in the Santiago and Verde River basins, up to the projected site of the Arcediano dam wall. It should be noted that LGEEPA Article 5, paragraph XI, establishes Semarnat's authority, acting through Conagua, to preserve and protect the quality of national waters in the area of interest. On this matter, relevant factual information is presented on enforcement actions of the above provisions by Mexico;

(ii) The effective enforcement of LGEEPA Articles 5, paragraph XVI, 18, and 157 in regard to guarantees of effective public participation in the design of environmental policy instruments in Mexico;

(iii) The effective enforcement of LGEEPA Article 78 concerning the formulation of ecological restoration programs; and,

(iv) The effective enforcement of LGEEPA Articles 161 and 170 and LAN Article 9, paragraphs I and XIII,[106] concerning inspection and vigilant monitoring as well the application of safety measures.

37. This factual record in accordance with Council Resolution 08-01 excludes information concerning:

(i) ongoing proceedings 120/2003 (*Guadalupe Lara Lara*), 41/2004 (*Sociedad Cooperativa de Producción Insurgentes de la Isla de Mezcala*), and 67/2004 (*Guadalupe Lara Lara*);

(ii) the Arcediano Project, within the Lerma-Chapala watershed (Lerma subregion) in the State of Jalisco, as identified in the submission; and,

(iii) consideration of legislation, or provisions thereof, primarily addressing issues of water distribution.[107]

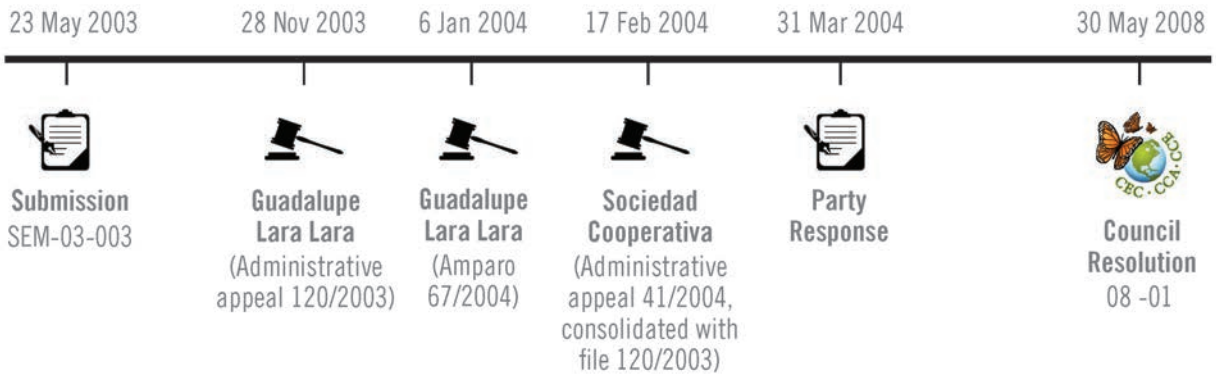
38. Likewise, this factual record describes:

> [...] actions undertaken by Mexico in compliance with the regulations cited in the title of this decision, but [refrains] from including any form of assessment of the effectiveness of the Party's policies or legislation.[108]

4.1 Proceedings 120/2003 (*Guadalupe Lara Lara*), 41/2004 (*Sociedad Cooperativa de Producción Insurgentes de la Isla de Mezcala*), and 67/2004 (*Guadalupe Lara Lara*)

39. Below is a timeline of proceedings included in Council Resolution 08-01:

Figure 1: Timeline of Proceedings cited in Council Resolution 08-01



40. As per Council Resolution 08-01 dated 30 May 2008, all these proceedings are excluded from this Factual Record.

41. Appeals for review nos. 120/2003 (*Guadalupe Lara Lara*) and 41/2004 (*Sociedad Cooperativa de Producción Insurgentes de la Isla de Mezcala, S.C.L.*) refer to the environmental impact assessment and authorization for the Arcediano Project, which is excluded from the factual record.

42. Amparo no. 67/2004 concerns suspension of the effects of the environmental impact authorization for the Arcediano Project until such time as the matters raised in the previously filed actions are resolved. In accordance with the request in Coun-

106. In accordance with Council Resolution 08-01, the Secretariat only includes provisions the main object of which is water quality, rather than water distribution.

107. Council Resolution 08-01, *supra* note 20.

108. *Idem*.

cil Resolution 08-01, no information is included in this factual record about proceedings concerning the stay of the environmental impact authorization for the Arcediano Project, even though these proceedings were not notified to the Secretariat pursuant to Article 14(3) of the Agreement, rather by means of a Council Resolution.[109]

4.2 Geographical scope

43. Council Resolution 08-01 determines the geographical scope of factual record SEM-03-003 where Council:

> FURTHER REQUESTS that the Secretariat limits the factual record to the area containing the Arcediano dam, within the Lerma-Chapala watershed (Lerma subregion) in the State of Jalisco, as identified in the Submission.

44. Based on cartographic information from Conagua and various decisions, technical documents, and administrative documents issued by Semarnat, Conagua, and CEA-Jalisco,[110] it is evident that the Arcediano Project is located in the Alto Santiago subregion and not the "Lerma subregion" (strictly speaking, the "Bajo Lerma subregion").[111] Figure 2 shows the location of the Bajo Lerma subregion in the State of Jalisco and the location of the Arcediano Project and its reservoir. Mexico's Response indicates that the large area of Region VIII (administered by the Lerma-Santiago-Pacífico Watershed Authority),[112] is divided based on the criterion of watersheds as the basic unit for national planning and regionalization.[113]

109. On 13 April 2011, the Transparency and Public Participation Coordinating Unit (*Unidad Coordinadora de Participación Social y Transparencia*—Ucpast) of Semarnat informed that appeals 120/2003 and 41/2004 under file numbers XV/2003/1668 and XV/2004/41 were no longer pending. Ucpast, file no. SEMARNAT/UCPAST/UE/486/11 (13 April 2011) in response to Infomex-Federal request no. 0001600068111 (16 March 2011).

110. *Cf.* "Decision publicizing the technical study of water resources in the Lerma-Chapala geographical area" (*Acuerdo por el que se da a conocer el estudio técnico de los recursos hídricos del área geográfica Lerma-Chapala*), DOF, 24 July 2006; "Decision determining the geographical delimitation of the watershed authorities of the National Water Commission" (*Acuerdo por el que se determina la circunscripción territorial de los organismos de cuenca de la Comisión Nacional del Agua*), DOF, 12 December 2007; H. Cotler, M. Mazari and J. de Anda, eds., *Atlas de la Cuenca Lerma-Chapala: construyendo una visión conjunta*, INE-Semarnat, 2006; Conagua, "Regiones hidrológicas de la República Mexicana" (Hydrological Regions of Mexico), <http://goo.gl/OiFQT> (viewed 21 March 2012); CEA-Jalisco, "Subregiones hidrológicas en Jalisco" (Hydrological subregions in Jalisco), <http://goo.gl/4JveS> (viewed 21 March 2012); Conagua, Subgerencia de Información Geográfica del Agua "Temas adicionales de consulta," <http://goo.gl/17fRi> (viewed 21 March 2012).

111. Council Resolution 08-01, *supra* note 20.

112. Mexico states at p. 48 of its response that this region occupies 13 percent of the area of Mexico, or 190,438 km^2. Response, *supra* note 10 at 48.

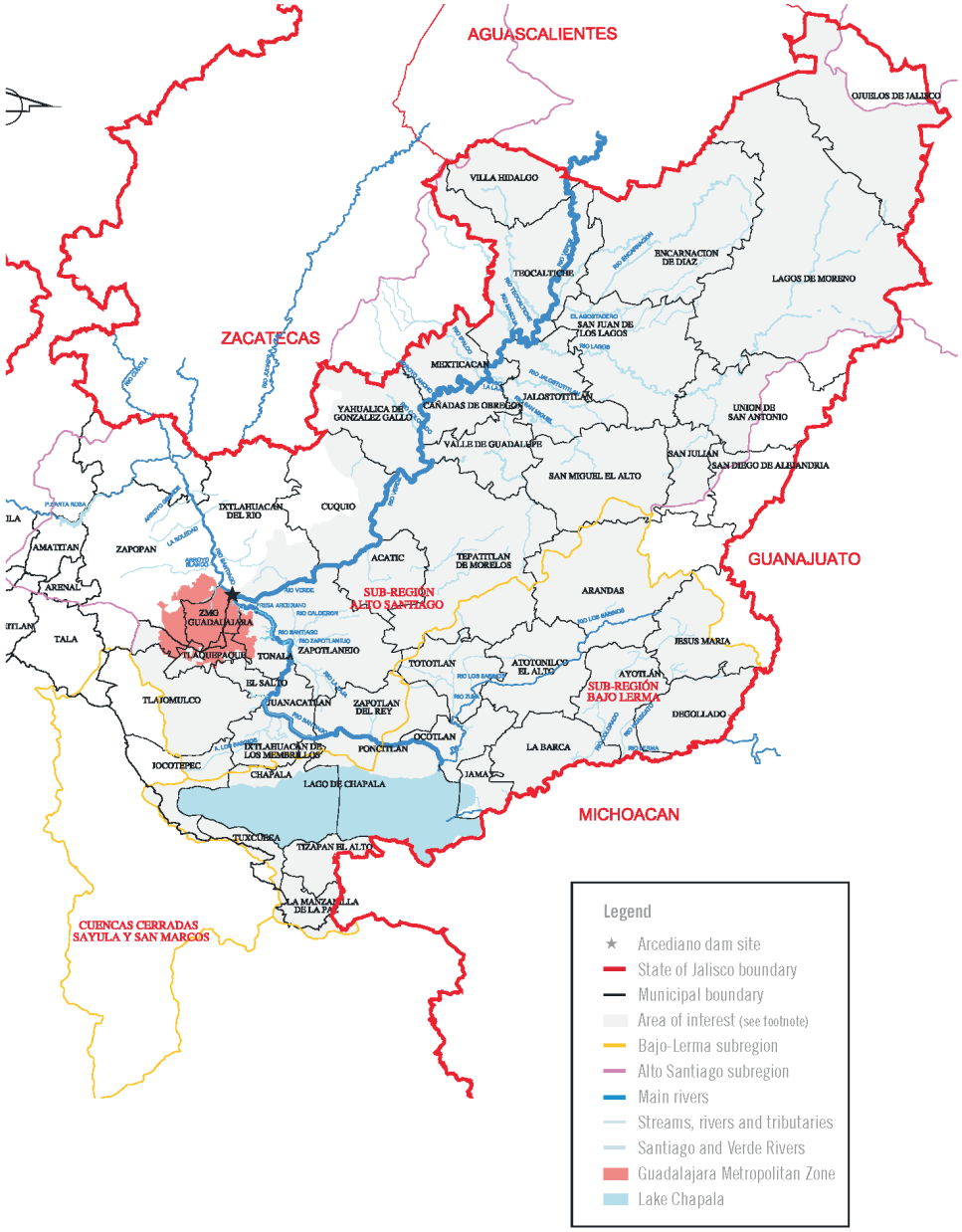
113. Response, *supra* note 10 at 48.

Figure 2: Location of the Arcediano Project with respect to the Bajo Lerma Subregion in the State of Jalisco[114]

114. Image created with information from: Conagua, Subgerencia de Información Geográfica del Agua, *supra* note 110. This image illustrates the closed watersheds of Sayula and San Marcos to the south and west of Lake Chapala, respectively, which have no hydrological relationship to the Arcediano site, but belong to the Bajo Lerma Subregion. A closed or endorheic basin is one that retains water that does not reach the ocean. For further information, *see*: Conagua, *Marco Conceptual de Referencia*, <http://goo.gl/3HafG> (viewed 21 March 2012).

45. In order to conform with Council Resolution 08-01, the Secretariat has included relevant factual information concerning enforcement actions undertaken by Mexico in the area comprising Lake Chapala, and the Santiago and Verde river basins in the State of Jalisco up to the Arcediano zone, which all together constitute the "area of interest" of the factual record (see Figure 3).

Figure 3: Area of Interest of the Factual Record[115]



Note: The "area of interest" comprises Lake Chapala, and the Santiago and Verde river basins in the State of Jalisco up to the Arcediano area. Sayula and San Marcos closed basins, located at South-West of Lake Chapala, do not form part of the area of this factual record.

115. Image created with information from Conagua, Subgerencia de Información Geográfica del Agua, *supra* note 110; Submission, *supra* note 3 at 1, 7, 12; Response, *supra* note 10 at 26; Notification, *supra* note 19 at 28; Notification, *supra* note 19 at 28; IMTA, *Evaluación de los estudios ambientales y de saneamiento en el proyecto Arcediano, asesoría y seguimiento para la creación del distrito de control ambiental*, final report for CEA-Jalisco, 2006 at 50. See: Executive presentation available at <http://goo.gl/waF8s> (viewed 21 March 2012); and CEA-Jalisco, *infra* note 126.

4.3 Laws and provisions primarily addressing water distribution

46. The Council, in Resolution 08-01, requests the Secretariat "to refrain from consideration of legislation, or provisions thereof, primarily addressing issues of water distribution."[116]

47. LAN Articles cited in the submission provide that the LAN's enforcement scope relates to the "preservation of the quantity and quality of all national waters," the environmental use of water; the public interest for the "protection, improvement, conservation and restoration of watersheds", and the "improvement of the quality of wastewater and the prevention and control of contamination thereof" and moreover, provide that Conagua is competent "in the national sphere, to promote the efficient use of water and the conservation thereof in all phases of the hydrological cycle." Consistent with the Secretariat's determination of 19 December 2003, and as per Council Resolution 08-01, the Secretariat includes factual information on the effective enforcement of LAN Articles 4 and 9 concerning water quality, but not distribution.

4.4 Environmental Law in Council Resolution 08-01

48. The preamble of Council Resolution 08-01 includes provisions the Secretariat earlier determined were not "environmental law", and these are thus not included in this factual record.[117] Article 166 cited by the Submitters is not included in the title of Resolution 08-01, and thus no information thereon is included in this factual record. Provisions related to the exercise of Semarnat's general authority only serve to guide the Secretariat in its consideration of specific powers related to water quality.[118] Certain provisions cited in the Council Resolution preamble related to preservation of the quality of national waters and of the habitat only serve to guide the Secretariat.[119] Provisions cited in the Council Resolution preamble related to the application of criteria for promotion of the rational use of water, and aquatic ecosystems and their incorporation into planning and enforcement mechanisms concerning the Arcediano Project are precluded from consideration in this factual record.[120] Provisions cited in the Council Resolution preamble referring to procedural formalities during the inspection and vigilant monitoring procedures were not raised in the Submission,[121] and are not considered in this factual record. Provisions enforceable outside the State of Jalisco were also not included in this factual record.[122]

49. In accordance with Council Resolution 08-01, the Secretariat presents relevant factual information relating to the assertions and to the provisions of environmental law listed below:

    (i) The effective enforcement of LGEEPA Articles 5, paragraph XI, and 133, with respect to the preservation of the quality of national waters as well as the systematic and ongoing monitoring of water quality in Lake Chapala and in the Santiago and Verde River basins, up to the projected site of the Arcediano dam wall. It should be noted that LGEEPA Article 5, paragraph XI, establishes Semarnat's authority acting by Conagua to preserve and protect the quality of national waters in the area of interest. On this matter, relevant factual information is presented on enforcement actions of the above provisions by Mexico;

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116. Council Resolution 08-01, *supra* note 20.

117. LGEEPA, Arts. 1 and 2; LGEEPA, Regulations on Environmental Impact Asssessment (*Reglamento de la LGEEPA en materia de evaluación del impacto ambiental*), Art. 3; LAN, Arts. 1, 2, 3 and 7, and RLAN, Art. 2. See: Determination pursuant to Article 14(1)(2), *supra* note 9 at 6-7 at footnotes 32, 34-35.

118. LGEEPA, Art. 5, para. XIX and Art. 44 of the Internal Regulation of Semarnat. It should be noted that Article 44 of the Internal Regulation of Semarnat was repealed by Article Second Transitory of the Internal Regulation of Conagua, DOF, 30 November 2006.

119. LGEEPA, Arts. 79, paras. I and III; 80, paras. I and VII, and 83.

120. LGEEPA, Arts. 88, paras. I, II and III, and 89. *See*: Notification, *supra* note 19 at 26 and 27.

121. LGEEPA, Arts. 162, 163, 164, 165, 167, 168 and 169.

122. LGEEPA, Art. 5, paras. III and IV.

(ii) The effective enforcement of LGEEPA Articles 5, paragraph XVI, 18, and 157 in regard to guarantees of effective public participation in matters of water quality;

(iii) The effective enforcement of LGEEPA Article 78 concerning the formulation of plans for ecological restoration zones; and,

(iv) The effective enforcement of LGEEPA Articles 161 and 170 and LAN Article 9, paragraphs I and XIII, concerning inspection and vigilant monitoring as well as the application of safety measures.

This factual record does not present information on the Lerma-Chapala watershed council decisions and LAN Article 4 referred to in submission SEM-03-003, since these refer primarily to water distribution matters.[123]

50. As noted above, this factual record contains information on "actions undertaken by Mexico in compliance with the regulations cited in the title of this decision [...]"[124] This factual record presents no assessment of the effectiveness of any of Mexico's policies or laws. The Secretariat has endeavored to only present the facts in accordance with Council Resolution 08-01.

51. The reader may refer to Appendix 9 which lists provisions cited in the submission but not further considered in this factual record and texts of the legal provisions and their amendments included in this factual record.

5. Information-gathering process

52. Pursuant to Council Resolution 08-01,[125] on 9 July 2008 the Secretariat published its general plan for preparation of the factual record (see Appendix 3). The Secretariat did not receive comments from the Parties on the general plan for preparation of the factual record.

53. Pursuant to NAAEC Article 15(4), in preparing a factual record:

> [...] the Secretariat shall consider any information furnished by a Party and may consider any relevant technical, scientific or other information: (a) that is publicly available; (b) submitted by interested nongovernmental organizations or persons; (c) submitted by the Joint Public Advisory Committee; or (d) developed by the Secretariat or by independent experts.[126]

54. On 4 September 2008, the Secretariat published a request for information (see Appendix 4) and sent it to the Parties, the Submitters, and the Joint Public Advisory Committee (JPAC).

55. On 12 September 2008, the Secretariat sent requests for information to various governmental entities in Mexico, including CEA-Jalisco.[127] On 16 September 2009, the Secretariat augmented its request to CEA-Jalisco, which in reply sent copies of various monitoring studies of the Santiago and Verde Rivers.[128] On 7 March 2011, the Secretariat

123. "THE COUNCIL [...] ALSO REQUESTS the Secretariat to refrain from consideration of legislation, or provisions thereof, primarily addressing issues of water distribution." Council Resolution 08-01, *supra* note 20.

124. Council Resolution 08-01, *supra* note 20. It should be noted that while the Council refers to "actions undertaken by Mexico *in compliance* with the regulations cited in the title [...]" this Factual Record only presents factual information on *effective enforcement* of the environmental law in question, consistent with NAAEC, Arts. 14 and 15.

125. Council Resolution 08-01, *supra* note 20, in relevant part:
DIRECTS the Secretariat to provide the Parties with its overall work plan for gathering relevant facts and with the opportunity to comment on that plan [...].

126. *See also* Section 11.1 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* (text as of 25 May 2012), <http://goo.gl/i2sOg> (viewed 21 March 2012).

127. CEC Secretariat, e-mail to the Director General of CEA-Jalisco (12 September 2008).

128. CEA-Jalisco, file no. DGLAB-201/2009 (2 October 2009). The studies, all prepared for CEA-Jalisco, included were:
- AyMA Ingeniería y Consultoría, *Evaluación del impacto económico derivado de la reclasificación del río Verde y Santiago*, prepared for CEA-Jalisco, Mexico, 2007;
- AyMA Ingeniería y Consultoría, *Identificación y caracterización de fuentes de contaminación de las cuencas directas del río Santiago entre los municipios de Ocotlán y directa del río Zula*, Mexico, 2006, <http://goo.gl/Wgw7n> (viewed 21 March 2012);
- AyMA Ingeniería y Consultoría, *Actualización y caracterización de fuentes de contaminación de la cuenca del río Verde en el estado de Jalisco*, Mexico, 2006b, <http://goo.gl/Wgw7n> (viewed 21 March 2012);
- AyMA Ingeniería y Consultoría, *Reporte de monitoreo y modelación de la calidad del agua de los ríos Verde y Santiago*, Mexico, 2003; and IMTA, *supra* note 116.

requested further information about the water quality-related duties and responsibilities of CEA-Jalisco in the area of interest; the latter in turn sent information to the Secretariat on 4 April 2011.[129]

56. On 17 November 2008, the Secretariat held a public meeting in the city of Chapala, Jalisco, to gather information for the preparation of the factual record (see Appendix 7). The latter meeting was attended by representatives of civic organizations, academics, and persons interested in presenting information. Mexican government authorities were also invited to attend the meeting and several of them did so.

57. On 1 December 2008, Mexico responded to the Secretariat's request for information, noting that the information presented should be "excluded from the factual record" by virtue of its confidentiality.[130] In reply to another information request from the Secretariat,[131] Mexico presented a summary of its reply of 1 December 2008 for public disclosure.

58. In that summary for public disclosure, Mexico states that:

> [...] the Secretariat included matters that the Council decided to exclude from the factual record because they are the subject of pending administrative and judicial proceedings relating to environmental impact assessment of the Arcediano Dam project and/or because they constitute matters of law enforcement relating primarily to water distribution, such as the National Waters Act.[132]

59. Mexico's reply to the Secretariat's request for information did not provide further information about environmental law enforcement and stated that the Response to the Submission of 31 March 2004 contains "a range of information about compliance with the water quality monitoring obligation set out in LGEEPA Article 133."[133]

60. The Secretariat also drew upon other sources of information mentioned in NAAEC Article 15(4) and section 11.1 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* in order to fulfill the requirements of the Council Resolution. A consultant retained by the Secretariat requested information through the federal and State of Jalisco information systems (Infomex-Federal and Infomex-Jalisco, respectively) for preparation of this factual record.[134]

61. The Secretariat's legal officer made a site visit to the area of interest for the purpose of interviewing representatives of the government of Mexico on 8 and 9 September 2009. The legal officer held meetings with the following authorities of the State of Jalisco: the State Attorney for Environmental Protection, the Minister of Environment for Sustainable Development of the State of Jalisco, and the Director General of CEA-Jalisco.[135] Likewise, the legal officer requested meetings with the director of the Lerma-Santiago-Pacífico Watershed Authority of Conagua as well as the Profepa officer in the State of Jalisco; however, both officials declined to meet with the Secretariat.[136]

62. For the preparation of the factual record, the Secretariat requested advice from technical and legal

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129. CEA-Jalisco, file no. DG-154/2011 (31 March 2011).

130. UCAJ, Doc. no. 00005526, Summary of matters presented in Doc. no. UCAJ00005167 (19 December 2008) at 3.

131. CEC Secretariat, file no. A14/SEM/03-003/95/REC (5 December 2008).

132. UCAJ, *supra* note 130 at 3.

133. *Idem*.

134. The information was obtained from the websites of the Federal Access to Information and Data Protection Institute (*Instituto Federal de Acceso a la Información y Protección de Datos*—Infomex-Federal), <http://goo.gl/F2kMO> (viewed 21 March 2012), and from the Access to Information System (*Sistema de Solicitudes de Información*) of the state of Jalisco (Infomex-Jalisco), <http://goo.gl/2smJf> (viewed 21 March 2012).

135. It should be noted that the Director General of CEA-Jalisco visited the Secretariat's offices in Montreal on 25 November 2008, for the purpose of personally delivering factual information and making a presentation on the Arcediano Dam project and the wastewater treatment projects for the city of Guadalajara, Jalisco.

136. Director General, Lerma-Santiago-Pacífico Watershed Authority, e-mail to the CEC Secretariat (3 September 2009); Attorney for Environmental Protection of the State of Jalisco (*Procurador Estatal de Protección al Ambiente*), e-mail to the Profepa Delegate in Jalisco (9 September 2009). Nevertheless, the director of the Watershed Authority provided information for preparation of the factual record by e-mail on 24 September 2009.

experts at various phases of the process. Dr. Juan Gualberto Limón[137] assisted the Secretariat by helping to delimit the scope of the factual record and by guiding the Secretariat on matters relating to the request for relevant factual information. Laura Dávalos Lind[138] acted as technical advisor on water quality, specifically in relation to the limnological and water quality aspects of Lake Chapala. Dr. Luis Vera Morales[139] provided legal expertise on the environmental law in question, including aspects of water quality, monitoring, public participation, sustainable water use, and water quality-related law enforcement. Attorney Mariana Tejado Gallegos[140] helped gather information from federal and State of Jalisco sources.[141]

6. Environmental law in question

63. This section presents information on the content of LGEEPA Articles 5, paragraphs XI and XVI, 18, 78, 88, paragraphs I, II, and III, 89, 133, 157, 161, and 170; LAN Articles 4 and 9, paragraphs I and XIII; and Article 44 of the Internal Regulation of Semarnat. The Secretariat presents facts relating to the environmental law in question and does not interpret the law. Also presented is information on amendments to the environmental law in question from the filing date of the Submission to the date when the CEC Council instructed the Secretariat to prepare a factual record. Appendix 9 reproduces the currently applicable texts of the laws in question and any amendments made thereto. For the purposes of this factual record, references to the environmental law in question correspond to the provisions in force up to 30 May 2008, the date of Council Resolution 08-01, except as otherwise indicated.

64. LGEEPA Articles 5, paragraphs XI and XVI, 18, 78, 88, paragraphs I, II and III, 89, 133, 157, 161, and 170 were not amended between the filing date of the Submission, 23 May 2003, and the date of Council Resolution 08-01, 30 May 2008.

65. LAN Article 4 has not been amended since being published in the Official Gazette of the Federation (*Diario Oficial de la Federación*—DOF) on 1 December 1992. LAN Article 9 was amended by an executive order published in the DOF on 29 April 2004. The latter order also amended 114 articles of the LAN, and repealed Articles 26 and 27, adding 66 provisions.[142]

66. With the amendments to the LAN in 2004, Conagua obtained a new internal regulation, published in the DOF on 30 November 2006. The text of Article 44 of the Internal Regulation of Semarnat, cited in the Submission, as well as the whole chapter on the powers of Conagua, were also repealed then. Article Second Transitory of the Internal Regulation of Conagua provided that "Articles 44 to 109 of the Internal Regulation of the Ministry of the Environment and Natural Resources are repealed."[143]

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137. Dr. Juan Gualberto Limón Macías obtained a degree in chemical engineering from the *Instituto Tecnológico y de Estudios Superiores de Occidente* and a doctorate in civil engineering, specializing in environmental engineering, from the University of Strathclyde. He is currently the general manager of *AyMA Ingeniería y Consultoría, S.A. de C.V.*

138. Laura Dávalos Lind, M.Sc., graduated from the *Universidad Autónoma de Guadalajara* in biology before going on to receive a master of science degree at Baylor University. She is currently a professor and researcher in the limnology program at the *Centro de Investigaciones Tropicales of Universidad Veracruzana* and a member of the limnology laboratory of Baylor University.

139. Dr. Luis Vera Morales, holds a law degree from the *Escuela Libre de Derecho*; he has also done postgraduate studies in economics and corporate law at *Universidad Panamericana*. He holds a master's degree in environmental and energy law (with honors) from Tulane University and a doctorate in environmental science from the *Centro Interdisciplinario de Investigaciones y Estudios de Medio Ambiente y Desarrollo* of the *Instituto Politécnico Nacional*. He is currently a managing partner in the firm of Vera & Carvajal.

140. Mariana Tejado Gallegos holds a law degree (with honors) from *Universidad Panamericana*. She obtained a specialization in environmental law from the *Universidad Nacional Autónoma de México* and studied at the *Universidad de Navarra* and at China University of Political Science and Law in Beijing. She has worked in Public Notary's Office 238 of the Federal District and in the firm of González Calvillo, S.C. on environmental, corporate, administrative, and registry law matters. At the time this factual record was prepared, she worked as a pro bono attorney for *Asociación Civil Innovación Social, A.C.*

141. For more information on the consultants that participated in the development of this Factual Record, the reader may consult Appendix 8.

142. A. Ortiz-Rendón, *Evolución y perspectivas del marco jurídico del agua en México: Nuevos retos y oportunidades para la gestión integrada del recurso hídrico*, Virtual Library of *Instituto de Investigaciones Jurídicas*, UNAM, <http://goo.gl/gmYMb> (viewed 21 March 2012).

143. Article 44 of the Internal Regulation of Semarnat provided as follows (repealed):
    The National Water Commission shall have the powers established in the National Waters Act, its Regulation, this regulation, and any other applicable provisions, which powers shall be exercised by the administrative units making up the Commission, without prejudice to the direct exercise thereof by the Director General of the Commission.
    In addition, it shall apply the policies and provisions issued in relation to transparency and access to information.

67. The LAN provides that authority over and administration of national waters and their inherent public lands rests with the Federal Executive, which exercises its authority through Conagua.[144] Conagua has, *inter alia*, the water-related powers vested in it by the LAN and the Regulation to the LAN.[145] Conagua is responsible for vigilant monitoring and enforcement of the LAN, its interpretation for administrative purposes, and the application of administrative sanctions thereunder.[146] The LAN also grants powers to Profepa in relation to national waters; however, those provisions are not included in submission SEM-03-003 since they were published subsequent to its filing.[147]

6.1 Preservation and monitoring of water quality

6.1.1 Preservation of water quality

68. LGEEPA Article 5, paragraph XI provides as follows:

> The following are powers of the Federation:
> [...]
> XI. The regulation of the sustainable enjoyment, protection, and preservation of national waters, biodiversity, fauna, and other natural resources under its jurisdiction.

69. For the protection and preservation of water quality, the competent authority has issued maximum allowable limits for wastewater discharges into national waters and property in the form of NOM-001-SEMARNAT-1996.[148] In addition, the limits applicable to discharges into municipal sewer systems are specified in NOM-002-SEMARNAT-1996.[149] Conagua can impose specific discharge conditions, i.e., maximum allowable levels different from those set out in NOM-001-SEMARNAT-1996, as well as wastewater discharge parameters additional to those set out in the standard and specific to each user or groups of users, for certain uses for a given receiving body, with the aim of conserving and controlling the quality of national waters pursuant to the LAN and the regulations ensuing from it.[150]

70. In addition, Conagua may establish water quality goals, and timelines within which to meet them, by means of declarations known as "National Water Body Classification Declarations" (*Declaratorias de Clasificación de los Cuerpos de Aguas Nacionales*),[151]

144. National Waters Act (*Ley de Aguas Nacionales*—LAN), DOF 1 December 1992, Art. 4:
> The authority over and administration of national waters and their inherent public assets rests with the Federal Executive, which exercises its authority through "The Commission" [Conagua].

145. *Ibid.*, Art. 9, para. I:
> To function as the Authority for water quantity and quality and for water management throughout the nation's territory and to exercise accordingly the powers vested in the water authority in accordance with this Act, within the scope of federal jurisdiction, with adherence to decentralization of the water sector, except those powers that shall be exercised directly by the Federal Executive or "the Ministry" and those under the responsibility of the state, Federal District, or municipal governments;

As to the powers vested in Conagua by the Internal Regulation of Semarnat, these are now contained in the Internal Regulation of Conagua, *supra* note 118.

146. *Ibid.*, Art. 9, para. XXXVI:
> To oversee compliance with and enforcement of this Act, to interpret it for administrative purposes, to apply sanctions, and to exercise relevant acts of authority that are not reserved to the Federal Executive;

147. Amendments published in the DOF on 29 April 2004.

148. Mexican Official Standard NOM-001-SEMARNAT-1996, establishing the maximum allowable limits for contaminants in wastewater discharges in national waters and lands, published in the DOF on 6 January 1997. *Cf.* Response, *supra* note 10 at 61.

149. Mexican Official Standard NOM-002-SEMARNAT-1996, Establishing the maximum allowable limits for contaminants in wastewater discharges into urban or municipal sewer systems, published in the DOF on 3 June 1998. *Cf.* Response, *supra* note 10 at 61.

150. LAN, *supra* note 144, Art. 3, para. XIV.

151. *Ibid.*, Art. 87:
> The "Water Authority" shall determine the parameters that shall be met by discharges, the assimilation and dilution capacity of national bodies of water, and the contaminant loads that they may receive, as well as the quality goals and the time periods in which to achieve them, by means of the issuance of National Water Body Classification Declarations, which shall be published in the Official Gazette of the Federation, as shall their amendments, for observance thereof.
> Such declarations shall contain:
> I. The delimitation of the body of water classified;

which include, among other elements, the criteria to be met by discharges into each body of water as well as the maximum allowable limits on pollutants.[152] Such declarations are water quality management instruments; however, apart from a declaration issued for the Lerma River, no such declarations were found for the area of interest.[153]

6.1.2 National Water Quality Monitoring Network

71. LGEEPA Article 133 provides that:

> The Ministry [of the Environment and Natural Resources], with the participation of the Ministry of Health in such manner as may be prescribed by other legal provisions, shall conduct systematic and ongoing water quality monitoring in order to detect the presence of pollutants or an excess of organic waste and to apply the relevant measures. In cases of waters under local jurisdiction, such efforts shall be coordinated with the state, Federal District, and municipal authorities.

72. Pursuant to LGEEPA Article 133, monitoring must be systematic (*sistemático*) and ongoing (*permanente*). That is, monitoring must follow or adhere to a system and it must be maintained over time.[154]

73. Outside the scope of LGEEPA Article 133, there are other environmental information systems contemplated in the LAN, including the National Water Quantity, Quality, Use, and Conservation System (*Sistema Nacional de Información sobre Cantidad, Calidad, Usos y Conservación del Agua*—Sina),[155] which is maintained by the watershed authorities in coordination with the state and Federal District governments and the watershed councils; as well as the Water Quality Information System (*Sistema de Información de la Calidad del Agua*—SICA).[156] Similarly, the watershed authorities, in coordination with the state and Federal District governments, are responsible for maintaining the Regional Water Quantity, Quality, Use, and Conservation System (*Sistema Regional de Información sobre Cantidad, Calidad, Usos y Conservación del Agua*—SRIA).[157]

74. The publication of monitoring information for national waters is the responsibility of Conagua[158] and the watershed authorities.[159]

6.2 Civic participation

75. The environmental laws in question (LGEEPA Articles 18 and 157) provide that the Federal Executive shall promote the participation of civil society in the development of programs the object of which is the preservation and restoration of ecological balance and the protection of the envi-

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II. The parameters that shall be met by discharges for each classified body of water in accordance with the periods set out in the regulation to this Act;
III. The capacity of the classified body of water to dilute and assimilate contaminants; and,
IV. The maximum discharge limits for the contaminants analyzed, which shall form the basis for establishing the specific discharge conditions.

152. *Idem*.

153. Classification Declaration for the Lerma River, establishing the river's assimilation and dilution capacity, the water quality criteria, the periods in which to meet them, and the parameters that shall be considered in determining the compliance of wastewater discharges. DOF 1 April 1996, <http://goo.gl/Yzqfw> (viewed 21 March 2012). The boundaries of the classified area lie outside the study area for this factual record; however, the declaration is cited because the Lerma River empties into Lake Chapala (see Figure 25).

154. Entries for "sistemático," "permanente" in Real Academia Española, *Diccionario de la Real Academia Española*, 22nd ed. (Madrid: Espasa 2001), <http://buscon.rae.es/draeI> (viewed 21 March 2012).

155. LAN, *supra* note 144, Art. 9, para. XLVII; see also Conagua, "Sistema Nacional de Información del Agua (SINA)," <http://goo.gl/1KSPC> (viewed 21 March 2012).

156. LAN, *supra* note 144, Art. 86, para. XIII(a). It should be noted that, although the LAN refers to the SINA and the SICA, no information was found in relation to the latter.

157. *Ibid*., Art. 12 *bis* 6, para. XXIX.

158. *Ibid*., Art. 9, paras. XLV, XLVI and XLVII.

159. *Ibid*., Art. 12 *bis* 6, para. XXVIII.

ronment,[160] as well as in the planning, implementation, evaluation, and oversight of environmental and natural resource policy.[161]

76. In this connection, LGEEPA Article 5, paragraph XVI stipulates:

> The following are powers of the Federation:
> [...]
> XVI. The promotion of the participation of society in environmental matters, in accordance with the provisions of this Act; [...]

77. Similarly, LGEEPA Article 18 provides:

> The Federal Government shall promote the participation of the various social groups in the development of programs the purpose of which is the preservation and restoration of ecological balance and the protection of the environment, as prescribed by this Act and any other applicable laws.

78. LGEEPA Article 157 provides that:

> The Federal Government shall promote the jointly responsible participation of civil society in the planning, implementation, evaluation, and oversight of environmental and natural resource policy.

79. Public participation in water quality matters is also covered by the second paragraph of LGEEPA Article 78, cited in the Submission, which provides that for the purpose of formulating ecological restoration programs, Semarnat shall promote the participation of landowners, landholders, public and private organizations, indigenous peoples, local governments, and other interested persons. The provisions applicable to the formulation, implementation, and oversight of ecological restoration programs are presented in the following section.

6.3 Formulation of ecological restoration programs

80. The first paragraph of LGEEPA Article 78 provides as follows:

> In those areas exhibiting processes of degradation or desertification, or serious ecological instability, the Ministry shall formulate and implement ecological restoration programs, for the purpose of ensuring that the measures necessary to restore and reestablish conditions favorable to the evolution and continuity of the natural processes that were occurring in such areas are taken.

81. For the formulation, implementation, and oversight of such LGEEPA Article 78 programs, Semarnat may promote the participation of landowners, landholders, civic organizations, local governments, and other interested persons.[162]

6.4 Inspection and vigilant monitoring

82. Articles 161 and 170 of the LGEEPA govern the acts of inspection and vigilant monitoring, as well as the imposition of security measures. Semarnat has the power to inspect and monitor in enforcing the LGEEPA. Inspection visits are made by deploying duly authorized inspectors.[163]

83. LGEEPA Article 161 provides as follows:

> The Ministry shall conduct acts of inspection and vigilant monitoring for enforcement of the provisions of this Act as well as any provisions derived therefrom.
>
> In Mexican marine zones, the Ministry, acting for itself or by the Ministry of the Navy, shall inspect, monitor and, as applicable, administer sanctions for violations of the provisions of this Act.

84. LGEEPA Article 170 provides as follows:

> Where there is an imminent risk of ecological instability, or of serious harm to or deterioration

160. LGEEPA, *supra* note 32, Arts. 5, para. XVI, 18 and 78, second paragraph.
161. *Ibid.*, Art. 157.
162. LGEEPA, *supra* note 32, Art. 78.
163. *Ibid.*, Art. 162.

> of natural resources, or cases of contamination with dangerous consequences for ecosystems, their components, or public health, the Ministry may, upon a basis in law and fact, order any of the following safety measures:
>
> I. The temporary partial or total closing of pollution sources and of facilities handling or storing specimens, products, or subproducts of species of wild flora or fauna, forest resources, or carrying on activities that give rise to the conditions to which the first paragraph of this article refers;
>
> II. The seizure of hazardous materials and wastes as well as specimens, products, or subproducts of wild flora or fauna species or their genetic material, forest resources, and also property, vehicles, tools, and instruments directly related to the conduct giving rise to the application of the safety measure; or
>
> III. Neutralization or any similar measure to prevent hazardous materials or wastes from giving rise to the effects contemplated in the first paragraph of this article. In addition, the Ministry may apply to the competent authority for the application of any safety measure that may be prescribed by other provisions.

85. LAN Article 9, paragraphs I and XIII, were amended subsequent to the filing of submission SEM-03-001 (see Appendix 9).

7. Description of the area of interest

7.1 Introduction

86. The area of interest partially covers the Lerma-Chapala and the Santiago River watersheds, both located within the Hydrological Region 12 Lerma-Santiago, in central Mexico.[164] The Lerma-Chapala watershed has an area of 53,391 km^2 divided among the states of Querétaro, Mexico, Jalisco, Michoacán, and Guanajuato, while the Santiago River watershed has an area of 78,809 km^2 divided among the states of Aguascalientes, Durango, Guanajuato, Jalisco, Nayarit and Zacatecas.[165] The Lerma-Chapala watershed covers the Alto Lerma, Bajo Lerma and Medio Lerma subregions, while the Santiago River watershed covers the Alto Santiago and Bajo Santiago subregions (see Figure 4).[166]

87. Lake Chapala and the Santiago and Verde Rivers belong to the Hydrological Region 12 Lerma-Santiago. While Lake Chapala is located in the Lerma-Chapala watershed (Lerma subregion), the Santiago and Verde Rivers in the area of interest are part of the Alto Santiago subregion.[167] Water management, water quality protection and enforcement of environmental law in question in the area of interest correspond to Conagua through Hydrological-Administrative Region VIII, Lerma-Santiago-Pacífico.[168]

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164. A hydrological region is a grouping of several watersheds with similar levels of runoff. [...] The most densely populated regions are no. 29, Tuxpan-Nautla, and no. 12, Lerma-Santiago. One of every four inhabitants of Mexican localities with populations over 100,000 lives in one or the other of these hydrological regions. Inegi, "Regiones Hidrológicas," *Instituto Nacional de Estadística y Geografía*, Mexico, 2010, <http://goo.gl/NhVSr> (viewed 21 March 2012).

165. INE, "Diagnóstico Bio-físico y Socio-económico de la Cuenca Lerma-Chapala," 2003, *Instituto Nacional de Ecología*, Mexico, 2003, <http://goo.gl/UsFvN> (viewed 21 March 2012); and Conagua, Semarnat, "Consejo de Cuenca del río Santiago," <http://goo.gl/VyLlb> (viewed 21 March 2012).

166. J. Aparicio, "Hydrology of the Lerma Chapala Watershed" in A. Hansen and M. van Afferden, eds., *The Lerma-Chapala Watershed: Evaluation and Management* (New York: Kluwer Academic/Plenum Publishers, 2001) at 3-30, print edition available at <http://goo.gl/vay9n> (viewed 21 March 2012).

167. *Idem*.

168. Internal Regulation of Conagua, *supra* note 118, Art. 6:
> At the head of the Commission there shall be a Director General who shall be appointed as prescribed by law.
> The Commission shall be organized into two levels for the exercise of its powers, one National and the other Regional Hydrological-Administrative. The directors of the administrative units of both levels shall be hierarchically subordinate to the Director General of the Commission.
> The directors of the national-level administrative units shall exercise over the entire territory of the nation the powers vested in them by the Act, as well as those vested in them by this Regulation and any other applicable provisions.

Figure 4: Regions in the Hydrological Region 12 Lerma-Santiago[169]

Note: For explanations of the terms utilized in the legend of this figure, consult the Glossary that appears at the beginning of this factual record.

88. The inhabited segments along the Santiago and Verde Rivers within the area of interest had a total population of 2,120,957 in the year 2000.[170] In the Verde River basin, 71.5 percent of the population was concentrated in 11 localities, while in the Santiago River basin, 87.4 percent of the population was concentrated in 37 localities.[171]

The administrative units of the Regional Hydrological-Administrative level shall be the Watershed Authority, whose directors and those of the attached units shall exercise their powers in accordance with the Act, this Regulation, and such administrative instruments as the Director General of the Commission may issue, in the corresponding territorial district.
Said Watershed Authorities shall be as follows:
[...]
VIII Lerma-Santiago-Pacífico.
[...]

169. Image created with information from: Conagua, Subgerencia de Información Geográfica del Agua, *supra* note 110.

170. Developed from Inegi, *Censo General de Población y Vivienda 2000* at: AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 5.

171. *Idem.*

Table 1: Populations of Municipalities in the Relevant Segments of the Verde and Santiago River Basins[172]

Verde River		Santiago River	
Municipality	**Population**	**Municipality**	**Population**
Acatic	15,593	Ocotlán	76,180
Cañadas de Obregón	4,407	Poncitlán	27,545
Cuquío	7,213	Zapotlán del Rey	12,572
Ixtlahuacán del Río	6,072	Chapala	7,101
Jalostotitlán	26,527	Jocotepec	2,004
Mexticacán	6,974	Ixtlahuacán de los Membrillos	21,605
Nochistlán de Mejía	19,603	Juanacatlán	11,792
San Juan de los Lagos	643	Tlajomulco de Zúñiga	110,456
San Miguel El Alto	27,329	El Salto	83,453
Teocaltiche	422	Zapotlanejo	52,713
Tepatitlán	114,051	Acatic	3,689
Valle de Guadalupe	5,958	Tepatitlán de Morelos	8,460
Yahualica de González Gallo	23,119	Tonalá	337,149
Zapotlanejo	748	Tlaquepaque	474,178
Guadalajara	483,073		
Zapopan	150,328		
Population in Verde River segment	**258,659**	**Population in Santiago River segment**	**1,862,298**
			Total 2,120,957

89. Excluding the municipalities of Guadalajara and Zapopan, the area of interest comprises 28 municipalities partially occupying the Verde, Santiago, and Zula River basins. The principal economic activities are livestock production, agriculture, manufacturing, commerce, and services.[173] Figure 5 presents the locations of the municipalities in the area of interest.

172. *Idem.*

173. Developed from Inegi, *Conteo de Población y Vivienda 2000* at: IMTA, *supra* note 115.

Figure 5: Municipalities in the Area of Interest[174]

174. Figure prepared with information from: IMTA, *supra* note 115 at 50.

7.2 Hydrogeological history of the area

90. Lake Chapala is located along the Trans-Mexican Volcanic Belt, which crosses central Mexico from east to west and more specifically, in the Citala Rift.[175] Origins of Lake Chapala likely date from the early Miocene[176] or the late Miocene;[177] the current lake dates from the Pleistocene.[178]

91. In the late nineteenth century, Lake Chapala had a water storage capacity of 5,800 Mm^3 and covered an area of 164,659 ha.[179] From 1902 to 1910, Mexico's development policies were aimed at increasing agricultural production, which led to the construction of dikes at the eastern end of Lake Chapala and the channelization of the Lerma River where it enters Lake Chapala.[180] At that time, some 50,000 ha of wetlands located on the banks of Lake Chapala were drained and put into agricultural production in the states of Jalisco and Michoacán.[181]

92. In the 1950s, the city of Guadalajara began to confront water shortages.[182] In 1953, it began to draw water from Lake Chapala via the Santiago River and the Atequiza-Las Pintas canal system;[183] by 1957, the lake had become the main source of water for the city.[184] In the 1970s, the Atequiza Canal was enlarged several times to increase water abstraction capacity from the Santiago River.[185] In 1984, construction began on the Chapala-Guadalajara aqueduct so that water could be drawn directly from the lake, and this line began operating in late 1991.[186] At the end of the 1980s, water abstraction from the Verde River was authorized by means of a project known as the La Zurda-Calderón system, which contemplated the construction of four reservoirs, a treatment plant, and a pumping system (located in San Gaspar).[187] Ultimately, two of the proposed reservoirs (Calderón and El Salto) and treatment plant no. 3 (San Gaspar) were built.[188]

7.3 Description of Lake Chapala

93. Lake Chapala (20°21'N, 103°26'W) is Mexico's largest lake[189] and is located mainly within the State of Jalisco.[190] In 2008, the maximum area of Lake Chapala was 113,228 ha;[191] however, its dimensions vary according to the water level, with a length ranging from 66 to 78 km and a width

175. P.F. Zárate del Valle *et al.*, "Geology, sediments and soils" in A. Hansen and M. van Afferden, *supra* note 166 at 31-57.

176. J. Urrutia-Fucugauchi and J. Rosas-Elguera, "Paleomagnetic Study of the Eastern Sector of Chapala Lake and Implications for the Tectonics of West-Central Mexico," *Tectonophysics* 239(1-4), 1994 at 61-71, <http://goo.gl/FpgE1> (viewed 21 March 2012).

177. L. Ferrari *et al.*, "Geology of the western Mexican Volcanic Belt and adjacent Sierra Madre Occidental and Jalisco block," *Geology Society of America* Special Paper 334, 1999, <http://goo.gl/YUJuE> (viewed 21 March 2012).

178. Although it has been suggested that the lake may date "possibly in latest Pliocene"; see T. Clements, "Pleistocene history of Lake Chapala, Jalisco, Mexico" in T. Clements, ed., *Essays in Marine Geology* (Los Angeles: University of Southern California Press, 1963) at 35-49.

179. H.G. Galeotti, "Coup d'œil sur la Laguna de Chapala au Mexique, avec notes géognostiques," *Bull. Acad. Brux.* VI, no. 1, 1839 at 14-29, bibliographic note at <http://goo.gl/u2MnV> (viewed 21 March 2012).

180. J. de Anda *et al.*, "Hydrologic balance of Lake Chapala (Mexico)," *J. Am. Water Resour. Assoc.* 34(6), 1998 at 1319-1331, <http://goo.gl/sD6Sd> (viewed 21 March 2012).

181. *Idem.*

182. E. von Bertrab, "Guadalajara's water crisis and the fate of Lake Chapala: a reflection of poor water management in Mexico," *Environment & Urbanization*, 15(2), 2003 at 127-140, <http://goo.gl/03Bkh> (viewed 21 March 2012).

183. F. de P. Sandoval, *Pasado y Futuro del Lago de Chapala*, Unidad Editorial de la Secretaría General de Gobierno del Estado de Jalisco, Mexico, 1994.

184. J. Palerm, "Practice Report: Needs and opportunities for SEA in Mexico: a view through the Arcediano dam case study," *Impact Assessment and Project Appraisal* 23(2), 2005 at 124-134, <http://goo.gl/zxGmi> (viewed 21 March 2012).

185. *Idem.*

186. R. Flores Berrones, "Acueducto Chapala Guadalajara," *Ingeniería Hidráulica en Mexico*, IMTA, January-April 1987, <http://goo.gl/mwFU4> (viewed 21 March 2012).

187. J. Palerm, *supra* note 184.

188. J. Durán and A. Torres, "Crisis ambiental en el Lago de Chapala y el abastecimiento para Guadalajara," *e-Gnosis*, vol. 1, art. 6, <http://goo.gl/LOevB> (viewed 21 March 2012).

189. T. Clements, *supra* note 178.

190. Eighty-six percent of Lake Chapala lies within Jalisco and 14 percent lies within Michoacán; CEA-Jalisco, "Lago de Chapala," <http://goo.gl/hytxC> (viewed 21 March 2012).

191. CEA-Jalisco, "Niveles máximos y mínimos del lago de Chapala 1900-2011," <http://goo.gl/7BmxL> (viewed 21 March 2012). Year 2008 was selected as this was the year of Council Resolution 08-01.

ranging from 18 to 22 km.[192] Chapala is a shallow lake, which is its main characteristic.[193] The rainy season at Lake Chapala coincides with the summer and fall and lasts for four or five months per year, while the dry season corresponds to the winter and spring, with occasional rainfall in December and January.[194]

94. Semarnat has stated that:

> Due to its geographical location, Lake Chapala epitomizes what is happening all along the Lerma River. The behavior of the lake reflects upstream growth in demand and the effects of untreated discharges, which degrade the quality of the water volumes stored in this body of water.[195]

7.3.1 Importance of light

95. Light penetration is fundamental to the entire dynamic of any lentic ecosystem.[196] A relevant parameter of the light environment is the ratio of the mixing depth of a lake to its photic depth (Z(mix)/Z(eu)).[197] Light availability, mixing characteristics, and phytoplankton circulation determine the productivity and types of algae in a lentic ecosystem,[198] algae being the basis of the food chain in such a system.[199]

96. In contrast to many other lakes, in Lake Chapala, water transparency is reduced mostly by resuspended clay and, to a lesser extent, by the presence of algae or phytoplankton, except in very shallow areas in the eastern sector.[200] Heavy resuspension means that light is the limiting factor in the lake's productivity, since suspended clay particles block out light, limiting photosynthesis.[201] In this respect, Lake Chapala is rather atypical, since nutrients, rather than light, are much more commonly the limiting factor in lake productivity.[202] Light penetration is also a function of lake depth, which in the case of Lake Chapala varies seasonally.[203]

97. Turbidity, one of the main characteristics of Lake Chapala,[204] is caused by the presence of fine, resuspended clay particles (0.5 ± 0.09 μm) of approximately uniform size throughout the lake.[205] The main physical factors in clay resuspension are the

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192. A. López-Caloca *et al.*, "Lake Chapala change detection using time series," *Proceedings of the International Society for Optics and Photonics* 7104, Remote Sensing for Agriculture, Ecosystems, and Hydrology X, 7104, 2008, <http://goo.gl/c8h5N> (viewed 21 March 2012).

193. "If a 1:10,000 scale model of this lake were made, the result would be a thin film of water measuring seven and one half meters long by one and one half meters wide by **less than one millimeter thick**. This objective physiographic characteristic catalogues Chapala not as a lake but as a precarious film of water." F. de P. Sandoval, *supra* note 183 at 14 (emphasis in the original).

194. *Sistema Meteorológico Nacional*, "Precipitación media anual 1941-2005," <http://goo.gl/Dr5PM> (viewed 21 March 2012).

195. Decision making public the technical study of the water resources in the Lerma-Chapala geographical area, Semarnat, DOF, 24 July 2006.

196. R.G. Wetzel, *Limnology* (Saunders, 1983), print edition available at <http://goo.gl/YBTeK> (viewed 21 March 2012). A lentic ecosystem is a freshwater ecosystem in which there is no unidirectional water movement; i.e., a lake, pond, or swamp, see: Andrew R.W. Jackson and Julie M. Jackson, *Environmental Science: the Natural Environment and Human Impact*, 2nd ed. (Harlow, Essex, UK: Pearson Education, 2000) at 212.

197. The mixing depth of a lake is the depth to which wind energy evenly mixes the water column. The photic depth is the depth at which light intensity falls to one percent of the value at the surface; that is, the depth to which some degree of photosynthesis is possible. On its critical role it has been stated that:

> [...] light is the sole energy source for nearly all plant species, ranging from the tiny phytoplankton to giant sequoia tree. As a consequence, the availability of light has a major impact on the dynamics and structure of the most (*sic*) aquatic and terrestrial communities.

See: D.R. Khanna, R. Bhutiani and K.S. Chandra, "Effect of the Euphotic Depth and Mixing Depth on Phytoplanktonic Growth Mechanism," *International Journal of Environmental Research*, 3, no. 2, 2009, <http://goo.gl/5YyZn> (viewed 21 March 2012).

198. R.G. Wetzel, *supra* note 196.

199. A.R.W. Jackson and J.M. Jackson, *supra* note 196 at 193.

200. O. Lind *et al.* "Clay turbidity: regulation of phytoplankton production in a large, nutrient-rich tropical lake," *Limnol. Oceanogr.* 37(3), 1992 at 549-565, <http://goo.gl/1GWFU> (viewed 21 March 2012).

201. L. Dávalos Lind, O. Lind and R. Doyle, "Evaluation of phytoplankton-limiting factors in Lake Chapala, Mexico: turbidity and the spatial and temporal variation in algal assay response," *Lake Reservoir Manage.* 5(2), 1989 at 99-104, <http://goo.gl/jzKbn> (viewed 21 March 2012).

202. A limiting factor is a physical or chemical factor in a body of water that limits algal growth. Common limiting factors are the concentration of a chemical compound (nitrogen or phosphorus) as well as physical parameters such as temperature and light availability. See: A.R.W. Jackson and J.M. Jackson, *supra* note 196 at 193. On the lake Chapala case, *see*: O. Lind, T. Chrzanowski and L. Dávalos-Lind, "Clay turbidity and the relative production of bacterioplankton and phytoplankton," *Hydrobiologia*, 353:1-18, 1997, <http://goo.gl/1jhq0> (viewed 21 March 2012).

203. O. Lind *et al.*, *supra* note 200.

204. *Idem.*

205. G. Limón, "The management of Lake Chapala (Mexico): Considerations after significant changes in the water regime," *Lake and Reservoir Management* 6, no. 1, 1990, <http://goo.gl/KJD7q> (viewed 21 March 2012).

shallowness of the lake and its long fetch.[206] The mean Secchi depth[207] was 0.56 m from 1972 to 1984[208] while two decades later, it was 0.23 m in summer 2007, 0.36 m in winter 2008, and 0.28 m in summer 2008.[209] At the end of the rainy season, when Lake Chapala is at maximum depth, turbidity is at its lowest level due to rainwater dilution, while in the driest months, dwindling water levels increase turbidity, creating a light environment highly unconducive to algal productivity.[210]

7.3.2 Temperature and currents

98. Lake Chapala's mean annual water temperature is 22°C, ranging annually from 21°C to 23°C.[211] There is no seasonal stratification of the lake, but stratification does occur on windless days when the temperature rises to 23°C and then cools off during the night.[212] Periodic afternoon, evening, and nighttime breezes counteract persistent stratification, while atmospheric pressure and wind patterns have a periodicity of 12 to 24 hours.[213] These thermal characteristics classify Lake Chapala as a warm polymictic lake; i.e., a lake in which mixing occurs several times a year.[214]

99. The temperature difference between the surface and the bottom ranges from 0.5° to 1°C in the middle of Lake Chapala and from 2° to 3°C at the eastern end, the warmest part of the lake due to heat transmission from the shallow sediments in the lake as well as the sediments carried in by Lerma River inflow.[215] Temperature fluctuations in the lake do not significantly affect the growth coefficient of organisms such as bacteria.[216]

100. Hydrodynamic modeling of Lake Chapala has shown that wind is the main factor in the lake currents.[217] When the wind is blowing from east to west, water entering from the Lerma River moves westward along the shore of the lake, meeting the return flow when it reaches the middle.[218] When the wind is blowing from west to east, Lerma River water flows through the center of the lake.[219]

7.3.3 Sediments

101. Studies on the distribution of solids in Lake Chapala have found significant changes related to the sediment load and volume of water flowing in from the Lerma River.[220] Table 3 (Section 7.3.4)

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206. The fetch of a lake is the maximum length across which wind acts upon the lake without land intervention; J. Edgerton, "Lake Shape," Kent State University, *Lake Scientist*, <http://goo.gl/QqYH1> (viewed 21 March 2012).

207. A Secchi disk is a standard disk with alternating black and white quadrants that is lowered into a water column to measure the transparency of the water. The depth at which it disappears from sight is taken as a measure of transparency, *see*: W. Hou, Z. Lee and A. Weidemann, "Why does the Secchi disc disappear? An imaging perspective," *Optics Express*, 15(6), 2007 at 2791-2802, <http://goo.gl/UP3M5> (viewed 21 March 2012).

208. J.G. Limón *et al.*, "Long- and short-term variation in the physical and chemical limnology of a large, shallow, turbid tropical lake (Lake Chapala, Mexico)," *Arch. Hydrobiol. Suppl.* 83(1), 1989 at 57-81.

209. A. Villamagna, *Ecological effects of water hyacinth* (Eichhornia crassipes) *on Lake Chapala, Mexico*, Ph.D. thesis, Virginia Polytechnic Institute and State University, 2009 at 158, <http://goo.gl/Ty6Hd> (viewed 21 March 2012).

210. J.S. Hernandez-Avilés *et al.*, "The algal growth potential and algae growth-limiting nutrients for 30 of Mexico's lakes and reservoirs," *Congress of the International Association of Theoretical and Applied Limnology: Proceedings 27*, Part 6 (2002): 1-6.

211. J.G. Limón *et al.*, *supra* note 208.

212. A.E. Filonov, "On the dynamical response of Lake Chapala, Mexico to lake breeze forcing," *Hydrobiologia* 467(1-3), 2002 at 141-157, <http://goo.gl/2VM0h> (viewed 21 March 2012).

213. *Idem.*

214. *Idem.*

215. *Idem.*

216. T. Chrzanowski *et al.*, "Estimates of bacterial growth rate constants from thymidine incorporation and variable conversion factors," *Microb. Ecol.* 25(2), 1993 at 121-130, <http://goo.gl/3J8Fb> (viewed 21 March 2012).

217. A.E. Filonov, *supra* note 212.

218. *Idem.*

219. *Idem.*

220. J. de Anda *et al.*, "Solids distribution in Lake Chapala, Mexico," *J. Am. Water Resour. Assoc.* 40(1), 2004 at 97-109, <http://goo.gl/MuvLr> (viewed 21 March 2012).

presents information about the interaction of factors affecting sediments in Lake Chapala from 1970 to 1990.[221]

102. In the 1970s, the Lerma contributed a mean water volume of 1,446 Mm^3 per year to Lake Chapala. At that time the lake had an average depth of 6.52 m,[222] and concentration of total solids in the water was a function of inflow from the Lerma River, resulting in a concentration gradient from east to west.[223] In the 1980s, inflow from the Lerma had dropped to 400 Mm^3 of water per year and the average depth of the lake had declined to 4.31 m.[224] Distribution models for total solids indicate the disappearance of the gradient that existed in the 1970s and the development of zones of high concentration of total solids in the eastern and south-central areas around the mouth of the La Pasión (Tizapán) River as well as in the central-western part of the lake.[225] In the 1990s, Lerma River inflow was relatively low, but relatively higher than the prior decade (annual mean of 476 Mm^3) but lake depth dropped even more precipitously to only 3.87 m.[226] During this time, the irregular distribution of solids was primarily a function of sediment resuspension.[227]

7.3.4 Biochemistry and trophic status of Lake Chapala

103. The biochemical environment and trophic status[228] maintaining the Lake Chapala ecosystem are characterized by water hardness and alkalinity, as well as phosphorus and nitrogen concentrations.[229] The water in Lake Chapala can be considered as "moderately hard" to "hard," with total hardness[230] (as $CaCO_3$) of 150 mg/l and alkalinity of 185 mg/l with pH of 8.7, varying according to the quantity of water in the basin. It is relevant to add that compounds in the water, with the exception of nitrogen, are diluted during the rainy season since direct inflow into the lake basin, from the Lerma River and other watercourses, increases. Moreover, increasing concentrations of salts in Lake Chapala have been shown to be attributable to dwindling water levels.[231]

104. Nitrogen and phosphorus are macronutrients that determine the productivity of aquatic ecosystems.[232] Nitrogen occurs in the form of nitrates, nitrites, ammonium, and organic nitrogen, while phosphorus occurs as orthophosphate or organic phosphorus.[233]

105. Dwindling water levels in Lake Chapala have caused phosphorus concentrations to increase,[234]

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221. *Idem*.
222. *Idem*.
223. *Idem*.
224. *Idem*.
225. *Idem*.
226. *Idem*.
227. *Idem*.
228. Trophic status is a fundamental concept in lake management. It refers to the relationship between nutrient concentration in a water body and organic matter growth. Eutrophication is the process where a water body changes its trophic status due to the increase of nutrients. The trophic status is total weight of biomass in a waterbody at a specific location and time. *See*: Food and Agriculture Organization of the United Nations (FAO), *Control of Water Pollution from Agriculture*, FAO: Irrigation and Drainage paper 55, FAO Natural Resources Management and Environment Department and GEMS/Water Collaborating Centre, Canada Centre for Inland Waters, Burlington, Ontario, Canada, 1996, <http://goo.gl/4oBCL> (viewed 21 March 2012); R.E. Carlson and J. Simpson, *A Coordinator's Guide to Volunteer Lake Monitoring Methods* (North American Lake Management Society, 1996), Madison, Wisconsin, <http://goo.gl/Ok1Av> (viewed 21 March 2012).
229. J.G. Limón, *supra* note 205.
230. O. Lind, T. Chrzanowski and Laura Dávalos-Lind, *supra* note 202. Note that hardness is the property of water that prevents it from producing suds when agitated with soap; hardness is primarily due to the presence of calcium and magnesium ions: Mexico, *Secretaría de Comercio y Fomento Industrial*, *Norma Mexicana NMX-AA-089/2-1992 Protección al Ambiente-Calidad del Agua-Vocabulario Part 2*, <http://goo.gl/Xu0aR> (viewed 21 March 2012). Hardness range varies depending on the reference; see for example: American Water Works Association, *Water Quality and Treatment*, 6th ed. (New York: McGraw Hill, 2011) at 13-16, in which the term "moderately hard" describes water in the 75-150 mg/l range; or MWH Inc., *Water Treatment: Principles and Design*, 2nd ed., rev. John C. Crittenden (Hoboken, NJ: Knovel Corporation), 2005 at 76, in which "moderately hard" describes water in the 50-100 mg/l range.
231. J.G. Limón *et al*., *supra* note 208; O. Lind and L. Dávalos Lind, "An introduction to the limnology of Lake Chapala, Jalisco, Mexico" in A. Hansen and M. van Afferden, *supra* note 166 at 139-149.
232. C.F. Mason *Biology of freshwater pollution*, 3rd ed. (Harlow, Essex, UK: Longman Scientific & Technical, 1991) at 93.
233. A.R.W. Jackson and J.M. Jackson, *supra* note 196 at 112-117.
234. J. de Anda *et al*., "Phosphorus balance in Lake Chapala (Mexico)," *J. Great Lakes Res*. 26(2), 2000 at 129-140, <http://goo.gl/Z62va> (viewed 21 March 2012).

a phenomenon that was documented throughout the 1980s and 1990s.[235] It has been maintained that water circulation patterns from Lake Chapala to the Santiago River changed with the construction of the Chapala-Guadalajara aqueduct and were a factor in phosphorus retention within the lake.[236] Prior to the construction of the aqueduct, outflow of phosphorus through the Santiago River was 50 tons per month, a figure that dropped to 9 tons per month once the aqueduct began being used (late 1991).[237] However, it has also been suggested that change in phosphorus concentrations is better explained by the cancellation of 536 Mm^3/year of concessions previously granted to hydroelectric power plants on the upper Santiago River.[238]

106. Approximately 80 percent of the phosphorus input to Lake Chapala comes from the Lerma River and 20 percent is due directly to contributions from the watershed, including runoff, streamflow, and wastewater treatment plant effluents.[239] A study noted that, "there is a significant internal phosphorus loading and a net accumulation of total phosphorus in Lake Chapala."[240] Water quality information for Lake Chapala, tabulated below, is based on data published by Semarnat.[241]

Table 2: Water Quality Data for Lake Chapala (2001–2006)[242]

Year	NH_4	Fecal coliforms	BOD_5 20 °C	COD $K_2Cr_2O_7$	NO_3	H_3PO_4	DO	DS	SS	pH*	Specific conductivity	Temp.
	mg N/L	*MPN/100 mL*	*mg O_2/L*	*mg O_2/L*	*mg N/L*	*mg/L*	*mg O_2/L*	*mg/L*	*mg/L*		*µS/cm*	*°C*
1990	0.41	0	1.71	30	0.15	0.24	7.6	662	52	8.92	1,024	26.15
1991	0.32	4.35E+5	1.23	31.61	0.36	0.28	7.18	850	40	8.59	885	23.1
1992	0.33	5.30E+7	1.22	41.29	0.18	0.27	7.45	613	37	7.59	673	22.4
1994	1.79	18.5	1.17	31.1	0.23	0.32	6.8	481.7	35.7	8.55	672	21.62
1996	0.13	48	2.34	0	0.17	0.43	6.7	613.5	25	8.8	913	21.6
1997	0.22	24	2.85	0	0.12	0.38	7.3	643.5	44	9	956	22.3
1998	0.15	26	2.46	39.6	0.12	0.38	7.55	730.8	61.6	9.2	358	21.7
1999	0.24	46.8	3.86	42.4	0.08	0.38	7.34	790	66	0	997	23.1
2000	0	5	2	47	0.2	0.46	8.6	802	66	0	1,127	23.3
2001	1.26	4.63	3.59	58.43	0	0.75	8.1	943	89	8.75	1,460	24.2
2002	0.35	7.77	2.32	65.33	0.22	0.54	7.4	931.1	64.2	8.87	1,369	22
2003	1.63	1.42	0	60.62	0.18	0.66	7.25	896.7	61.5	8.69	1,220	23
2004	0.92	0	1.94	40	2.58	0.64	6.77	575.7	48.8	8.43	750	23.8
2005	0.4	0	3.08	67	0.2	0.52	6.5	514	94	8.44	ND	21.7
2006	2.92	0	1.38	35.9	0.2	0.58	7.1	560	29.2	8.43	ND	23.5

* Laboratory measurement. Data for 1993 and 1995 were not reported.

235. *Idem.*
236. *Idem.*
237. *Idem.*
238. F. de P. Sandoval, *supra* note 183 at 61.
239. J. de Anda *et al.*, *supra* note 234.
240. *Idem.*
241. There is no indication, for the data in the Semarnat statistical database, of the methodology followed in performing the monitoring work or laboratory measurements. The table presents the parameter values without indicating whether they are averages and without taking account of seasonality, nor are any data given about sampling replication. It is not clear whether the zero values are actual measurements, whether the value was below the detection limit, whether there were technical flaws, or whether the sample was simply not taken.
242. Semarnat, Conagua, Water Treatment and Quality Branch (*Gerencia de Saneamiento y Calidad del Agua*), "Compendio de Estadísticas Ambientales: calidad del agua conforme a parámetros físicos, químicos y biológicos," <http://goo.gl/LdEjp> (viewed 21 March 2012).

(i) Primary productivity

107. Primary productivity is the rate at which new biomass is produced per unit area,[243] and as such it is related to nutrient concentration and, as a result, with algal abundance in a body of water.[244] This reaffirms the notion that the trophic State of a waterbody is directly related to and preceded by nutrient loads.[245] On the basis of phosphorus loads, Lake Chapala is classified as eutrophic.[246] Phosphorus is generally considered the limiting factor in the primary productivity of temperate and cold bodies of water and, consequently, of their trophic state.[247] However, and perhaps especially in the case of Lake Chapala, light penetration is the limiting factor in primary productivity.[248] In Lake Chapala, light penetration—a function of turbidity and mixing depth—determines the availability of energy for phytoplanktonic photosynthesis (i.e., primary productivity) and thus determines trophic classification.[249] High inorganic turbidity decreases the photic depth of the lake but does not affect its mixing depth—i.e., the depth to which water and algae circulate; hence it increases the ratio between mixing depth and photic depth (Z(mix)/Z(eu)).[250] As a result, photosynthetic organisms spend proportionately more time in the region of the water column reached by insufficient light to allow for photosynthesis, and their productivity is reduced concomitantly.[251] While nutrient loads (nitrogen, phosphorus) in Lake Chapala are generally high, these nutrients cannot be fully used due to the lack of solar energy, blocked by increased turbidity.[252] The lack of solar energy has been used to argue that light is the main factor limiting primary productivity in Lake Chapala,[253] a hypothesis that has been verified by observations made in the central and western portions of the lake during the rainy season, when the higher water level—and hence, the greater depth—dilutes the suspended particles and lets more light penetrate.[254]

108. Quantity of primary production in a biological system equals the biomass produced (in grams of carbon(c)) per unit of water per unit of time, and if this volumetric production is integrated along the water depth, it is referred to as unit of area of the lake.[255] The mean annual production measured in Lake Chapala in the mid-1980s was estimated at 80 gC/m^2, which is a low value, with significant differences among various regions of the lake.[256] In contrast, mean annual production in the early 1990s was 100 gC/m^2. One variable used to measure production quantity is mean concentration of chlorophyll-*a* (Chl*a*), which was 5.4 mg Chla/m^3 in the mid-1980s, indicating low algal productivity in that decade.[257] Chlorophyll-*a* concentration rose to 13.9 mg Chla/m^3 in the early 1990s.[258]

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243. A.R.W. Jackson and J.M. Jackson, *supra* note 196 at 192.

244. R.A. Vollenweider, *Scientific Fundamentals of the Eutrophication of Lakes and Flowing Waters, with Particular Reference to Nitrogen and Phosphorus as Factors in Eutrophication* (Paris: Organisation for Economic Co-operation and Development, 1968), Appendix 21.

245. R.E. Carlson, "A trophic state index for lakes," *Limnology and Oceanography*, V, 22(2), 1977, <http://goo.gl/wyVwT> (viewed 21 March 2012).

246. J. de Anda *et al.*, *supra* note 234. This determination was based on criteria proposed in R.A. Vollenweider, "Input-output models with special reference to the phosphorus loading concept in limnology," *Schweizerische Zeitschrift für Hydrologie* 37, 1975 at 53-84.

247. R.W. Sterner, "On the Phosphorus Limitation Paradigm for Lakes," *Int. Review Hydrobiol.* 93, nos. 4-5, 2008 at 433-445, <http://goo.gl/bBei7> (viewed 21 March 2012).

248. Research on primary productivity has been developed with reference to bodies of water that are not readily comparable with semitropical ecosystems such as Lake Chapala, *see*: O. Lind *et al.*, *supra* note 200.

249. O. Lind *et al.*, *supra* note 200.

250. J. Grobbelaar, "Phytoplankton productivity in turbid waters," *Journal of Plankton Research* 7, no. 5, 1985 at 653-663, <http://goo.gl/umsb4> (viewed 21 March 2012).

251. *Idem*.

252. O. Lind *et al. supra* note 200.

253. *Idem.*

254. In short, it may be stated that the smaller the Z_{mix}/Z_{eu} ratio, the more favorable the light environment; O. Lind, T. Chrzanowski and L. Dávalos-Lind, *supra* note 202.

255. For further reference, *see*: G. Lacroix, F. Lescher-Moutoué and A. Bertolo, "Biomass and production of plankton in shallow and deep lakes: are there general patterns?," *Annales de Limnologie* 35(2), 1999, <http://goo.gl/sKVQj> (viewed 21 March 2012).

256. The lowest productivity was recorded in the eastern sector at the start of the rainy season, i.e., when the sediment load entering from the Lerma River renders the lake relatively impermeable to light, see: O. Lind *et al.*, *supra* note 200.

257. *Idem.*

258. O. Lind and L. Dávalos-Lind, "Interaction of water quantity with water quality: the Lake Chapala example," *Hydrobiologia*, 467(1-3), 2002, <http://goo.gl/fpw0W> (viewed 21 March 2012).

109. With mean productivity of 80 gC/m², Lake Chapala was classified as oligotrophic;[259] when its productivity rose to 100 gC/m², the lake was classified as borderline oligotrophic-mesotrophic.[260] From 1980 to 1990, there was a change in turbidity and annual depth fluctuations, which altered algal growth and stimulated the development of submerged macrophytes.[261]

110. The table below was prepared based on the foregoing data and on the sediment-related information presented in section 7.3.3, summarizing various aspects of primary productivity in Lake Chapala.

Table 3: Primary productivity in Lake Chapala[262]

Decade	Water volume in the Lerma River (Mm^3/year)	Lake depth (m)	Distribution of total solids	Productivity (gC/m^2)	Mean chlorophyll-*a* concentration (mg Chl*a*/m^3)	Classification
1970s	1,446	6.52	East-to-west concentration gradient	ND	ND	ND
1980s	400	4.31	Disappearance of gradient and development of zones of high concentration in the eastern, south-central, and central-western portions of the lake	80	5.4	oligotrophic
1990s	476	3.87	Irregular distribution determined by sediment resuspension	100	13.9	borderline oligotrophic-mesotrophic

111. Under a Z_{mix}=Z_{eu}.ratio,[263]—without the turbidity barrier—high nutrient concentrations and light availability would result in high algal productivity.[264] Productivity would increase to the level at which one of the nutrients constituted the limiting factor. In 1989 it was shown that nitrogen is the limiting nutrient in Lake Chapala—not phosphorus, the typical limiting factor in temperate lakes.[265] The limiting status of nitrogen has not changed since 1985, if not earlier, and has been documented subsequently.[266] Other problems may arise under nitrogen-limiting conditions, including higher populations of nitrogen-fixing cyanobacteria, a group of organisms that are equipped to use atmospheric nitrogen—i.e., they are independent of water nitrogen levels—and are thus able to dominate aquatic ecosystems.[267] These bacteria give water a foul odor and flavor and, in some instances, generate compounds toxic to humans,[268] but it has been noted that "fortunately, nitrogen fixation by cyanobacteria does not occur in this lake,"[269] a phenomenon attributed to wind-caused water turbulence and inadequate light.[270] Although in recent years there have been reports

259. O. Lind *et al.*, *supra* note 200. *See also:* R. Wetzel, *supra* note 196.
260. O. Lind *et al.*, *supra* note 200.
261. *Idem.*
262. J. de Anda *et al.*, *supra* note 220.
263. That is, the entire mixing zone of Lake Chapala receiving light.
264. L. Dávalos Lind, O. Lind and R. Doyle, *supra* note 201.
265. L. Dávalos Lind, O. Lind and R. Doyle, *supra* note 201.
266. J.S. Hernández-Avilés *et al.*, *supra* note 210.
267. L. Mur, O. Skulberg and H. Utkilen, "Cyanobacteria in the environment" in I. Chorus and J. Bartram, eds., *A guide to their public health consequences, monitoring and management*,World Health Organization, 1999, <http://goo.gl/QYmQI> (viewed 21 March 2012).
268. Health Canada, *Blue-Green Algae (Cyanobacteria) and their toxins*, <http://goo.gl/KM2Tz> (viewed 21 March 2012).
269. L. Dávalos Lind, O. Lind and R. Doyle, *supra* note 201.
270. J. Glass, *Biological nitrogen fixation in a nitrogen-limited tropical lake, Lake Chapala Mexico,* M.Sc. thesis, Baylor University, 1987.

of cyanobacteria occurring in Lake Chapala due to a combination of weak winds and intense light,[271] its origin is disputed.[272]

(ii) Bacterial productivity

112. Bacterial productivity is important in aquatic ecosystems since it is the basis of two interdependent processes that are essential to the health of these ecosystems.[273] On the one hand, bacterial productivity is critical to the transformation and recycling of organic matter for use by other organisms, primarily phytoplankton and zooplankton;[274] on the other, bacterial productivity itself constitutes a source of particulate food—bacterioplankton—used by other organisms in the aquatic ecosystem.[275]

113. Bacterial productivity in Lake Chapala is considered to be high (9.3 x 10^{10} gCm^2/year), with findings indicating that benefits from high turbidity.[276] Highest bacterial abundance—almost double what is found in the central and western portions of the lake—corresponds to the zone of highest turbidity at the east end.[277] It is estimated that 90 percent of bacterial abundance occurs in the form of bacteria adhering to clay particles.[278] Adherent bacteria in the lake are approximately 56 percent bigger than free-floating bacteria: organic matter and dissolved nutrients (e.g., phosphorus) are also adsorbed to the clay,[279] creating a nutrient-rich growth medium.[280] The great importance of bacterioplankton in biomass production in the lake can be readily appreciated by comparing it with phytoplankton production, which represents an average of 58 percent of the lake's primary production.[281]

Table 4: Autotrophic phytoplankton productivity versus heterotrophic bacterial productivity in Lake Chapala (1997)[282]

Region of the lake	Production (gC/m^2 per year)	
	Phytoplankton	Bacterioplankton
East	125	24
Center	139	114
West	138	113

271. "Chapala padece por contaminación con algam," *El Informador*. Guadalajara, Jalisco, December 8, 2011, <http://goo.gl/v9eNR> (viewed 21 March 2012), where it was actually reported that wind-caused turbulence will remove sediments and eventually, algae; P. Ramírez-García *et al.*, *Cianobacterias, Microorganismos del Fitoplancton, y su Relación con la Salud Humana*, INE, México, [n.b.: year is not available] <http://goo.gl/1DcYb> (viewed 21 March 2012); and E. Cervantes-Flores "Lago de Chapala, invadido por algas que hacen que el agua se vea verde," *Notisistema*, Mexico, January 27, 2011, <http://goo.gl/3cnMW> (viewed 21 March 2012).
272. A. Del Castillo "Un alga hizo que el agua oliera mal," *Milenio*. Guadalajara, Jalisco, December 11, 2009, sec. Ciudad y Región, <http://jalisco.milenio.com/> (viewed 21 March 2012), where it was reported that cyanobacteria allegedly was an algae of the *Anabaena* species, which smells bad when it is killed by chlorine.
273. D.C. Sigee, *Freshwater microbiology: biodiversity and dynamic interactions of microorganisms in the aquatic environment* (Chichester, West Sussex, England: John Wiley and Sons, 2005) at 304, <http://goo.gl/af59H> (viewed 21 March 2012).
274. *Idem.*
275. *Ibid.* at 351.
276. O. Lind, T. Chrzanowski and L. Dávalos-Lind, *supra* note 202.
277. Bacterial abundance is as follows: East: 400±1.18; center: 195±0.47; west: 195±0.57 (x 10^{10} cells l/year), respectively. *Idem*.
278. L. Owen and L. Dávalos-Lind, "Association of turbidity and organic carbon with bacterial abundance and cell size in a large, turbid, tropical lake," *Limnology and Oceanography* 36(6), 1991, <http://goo.gl/3NZGH> (viewed 21 March 2012).
279. Adsorption is the adhesion of molecules to a surface.
280. O. Lind, T. Chrzanowski and L. Dávalos-Lind, *supra* note 202.
281. *Idem.*
282. *Idem.*

114. Bacterial productivity highlights the compensatory role played by clay particles in Lake Chapala, since they affect the availability of light (by blocking it out) and of macronutrients by sequestering them (in the photosynthetic—autotrophic—activity of phytoplankton), and in addition they agglomerate the dissolved organic matter used in the heterotrophic activity of bacterioplankton.[283] In fact, suspended clay protects the lake ecosystem by impeding the excessive phytoplankton productivity that would otherwise result from the heavy macronutrient (nitrogen and phosphorus) burden, making up for low autotrophic biomass production with heterotrophic production.[284] The consequences of this peculiar state of affairs for the food chain are discussed in the following section.

(iii) Role of clay aggregates in the food chain

115. Recent studies of fish production in Lake Chapala stress the ecological importance of charal/silversides (*Chirostoma consocium*, *C. jordani*, and *C. labarcae*) for this region.[285] Fish production between 1983 and 1996 was estimated at 8,576 tons annually (50 percent of the reported total catch in Jalisco).[286] It has been found that fish populations observed in Lake Chapala exceed that which are predicted by models based on measurements of the lake's limnological characteristics and phytoplankton productivity.[287] Experts note that this suggests the presence of other food sources, among them: i) organic matter entering the lake from the Lerma River during the rainy season; ii) organic matter originating in the floating masses of Common Water Hyacinth (*Eichhornia crassipes*) and in cattails (*Typha* sp.); and, iii) organic matter produced by bacterioplankton.[288]

116. Bacterial productivity contributes to this favorable nutrient abundance for the charal in Lake Chapala, as it has been shown that clay-organic-bacteria aggregates (COBA) are eaten by that species.[289] Introduced fish species such as *Oreochromis niloticus* (Nile Tilapia) and *Goodea atripinnis* (Blackfin Goodea) do not base their diet on COBA.[290]

117. A 1997 paper presents a conceptual model of trophic processes in Lake Chapala, including the various factors affecting phytoplankton and bacterial productivity and, consequently, fish production.[291] The model, which summarizes the foregoing discussion in this subsection, is presented below.

283. *Idem.*

284. *Idem.*

285. A 2008 study on the members of the genus commonly known as charal examined genetic diversity, diet, niche separation, trophic relations, and changes in biotic integrity. The study recommended management and conservation measures. R. Moncayo, *Coexistence in a Chirostoma Species flock: niche analysis and the role of water-level fluctuation on the structure and function of the zooplanktivorous guild*, Ph.D. dissertation, Baylor University, 2008, <http://goo.gl/2NEUm> (viewed 21 March 2012).

286. *Idem.*

287. O. Lind *et al.*, *supra* note 200.

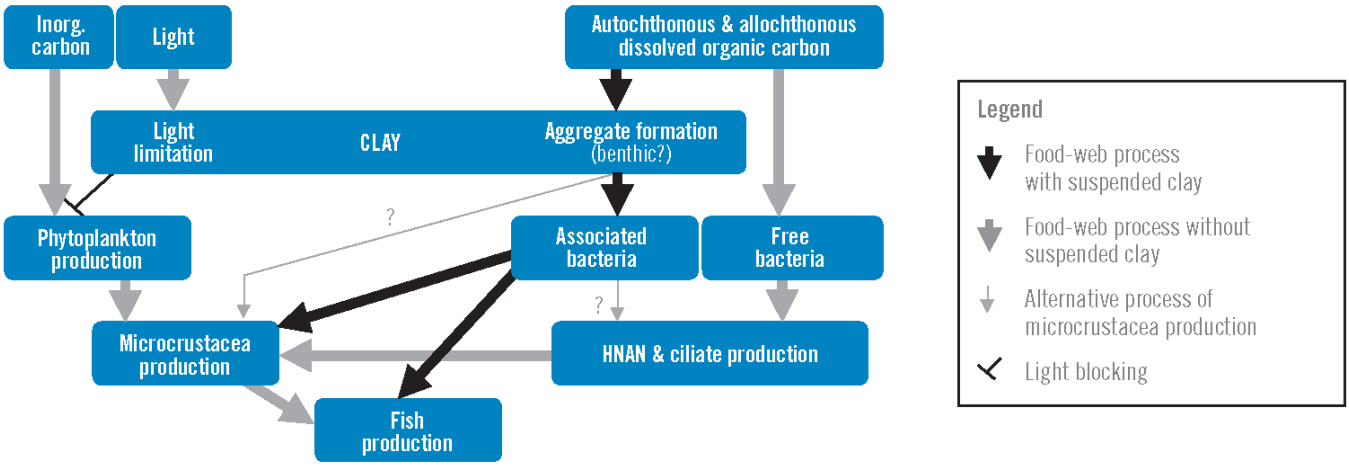
288. O. Lind and L. Dávalos Lind, *supra* note 231.

289. T. Ford *et al.*, "Trace metal concentrations in Chirostoma sp. from Lake Chapala, Mexico: elevated concentrations of mercury and public health implications," *J. Environ. Sci. Health, Part A*, 35(3), 2000 at 313-325, <http://goo.gl/AzoFV> (viewed 21 March 2012).

290. L. Dávalos-Lind and O. Lind, "Bacterioplankton grazing by fish and zooplankton in clay-rich and clay-free water," *Congress of the International Association of Theoretical and Applied Limnology: Proceedings 29*, Part 1, 2005 at 140-142, <http://goo.gl/zLIPw> (viewed 21 March 2012).

291. O. Lind, T. Chrzanowski and L. Dávalos-Lind, *supra* note 202.

Figure 6: Conceptual model of energetic processes in Lake Chapala[292]



118. In summary, clay particles in Lake Chapala constitute a critical limitation on the proliferation of algal masses and they also help to maintain the food chain by adsorbing organic matter.[293] However, clay particles are also concentrators of heavy metals, which readily agglomerate with COBA.[294]

7.4 Description of the Santiago and Verde Rivers, and their main tributaries in the area of interest

119. This section describes the portions of the Verde and Santiago River basins in the State of Jalisco, defined as follows:

(i) the Santiago River, from the Poncitlán gates in the municipality of the same name to the Arcediano site,[295] and

(ii) the Verde River, from the site known as Apanico (in Jalisco) to its confluence with the Santiago River.[296]

7.4.1 Santiago River

120. Although the riverbed of the Río Grande de Santiago (commonly known as the Río Santiago, or Santiago River) begins in Lake Chapala, it actually starts flowing 22 km northwest of this point.[297]

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292. *Idem.*

293. O. Lind *et al.*, "Clay and the movement of metals into food fishes," *J. Environ. Sci. Health, Part A*, 35(7), 2000 at 1171-1182, <http://goo.gl/sGmtE> (viewed 21 March 2012).

294. T. Ford *et al.*, *supra* note 289, stated at p. 313 that:
Concentrations of six metals (cadmium, copper, nickel, lead, zinc and mercury) were determined in *Chirostoma* sp. obtained from three different locations around Lake Chapala, Mexico, in July 1996. Concentrations of all metals were below trace metal action levels, where available, with the exception of mercury. Mercury concentrations ranged from 0.217 to 8.149 ìg/g dry weight, with highest concentrations in fish seined from the most turbid, eastern end of the Lake near the outflow. Samples of fried fish obtained from a fish market did not have elevated concentrations relative to other samples.

295. The immediate watershed of Lake Chapala is considered to begin on the upstream side of the Poncitlán gates on the Santiago River, since they have controlled the outflow from the lake since 1903; *Cf.* F. de P. Sandoval, *supra* note 183.

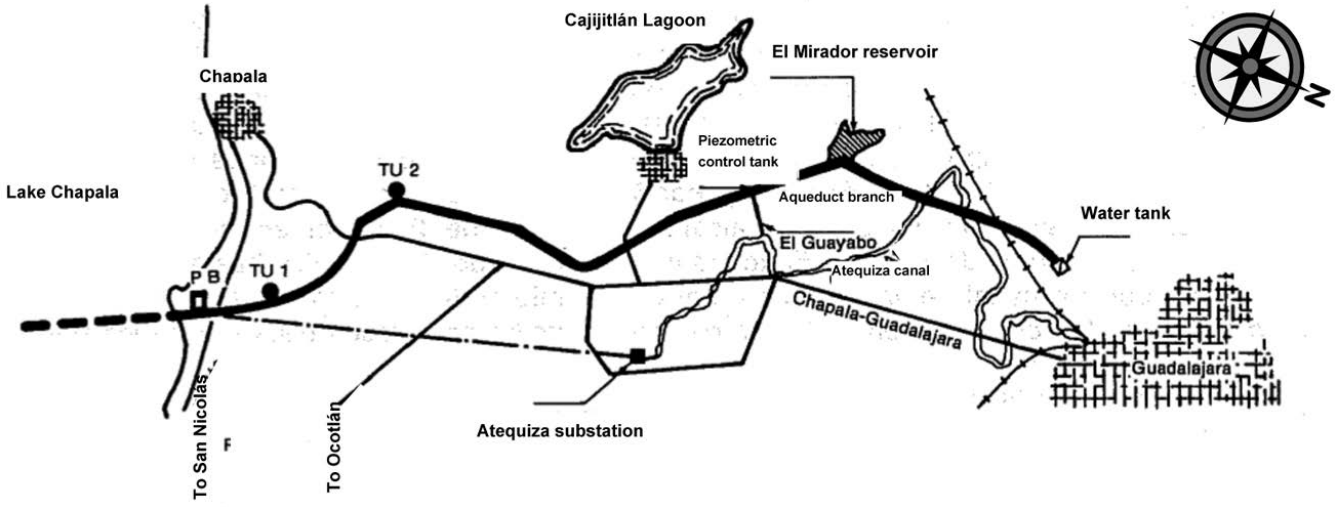
296. *See*: AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 2.

297. AyMA Ingeniería y Consultoría (2007), *supra* note 128, ch. 5, p. 17.

From there, it continues approximately 475 km to its mouth at the Pacific Ocean near the community of San Blas, Nayarit.[298] The river basin comprises an approximate area of 77,185 km^2.[299]

121. Prior to 1991, the Santiago River was the main outlet of Lake Chapala, but after 1991,[300] when the Chapala-Guadalajara aqueduct began operating,[301] the aqueduct has constituted the lake's largest outlet (figure 7),[302] exceeded only by evaporation.[303]

Figure 7: Chapala-Guadalajara aqueduct and main structures[304]



122. The section of the Santiago River in the area of interest has a length of 85 km from its beginning at the Poncitlán gates to its confluence with the Verde River (Figure 8). The Santiago receives inflow from the Verde River and other, smaller watercourses that drain portions of the State of Jalisco. This section of the Santiago River basin covers an approximate area of 3,033.4 km^2 and comprises the Chapala-Corona, La Laja River, Calderón River, and Corona-Verde River subwatersheds.[305] After the Poncitlán gates, the Santiago briefly runs through Poncitlán before forming the boundary between two sequences of municipalities: along the left bank, Poncitlán, Chapala, Ixtlahuacán de los Membrillos, Tlajomulco de Zúñiga, El Salto, Tonalá, and Guadalajara; and along the right bank, Ocotlán, Zapotlán del Rey, Juanacatlán, and Zapotlanejo.[306]

298. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 2.

299. IMDEC and Vida Institute, *Informe sobre violaciones al derecho a la salud y a un medio ambiente sano en Juanacatlán y El Salto, Jalisco, México* (Guadalajara: *Instituto Mexicano para el Desarrollo Comunitario, A.C.*, and *Instituto de Valores Integrales y Desarrollo Ambiental, A.C., Mártires del Río Santiago*, 2007) at 11, <http://goo.gl/BsPGx> (viewed 21 March 2012).

300. While it had been planned that the Chapala-Guadalajara aqueduct would be operating by 1987, it did not begin operating until 1991; see timeline *in* "Altos costos y falta de saneamiento hundieron el plan original de Arcediano," *El Informador*, 1 November 2010, <http://goo.gl/uJWcV> (viewed 21 March 2012).

301. The Chapala-Guadalajara aqueduct is located in the central portion of Jalisco and crosses the municipalities of Chapala, Ixtlahuacán de los Membrillos, Tlajomulco de Zúñiga and Tlaquepaque. The main purpose of this structure was to optimize water use from Lake Chapala, for bulk water supply not only to Guadalajara but also to its metropolitan area, which comprises the municipalities of Zapopan, Tlaquepaque and Tonalá; see J. Durán and A. Torres, *supra* note 188.

302. R. Flores Berrones, *supra* note 186.

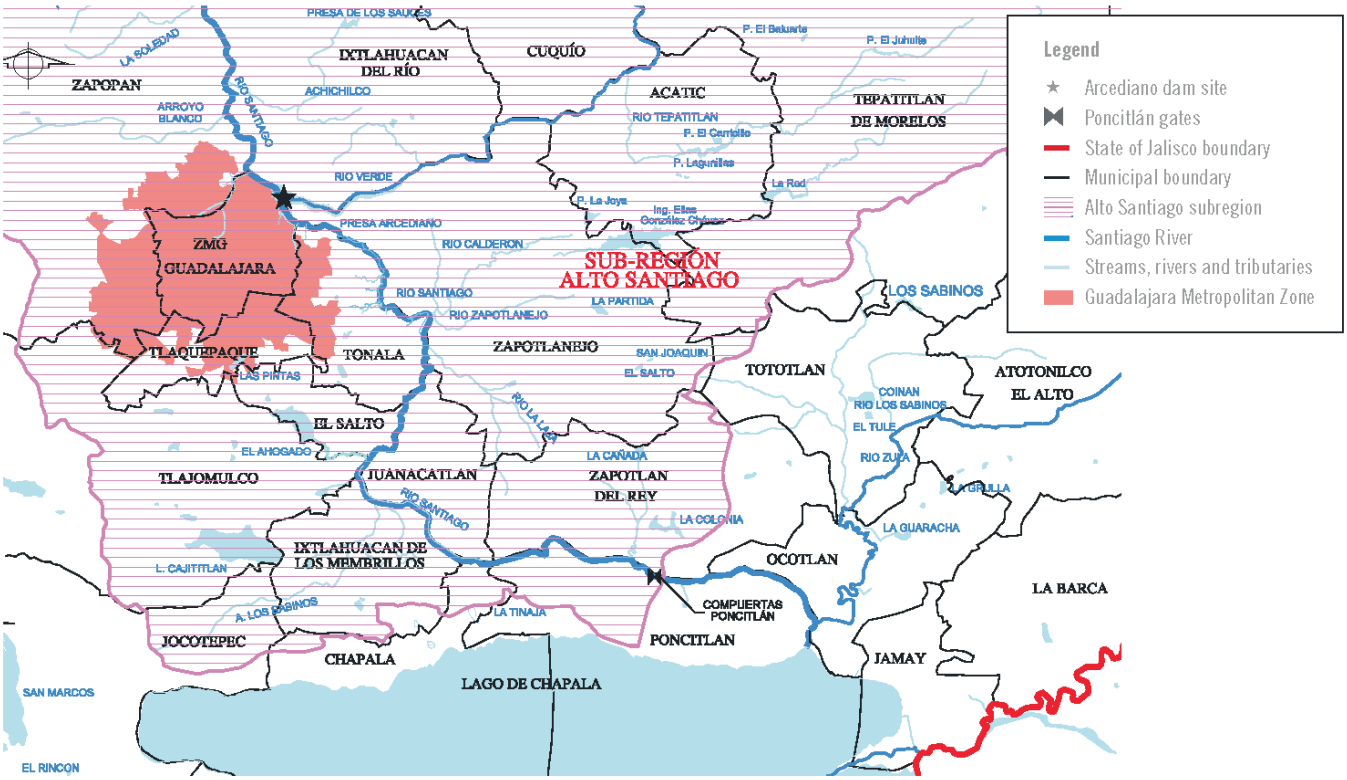
303. A. López-Caloca *et al.*, *supra* note 192.

304. R. Flores Berrones, *supra* note 186.

305. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 2.

306. *Idem.*

Figure 8: Location of the Santiago River from its source northeast of Lake Chapala to the Arcediano site[307]



123. Water flows into the Santiago River primarily from the watercourses listed in Table 5. Of these, the El Ahogado basin is notable for the industrial wastewater it receives from facilities sited along the El Salto-Ocotlán industrial corridor as well as municipal wastewater discharges from the Guadalajara Metropolitan Area (*Zona Metropolitana de Guadalajara*—ZMG); while the main discharges into the Zula River, the first tributary of the Santiago, consist of municipal sewage as well as discharges from the tequila and food industries.[308] It should be noted, however, that in this section, discharges from the Zula River, whose waters would normally flow downstream after the confluence with the Santiago, in reality flow into the lake when the gates at Poncitlán are closed, so that in fact the immediate watershed of Lake Chapala is considered to begin at Poncitlán.[309]

307. Image developed with information from: F. de P. Sandoval, *supra* note 183; AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary; and AyMA Ingeniería y Consultoría (2007), *supra* note 128, ch. 5, pp. 25, 30.

308. IMTA, *supra* note 115 at 39-55.

309. F. de P. Sandoval, *supra* note 183 at 23.

Table 5: Tributaries of the Santiago River in the area of interest[310]

Basin	Watercourse	Municipalities of origin	Bank of river where tributary enters
Santiago River	Zula River[311]	Atotonilco El Alto, Tototlán, Ayotán	Right
	Agua Fría Stream	Zapotlán del Rey	Right
	La Cañada Stream	Zapotlán del Rey	Right
	Los Sabinos Stream	Ixtlahuacán de Los Membrillos	Left
	El Ahogado Arroyo	Zapopan, Tlaquepaque, Tlajomulco, El Salto	Left
	La Laja River	Zapotlanejo	Right
	Zapotlanejo River	Tepatitlán de Morelos, Acatic, Zapotlanejo	Right
	Calderón River	Zapotlanejo	Right

7.4.2 Verde River

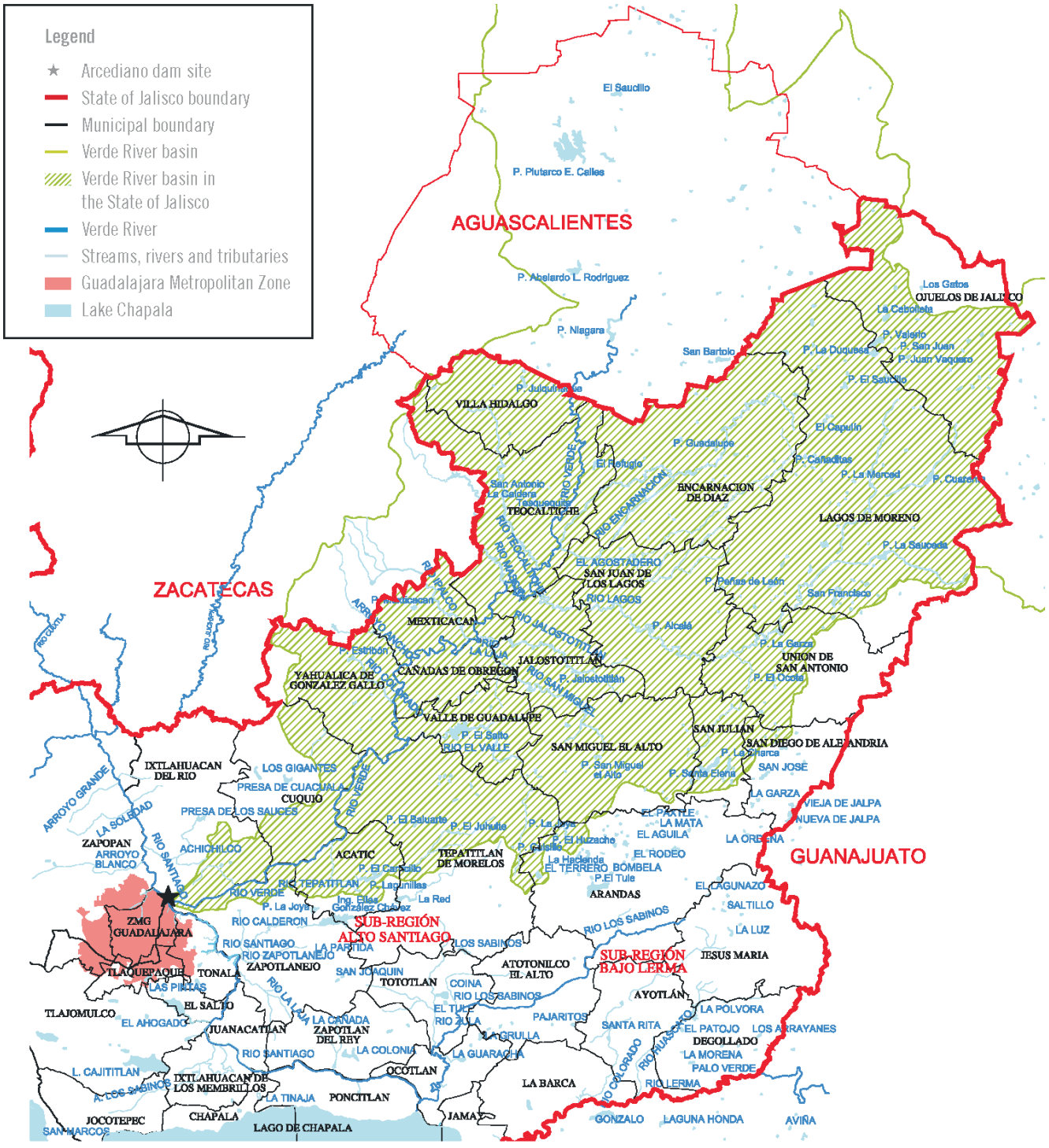
124. The Río Verde Grande (commonly known as the Río Verde or Verde River), is over 200 km long and some 15 percent of its length lies within the State of Zacatecas, 21 percent in Aguascalientes, 7 percent in Guanajuato, and 57 percent in Jalisco.[312] The Verde River receives water from 18 main tributary streams and supplies 58 water towers for residential and irrigation uses.[313] In 2005, the population residing along the Verde River was 771,545.[314]

125. At its source, the Verde River is known as the Aguascalientes River and arises on the north slope of El Devisador Peak, 6 km east of the locality of San Jerónimo, Zacatecas.[315] The Verde River supplies a considerable area of watershed in the State of Zacatecas before entering the State of Jalisco through the municipality of Valle Hidalgo.[316] The Verde River, after entering Jalisco, traverses the municipality of Teocaltiche before forming the boundary between two series of municipalities: along the left bank, Jalostotitlán, Cañadas de Obregón, Valle de Guadalupe, Tepatitlán de Morelos, Acatic, and Zapotlanejo; and along the right bank, Teocaltiche, Mexticacán, Yahualica de González Gallo, Cuquío, and Ixtlahuacán del Río. Finally, it converges with the Santiago River in the Oblatos gorge at 990 meters above sea level (m.a.s.l.).[317]

126. In the State of Jalisco there are 21 municipalities located totally or partially within the Verde River basin, 17 of them totally or largely within it and four of them having less than 40 percent of their total area within the watershed.[318]

310. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 4.
311. It is however considered as an inflow into Lake Chapala.
312. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 1.
313. *Ibid*., ch. 1, p. 8.
314. Inegi, *Conteo de Población y Vivienda 2005*, Mexico, 2006.
315. Conagua, *Determinación de la disponibilidad de agua en el acuífero Lagos de Moreno, Estado de Jalisco*, National Water Commission, General Technical Branch, Groundwater Division (*Subdirección General Técnica, Gerencia de Aguas Subterráneas*), Mexico, 30 April 2002 at 6-7, <http://goo.gl/3WRp> (viewed 21 March 2012).
316. AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 1, p. 1.
317. *Ibid*., executive summary, p. 1.
318. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 6.

Figure 9: Location of the Verde River basin in the State of Jalisco[319]



319. Image generated based on: CEA-Jalisco, "Jalisco en cuencas," <http://goo.gl/urAei> (viewed 21 March 2012); and AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 3.

127. The Verde River basin has various tributaries running into the main river, such that the basin extends to a large number of municipalities in the Altos de Jalisco region, in addition to including a portion of the State of Zacatecas, specifically the municipality of Nochistlán de Mejía and Apulco.[320] The main industrial activities discharging wastewater into the Verde River are related to agricultural food processing, dairy production, and tequila production.[321]

Table 6: Tributaries of the Verde River in the area of interest[322]

Basin	Watercourse	Municipalities of origin[323]	Bank of river where tributary enters
Verde River	Lagos River	San Juan de Los Lagos, Jalostotitlán	Left
	Mazcua River (confluence of Ahuetita and Apulco Rivers)	Nochistlán de Mejía, Apulco, Teocaltiche	Right
	Santa Rosa Stream	Nochistlán, Mexticacán, Teocaltiche	Right
	La Laja River (confluence of Jalostotitlán and San Miguel Rivers)	Jalostotitlán, San Miguel El Alto, Cañadas de Obregón	Left
	Ipalco River	Nochistlán de Mejía, Mexticacán	Right
	El Salitre Stream	Valle de Guadalupe, Cañadas de Obregón	Left
	Colorado Stream	Cañadas de Obregón	Left
	Mexticacán Stream	Mexticacán	Right
	Ancho River	Nochistlán de Mejía, Yahualica de González Gallo, Mexticacán	Right
	Yahualica River	Yahualica de González Gallo	Right
	El Salto River	San Miguel El Alto, Tepatitlán de Morelos, Valle de Guadalupe	Left
	Atenguillo River	Yahualica de González Gallo, Cuquío	Right
	Tepatitlán River	Tepatitlán de Morelos, Acatic	Left
	La Máquina Stream	Cuquío, Ixtlahuacán del Río	Right
	Lagunillas Stream	Ixtlahuacán del Río	Right

320. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 4.

321. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 23.

322. *Ibid.* at 4.

323. The municipalities mentioned are located in the state of Jalisco, with the exception of Nochistlán de Mejía and Apulco, which are in the state of Zacatecas; see, in this regard, *Instituto Nacional para el Federalismo y el Desarrollo Municipal*, Government of the State of Jalisco, "Enciclopedia de los Municipios de Jalisco," <http://goo.gl/Z4tHn> (viewed 21 March 2012).

8. Measures taken by Mexico to enforce LGEEPA, Articles 5, paragraph XI, and 133 in relation to preservation of the quality of national waters and to water quality monitoring in the area of interest

128. The Submitters assert that Mexico is failing to effectively enforce LGEEPA Article 133, which establishes Semarnat's obligation to conduct systematic and ongoing monitoring of water quality for the purpose of timely detection of contaminants or excess organic wastes, with consequent application of the relevant measures.[324] The submitters further argue that Mexico is failing to effectively enforce LGEEPA Article 5, paragraph XI, which provides for the Federation's jurisdiction over the protection and preservation of national waters.[325]

129. This section of the factual record contains factual information pertaining to measures taken by Mexico with a view to enforcing LGEEPA Articles 5, paragraph XI, and 133, relating to preservation of the quality of national waters and to monitoring of water quality in the area of interest. As noted above, the Secretariat merely presents the facts in this regard, but draws no conclusions regarding the meaning of these facts.

8.1 Mechanisms to preserve quality of national waters

130. Mexico has stated that "a water quality index developed by IMTA was applied to the data provided by the [monitoring] stations for the lake [Chapala]."[326] Conagua uses a water quality index (WQI) devised by IMTA[327] as a tool for its water quality monitoring.[328] The WQI indicates the level of water contamination on the sampling date, expressed as a percentage of pure water.[329] Thus, highly contaminated water will have a WQI near or equal to zero percent, while excellent quality water will have an index near one-hundred percent.[330] The WQI is a weighted and simplified composite of eighteen physicochemical quality variables,[331] in which the weightings depend on the use of the water.[332]

131. The criteria derived from the WQI are merely indicative for the water authority[333] and are not binding on private citizens.[334] In any case, the authority must base its acts of enforcement on the appropriate NOM, the LAN, its regulation, and any specific discharge conditions that may apply, but not on the WQI.[335]

132. Moreover, certain water quality-related documents applicable to the area of interest refer to the Ecological Criteria for Water Quality (*Criterios Ecológicos de Calidad del Agua*—CECA) established in 1989,[336] considering that "[...] in order to put the pertinent environmental policy into practice, it is essential to define ecological criteria for water

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324. Submission, *supra* note 3 at 12.
325. *Ibid.* at 7-8.
326. SEM-97-007 (*Lake Chapala*), Party Response (15 December 1998) at 10.
327. Semarnat, *Informe de la situación del medio ambiente en México*, chapter 4, "Agua," Secretaría de Medio Ambiente y Recursos Naturales, Mexico, 2003, <http://goo.gl/jjtxa> (viewed 21 March 2012).
328. *Cf.* LAN, *supra* note 144, Art. 86, para. I and LGEEPA, *supra* note 32, Art. 133.
329. Semarnat, *supra* note 327.
330. *Idem*.
331. In total, eighteen physicochemical parameters are calculated indicating their weighted importance (*Wi*). Semarnat, *supra* note 327, Table III.2.2.2.
332. *Centro de Investigación en Geografía y Geomática, Ing. J.L. Tamayo*, "Variación del Nivel y el Indice de Calidad del Agua: análisis de Calidad de Agua en el Lago de Chapala," SEP-Conacyt, Mexico, 1999, <http://goo.gl/Bf7Ob> (viewed 21 March 2012).
333. L. León, "Índices de calidad del agua (ICA): forma de estimarlos y aplicación en la cuenca Lerma-Chapala," IMTA, Mexico, 1992, <http://goo.gl/Tr4Ty> (viewed 21 March 2012).
334. Expert opinion of Dr. Luis Vera at a meeting on 16 July 2009.
335. *Idem.*
336. *Secretaría de Desarrollo Urbano y Ecología*, Decision establishing the Ecological Water Quality Criteria CE-CCA-001/89, DOF 13 December 1989.

quality, with this reference framework, which specifies the levels of the parameters and of the substances found in water."[337] The CECA does not list the biochemical oxygen demand in five days (BOD_5) and chemical oxygen demand (COD) criteria used by Conagua for water body classification purposes (see Table 12 *infra*).

133. In Mexico, wastewater discharges into national property, such as Lake Chapala and the Santiago and Verde Rivers, are governed by the maximum allowable standards set out in NOM-001-SEMARNAT-1996 for different types of receiving bodies, as per the classification given in the Federal Duties Act (*Ley Federal de Derechos*—LFD).[338] Thus, the maximum allowable limits of NOM-001-SEMARNAT-1996 apply to different bodies of water on the basis of their classification as type A, B, or C receiving bodies under LFD Article 278-A.[339] In principle, a type C receiving body should present a better water quality than type A and B receiving bodies since the standards applicable to the wastewater discharges in the former are more strict. For illustrative purposes, these three categories may be considered: poor (A), good (B) and excellent (C). The classification of receiving bodies is also relevant for the performance of monitoring activities in accordance with LGEEPA Article 133.[340]

134. The classifications of the Santiago and Verde Rivers (and their tributaries) in effect since 1996[341] were amended on 13 November 2008, by means of a transitory article of the amendments to the LFD that entered into force on 1 January 2009.[342] Thus, the Santiago and Verde Rivers were reclassified—from their source in the State of Jalisco to the Arcediano site—as type C wastewater receiving bodies. These changes of classification are reflected in Table 7.

337. *Idem*.

338. NOM-001-SEMARNAT-1996, *supra* note 148, Tables 1 and 2.

339. Federal Duties Act (*Ley Federal de Derechos*—LFD), DOF 31 December 1981, Art. 278-A was added as part of the amendments published in the DOF on 15 December 1995 that established the classification of wastewater receiving bodies.

340. Meeting with Dr. Luis Vera, *supra* note 334.

341. In this regard: LFD, *supra* note 339, Art. 278-A, added as part of the amendments published in the DOF on 15 December 1995, provided as follows:

> National bodies of water which receive wastewater discharges shall be considered type "A," with the exception of the following: type "B" receiving bodies [...] Jalisco: [...] Santiago River (Chapala-Atequiza) in the municipalities of Ocotlán, Poncitlán, Zapotlán del Rey, Juanacatlán, and Ixtlahuacán de los Membrillos; [...] Verde River in the municipalities of Teocaltiche, Villa Hidalgo, Jalostotitlán, Mexticacán, Cañadas de Obregón, Valle de Guadalupe, Cuquio, Tepatitlán de Morelos, and Acatic; [...]

342. *Ibid.*, Article First Transitory of the reforms published in DOF on 13 November 2008.

Table 7: Reclassification of Receiving Bodies of Water

Municipality	In force in 2008[343]	In force in 2009[344]
Santiago River		
Ocotlán	B	C
Poncitlán	B	C
Zapotlán del Rey	B	C
Chapala	B	C
Ixtlahuacán de los Membrillos	A	C
Juanacatlán	A	C
El Salto	A	C
Tlajomulco de Zúñiga	A	C
Tonalá	A	C
Zapotlanejo	A	C
Verde (or San Pedro) River		
Teocaltiche	B	C
Jalostotitlán	B	C
Mexticacán	B	C
Cañadas de Obregón (or Villa Obregón)[345]	B	C
Valle de Guadalupe	B	C
Yahualica de González Gallo	B	C
Cuquío	B	C
Tepatitlán de Morelos	B	C
Acatic	B	C
Zapotlanejo	B	C
Ixtlahuacán del Río	B	C

135. In addition, the same transitory article of the LFD included the "direct and indirect tributaries" of the Santiago and Verde Rivers;[346] hence, the reclassification also applies to the tributaries of the Santiago and Verde Rivers in the following municipalities listed in Table 2.

343. *Ibid.*, Art. 278-A (in force in 2008).

344. *Ibid.*, Article Sixth Transitory of the reforms published in DOF on 13 November 2008 (in force as of 1 January 2009).

345. The text of the LFD in force in 2008 refers to the locality of Villa de Obregón. However, on 10 January 1980, by means of executive order no. 10,194, the municipality of Villa Obregón, formerly called Cañadas, was authorized to change its name to Cañadas de Obregón; see *Instituto Nacional para el Federalismo y el Desarrollo Municipal*, "Enciclopedia de los municipios de México, Estado de Jalisco, Cañadas de Obregón," <http://goo.gl/sB9P3> (viewed 21 March 2012).

346. LFD, *supra* note 339, Article Sixth Transitory of the reforms, published in the DOF on 13 November 2008:
As of 1 January 2009 and for the purposes of Article 278-A of the Federal Duties Act, the following national bodies of water that are wastewater discharge receiving bodies located in the state of Jalisco are considered type "C" receiving bodies, in addition to those mentioned as such in the aforecited article: San Pedro or Verde River and its direct and indirect tributaries up to the Arcediano site, in the municipalities of Teocaltiche, Jalostotitlán, Mexticacán, Cañadas de Obregón, San Juan de los Lagos, San Miguel El Alto, Valle de Guadalupe, Yahualica de González Gallo, Cuquío, Tepatitlán de Morelos, Acatic, Zapotlanejo, and Ixtlahuacán del Río; Santiago River and its direct and indirect tributaries up to the Arcediano site, in the municipalities of Ocotlán, Poncitlán, Zapotlán del Rey, Chapala, Guadalajara, Ixtlahuacán de los Membrillos, Ixtlahuacán del Río, Juanacatlán, El Salto, Tlajomulco de Zúñiga, Tlaquepaque, Tonalá, Zapopan, and Zapotlanejo, and Zula or Los Sabinos River and its direct and indirect tributaries in the municipalities of Arandas, Atotonilco El Alto, Tototlán, and Ocotlán.

Table 8: Reclassification of Receiving Bodies of Water (tributaries)

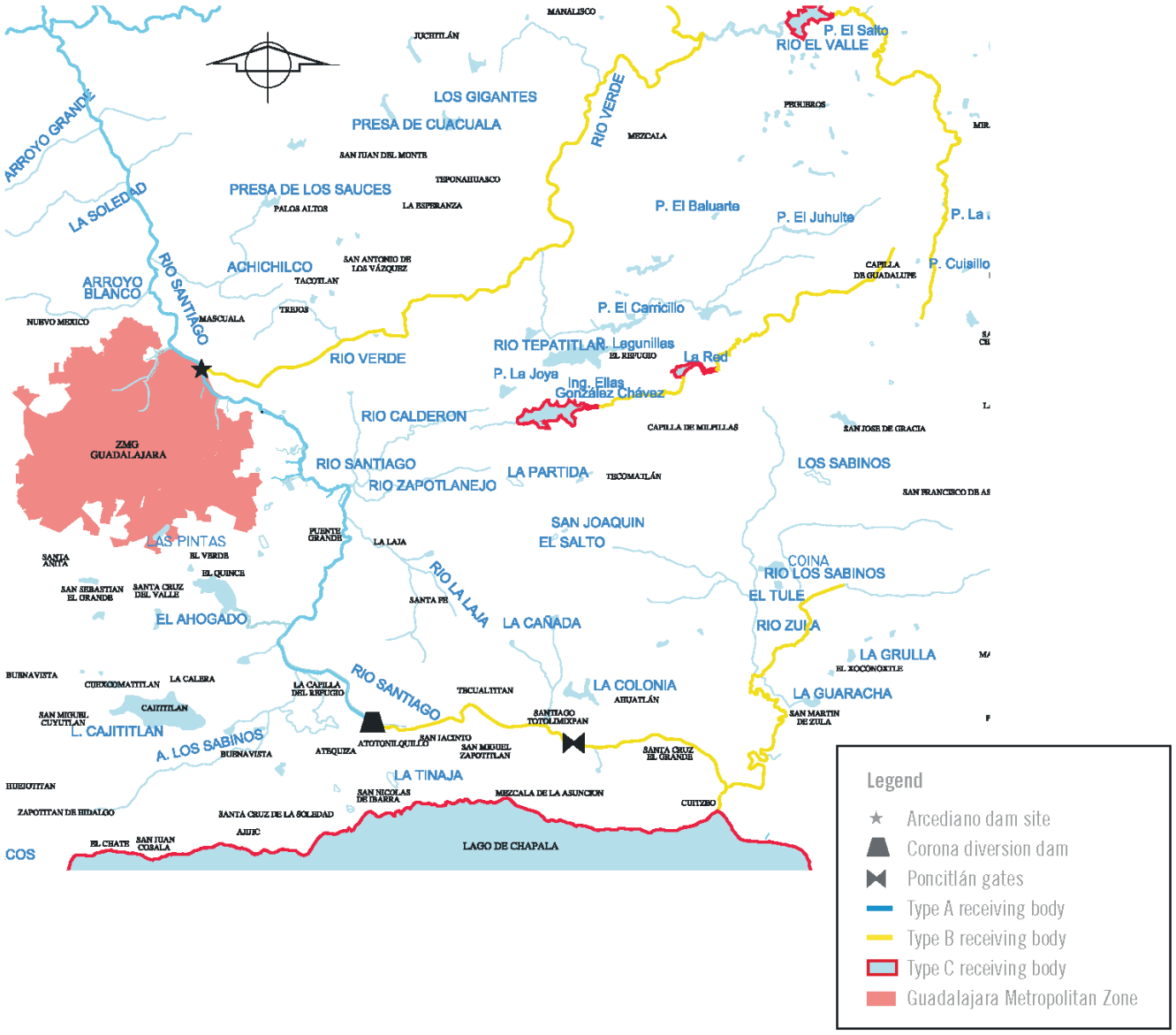
Municipality	In effect in 2008[347]	In effect in 2009[348]
Santiago River and tributaries		
Guadalajara	A	C
Zapopan	A	C
Ixtlahuacán del Río	A	C
Tlaquepaque	A	C
Verde (or San Pedro) River and tributaries		
San Juan de los Lagos	A	C
Zula (or Los Sabinos) River and tributaries		
Tototlán	B	C
Ocotlán	B	C
Arandas	A	C
Atotonilco El Alto	A	C

136. The following is a map showing the classification of the Verde and Santiago Rivers in effect until 2008.

347. *Ibid.,* Art. 278-A in force in 2008.

348. *Ibid.,* Article Sixth Transitory of the reforms published in DOF on 13 November 2008.

Figure 10: Classification of the Verde and Santiago Rivers under the LFD until 2008[349]



137. With the most recent classification of bodies of water, the following parameters and maximum allowable limits now apply to discharges into Lake Chapala and the Santiago and Verde River basins:[350]

349. Image developed with information from: AyMA Ingeniería y Consultoría (2007), *supra* note 128.

350. NOM-001-SEMARNAT-1996, *supra* note 148.

Table 9: Maximum Allowable Pollution Levels for Discharges of Wastewater (Basic Contaminants) into Receiving Bodies as per Table 2 of NOM-001-SEMARNAT-1996

Maximum allowable levels for basic contaminants[351]				
Parameter (mg/L except as specified)	**Rivers**		**Natural and artificial reservoirs**	
	Protection of aquatic life (type C bodies of water as per LFD)		**Urban public use (type C bodies of water as per LFD)**	
	Monthly Average	Daily Average	Monthly Average	Daily Average
Temp. (ºC) (1)	40	40	40	40
O&G (2)	15	25	15	25
Floating matter (3)	absent	absent	absent	absent
SS (mL/L)	1	2	1	2
TSS	40	60	40	60
BOD_5	30	60	30	60
Total nitrogen	15	25	15	25
TP	5	10	5	10

(1) Instantaneous, at time of sampling; (2) simple sample, weighted average; (3) absent as determined by assay method prescribed by NMX-AA-006.

For fecal coliforms, the maximum allowable limit is 1,000–2,000 microorganisms/100 ml as most probable number (MPN) for monthly and daily averages, respectively (section 4.2 of NOM-001-SEMARNAT-1996).

Table 10: Maximum Allowable Limits for Discharges of Heavy Metals into Receiving Bodies as per Table 3 of NOM-001-SEMARNAT-1996

Maximum allowable limits for metals and cyanides				
Parameter (*) (mg/L)	**Rivers**		**Natural and artificial reservoirs**	
	Protection of aquatic life (type C bodies of water as per LFD)		**Urban public use (type C bodies of water as per LFD)**	
	Monthly Average	Daily Average	Monthly Average	Daily Average
Arsenic	0.1	0.2	0.1	0.2
Cadmium	0.1	0.2	0.1	0.2
Cyanides	1.0	2.0	1.0	2.0
Copper	4.0	6.0	4.0	6.0
Chromium	0.5	1.0	0.5	1.0
Mercury	0.005	0.01	0.005	0.01
Nickel	2.0	4.0	2.0	4.0
Lead	0.2	0.4	0.2	0.4
Zinc	10.0	20.0	10.0	20.0

(*) Measured as total.

351. Basic contaminants are "those compounds and parameters that may be removed or stabilized following conventional treatment"; NOM-001-SEMARNAT-1996, *supra* note 148, para. 3.8.

138. The Chamber of Representatives (*Cámara de Diputados*) indicated concern as to the level of contamination of bodies of water in the area of interest, in their remarks on the draft amendments to the LFD's reclassification bodies of water in the Arcediano area.[352] Consequently, the Chamber of Representatives proposed the inclusion, in the amendments to the LFD put forward by the Executive, of a transitory article to reclassify the Verde, Santiago, and Zula Rivers as well as their respective direct and indirect tributaries.[353]

8.2 Preservation and monitoring of water quality in Mexico and in the area of interest

139. Conagua, through the Unit of Water Quality (*Gerencia de Calidad del Agua*, subsidiary of the *Subdirección General Técnica*), is the administrative unit of Semarnat charged with responsibility for carrying out systematic and permanent monitoring through the operation of water quality monitoring systems, including the RNMCA.[354] Monitoring is conducted pursuant to the applicable Mexican official standards and specific discharge conditions.[355]

140. Semarnat oversees the National Environment and Natural Resources Information System (*Sistema Nacional de Información Ambiental y de Recursos Naturales*—SNIARN), the purpose of which is to record, organize, update, and disseminate national environmental information.[356] Among other data, SNIARN contains water quality monitoring data obtained from relevant scientific and academic work, as well as from technical work or work of any other nature that relates to the environment and the preservation of natural resources.[357] Among the tools making up SNIARN is the Pollutant Release and Transfer Register (PRTR),[358] the primary objective of which is to collect information on air, water, and soil emissions of 178 pollutants[359] by means of relational databases, geographical information systems, and methods for estimating air emissions, wastewater discharges, and hazardous waste generation.[360] In addition to these tools there is the RNMCA, which as noted above is one of the enforcement instruments for LGEEPA Article 133.[361]

141. Systematic observation of water quality through the RNMCA has been ongoing in Mexico since 1974.[362] The total number of monitoring stations operating in the country has increased from 363 in 1982 to 1,534 in 2009, all belonging to the RNMCA (see Appendix 10).[363]

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352. Cámara de Diputados, "Dictamen de la Comisión de Hacienda y Crédito Público, con Proyecto de Decreto que Reforma, Adiciona y Deroga Diversas Disposiciones de la Ley Federal de Derechos," *Gaceta Parlamentaria*, no. 2612-IV, 14 October 2008, <http://goo.gl/23W57> (viewed 21 March 2012).

353. *Ibid.*

354. Conagua Internal Regulations, *supra* note 118, Arts. 1 and 57, paras. III and V.

355. Cf. LAN, *supra* note 144, Art. 86, para. I:
> The "Water Authority" shall, pursuant to law be responsible for:
> I. Promoting and, as applicable, implementing and operating the federal infrastructure, monitoring systems, and services necessary for the preservation, conservation, and improvement of water quality in watersheds and aquifers, in accordance with the applicable Mexican Official Standards and specific discharge conditions. [...]

356. LGEEPA, *supra* note 32, Art. 159 *bis*.

357. *Idem*.

358. *Ibid*., Art. 109 *bis*.

359. Following the report on national emissions and transfer of contaminants corresponding to 1997-1998, references to this register are found only for the years 2004, 2005 and 2006, in which the list of substances monitored was reduced to 104; "Informe Nacional de Emisiones y Transferencias de Contaminantes (RETC)," Semarnat, <http://goo.gl/31Tvn> (viewed 21 March 2012). See also: CEC, *Taking Stock: North American Pollutant Releases and Transfers*, Commission for Environmental Cooperation, Montreal, 2012, <http://www.cec.org/takingstock/> (viewed 21 March 2012).

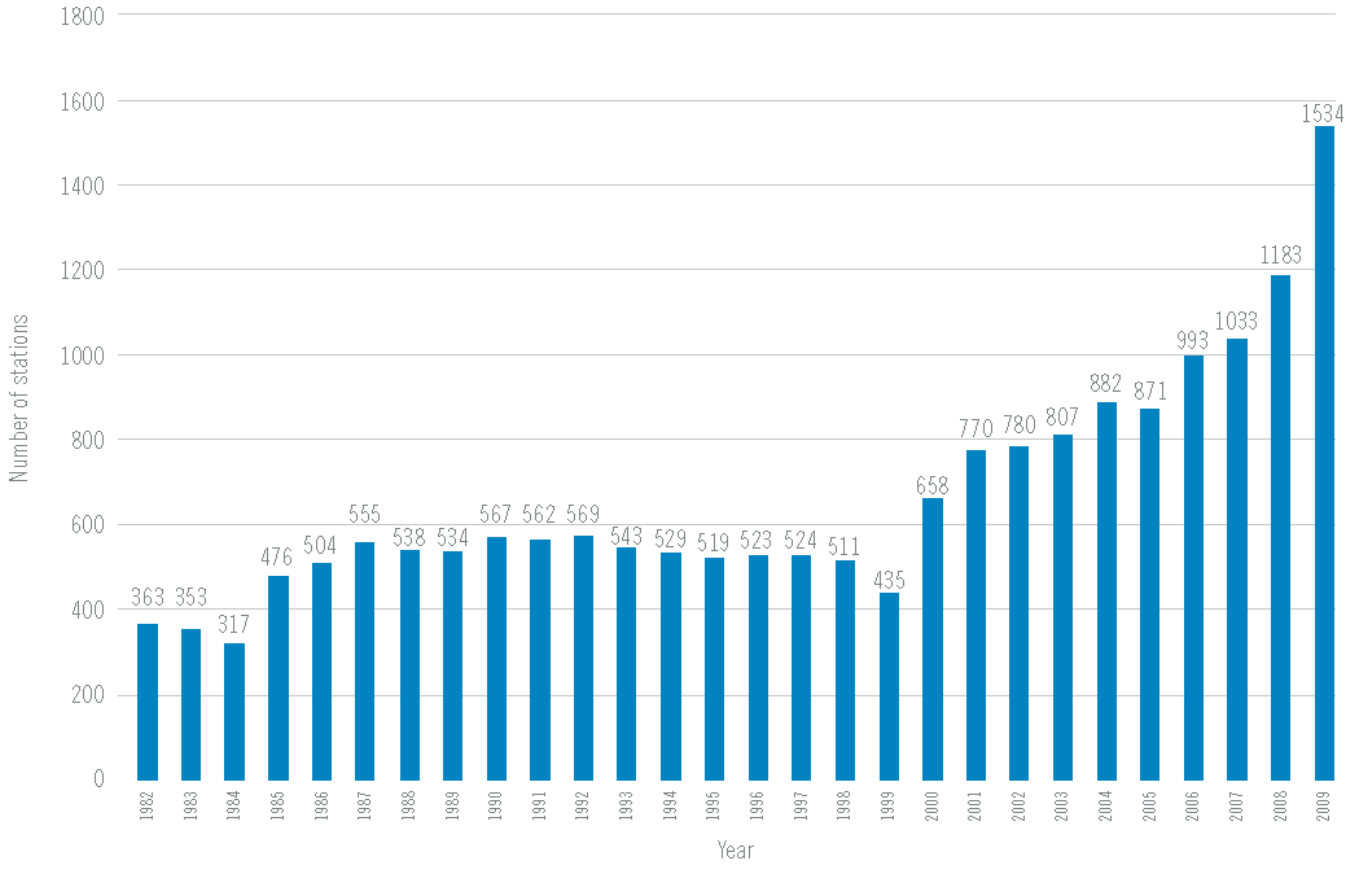
360. INE and Semarnap, *Informe nacional de emisiones y transferencia de contaminantes 1997-1998*, Instituto Nacional de Ecología, Secretaría de Medio Ambiente y Recursos Naturales, Mexico, 1999 at 10, <http://goo.gl/uhhkW> (viewed 21 March 2012).

361. Response, *supra* note 10 at 58; see also Conagua, "Red nacional de monitoreo de la calidad del agua," November 2002, <http://goo.gl/R29b> (viewed 21 March 2012).

362. Response, *supra* note 10, Appendix 12: Conagua, *Red Nacional de Monitoreo de la Calidad del Agua*, National Water Commission (*Comisión Nacional del Agua*), November 2002 at 4.

363. Conagua, response to Infomex-Federal request no. 1610100230710 (1 February 2011). It should be noted that the number of stations varied in the Response: *supra* note 10 at 59.

Figure 11: Numbers of RNMCA monitoring stations (1982-2009)[364]



142. In 1994, Conagua embarked upon a redesign of the RNMCA, identifying various deficiencies in the existing system, such as the absence of a periodic review procedure for water quality data.[365] It was concluded that:

> All states had RNM stations, but not in all hydrological regions of the country [...;] there were different types of water quality monitoring being conducted (point source, trends, combined effects) and different aquatic systems [...;] the variables being measured were limited to the water column and the usual physicochemical parameters; information on heavy metals was very scarce and there was no analysis of toxic organic compounds.[366]

143. The redesign of the RNMCA was implemented with the aim of making it the operational arm of the National Monitoring Program (*Programa Nacional de Monitoreo*), defined in general terms as a structured, organized system for collection of specific data.

> For the purposes of the [Conagua] National Monitoring Program, the operational definition of water quality contemplates statistically representative physical, chemical, and biological characteristics during a given period of time and at a given place in an aquatic system, whose levels allow for the water's direct use in a given beneficial activity without negative impacts.[367]

364. *Idem.*

365. Response, *supra* note 10, Appendix 12: Conagua, *Red Nacional de Monitoreo de la Calidad del Agua*, November 2002 at 6. *See also*: E. Barrios, "Proyecto de rediseño del programa nacional de monitoreo de la calidad del agua en México" in P. Ávila García, ed., *Agua, Medio Ambiente y Desarrollo en el siglo XXI*, El Colegio de Michoacán, Mexico, 2003 at 175, <http://goo.gl/15VYl> (viewed 21 March 2012).

366. *Idem.*

367. Response, *supra* note 10, Appendix 12: Conagua, *Red Nacional de Monitoreo de la Calidad del Agua*, November 2002 at 12.

144. During 1996, Conagua carried out a project to incorporate the water quality databases into the National Water Quality System (*Sistema Nacional de Calidad del Agua*), making it possible to create new computer applications based on RNMCA data.[368]

145. Currently, the RNMCA is divided into a primary network, a secondary network, a special research network, and a groundwater reference network (Table 11). In addition, it must be noted that the operating data of the monitoring stations in Lake Chapala and the Santiago and Verde rivers are presented in Table 13. Finally, this factual record presents information about the location of RNMCA stations in the area of interest (Figure 12) and the frequency of sampling (Table 14).

Table 11: National Monitoring Network sites in 2007[369]

Network	Function	Area	No. of sites
Primary network	Essential, permanent component of the RNMCA the purpose of which is to generate descriptive, long-term information on the country's most important bodies of water	Surface water	207
		Coastal zones	52
		Groundwater	130
Secondary network	Flexible component of the RNMCA associated with specific sources of impact on aquatic systems; its purpose is to generate descriptive short- and medium-term information serving to support regulatory and pollution control measures	Surface water	241
		Coastal zones	19
		Groundwater	25
Special studies	Ad hoc component arising from specific water quality information needs and serving to support other components of the RNMCA	Surface water	81
		Coastal zones	47
		Groundwater	123
Groundwater reference network	Permanent component whose purpose is to generate descriptive, long-term information on groundwater hydrogeology	Groundwater	89
Total			1,014

Note: The total number of water quality monitoring stations operated by RNMCA in the area of interest is 37 (see Table 14).[370]

368. The database of the National Water Quality Information System (*Sistema Nacional de Información de Calidad del Agua*) was created in 1996 as an offshoot of the Wastewater Discharge Updating System (*Sistema de Actualización de Descargas de Aguas Residuales*—SACDAR), the Industrial and Municipal Wastewater Treatment Plant Information System (*Sistema de Información de Plantas de Tratamiento de Aguas Residuales Industriales y Municipales*—SIPTARIM), and the Environmental Quality Information System (*Sistema de Información sobre la Calidad Ambiental*); *see*: Response, *supra* note 10, Appendix 12: Conagua, *Red Nacional de Monitoreo de la Calidad del Agua*, November 2002 at 21.

369. Conagua, *Estadísticas del agua en México*, Comisión Nacional del Agua, 2008 at 44, <http://goo.gl/EEOeH> (viewed 21 March 2012); and Response, *supra* note 10, Appendix 4: Conagua, *Red Nacional de Monitoreo de la Calidad del Agua*, 2003 at 12.

370. Conagua, Response to Request No. Infomex-Federal. 1610100223710 (5 November 2010).

146. The *Red Nacional de Monitoreo de la Calidad del Agua* bulletin published by Conagua[371] indicates that the sampling frequency at RNMCA stations is determined based on the following factors:

(i) Program objectives;

(ii) Cost-benefit analysis, and

(iii) Sampling and analysis capacity of Conagua.

147. Sampling frequency is monthly, bimonthly, quarterly, or every four months.[372] In the case of the primary network, sampling is monthly or bimonthly, while for the secondary network, periodic sampling at irregular intervals depending on the source of impact.[373] Water quality monitoring stations are normally sited in areas with high anthropogenic influence.[374]

148. Conagua uses three indicators to evaluate water quality: five-day biochemical oxygen demand (BOD_5), chemical oxygen demand (COD), and total suspended solids (TSS).[375] Measurement of BOD_5 and COD is used to ascertain the quantity of organic matter present in bodies of water that is "primarily from wastewater discharges of municipal and non-municipal origin."[376] Dissolved oxygen concentration is inversely related to these indicators, such that when they rise, aquatic ecosystems are negatively affected.[377] TSS derives from wastewater discharges and soil erosion; as the value of TSS increases, it is reflective of a body of water that is gradually losing its capacity to support aquatic life.[378]

149. In its annual water statistics report, Conagua published the water quality classifications based on BOD_5, COD, and TSS, and this is illustrated in Table 12.

371. Response, *supra* note 10, Appendix 4: Conagua, *Red Nacional de Monitoreo de Calidad del Agua,* November 2003.
372. *Ibid.* at 17.
373. *Idem.*
374. Conagua, *supra* note 369 at 44.
375. *Idem.*
376. *Idem.*
377. *Idem.*
378. *Idem.*

Table 12: Conagua water quality classification[379]

Criterion	Classification	Color
Biochemical oxygen demand (BOD_5)		
mg/L $BOD_5 \leq 3$	*Excellent* Uncontaminated water.	Blue
$3 < BOD_5 \leq 6$	*Good quality* Surface water with low concentrations of biodegradable organic matter.	Green
$6 < BOD_5 \leq 30$	*Acceptable* Signs of contamination. Surface water with self-purifying capacity or with biologically treated wastewater discharges.	Yellow
$30 < BOD_5 \leq 120$	*Contaminated* Surface water with raw wastewater discharges, primarily of municipal origin.	Amber
$BOD_5 > 120$	*Highly contaminated* Surface water with heavy impact of municipal and non-municipal raw wastewater discharges.	Red
Chemical oxygen demand (COD)		
$COD \leq 10$	*Excellent* Uncontaminated water.	Blue
$10 < COD \leq 20$	*Good quality* Surface water with low concentrations of biodegradable and non-biodegradable organic matter.	Green
$20 < COD \leq 40$	*Acceptable* Signs of contamination. Surface water with self-purifying capacity or containing biologically treated wastewater discharges.	Yellow
$40 < COD \leq 200$	*Contaminated* Surface water with raw wastewater discharges, primarily of municipal origin.	Amber
$COD > 200$	*Highly contaminated* Surface water with heavy impact of municipal and non-municipal raw wastewater discharges.	Red
Total suspended solids (TSS)		
$TSS \leq 25$	*Excellent* Exceptional, very high quality.	Blue
$25 < TSS \leq 75$	*Good quality* Surface water with low concentration of suspended solids, generally natural conditions. Favors the conservation of aquatic communities and unrestricted agricultural irrigation.	Green
$75 < TSS \leq 150$	*Acceptable* Surface water with signs of contamination. Contains biologically treated wastewater discharges. "Regular" condition for fish. Restricted agricultural irrigation.	Yellow
$150 < TSS \leq 400$	*Contaminated* Surface water of poor quality, containing raw wastewater discharges. Water with high concentration of suspended matter.	Amber
$TSS > 400$	*Highly contaminated* Surface water with heavy impact of municipal and non-municipal raw wastewater discharges with high contaminant loads. Poor condition for fish.	Red

379. *Idem.*

150. The operation of the RNMCA has been studied and audited by the government of Mexico, and in a 2003 study, the RNMCA reported that on average, at the national level, 26 variables were monitored with five of these—chlorides, conductivity, alkalinity, pH, and total hardness—monitored at 90 percent of the sites.[380] For its part, the Office of the Auditor General of the Federation (*Auditoría Superior de la Federación*, ASF), the technical auditing body of the Chamber of Deputies (*Cámara de Diputados*),[381] made the following observation in 2005 in regard to the level of compliance with the RNMCA-prescribed sampling frequency for BOD_5 and COD:

> [...] the rate of compliance with the BOD_5 sampling frequency was 7.7% since of 363 stations verified, 28 were sampling at monthly or bimonthly intervals as prescribed by the *Red Nacional de Monitoreo de Calidad de Agua* bulletin; while for COD monitoring, compliance with the prescribed frequency was 8.4%, since 29 of the 345 stations checked were monitoring according to the technical criteria established by [Conagua...].[382]

The Secretariat did not obtain information concerning the location of monitoring stations audited by ASF.

151. As to the area covered by water quality monitoring carried out by Conagua through the RNMCA, ASF reported:

> On average, of 975 watersheds (308) and subwatersheds (667) in the country, 132 (13.5%) were monitored by means of 354 stations in order to determine their level of contamination. On average, of the 354 monitoring stations, only 28 (7.9%) were performing water quality measurements based on the parameters and frequencies prescribed by the standard.[383]

The ASF audit report consulted by the Secretariat does not specify the geographic location of monitoring stations where results were reported.

152. According to information from Conagua, in 2009, Lake Chapala and the Santiago and Verde Rivers had 40 RNMCA monitoring stations that performed 183 sampling events and 4,801 tests in that year.[384] From 2003 to 2009, the activities of these monitoring stations were as follows (see also Appendix 10):

380. E. Barrios, *supra* note 365 at 175.

381. ASF, *Transparencia*, <http://www.asf.gob.mx/> (viewed 21 March 2012).

382. ASF, *Informe de Revisión de la Cuenta Pública 2005: Auditoría del Programa Estratégico para Contribuir a Detener y Revertir la Contaminación de los Sistemas que Sostienen la Vida (Aire, Agua y Suelos)*, Public Accounts 2005, Audit No. 117 at 55, <http://goo.gl/RYyAe> (viewed 21 March 2012).

383. *Idem*.

384. Conagua, *supra* note 363.

Table 13: Numbers of monitoring stations, sampling events, and water quality tests performed for Lake Chapala and the Santiago and Verde Rivers from 2003 through 2009[385]

Lake Chapala							
Year	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Stations	21	21	21	21	26	34	24
Sampling events	84	84	56	61	125	109	89
Tests	2373	2335	1589	1567	2595	1829	2610
Verde River							
Stations	5	3	3	4	4	4	4
Sampling events	13	6	13	19	19	14	12
Tests	370	194	433	485	484	319	292
Santiago River							
Stations	13	13	13	12	12	12	12
Sampling events	34	43	39	62	67	48	82
Tests	1036	1043	721	918	1203	808	1899
Total							
Stations	39	37	37	37	42	50	40
Sampling events	131	133	108	142	211	171	183
Tests	3779	3572	2743	2970	4282	2956	4801

Note: In regard to the Santiago and Verde Rivers and the discrepancy between the number of monitoring stations shown in the table and the information reported by the RNMCA for the area of interest (see Figure 12), this is due to the fact that the area of interest only comprises *part* of these bodies of water while the above table shows all the stations along both rivers.

153. From the monitoring stations listed in the above table, one must subtract those located in the Santiago and Verde Rivers but outside the area of interest. When this is done, the locations of the monitoring stations in the area of interest are as shown in Figure 12:

385. *Idem*.

Figure 12: RNMCA water quality monitoring stations in the area of interest[386]

Note: Only 32 of 37 monitoring stations can be seen on the figure as distinct points because of the scale of image, but this figure is included here in order to illustrate the location of the majority of the monitoring station sites.

386. Image produced in Google Earth from map coordinates of the RNMCA stations in: Conagua, Response to request Infomex-Federal No. 10100044511 (11 April 2011) and Director General of the Lerma-Santiago-Pacífico Watershed Authority, e-mail to the CEC Secretariat (24 September 2009).

154. Concerning prescribed monitoring frequency, Conagua's Lerma-Santiago-Pacífico Watershed Authority reported the following for 37 stations within the area of interest:

Table 14: Prescribed sampling frequency at RNMCA monitoring stations in the area of interest[387]

No.	Frequency	Chapala	Santiago	Verde	Other sites
7*	Monthly	2	1	0	4
3**	Bimonthly	0	2	0	1
22	Quarterly	22	0	0	0
1	Every four months	0	0	1	0
4	Semiannually	0	3	1	0

* Includes the stations in La Pasión River where it enters Lake Chapala; the Zula River at San Martín de Zula; the intake channel of the Chapala-Guadalajara aqueduct, and the Lerma River at Maltaraña.

** Includes the station in the community of San Martín de Zula.

155. It was not possible to ascertain how the prescribed sampling frequency was worked out with reference to objective factors such as program-related issues, cost-benefit considerations, and Conagua's sampling and analysis capacity.[388] The Secretariat was also not able to obtain the rate of compliance for RNMCA stations in the area of interest, and hence it was not possible to learn whether sampling was being done according to the frequency set for each monitoring station.[389] With respect to the type of station, codes used in the identification of monitoring stations define whether it is part of the primary, secondary or special studies network.[390]

156. Nevertheless, information about water quality monitoring results for Lake Chapala (2009) and the Santiago and Verde Rivers (2006–2009) was available from the RNMCA stations. In some cases[391] quality reports were not available for all stations listed in Table 14, while in others, although sampling was being performed four times per year, for example, these sampling events were not conducted at strict quarterly intervals; and in still other cases, the station had no set monitoring frequency,[392] or data registry was interrupted during a period of one or more years.[393]

157. In 2010, Conagua reported through the RNMCA that based on water quality measurements for one, two, or three of the indicators (BOD_5, COD, and TSS) it was determined that within hydrological-administrative region VIII, the Lerma-Santiago-Pacífico, Santiago and Verde Rivers were classified as "highly contaminated."[394] That situation is also reflected in the Vision 2030 Water Program (*Programa Hídrico Visión 2030*) for the State of Jalisco:

> According to information generated by the [National Monitoring Network], the main watercourses in the State of Jalisco and Lake Chapala exhibit major problems of contamination, especially: the industrial zone of El Salto [...] Lake Chapala is moderately contaminated [and] the Santiago River highly contaminated between the Las Juntas hydroelectric power plant and the Corona Diversion Dam [...].[395]

387. Director General of the Lerma-Santiago-Pacífico Watershed Authority, *supra* note 386.

388. Response, *supra* note 10, Appendix 4: Conagua, *Red Nacional de Monitoreo de la Calidad del Agua*, November 2003.

389. Conagua, *supra* note 363.

390. Conagua, *supra* note 370.

391. Such was the case for the Lerma River stations in Maltaraña, Lake Chapala Estación Lacustre 25, Lake Chapala Estación Lacustre 26, Chapala-Guadalajara Aqueduct, Intake Canal, and La Pasión River in Tizapán El Alto.

392. This was the case for monitoring stations downstream from the Santa Rosa Dam and at the Poncitlán Bridge.

393. This was the case of the monitoring station in the Santiago River downstream of El Ahogado, where no data were produced from 2006 to 2008.

394. Conagua, *supra* note 369 at 54.

395. Conagua, *Programa Hídrico Visión 2030 del Estado de Jalisco 2007-2030, Comisión Nacional del Agua*, Mexico, 2007 at 28, <http://goo.gl/Bm9Hm> (viewed 21 March 2012).

158. Concerning the information presented by Mexico in its Response on plans to carry out real-time water quality monitoring,[396] the Secretariat did not have any corresponding information relating to this matter in the area of interest.

159. The Secretariat obtained water quality data for the dry and rainy seasons in the area of interest and identified monitoring data produced by CEA-Jalisco.[397] The locations of the monitoring stations are presented in Figure 13, while the results were compared with the Conagua's classification parameters (BOD_5, COD, and TSS) in Table 15 below.[398]

Table 15: Water quality reported for the Santiago River at monitoring sites operated by CEA-Jalisco according to the Conagua classification[399]

Dry season			
Station	**BOD_5**	**COD**	**TSS**
RS1-Ocotlán*	Acceptable	Contaminated	Good quality
RS2-Presa Corona	Acceptable	Contaminated	Excellent
RS3-Ex Hacienda Zap.	Acceptable	Contaminated	Excellent
RS4-Salto-Juanacatlán	Contaminated	Contaminated	Good quality
RS5-Puente Grande	Acceptable	Contaminated	Excellent
RS6-Matatlán	Acceptable	Contaminated	Good quality
Rainy season			
Station	**BOD_5**	**COD**	**TSS**
RS1-Ocotlán	Acceptable	Contaminated	Good quality
RS2-Presa Corona	Good quality	Contaminated	Excellent
RS3-Ex Hacienda Zap.	Acceptable	Contaminated	Good quality
RS4-Salto-Juanacatlán	Acceptable	Contaminated	Good quality
RS5-Puente Grande	Acceptable	Contaminated	Good quality
RS6-Matatlán	Acceptable	Contaminated	Good quality

* RS: Santiago River.

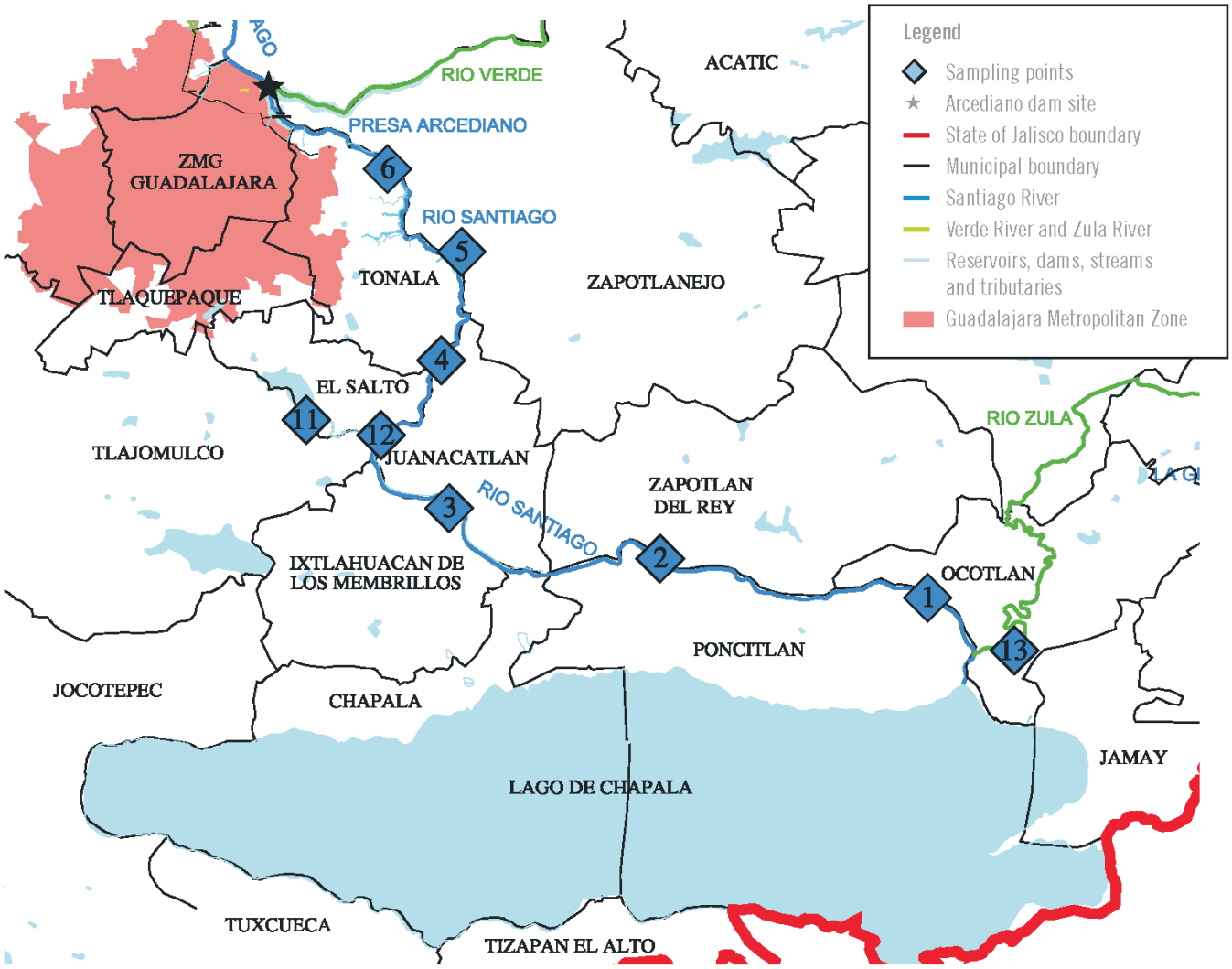
396. Response, *supra* note 10 at 60.

397. CEA-Jalisco, "Resultados del Monitoreo de Calidad del Agua del Río Santiago," 17 sampling campaigns (May 2009 to November 2010), State Water Commission (*Comisión Estatal del Agua*) of Jalisco, 2011, <http://goo.gl/HKN4l> (viewed 21 March 2012).

398. Conagua, *supra* note 369 at 44.

399. CEA-Jalisco, *supra* note 397.

Figure 13: Sampling points with map coordinates for CEA-Jalisco water quality studies



160. CEA-Jalisco commissioned water quality studies for the Santiago and Verde Rivers, which were provided to the Secretariat.[400] The relevant information from these studies is presented in the respective sections on those rivers. Likewise, the reader may consult Appendix 11, containing the results of a study commissioned by CEA-Jalisco in 2003[401] in which dry and rainy season averages are compared with the Conagua water quality index.

400. CEA-Jalisco, *supra* note 128.

401. AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 5 and Appendix 5-1 "Calidad de Agua en Estaciones de Monitoreo."

8.3 Preservation and monitoring of water quality monitoring and preservation for Lake Chapala

161. Conagua has performed regular monitoring of Lake Chapala through the RNMCA stations, recording the following: phenolphthalein alkalinity (mg/L $CaCO_3$), total alkalinity (mg/L $CaCO_3$), chlorides (mg/L), specific conductivity (μS/cm), five-day biochemical oxygen demand (mg O_2/L), chemical oxygen demand (mg O_2/L), calcium hardness (mg/L $CaCO_3$), total hardness (mg/L $CaCO_3$), ammonia nitrogen (mg/L), nitrate nitrogen (mg/L), orthophosphate (mg/L), total phosphorus (mg/L), settleable solids (mL/L), dissolved oxygen (mg/L), laboratory pH, total solids (mg/L), water temperature (°C), and turbidity (NTU).[402]

162. Of the 27 water quality monitoring stations listed in Table 16, five stations have scheduled monthly monitoring while the remaining (22) have quarterly monitoring. Two of the 27 stations are located in tributaries of Lake Chapala (the Lerma and La Pasión Rivers), while one is located in the intake channel of the Chapala-Guadalajara aqueduct. The monitoring stations, their location and monitoring frequency are presented in Table 16 and illustrated in Figure 14.

Figure 14: Lake Chapala RNMCA monitoring stations[403]

Note: The Chapala-Guadalajara Aqueduct and Littoral 1 stations are separated by a distance of just 270 meters, which does not allow them to be distinguished as separate points in Figure 14.

402. Director General of the Lerma-Santiago-Pacífico Watershed Authority, *supra* note 386. Water turbidity is measured in nephelometric turbidity units (NTU).

403. Figure prepared with information from: Director General of the Lerma-Santiago-Pacífico Watershed Authority, *supra* note 386.

Table 16: RNMCA monitoring stations in Lake Chapala[404]

	Station name	Longitude	Latitude	Frequency
1	Lake Chapala, Lake Station (*Estación Lacustre*) 01	-103.391111	20.279722	Quarterly
2	Lake Chapala, Lake Station 02	-103.375555	20.233333	Quarterly
3	Lake Chapala, Lake Station 03	-103.316666	20.219722	Quarterly
4	Lake Chapala, Lake Station 04	-103.241666	20.205833	Quarterly
5	Lake Chapala, Lake Station 05	-103.2225	20.275833	Quarterly
6	Lake Chapala, Lake Station 06	-103.241944	20.267777	Quarterly
7	Lake Chapala, Lake Station 07	-103.298333	20.275833	Quarterly
8	Lake Chapala, Lake Station 08	-103.3425	20.275555	Quarterly
9	Lake Chapala, Lake Station 10	-103.169444	20.295833	Quarterly
10	Lake Chapala, Lake Station 11	-103.18	20.23	Monthly
11	Lake Chapala, Lake Station 12	-103.173055	20.183333	Quarterly
12	Lake Chapala, Lake Station 13	-103.123888	20.183333	Quarterly
13	Lake Chapala, Lake Station 14	-103.061111	20.2	Quarterly
14	Lake Chapala, Lake Station 15	-103.05	20.25	Quarterly
15	Lake Chapala, Lake Station 16	-103.066666	20.316666	Quarterly
16	Lake Chapala, Lake Station 17	-103.092222	20.294444	Quarterly
17	Lake Chapala, Lake Station 20	-102.95	20.3	Quarterly
18	Lake Chapala, Lake Station 21	-102.95	20.25	Quarterly
19	Lake Chapala, Lake Station 22	-102.9	20.183333	Quarterly
20	Lake Chapala, Lake Station 25	-102.816666	20.233333	Quarterly
21	Lake Chapala, Lake Station 26	-102.766666	20.266666	Quarterly
22	Lake Chapala, Lake Station 27	-102.816666	20.3	Quarterly
23	Lake Chapala, Lake Station 28	-102.883333	20.25	Quarterly
24	Lake Chapala, Littoral I	-103.144444	20.313888	Monthly
25	Lerma River at Maltaraña	-102.68689	20.2294	Monthly
26	La Pasión River at Tizapán El Alto	-103.038894	20.161219	Monthly
27	Chapala-Guadalajara Aqueduct, Intake Channel	-103.145608	20.316066	Monthly

404. *Idem.*

8.4 Preservation and monitoring of water quality in the Santiago River

163. Currently, the RNMCA operates five monitoring stations in the Santiago River within the area of interest. Based on the information in Mexico's Response[405] and information from Conagua, the following monitoring sites illustrated in Figure 15 have been identified:

Figure 15: Santiago River RNMCA monitoring stations in the area of interest[406]

Note: The stations at El Salto-Juanacatlán and Canal La Aurora are separated by a distance of only 200 meters, which does not allow them to be distinguished as separate points.

405. Response, *supra* note 10 at 59.

406. This factual record also notes a monitoring station in El Ahogado Arroyo, monitoring water quality at the confluence with the Santiago River on a bimonthly basis. Its coordinates are lat. 20.499481, long. -103.196053.

Table 17: Santiago River RNMCA monitoring stations in the area of interest, with map coordinates and monitoring frequency[407]

	Station	Longitude	Latitude	Frequency
1	Santiago River at Cuitzeo-Ocotlán	-102.785708	20.3309	Monthly
2	Poncitlán Bridge	-102.922005	20.384663	Semiannually
3	Corona Diversion Dam	-103.089242	20.39915	Semiannually
4	Santiago River downstream of El Ahogado Arroyo	-103.196053	20.499481	Bi-monthly
5	Santiago River right bank of La Aurora Canal	-103.174984	20.510704	Semiannually
6	Santiago River El Salto-Juanacatlán	-103.175000	20.512500	Bi-monthly

164. In conformity with the classification of receiving bodies of water effective in 2008 (refer to paragraph 134 of this factual record), the section of the Santiago River in question was divided into different segments classified as either type A (*i.e.* "low" category) or type B (*i.e.* "intermediate" category). It has been pointed out that this segmentation corresponds to the bulk water supply scheme for the Guadalajara Metropolitan Area (ZMG) through the Santiago River.[408] Thus, the water in Lake Chapala that was routed through the Santiago River was diverted at the Corona Diversion Dam into the Atequiza Canal, classified as type B, while downstream of the Corona Diversion Dam, the Santiago River was classified as a type-A receiving body.[409] As of 2009, the Santiago River in the area of interest was designated as type C (*i.e.* "superior" category).[410]

8.4.1 Pollution sources in the Santiago River basin

165. Information for section 8.4.1 was obtained mainly from reports provided by CEA-Jalisco to the Secretariat.[411]

166. In the area of interest, the Santiago River receives municipal and industrial wastewater discharges from the ZMG as well as from the localities of Poncitlán, Atequiza, El Salto, Juanacatlán, and Zapotlanejo.[412] While the Zula River meets the Santiago River, its water actually flows towards Lake Chapala.[413] The Zula receives municipal wastewater from the localities of Arandas, Tototlán, and Atotonilco el Alto, as well as food and tequila industry waste, and discharges from hog farms.[414] The following figure of the Santiago River shows its tributaries and main point-source discharges.

407. Director General of the Lerma-Santiago-Pacífico Watershed Authority, *supra* note 386.

408. F. de P. Sandoval, *supra* note 183.

409. LFD, *supra* note 339, Art. 278-A (in force in 2008):
Nationally owned receiving bodies that receive wastewater discharges are classified as follows: TYPE A RECEIVING BODIES: all those that are not indicated as type B or C [...] TYPE B RECEIVING BODIES [...] Jalisco: [...] Santiago River in the municipalities of Ocotlán, Poncitlán, Zapotlán del Rey, and Chapala; Atequiza Canal in the municipalities of Chapala, Iztlahuacán de los Membrillos, Poncitlán, Tlajomulco de Zúñiga, and Tlaquepaque [...].

410. *Ibid*., Article Sixth Transitory of the reforms published in DOF on 13 November 2008.

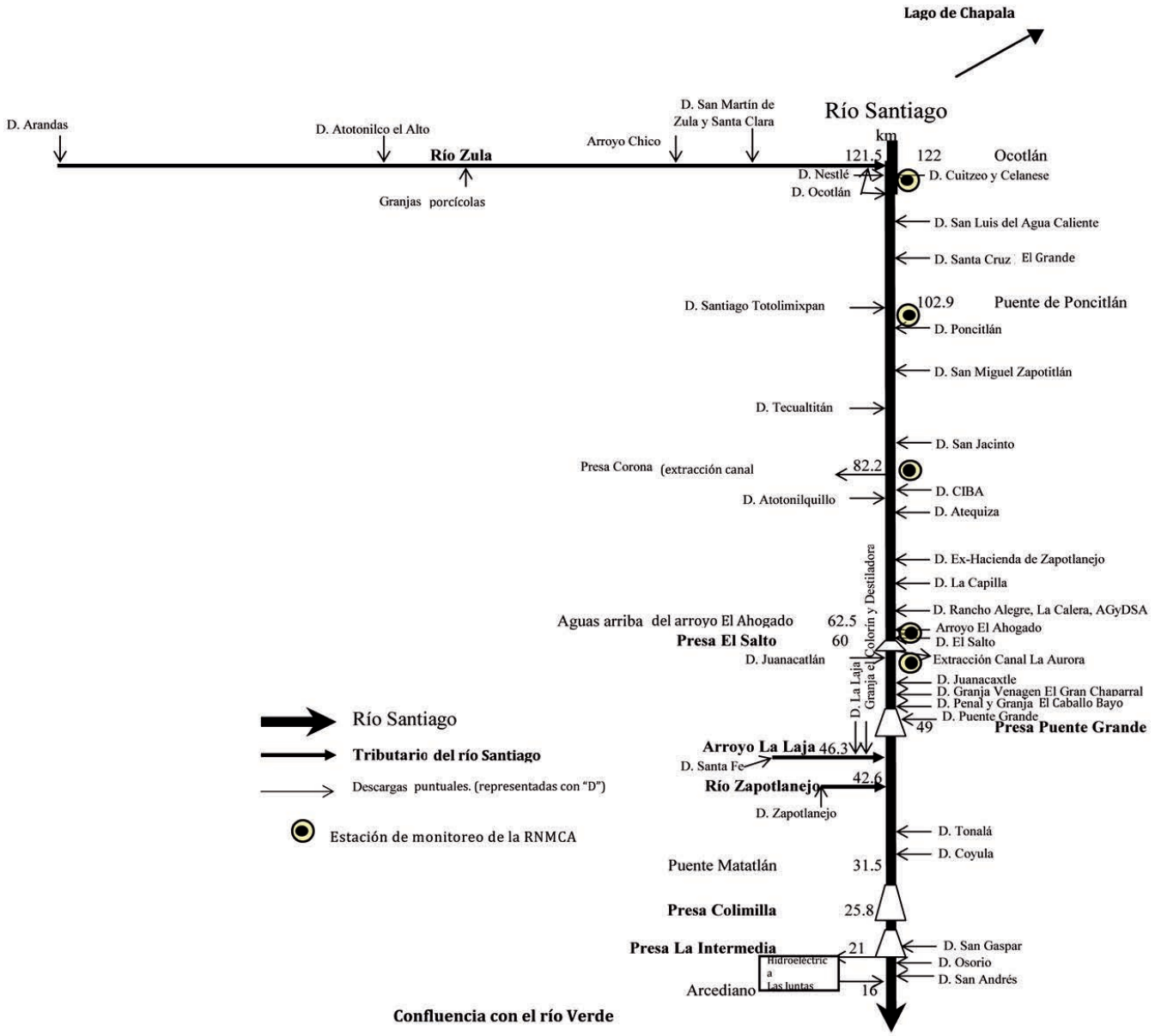
411. The reader may refer to reports cited in *supra* note 128.

412. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 16.

413. As noted in *supra* Section 7.4.1, discharges from the Zula River, whose waters would normally flow downstream after the confluence with the Santiago, flow into Lake Chapala rather than continuing downstream into the Santiago River.

414. Conagua, *supra* note 395.

Figure 16: The Santiago River and its tributaries[415]

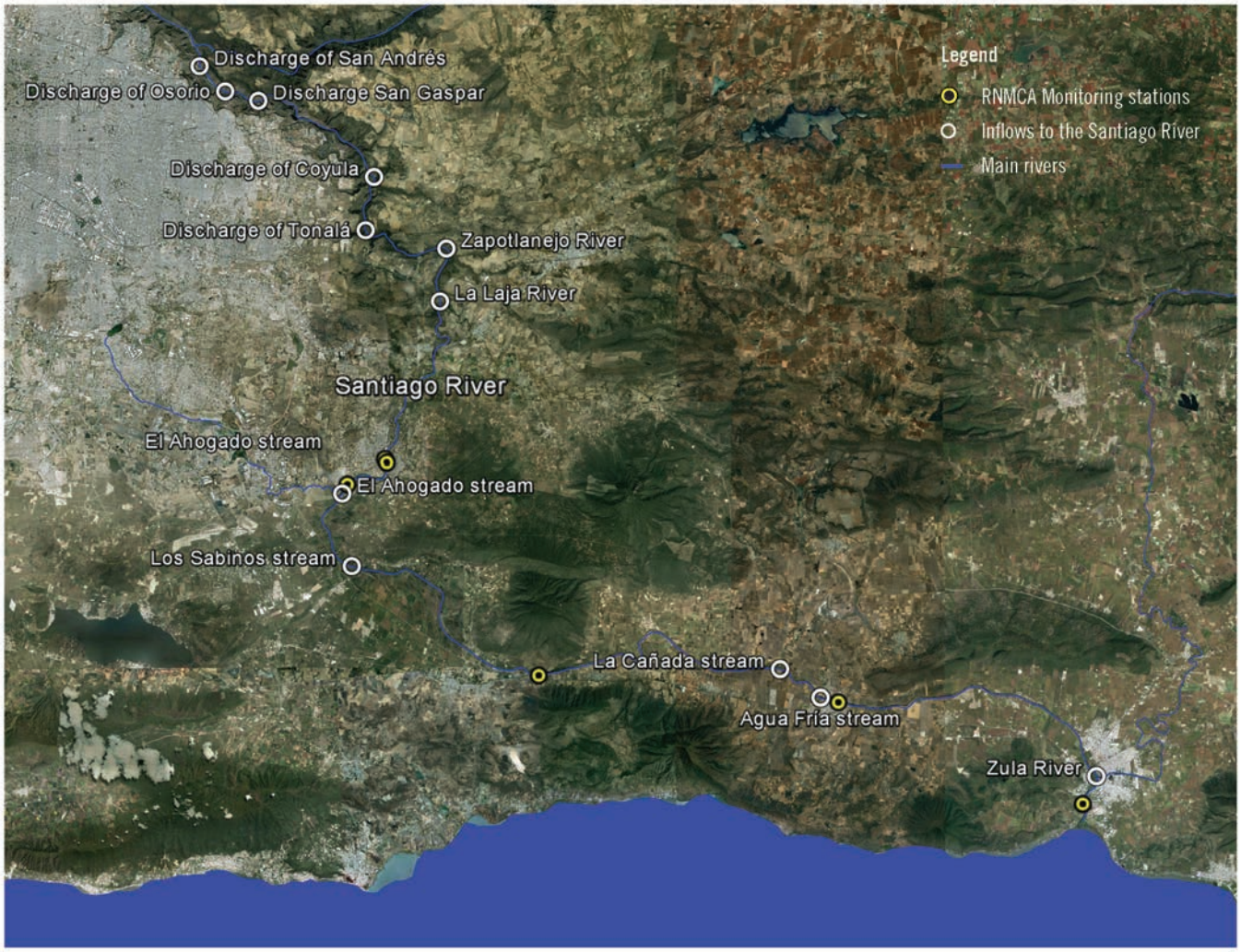


Note: The reader is advised that this figure is not oriented geographically, and merely illustrates the flow of waters in Santiago River basin.

415. AyMA Ingeniería y Consultoría (2007), *supra* note 128, ch. 5, p. 30.

167. Information provided by CEA-Jalisco on the characterization of the Santiago River includes pollution sources discharging into the Santiago River basin between the municipalities of Ocotlán and Tonalá. These figures include direct discharges into the Zula River, noting that the action of the Poncitlán gates in the Santiago River turns the Zula into a tributary of Lake Chapala even though it should flow into the Santiago.[416] The points at which tributaries flow into the Santiago River in the section under study are shown in Figure 17.

Figure 17: Main inflows to the Santiago River and RNMCA monitoring stations[417]



168. Below are details of water quality and discharges from the tequila industry, hog farms, towns and municipalities with wastewater treatment plants and those lacking them. It is important to emphasize the difficulty in analyzing the waste outputs from livestock-raising operations (see paragraph 172 *infra*) and the fact that, in some cases, there is a lack of wastewater discharge permits issued by

416. In one of the studies consulted by the Secretariat, it was indicated that water from the Zula River was assumed to flow directly into Lake Chapala, *see*: AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch 1, p. 34. However, another study considered and quantified flow from the Zula River into the Santiago River, *see:* AyMA Ingeniería y Consultoría (2007), *supra* note 128, ch. 6, p. 5.

417. Image generated from coordinates in AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 1, p. 35 and Director General of the Lerma-Santiago-Pacífico Watershed Authority, *supra* note 386. Note that in hydrological terms, the Zula flows into Lake Chapala.

Conagua.[418] It was thus not possible to include an exhaustive analysis of hog farming pollution sources in the area of interest.[419]

169. The studies provided by the CEA-Jalisco on the characterization of water quality in the Santiago River basin (see *supra* note 128) were conducted from inventories of wastewater discharges provided by the municipalities of El Salto, Juanacatlán, Poncitlán and Tototlán to Conagua.[420] A total of the 305 discharges into the Santiago River registered with Conagua have been identified, the majority of them (220, all industrial) in the municipality of El Salto. About 89 percent of the discharges to the Santiago River are of industrial origin, 6.5 percent are of municipal origin, and 4.5 percent are of livestock industry origin. The pollutant load varies according to the type of discharge.[421]

(i) Tequila industry

170. Writing about discharges of basic pollutants from seven tequila facilities in the area of interest, CEA-Jalisco studies found that "wastewater discharged by the tequila industry has a highly adverse point-source impact" due to high loads of organic matter, solids, nitrogen and, to a certain extent, phosphorus.[422] The impact is increased by the high temperature and acidity of the discharges that, in combination with the organic matter content, affects the oxygen balance of bodies of water.[423] The studies concluded that discharges from the seven tequila factories add a BOD_5 load equivalent[424] to a human population of 70,000.[425]

171. Also, IMTA analyzed point source industrial pollution inflows into the Santiago, Verde, and Zula River basins.[426] In so doing, IMTA revised the wastewater discharge inventory of CEA-Jalisco and complemented those data with the database of the Registro Público de Derechos de Agua (Repda) for the year 2006 operated by Conagua, and found that 71 percent of the industries were located in municipalities with outflow to the Santiago River, one percent with outflow to the Verde River, and 28 percent to the Zula.[427] IMTA identified from the database of discharge information available for the Santiago, Verde and Zula basins that "the tequila-producing municipality of Arandas generates 71 percent of the BOD_5, 46 percent of COD, 61 percent of TSS, 31 percent of TKN and 27 percent of copper, considering that the data available for this municipality only include tequila plants."[428]

(ii) Hog farms

172. Non-point sources, such as agricultural runoff, are associated with negative impacts on water quality in river basins, especially during some seasons of the year. The negative impacts of wastewater discharges from intensive animal feeding operations are related to water pollution by fecal matter and other organic residues.[429] On the situation of inten-

418. Semarnat-Conagua, *Compendio de estadísticas ambientales: calidad del agua conforme a parámetros físicos, químicos y biológicos*, Secretaría de Medio Ambiente y Recursos Naturales y Comisión Nacional del Agua, Gerencia de Saneamiento y Calidad del Agua, Mexico, 2007, <http://goo.gl/LdEjp> (viewed 21 March 2012) at 45. According to this Compendium, 12 percent of the acts punishable by Conagua are related to discharge of wastewater without permission.

419. AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 4, p. 10.

420. AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 1, p. 9.

421. *Ibid*., ch. 1, pp. 9-27.

422. *Ibid*., ch. 4, p. 8.

423. *Ibid*., ch. 4, pp. 8 and 9.

424. The equivalent population method used in water quality reports for CEA-Jalisco assumes the following per capita factors: TSS, 65 g/person-day; COD, 110 g/person-day; total nitrogen, 13 g/person-day; total phosphorus, 3 g/person-day; see G. Tchobanoglous, F.L. Burton and H.D. Stensel, *Wastewater Engineering: Treatment and Reuse*, 4th ed. (Boston: McGraw-Hill, 2003), print edition available at <http://goo.gl/6Ne0Q> (viewed 21 March 2012), in AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 5, p. 4.

425. AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 18.

426. IMTA, *supra* note 115.

427. *Idem*.

428. *Ibid.* at 47.

429. J. Speir *et al*., *Comparative Standards for Intensive Livestock Operations in Canada, Mexico and the United States*, Commission for Environmental Cooperation, Montreal (Quebec), 2003, <http://goo.gl/0ziGo> (viewed 21 March 2012) at 63.

sive animal feeding operations in Mexico, it has been pointed out that:

> The most significant water impacts are associated with slaughterhouses and hog farms that lack the proper process to treat their effluents. Although the problem is limited, it is estimated that these activities represent larger emissions of organic matter to the watercourses and water bodies than the entire human population of the country.[430]

173. The studies conducted by CEA-Jalisco provide an explanation of why they do not include an exhaustive analysis of agricultural runoff in the area of interest. With respect to intensive animal feeding operations, one of the studies conducted by CEA-Jalisco noted the difficulty of inventorying and adequately quantifying pollutants in the wastewater discharges from these activities.[431] It also underlines the lack of "recent and accurate information on the number and size of the sheds or barns in which the livestock is housed, as well as production units [herd size and hectareage] where livestock roam in meadows and pastures."[432]

174. A report published by the CEC examining the state of intensive hog feeding operations in the State of Jalisco classified these as follows:

- Small-scale operations (up to 70 heads) 2,364 installations
- Medium-size operations (from 70 to 250 heads) 500 installations
- Large-scale operations (more than 250 heads) 349 installations.[433]

175. For its report analyzing the hog feeding operations, CEA-Jalisco only included pollutant data on six installations, but these were intensive, large-scale operations in the area of interest. The latter report found that the discharge from a farm in the area of La Capilla, Ixtlahuacán de los Membrillos, was "particularly aggressive to the environment and public health;"[434] one of the tests performed found 133 acute toxicity units, classifying the discharge as "high, acute toxicity."[435] Hog farms, according to the study consulted by the Secretariat, "have a severe impact on the Santiago and Zula Rivers, with the five facilities characterized discharging a BOD_5 load equivalent to that of 200,000 people."[436]

(iii) Municipalities with treatment plants

176. The information provided to the Secretariat by CEA-Jalisco concerning treated wastewater discharged from treatment plants indicates that levels of all effluents conform to the maximum allowable limits set by NOM-001-SEMARNAT-1996 for type-B bodies of water as defined in the LFD.[437] The treatment plants sampled also satisfy the maximum allowable limits of NOM-001-SEMARNAT-1996 for presence of heavy metals in treated municipal wastewater discharges. However, in one case, "the Poncitlán raw water sump was observed to be diverting wastewater directly into the Santiago River,"[438] while in another case, in Ocotlán, "there is a bypass in the treatment plant itself that diverts screened influent[439] into a manhole where it is

430. *Idem*.

431. AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 4, p. 42.

432. *Idem*.

433. Speir *et al*., *supra* note 429 at 48.

434. AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 10.

435. *Ibid*., ch. 4, p. 23. According to the author, toxicity testing was performed at the IMTA laboratories.

436. *Ibid*. at 18. The toxicity test calculates the median effective concentration, or the dilution of the original sample at which half the population of organisms dies (EC_{50}). Thus, for example, a sample with an EC_{50} of 25 percent is more toxic than one with an EC_{50} of 50 percent, since the same percentage of organisms dies in a more diluted toxic solution.
The mortality percentages obtained from a series of dilutions prepared from the original sample are graphed against the corresponding concentrations to produce a logarithmic curve. The median effective concentration or median lethal concentration (EC_{50} or LC_{50}) can then be determined from the graph by interpolation. The EC_{50} can then be used to calculate toxicity units (TU) from the following equation: $TU = 100/EC_5$. *See*: Y. Verma, "Toxicity Evaluation of Effluents from Dye and Dye Intermediate Producing Industries Using Daphnia Bioassay," *The Internet Journal of Toxicology* 4, no. 2, 2008, <http://goo.gl/uC60O> (viewed 21 March 2012).

437. AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 11. *See also*: NOM-001-SEMARNAT-1996, *supra* note 148.

438. AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 11.

439. Screening removes large floating objects such as rags or sticks that could damage the pumps or block small-diameter pipes.

combined with treated and disinfected effluent from the treatment plant."[440]

177. The levels of pollutants released from wastewater treatment plants into the Santiago River basin are summarized below:

Table 18: Pollutant levels discharged in wastewater treatment plant effluents into the Santiago River basin (t/year)[441]

Municipality	BOD_5	COD	TP	O&G	TKN	SS	TSS
Ocotlán	219,800	590,799	39,154	79,638	78,858	ND	172,305
Poncitlán	59,660	204,575	9,225	53,990	15,724	ND	39,657
Ixtlahuacán de los Membrillos-Chapala	71,241	123,032	5,257	17,679	7,203	129	59,019
El Salto	10,592	69,696	11,246	2,609	14,258	ND	23,439
Juanacatlán	14,889	109,415	8,800	7,043	13,073	ND	13,972
Tonalá	6,553	8,136	2,576	888	2,712	ND	3,051
Total- Santiago River	**382,734**	**1,105,653**	**76,260**	**161,847**	**131,829**	**129**	**311,443**
Arandas	167,028	230,000	39,979	58,629	56,884	6,170	221,846
Total- Zula River	**167,028**	**230,000**	**39,979**	**58,629**	**56,884**	**6,170**	**221,846**

(iv) Sources without wastewater treatment plants

178. The ZMG is the main source of pollution of municipal origin entering the Santiago River.[442] Wastewater is dumped either directly into the Santiago River or into the Seco Stream and its continuation, the El Ahogado Arroyo, which is a tributary of the Santiago River.[443] The following is a list of the main wastewater outfalls from the ZMG into the Santiago River, upstream of its confluence with the Verde River:

(i) San Andrés outfall, Santiago River;
(ii) Osorio outfall, Santiago River;
(iii) San Gaspar outfall, Santiago River;
(iv) Tonalá outfall, Santiago River;
(v) Garabatos outfall, El Ahogado Arroyo basin, and
(vi) Las Juntas sump, El Ahogado Arroyo basin.[444]

179. The discharges from the Las Juntas sump and the Garabatos, San Gaspar, Osorio, and San Andrés outfalls account for two-thirds of the BOD_5 and TKN released from the ZMG.[445] Furthermore, more than 70 percent of the discharges of suspended solids and phosphates come from these five municipal wastewater discharge locations.[446]

180. The impact of the discharges from the Las Juntas sump and the Garabatos outfall is somewhat attenuated, however, since before reaching the Santiago River, the water is stored in the El Ahogado reservoir, which has a hydraulic retention time greater than 60 days.[447] Self-purifying mechanisms operate in this reservoir, resulting in reduced concentrations of basic pollutants.[448] Wastewater discharges from the ZMG outfalls at the edge of the Santiago River gorge (San Andrés, Osorio, San

440. AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 11.
441. IMTA, *supra* note 115 at 52.
442. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 16.
443. *Ibid*. at 18.
444. The Garabatos outfall and the discharge from the Las Juntas sump go into the El Ahogado Arroyo, as it services the municipalities of El Salto, Tlajomulco, Tonalá, Tlaquepaque, and Zapopan, from that point (El Ahogado Arroyo), flows towards the Santiago River.
445. AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 4, p. 11.
446. *Ibid*.
447. *Idem*.
448. *Idem*. The median values for BOD_5 and TSS between the dry and rainy seasons are less than 45 mg/l and 25 mg/l, respectively. However, the ammonia, nitrogen and phosphate concentrations remain very high.

Gaspar, and Tonalá) flow 450 m down through rocky terrain before reaching the Santiago and in this portion of the watercourse, pollutant levels fall moderately.[449]

181. Also relevant to the pollution levels of the Santiago River are documented sanitary sewer overflows in the ZMG during the rainy season, which enter the river through the San Andrés, Osorio, and San Gaspar outfalls.[450] During this period, pollutant levels become moderately diluted, at least as regards BOD_5 levels from these three outfalls,[451] with a median value of 120.5 mg/L; this is similar to the levels of discharges established for type-A receiving bodies (*i.e.* the "inferior" category).[452] However, organic matter contributions from the three outfalls are equivalent to a population of 145,000 in October and 625,000 in July.[453] The seasonal load exceeds that of any of the other urban localities in the area of interest.[454]

Table 19: Pollutant levels discharged in stormwater by the San Gaspar, Osorio, and San Andrés outfalls[455]

Variable	Annual mass/year
BOD_5	4,008 t
TSS	12,788 t
TKN	464 t
Ammoniacal nitrogen	188 t
Organic nitrogen	276 t
Total phosphorus	145 t
SS	68,182 m^3

Note: The values correspond to the period between June and October and do not include precipitation outside the rainy season (accounting for 4.4% of the annual total)

182. Nevertheless, the El Ahogado Arroyo (see Photo 1) constitutes "the main source of pollution of the Santiago River."[456] It has a gauged flow (2006) of 5.7 and 2.7 m^3/sec at the locality of "El Muelle" and average BOD_5 levels of 45 mg/L, similar to that of the effluent from a secondary treatment plant.[457] The pollutant volume discharged by the El Ahogado Arroyo into the Santiago results in raw water inflow equivalent to a population of 230,000.[458] Considering the discharge volumes of nitrogen and phosphorus contributed by the El Ahogado, these are equivalent to populations of 575,000 and 700,000, respectively.[459] Regarding toxicity, the El Ahogado exhibited *Vibrio fischeri* bioassay toxicity values of 15.8 and 19.9, which is considered "significant" toxicity, at two sampling events.[460]

449. *Ibid.*, ch. 4, p. 12.
450. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 21.
451. Significant variations of BOD_5 were found in the report.
452. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 21.
453. *Idem.*
454. *Ibid.* at 22.
455. *Ibid.* at 21.
456. AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 38.
457. *Idem.*
458. *Idem.*
459. *Idem.*
460. *Idem.*

Photo 1: El Ahogado Arroyo[461]

183. Heavy metals in the wastewater discharges never exceeded the maximum allowable limits for the type of receiving body in question.[462] Heavy metal analysis at 15 monitoring stations in the Santiago River and its tributaries (the Zula River and the El Ahogado and Chico Streams) determined, however, that two segments of the Santiago River exhibited high arsenic concentrations: downstream of Poncitlán, and upstream of El Ahogado up to the Matatlán Bridge.[463]

184. The Santiago River has two segments in which water quality deteriorates badly, as well as two segments where it is recovering (Figure 18). The first segment–20.8 km long between Cuitzeo and Poncitlán—displays the most significant degrada-

461. Courtesy CEC Secretariat. Photographed during site visit on 21 September 2009 to the El Ahogado Arroyo. This photo was taken at West of the "Cárdenas del Río" locality – South of ZMG –, 6.6 km. before the El Ahogado reservoir and 14.5 km before its confluence with Santiago River.

462. *Ibid.*, ch. 4, p. 16.

463. *Ibid.*, ch. 4, p. 19.

tion, reaching the highest TSS and BOD_5 levels at Poncitlán.[464] Toxicity in this segment of the stream, evaluated by *Vibrio fischeri* (formerly known as *Photobacterium phosphoreum*) and *Daphnia magna* bioassays,[465] yielded the highest values at Cuitzeo[466] and San Luis del Agua Caliente.[467] However, unlike various pollutants, whose concentration levels increase along the course of the river, toxicity decreases downstream to non-detectable levels at the Poncitlán station.[468] Over the 20 km from Poncitlán to the Corona Dam, water quality in the Santiago River shows considerable improvement.[469] This is the stretch with the best quality in the whole study area because the river flows freely here, without impoundments, and also because of the relative low number of untreated wastewater discharges and the presence of water hyacinth, which takes up nitrogen and phosphorus.[470]

185. The second segment exhibiting low water quality is between the Corona Dam and the confluence with the El Ahogado Arroyo. At this point, water quality degrades gradually, reaching its worst point downstream at the Tololotlán station.[471] The highest nitrogen (23.2 mg/L),[472] phosphorus (8.15 mg/L),[473] and conductivity values (1,592 μS/cm)[474] were found here, while BOD values were at 43—52 mg/L.[475]

464. In this segment there is a rise in specific conductivity, from 418 μS/cm at Cuitzeo to 914 and 935 μS/cm at San Luis del Agua Caliente and Poncitlán, respectively. In many cases, conductivity is directly related to the quantity of total dissolved solids; AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 36.

465. Ministry of Commerce and Industry Development (*Secretaría de Comercio y Fomento Industrial*—Secofi, now Ministry of Economy), Norma Mexicana NMX-AA-112-SCFI *Análisis de agua y sedimentos. Evaluación de toxicidad aguda con* Photobacterium phosphoreum. *Método de pruebas*. DOF 12 April 1996; and Secofi, Norma Mexicana NMX-AA-087-SCFI. *Análisis de agua. Evaluación de toxicidad con* Daphnia magna, *Straus (Crustacea-Cladoccera): Método de prueba*, DOF 14 November 1995 (substituted by NMX-AA-087-2010, DOF 3 March 2011).

466. Toxicity to *Vibrio fischeri* for the two sampling campaigns at the Cuitzeo station in the Santiago River was 5.2/45.5 and 19.1/2.2 (EC_{50}/toxicity units); AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 33.

467. Toxicity to *Vibrio fischeri* for the two sampling campaigns at the San Luis de Agua Caliente station in the Santiago River was 13.9/62.1 and 7.2/1.6 (EC_{50}/toxicity units); AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 33.

468. *Ibid*., ch. 4, p. 35.

469. *Idem.*

470. *Idem.*

471. *Ibid*., ch. 4, p. 36.

472. *Ibid*., ch. 4, p. 26, measured as TKN.

473. *Ibid*., ch. 4, p. 28.

474. *Ibid*., ch. 4, p. 30.

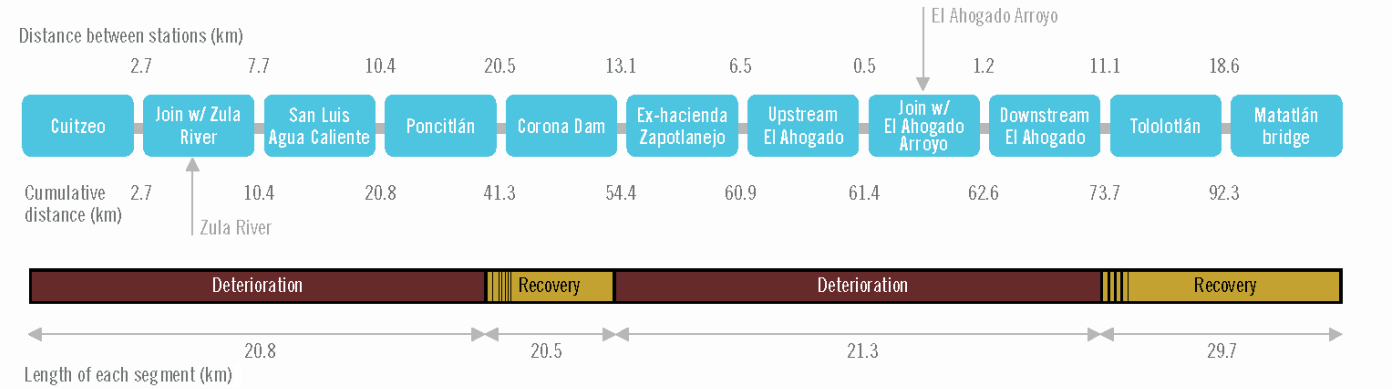
475. *Ibid*., ch. 4, pp. 36-37.

Photo 2: The Santiago River in El Salto[476]

476. Courtesy CEC Secretariat. Photographed on 21 September 2009 during a field trip to the Santiago River at the "El Salto" waterfall, to the east of the community of El Salto and 300 m west of Juanacatlán WWTP. Foam on the river's surface can be observed.

186. The first segment of the Santiago River where water quality recovers somewhat is between downstream of the Poncitlán gates and the Corona dam, where TKN values registered a decrease (0.92 mg/L).[477] The second such segment of the Santiago River is downstream from the Tololotlán station (situated 2.5 km upstream from where the river crosses the Zapotlanejo highway).[478] Here, the improvement is gradual but not sustained due to the various pollutant inflows from Tonalá and the La Laja and Zapotlanejo Rivers,[479] which counteract the Santiago River's self-cleaning process.[480] Some recovery of the river in this segment is corroborated, however, by results indicating decreased toxicity.[481]

Figure 18: Segments of the Santiago River exhibiting water quality deterioration and recovery[482]



477. *Ibid.* ch. 4, p. 26.

478. *Ibid.* ch. 4, p. 36.

479. These inflows are, from largest to smallest: the raw wastewater discharges from Tonalá on the left bank of the Santiago, the La Laja Stream with discharges from livestock and tequila facilities, and the Zapotlanejo River; AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 36.

480. *Ibid.* ch. 4, p. 36.

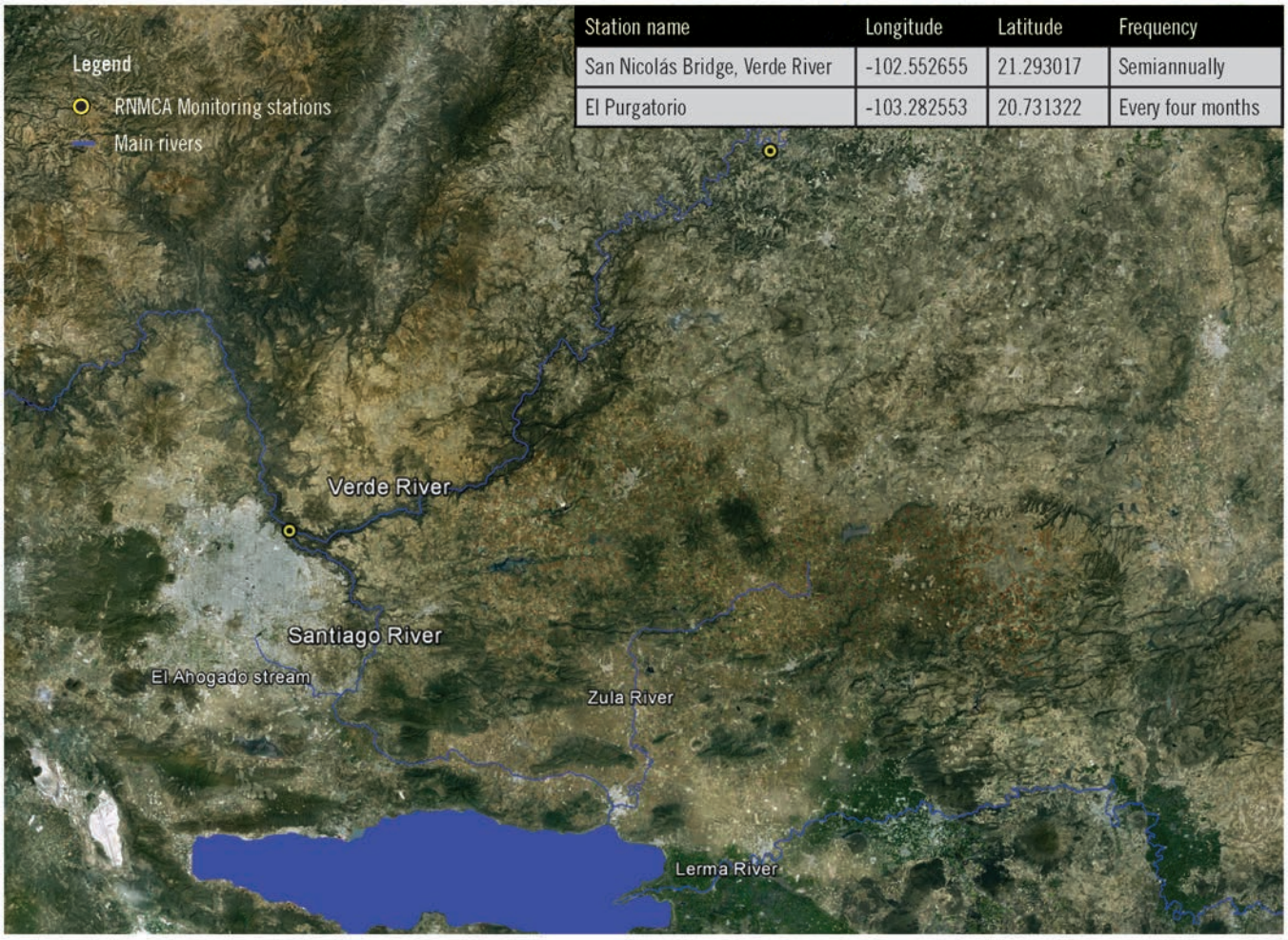
481. While values of 3.4 and 3.5 TU were obtained in two rounds of sampling at the station downstream of El Ahogado, no toxicity was detected in any sampling event at the Tololotlán and Matatlán Bridge stations; AyMA Ingeniería y Consultoría (2006), *supra* note 128, ch. 4, p. 36.

482. *Ibid.*, ch. 4, p. 37.

8.5 Preservation and monitoring of water quality in the Verde River

187. The RNMCA currently operates two monitoring stations in the Verde River in the State of Jalisco:

Figure 19: RNMCA Monitoring stations in the Verde River, coordinates and monitoring frequency



Station name	Longitude	Latitude	Frequency
San Nicolás Bridge, Verde River	-102.552655	21.293017	Semiannually
El Purgatorio	-103.282553	20.731322	Every four months

8.5.1 Verde River pollution sources

188. Information to prepare section 8.5.1 and its subsections was obtained mainly from reports provided by CEA-Jalisco to the Secretariat.[483]

189. Verde River basin pollution is characterized by activities related to agricultural processing and, to a lesser extent, dairy and tequila production.[484] In 2005, Conagua registered 164 point-source discharges into the Verde River basin,[485] for a total of 10,692 m^3/d, equivalent to a flow rate of 123.8 L/s.[486] The Conagua point-source discharge database in the Verde River basin can be broken down

483. The reader may refer to reports cited at *supra* note 128.

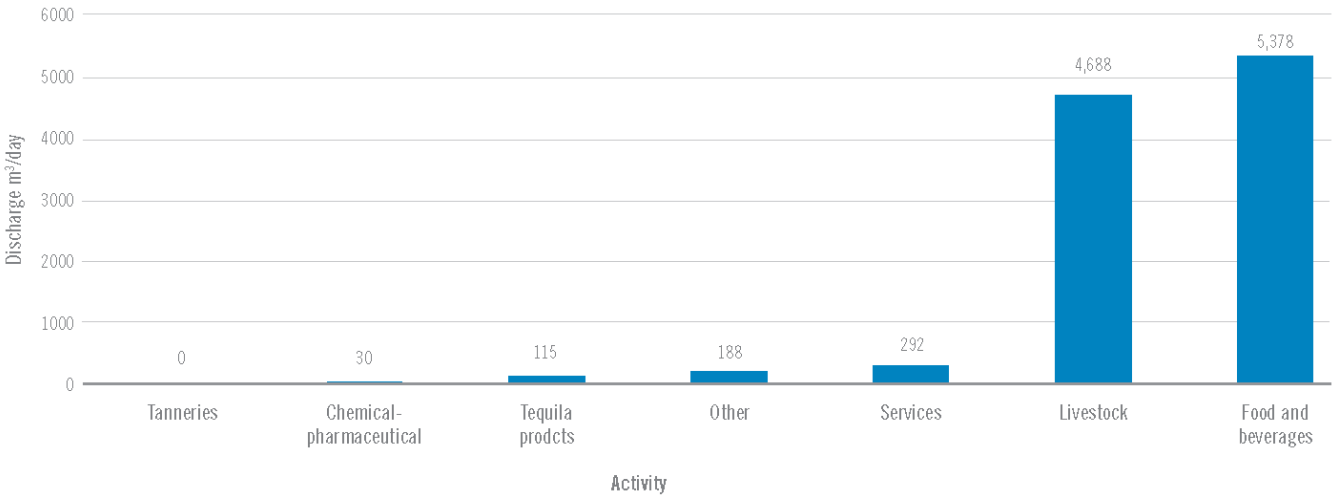
484. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 78.

485. The author of the report noted that a single facility can have more than one wastewater discharge registered with Conagua. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 43.

486. Conagua data reported in AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 43.

into categories by industrial sector as follows: 59.8% livestock (60% hogs, 21.5% poultry, 7.7% beef, 10.8% mixed); 20.7% food and beverages; 13.4% services; 2.5% miscellaneous; 1.2% tanneries; 1.2% tequila; and 1.2% pharmaceutical.[487] Wastewater volume is aggregated among these sectors as indicated in the chart below:

Figure 20: Wastewater volumes discharged into the Verde River, by sector[488]



Note: Volumes obtained from data reported to Conagua aggregating 127 registered discharges.

190. Also, studies commissioned by CEA-Jalisco identified 161 point-source wastewater discharges into the Verde River basin, most prominently those of agricultural origin:

Table 20: Classification of wastewater discharges into the Verde River basin[489]

Origin	No. of discharges	Percentage	Direct discharges	Indirect discharges
Sanitary landfill	6	3.7%	0	6
Livestock	130	80.7%	51	79
Industrial	13	8.1%	2	11
Municipal	12	7.5%	6	6
Total	**161**	**100.0%**	**59**	**102**

Note: For the purposes of this table, a "direct discharge" is one that enters the Verde River directly, while an indirect discharge is one that enters a tributary of the Verde.

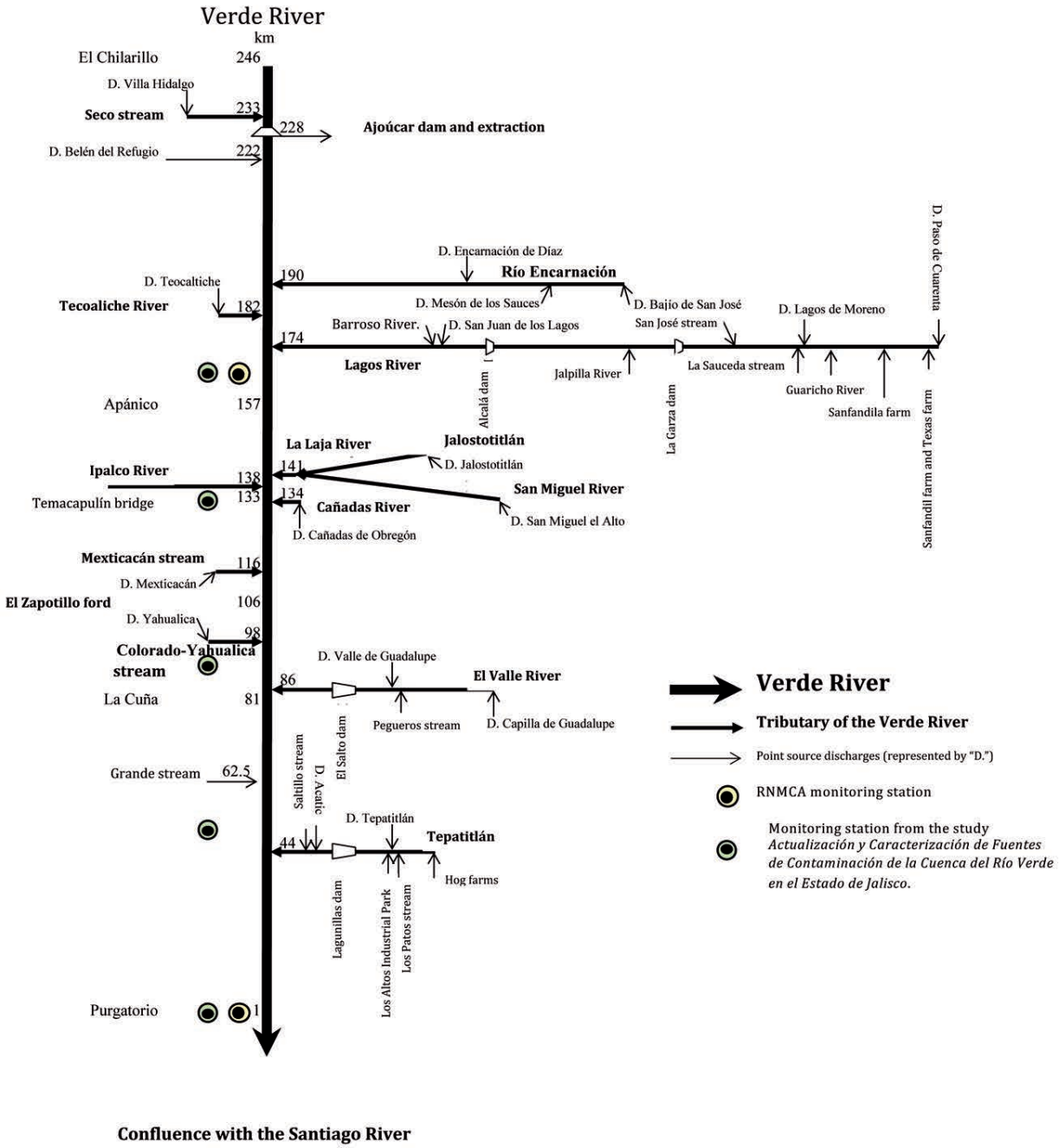
487. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 43. Figures in the original document do not add up to 100%; however, the figures in this record have been verified and further confirmed by the author.

488. *Ibid.*, ch. 1, p. 44.

489. *Ibid.*, ch. 2, p. 3.

191. Of the point-source pollution sources identified as affecting the Verde River, 59 discharge directly into the watercourse while the rest discharge into some other receiving body (including infiltration into the ground) and eventually reach the Verde River; that is, they are "indirect."[490] The figure below of the Verde River shows its natural tributaries and the main point-source discharges into the basin.

Figure 21: The Verde River and its tributaries[491]



Note: The reader is advised that this figure is not oriented geographically, but merely illustrates the flow of waters in Verde River basin.

490. *Idem.*

491. AyMA Ingeniería y Consultoría (2007), *supra* note 128, ch. 5, p. 25 and AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 4, p. 4. RNMCA monitoring stations were obtained from: Director General of the Lerma-Santiago-Pacífico Watershed Authority, *supra* note 386.

(i) Tequila industry

192. Agave growing and tequila manufacturing in the Verde River basin mainly take place in the municipalities of Tepatitlán, Acatic, and Valle de Guadalupe.[492] The list maintained by the National Tequila Industry Association (*Cámara Nacional de la Industria del Tequila*) contains a total of seven facilities within the Verde River basin[493] that are estimated to generate a wastewater volume of 12,776 m^3/year with estimated BOD_5 loads of 52 t/year, estimated COD loads of 90 t/year, and estimated TSS loads of 66 t/year.[494] Approximately 3.6 percent of the pollutant load generated by the tequila industry in the area of interest is generated in the Verde River basin.[495]

(ii) Livestock production

193. The inventory of discharges from livestock production activities taken by the Jalisco state Ministry of the Environment for Sustainable Development (*Secretaría de Medio Ambiente para el Desarrollo Sustentable*—Semades) includes data on a total of 212 hog farms, 41 cattle farms, and 120 poultry farms.[496] The municipalities of Tepatitlán, Lagos de Moreno, and Acatic account for 74 percent of the hog and poultry facilities as well as 80 percent of the cattle facilities located in the Verde River basin.[497] In terms of the breakdown of the pollutant load by sector, 77.5 percent of the BOD_5 mass is of livestock origin,[498] while the municipalities of Tepatitlán and Acatic are the largest contributors of livestock-related pollution in the area of interest, since they generate 47 percent of the BOD_5, 46 percent of the nitrogen, and 51 percent of the phosphorus discharge.[499] The BOD_5, total nitrogen, and total phosphorus mass in the Verde River basin break down by municipality as follows:[500]

492. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 12.
493. *Ibid.*, ch. 1, pp. 12-13.
494. AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 4, p. 32.
495. *Ibid.*, ch. 4, p. 33.
496. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 14.
497. *Idem.*
498. AyMA Ingeniería y Consultoría (2003), *supra* note 128, executive summary, p. 78.
499. *Ibid.*, ch. 4, p. 46.
500. In addition, nine municipalities in the area of interest generate 95 percent of the total contaminant load from hogs: Tepatitlán de Morelos, Acatic, Tlajomulco de Zúñiga, Zapotlanejo, Tonalá, Valle de Guadalupe, Jalostotitlán, Tlaquepaque, and Yahualica; *see*: AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 4, p. 45.

Table 21: Pollutants mass from livestock source effluent entering surface receiving bodies in the Verde River basin[501]

Municipality	BOD_5 (t/year)	Total nitrogen (t/year)	Total phosphorus (t/year)
Jalostotitlán	1,039	332	68.2
Mexticacán	349	111	19.6
San Miguel El Alto	1,143	367	61.9
Teocaltiche	356	114	21.1
Tepatitlán de Morelos	1,575	495	119.0
Valle de Guadalupe	1,053	358	89.0
Villa Obregón	424	135	24.8
Yahuálica	962	306	58.0
Acatic	3,222	1,023	258.3
Tepatitlán de Morelos	3,301	1,038	249.4
Total for Verde River basin	**13,423**	**4,280**	**969**

(iii) Hog farms[502]

194. The Verde River basin includes 56 percent of the total hog production (expressed as head per year) in the area of interest (see Table 22).

Table 22: Hog production in municipalities of the area of interest[503]

Municipality	Watercourse	Proportion (%)
San Juan de los Lagos	Verde River	20
Tepatitlán de Morelos	Verde River	14
Lagos de Moreno	Verde River	13
Acatic	Verde River	9
Arandas	Zula River	24
Others	Santiago, Verde, and Zula Rivers	20
Total		**100%**

501. AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 4, p. 45.

502. No information is presented on discharges from poultry farms due to their low generation of wastewater. Poultry manure is a byproduct with economic value, and therefore the prevailing practice in the study area is temporary storage of manure followed by its removal for future use. Nevertheless, if the solid waste is not removed periodically and is left exposed to rainwater, the surface runoff carries organic matter, solids, and nutrients into bodies of water; see AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 6, pp. 21-22.

503. IMTA, *supra* note 115 at 41.

195. Semades records indicate a total of 212 hog farms, with a total population of 582,000 head, in the Verde River basin.[504] Inegi reported 394,900 head on hog farms located in the municipalities indicated in the following table:

Table 23: Hog numbers in the Verde River basin[505]

Municipality	No. of hogs	Percentage of total for State of Jalisco*
Acatic	57,655	5.83
Cuquío	4,937	0.50
Ixtlahuacán del Río	13,036	1.32
Zapotlanejo	9,548	0.96
Tepatitlán de Morelos	137,722	13.91
San Miguel El Alto	5,957	0.60
Ojuelos de Jalisco	1,780	0.18
Encarnación de Díaz	18,482	1.87
San Juan de los Lagos	68,607	6.93
Jalostotitlán	25,673	2.59
Teocaltiche	4,320	0.44
Villa Hidalgo	1,180	0.12
Valle de Guadalupe	20,433	2.06
Mexticacán	772	0.08
Cañadas de Obregón	217	0.02
Yahualica de González Gallo	6,053	0.61
San Julián	4,906	0.50
San Diego de Alejandría	823	0.08
Unión de San Antonio	1,808	0.18
Lagos de Moreno	10,991	1.11
Total for Verde River basin	**394,900**	**39.90**

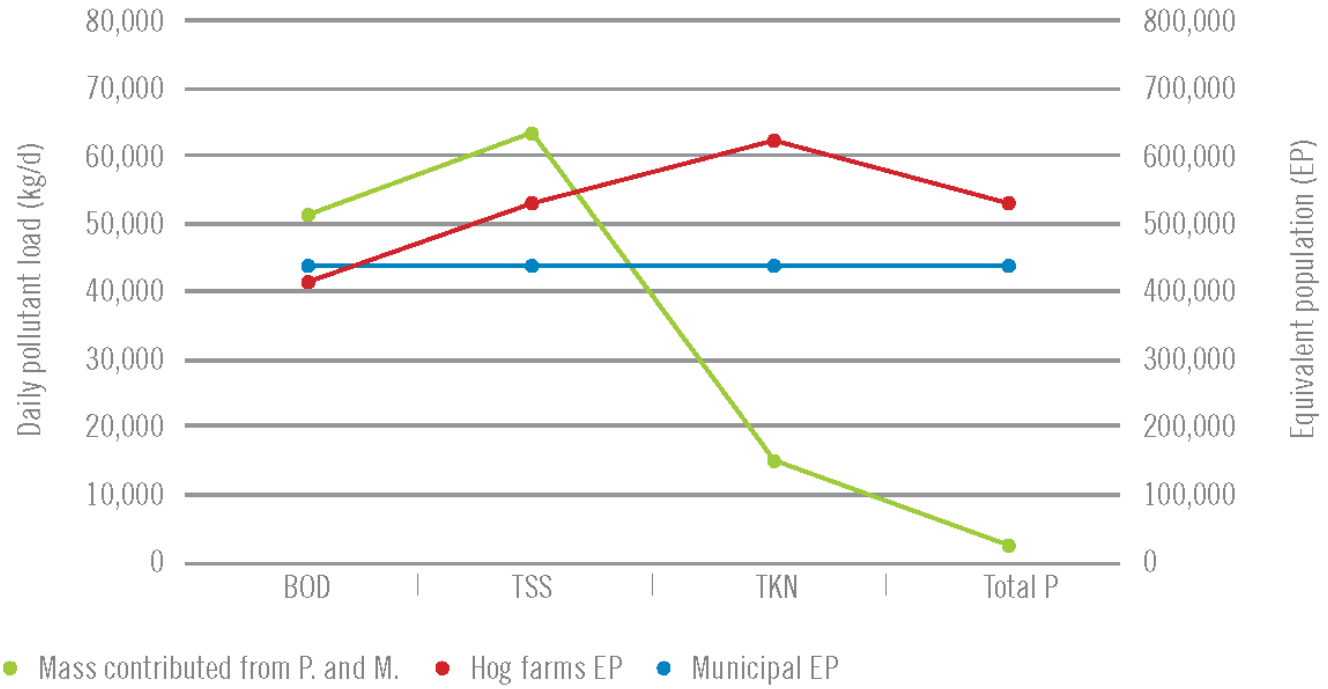
* The total number does not add to 100 percent since only hogs in municipalities in the Verde River basin are shown. In the State of Jalisco, the total number of hogs (100 percent) is 989,779 (Inegi, Livestock Census, 2007).

504. Semades, *Dictámenes de Cédulas Agropecuarias*, Secretaría de Medio Ambiente pare el Desarrollo Sustentable, México 2006, in AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 6, p. 22.

505. Inegi, *Censo Agropecuario 2007, VIII Censo Agrícola, Ganadero y Forestal*, Mexico, 2009, <http://goo.gl/o2pJq> (viewed 21 March 2012).

196. The chart below contrasts the quantity of pollutants contributed by the 582,000 hogs on hog farms in the Verde River basin with that produced by municipal discharges in the same region:

Figure 22: Daily pollutant load contributed by hog farms (P) and by localities with populations over 1,000 (M) (Mass contributed from P and M, respectively) and equivalent population (EP) in the Verde River basin[506]



Note: The number of hog farms was obtained from the Semades inventories. The values were derived from the generation of TSS, BOD, total nitrogen, and total phosphorus per Animal Population Unit (*Unidad de Población Animal*—UPA) using a unit weight of 55 kg/head. Based on this value, the discharge volume per farm was calculated.

506. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 6, p. 31.

197. A study of the Verde River basin commissioned by CEA-Jalisco reported the following findings concerning discharges from 16 hog farms:

Table 24: Main findings regarding discharges from hog farms in the Verde River basin[507]

Temperature and pH	In the 16 discharges sampled temperature and pH were fully compliant.
Settleable solids	It was found that 11 of the 16 discharges exceeded the reference values. Reported data was within a range of 3–260 mL/L.
TSS	It was found that 11 of the 16 discharges exceeded the reference values. Reported data was within a range of 220–13,400 mg/L.
Oil and grease	13 of the 16 discharges exceeded the reference values. Reported data was within a range of 25.8–1,560 mg/L.
BOD_5	With reported data within a range of 249–12,000 mg/L, this variable exceeded the reference value in 11 of the 16 discharges.
Nitrogen and phosphorus	These variables exceeded the reference values in 15 of the 16 discharges, with ranges of 220–1327 and 31.9–1075 mg/L, respectively.

Note: As a summary, 15 of the 16 discharges exceeded reference values for one or more variables established for type-B receiving bodies under the LFD.

198. In toxicity tests[508] performed at 28 selected sites in the Verde River basin,[509] five hog farms registered acute toxicity unit values over 100.[510] According to a framework employed in a study commissioned by CEA-Jalisco, these discharges are classified as "high toxicity."[511] Likewise, 11 hog farm discharges exhibited "significant toxicity."[512]

(iv) Municipalities with wastewater treatment plants

199. The Verde River basin has 52 settlements with populations over 1,000.[513] In 2005, the reported population living in the Verde River basin in the State of Jalisco was 331,140.[514] That same year, within that portion of the basin, there were a total of 11 municipal wastewater treatment plants with an installed capacity of 902 L/s,[515] but operating deficiencies were reported.[516] For example, the Mexticacán, Jalisco, sewage pond was observed to be operating "without the design criteria and geometry necessary to produce high-quality effluent,"[517] while the Capilla de Guadalupe wastewater treatment plant, built in 2002, was observed to be out of service, with the untreated wastewater destined for the plant being channeled through a pipe and welling up to the surface before

507. *Ibid.*, ch. 5, p. 41.
508. Acute toxicity tests (*Vibrio fischeri* and *Daphnia magna*) were performed at the IMTA lab according to the methodology used by the IMTA, see: AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 5, p. 46.
509. Of the 28 sites selected, 18 correspond to hog farms.
510. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 5, p. 46.
511. *Idem.*
512. *Idem.*
513. *Ibid.*, ch. 5, p. 48.
514. Municipalities of Acatic, Cañadas de Obregón, Cuquío, Ixtlahuacán del Río, Jalostotitlán, Mexticatán, San Juan de los Lagos, San Miguel El Alto, Tepatitlán de Morelos, Valle de Guadalupe, and Yahualica de González Gallo; Inegi, *Conteo de Población y Vivienda 2005*, Mexico, 2008, <http://goo.gl/PEk0D> (viewed 21 March 2012).
515. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, p. 12.
516. *Ibid.*, ch. 6, p. 13.
517. *Idem.*

reaching the plant in question.[518] At the Tepatitlán plant, built more than 15 years ago, with a nominal treatment capacity of 200 L/s, recurrent "diversion of raw untreated wastewater into the Tepatitlán River" was noted.[519] It was also observed that the Lagos de Moreno and San Juan de los Lagos treatment plants were, along with the Tepatitlán plants, "the largest point sources of contamination in the study area."[520] The table below, based on IMTA data, offers a breakdown of pollutant loads entering the Verde River from treatment plants in the watershed:

Table 25: Pollutant levels in wastewater treatment plant effluent discharged into the Verde River basin (t/year)[521]

Municipality	BOD_5	COD	TP	O&G	TKN	SS	TSS	Nickel	Zinc	Lead	Cyanide
Tepatitlán de Morelos	840,501	1,583,830	24,752	101,847	302,683	370	449,086	ND	2,595	209	0
San Miguel el Alto	257,395	503,748	9,634	34,642	64,365	ND	100,789	30	667	36	12
Jalostotitlán	104,515	170,099	3,332	28,707	9,579	47	13,750	ND	380	12	1
Total Verde River	**1,202,411**	**2,257,677**	**37,718**	**165,196**	**376,627**	**417**	**563,625**	**30**	**3,643**	**257**	**13**

(v) Municipalities without wastewater treatment

200. In 2005, 16 localities in the Verde River basin with populations over 2,000 were identified as having no wastewater treatment infrastructure and these are presented in the following table:

Table 26: Localities in the Verde River basin with populations over 2,000 without wastewater treatment infrastructure (2005)[522]

Municipality	Locality	Population (2005)	Receiving body
Acatic	Acatic	10,411	Tepatitlán River
Cañadas	Cañadas de Obregón	2,483	Cañadas/El Salitre Stream
Encarnación	Encarnación de Díaz	22,902	Encarnación River
Encarnación	Bajío de San José	3,719	Innominado Stream and Encarnación River
Encarnación	Mesón de los Sauces	2,475	Encarnación River
Encarnación	El Tecuán	2,057	Innominado Stream and Encarnación River
Lagos de Moreno	Paso de Cuarenta	3,499	Lagos River
Lagos de Moreno	Los Azulitos	2,087	Tepetates Colorados Stream and irrigation canal
Mexticacán	Mexticacán	3,516	La Cruz de Piedra/Mexticacán Stream
San Juan de los Lagos	Col. Santa Cecilia (La Sauceda)	2,201	Lagos River
San Julián	San Julián	11,096	Las Moras/El Carrizo/San Julián/Jalpilla Stream and Lagos River
Tepatitlán	Capilla de Guadalupe	12,496	Valle River
Tepatitlán	Pegueros	3,187	Pegueros/Los Gatos Stream, Valle River
Unión de San Antonio	Unión de San Antonio	6,668	La Gazapa/El Ocote, Jalpilla and Lagos
Villa Hidalgo	Villa Hidalgo	13,782	Seco/Custique/El Rincón Stream and Verde River
Yahualica de González Gallo	Yahualica	14,265	Colorado Stream
Total population without wastewater treatment along the Verde River		**118,849**	

518. *Ibid.*
519. *Ibid.*, ch. 6, p. 15.
520. *Idem.*
521. IMTA, *supra* note 115 at 52.
522. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 6, p. 17.

201. For the above-mentioned localities, the CEA-Jalisco website reports recent construction and/or operation of the following municipal wastewater treatment plants in the Verde watershed; average treatment capacity is indicated:[523]

- Lagos de Moreno 285 L/s
- Encarnación de Díaz 100 L/s
- San Juan de los Lagos 200 L/s
- Villa Hidalgo 60 L/s
- Yahualica 65 L/s
- Acatic 30 L/s
- San Julián 30 L/s
- Cañadas de Obregón 7.5 L/s
- Valle de Guadalupe 18 L/s

(vi) Other sources

202. A 2003 report of the Agricultural Council of Jalisco (*Consejo Agropecuario de Jalisco*) mentions: 4 slaughterhouses; 45 milk production plants; 7 animal feed manufacturers; 1 wheat flour manufacturer; 2 cream, butter, and cheese plants; 10 plants producing dairy sweets (*cajetas*) and other dairy products; and 11 milk processing and packing plants.[524]

8.5.2 Data from special water quality monitoring studies

(i) Basic variables

203. The following pollutant levels were reported:

(i) *Ammonia-nitrogen*.[525] The Belén del Refugio station had the highest value (1.41 mg/L), decreasing at the San Nicolás de las Flores station (0.25 mg/L).

(ii) *Specific conductivity*.[526] At Belén del Refugio, the value is 834 μS/cm, and this increases to 931 μS/cm at the second monitoring station, with a gradual decline afterward to 660 μS/cm upstream of the Tepatitlán River.

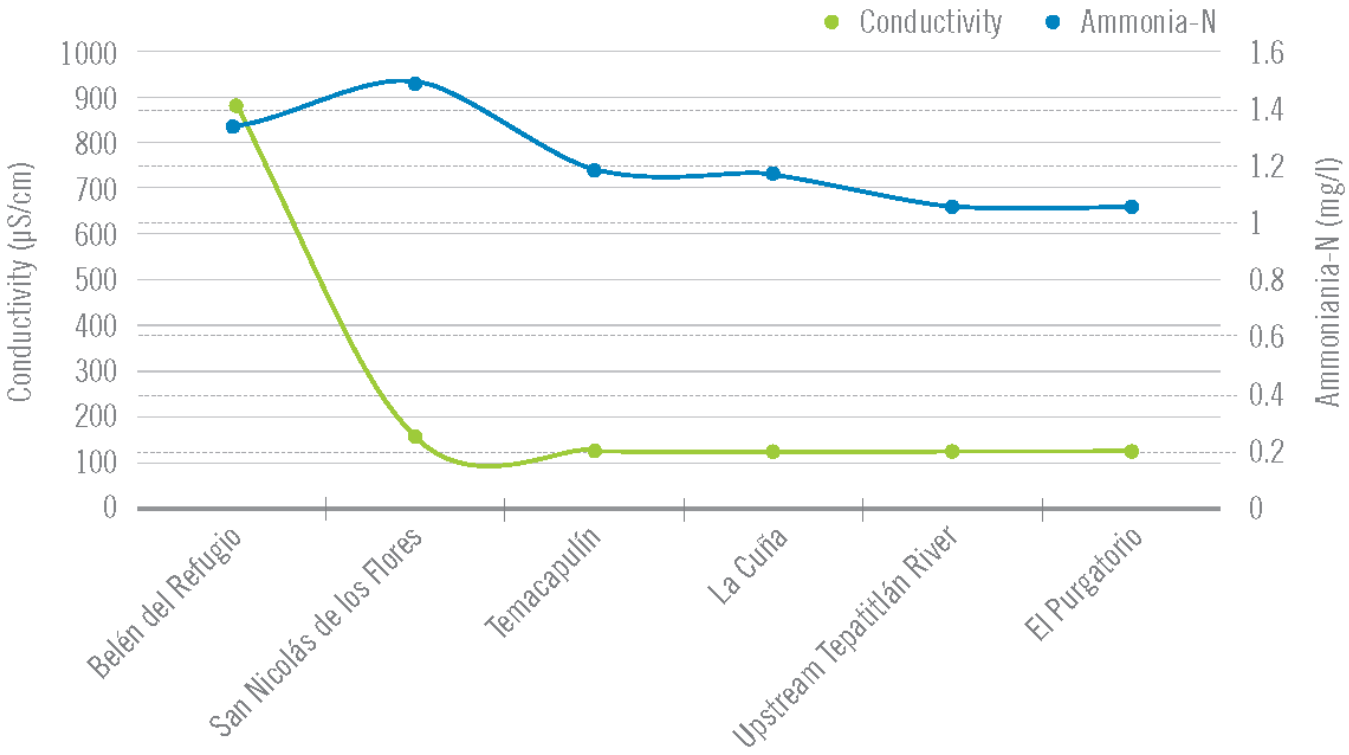
523. CEA-Jalisco, "Operating wastewater treatment plants," <http://goo.gl/uqvG3> (viewed 21 March 2012).

524. *Consejo Agropecuario de Jalisco*, <http://www.caj.org.mx/> (viewed 21 March 2012)), in AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 1, pp. 15-24.

525. Ammonia-nitrogen is nitrogen occurring in the form of ammonia (NH_3) or ammonium (NH_4^+) ions.

526. Specific conductivity is measured as a proxy for dissolved solids.

Figure 23: Conductivity and ammoniacal nitrogen levels in the Verde River[527]

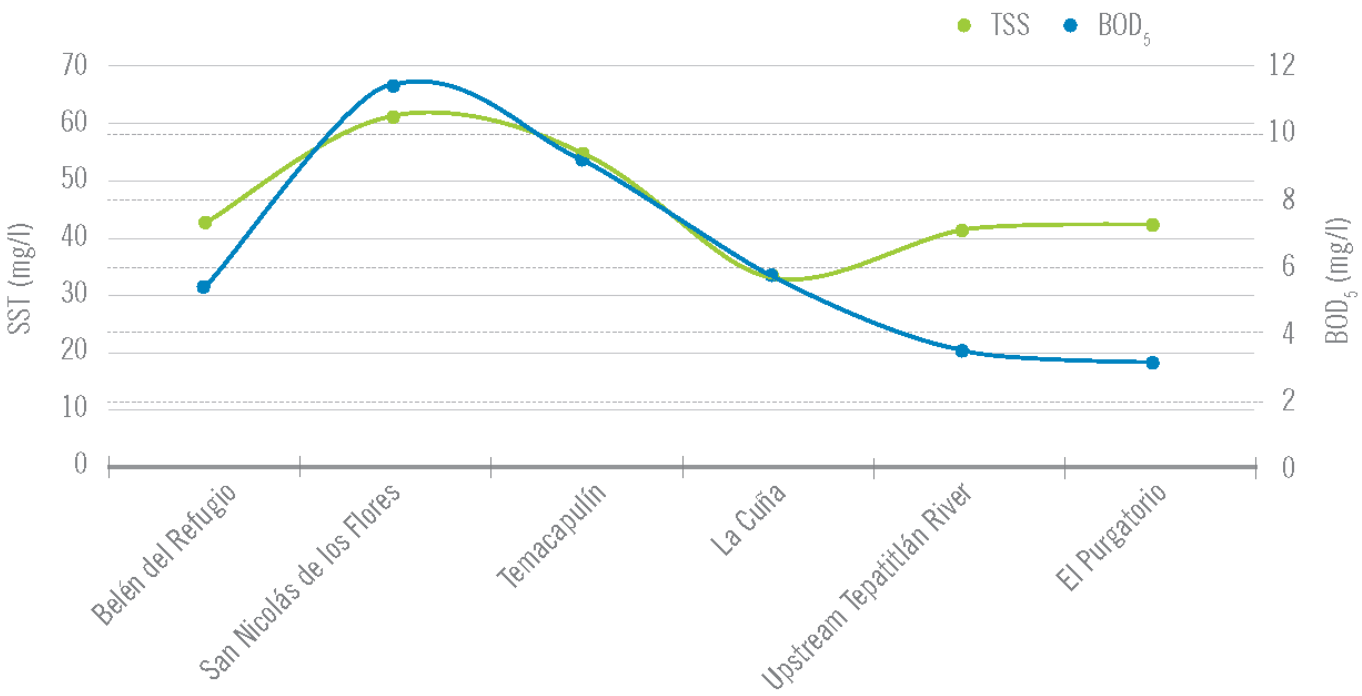


(iii) *Five-day biochemical oxygen demand (BOD_5)*. The BOD_5 results for the Verde River range from 5.6 mg/L (La Cuña) to 10.4 mg/L (San Nicolás de las Flores).

(iv) *Total suspended solids (TSS)*. According to results of the CEA-Jalisco study, in the mean, the TSS level "remains within an interval of 18—66 mg/L."[528] The site with the best observed quality is El Purgatorio, while the worst TSS values were detected at San Nicolás de las Flores, followed by Temacapulín.[529]

527. Chart generated from data in AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 5, p. 24.
528. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 5, p. 24.
529. *Idem.*

Figure 24: Total suspended solids and five-day biochemical oxygen demand for the Verde River[530]



(v) *Dissolved oxygen*. The best quality for this variable was found in the upper part of the watershed at the monitoring stations used for studies commissioned by CEA-Jalisco in the localities of San Gaspar and San Nicolás. The lower part of the Verde River basin, upstream of the Tepatitlán River and El Purgatorio, "exhibits low dissolved oxygen values."[531]

Table 27: Mean levels and variables of pollution monitored in the Verde and Lagos Rivers[532]

	Belén del Refugio	San Nicolás de las Flores	Temacapulín	La Cuña	Upstream of Tepatitlán River	El Purgatorio
Conductivity (μS/cm)	834	931	741	730	660	661
pH	7.88	8.53	9	8.86	8.79	8.67
TDS (mg/L)	598	722	529	494	520	587
TSS (mg/L)	31	66	53	33	20	18
DO (mg/L)	4.5	7.1	4.5	5	4.8	5.4
BOD_5 (mg/L)	7.2	10.4	9.3	5.6	7	7.2
COD (mg/L)	54	70	57	69	48	47
Ammonia-N (mg/L)	1.41	0.25	0.2	0.2	0.2	0.2

Note: Conductivity at 25ºC; pH at 25ºC.

530. Chart generated from data in AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 5, p. 26.
531. *Ibid.*, ch. 5, p. 24.
532. *Ibid.*, ch. 5, p. 25.

204. It should be noted that the information in Table 27 is for the water quality of the Verde River at the Belén del Refugio monitoring site just where the river enters the State of Jalisco from the State of Aguascalientes.[533] Between the El Purgatorio monitoring station and the monitoring station upstream of the Tepatitlán River, the natural flow of the Verde River is observed to be affected by municipal wastewater discharges and discharges from livestock operations.[534] Finally, the El Purgatorio station is situated immediately upstream of the Arcediano site, where the Verde and Santiago Rivers converge.[535]

(ii) Heavy metals detected in the Verde River and its tributaries

205. In the study prepared for CEA-Jalisco, nine monitoring sites on the Verde River and its tributaries were selected in which sampling and analysis levels were performed for the heavy metals, cyanide, arsenic, cadmium, copper, chromium, mercury, nickel, lead, and zinc, and the results were compared with the standards set forth in LFD Article 224, Water Quality Guidelines in force in 2006.[536]

206. Concentrations of arsenic and zinc were detected in the Lagos River, all within the above-mentioned Water Quality Guidelines. In that connection, the study's author reported that:

> Concerning cyanide, copper, chromium, and mercury, the values obtained are in all cases lower than the concentrations established as safe for public water supply and agricultural purposes. The cadmium, nickel, and lead values were in all cases lower than the detection limits of the analytical methods employed.[537]

(iii) Acute toxicity in the Verde River and its tributaries

207. The studies provided by CEA-Jalisco indicate that acute toxicity assays were performed with *Vibrio fischeri* (Microtox) and *Daphnia magna* at six monitoring stations in the Verde River and one in the Lagos River.[538] Two of the six sampled sites in the Verde River exhibited toxicity to Microtox and the *D. magna* assays detected acute toxicity at one sampling site,[539] namely, at the San Nicolás de las Flores station that measures the impact of the Lagos River on water quality in the Verde River.[540] However, the consultants' study for CEA-Jalisco clarified that, according to the reference framework used in the study, the concentrations obtained for the Verde River exhibited "a negligible degree of acute toxicity," or else toxicity was reported to be "present" without it being possible to calculate toxicity units.[541] The Temacapulín station reported 3.386 toxicity units, which is classified as moderate acute toxicity compared to the scale of the study's reference framework.[542]

208. In the Valle River in Valle de Guadalupe and the Barroso Stream—both of which flow into the San Juan de los Lagos River, a tributary of the Verde—water quality values of 2.149 and 7.616 toxicity units, respectively, were detected. The Barroso Stream exhibited toxicity because it receives discharges from hog farms.[543] The La Jara Stream, a tributary of the San Juan de los Lagos River, exhibited "the highest toxicity value for all the tributaries of the main rivers" flowing into the Verde River, with 80 toxicity units, which classifies it as having "significant, acute toxicity."[544]

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533. *Idem.*
534. *Idem.*
535. *Idem.*
536. *Ibid.*, ch. 5, p. 32.
537. *Ibid.*, ch. 5, p. 33.
538. Laboratory tests of acute toxicity in the Verde River and its tributaries were performed at the IMTA labs using *Vibrio fischeri* (Microtox) and *Daphnia magna* bioassays.
539. AyMA Ingeniería y Consultoría (2006b), *supra* note 128, ch. 5, p. 36.
540. *Ibid.*, ch. 4, p. 3.
541. *Ibid.*, ch. 5, p. 36.
542. *Idem.*
543. *Ibid.*, ch. 5, p. 37.
544. *Ibid.*, ch. 5, p. 38.

8.6 Wastewater treatment projects

209. Mexico, in its Response, affirms that "the Santiago and Verde Rivers exhibit contamination due to their receiving untreated municipal and industrial wastewater discharges."[545] Likewise, the Vision 2030 Water Program for the State of Jalisco (the "Program") indicates that according to RNMCA data:

> [...] the principal watercourses of Jalisco and of Lake Chapala exhibit major problems of contamination, especially the El Salto industrial zone[,] the Guadalajara Metropolitan Area[,] the Lagos de Moreno area, and the tequila zone in Tequila[.] Lake Chapala is moderately contaminated[;] the Santiago River [is] highly contaminated between the Las Juntas hydroelectric power plant and the Corona Diversion Dam, and there is latent, increasing contamination in certain basins where [...] various sections of main watercourses [...] receive domestic, industrial, and[/or] agricultural discharges, despite the absence of on site monitoring.[546]

210. Similarly, the Program notes the deterioration of water quality and that "the most affected watershed is the Lerma-Chapala-Santiago system."[547]

211. Taking into account water contamination inventories and BOD_5 discharged by each source, the following facts relating to pollution indicators in the Verde and Santiago River basins is noted:

Table 28: Pollution indicators for the Verde and Santiago River basins[548]

Origin	Verde River basin	Santiago River basin
Municipal	6,081	29,970
Municipal stormwater	–	4,008
Livestock	21,288	3,933
Tequila industry	52	226
Direct non-domestic discharges into the riverbed	–	2,143
Total	**27,421**	**40,280**
Industrial discharges*	**Verde River basin**	**Santiago River basin**
Number of discharges	14	266
Average rate of discharge (L/s)	6.7	226.9

Note: figures in t BOD_5/year unless otherwise indicated.
*Information developed by the author of the study based on data from Conagua.

212. The main source of pollution to the Verde River is from livestock-related activities, accounting for an estimated 77.5 percent of total BOD_5, followed by municipal sources at 22.2 percent and other sources combining to account for the remainder.[549] In the case of the Santiago River, the pollution load contributed by urban and semi-urban locales amounts to 82.6 percent of BOD_5.[550] Discharges from ZMG outfalls are the main source of pollution to the Santiago River.[551]

545. Response, *supra* note 10 at 35. The Secretariat has provided factual information related to these discharges, above in this section.
546. Conagua, *supra* note 395 at 28.
547. *Ibid.* at 55.
548. AyMA Ingeniería y Consultoría (2003), *supra* note 128, ch. 4, p. 49.
549. *Ibid.*, ch. 4, p. 50.
550. *Idem.*
551. *Idem.*

213. The Response discusses the enforcement activities being carried out by the government of the State of Jalisco, including construction and operation of wastewater treatment plants at Agua Prieta (which will collect wastewater from Coyula via a collecting tunnel) and El Ahogado (which will collect water from Santa María Tequepexpan and Aeropuerto).[552] The Secretariat attempted to identify efforts aimed at cleaning up the Santiago and Verde River basins, given their reclassification as type C water bodies starting in 2009, after which wastewater discharges must meet the strictest water quality standards (see chapter 6 of this factual record).[553] The Secretariat found that studies have been performed to assess the viability of such work.[554] According to one such study consulted by the Secretariat, the initial investment and the costs to develop sufficient treatment capacity to achieve reclassification of both rivers as type C water bodies would be as follows:

Table 29: Initial investment, operating, and maintenance costs associated with reclassification of the Santiago and Verde Rivers[555]

	Santiago River	Verde River
Initial investment	P$236 M	P$309 M
Operation and maintenance	P$22.08 M/year	P$31.76 M/year
Operation and maintenance (unit cost)	P$3.70 /$m^3$	P$3.78 /$m^3$
Combined cost of water treatment and amortization of investment	P$7.73 /$m^3$	P$7.52 /$m^3$

214. In 2003 the Congress of the State of Jalisco reached agreement to fund six wastewater treatment plants: Agua Prieta, Coyula, Puente Grande, Santa María Tequepexpan, Aeropuerto and Río Blanco.[556] In 2007, CEA-Jalisco decided to construct two wastewater treatment plants, the Agua Prieta and El Ahogado facilities,[557] whose total combined capacity would equal that of the original six plants (see Photo 3 and Table 30).[558]

552. Response, *supra* note 10 at 36.
553. LFD, *supra* note 339, Article Sixth Transitory of the reforms published in the DOF on 13 November 2008.
554. AyMA Ingeniería y Consultoría (2007), *supra* note 128.
555. *Ibid.*, ch. 8, pp. 8-12.
556. *Comisión Estatal de los Derechos Humanos de Jalisco*, Recomendación 7/2007 (19 September 2007), <http://goo.gl/sKfU5> (viewed 21 March 2012).
557. Conagua, CEA-Jalisco, Gobierno del estado de Jalisco, *supra* note 96.
558. *Comisión Estatal de los Derechos Humanos de Jalisco*, *supra* note 556.

Photo 3: View of the El Ahogado wastewater treatment plant under construction[559]

Table 30: Information on El Ahogado and Agua Prieta wastewater treatment plant projects[560]

	El Ahogado plant	Agua Prieta plant
Municipality	Tlajomulco de Zúñiga	Zapopan
Process	Secondary biological system using activated sludge with nutrient removal	Secondary biological system using activated sludge
Average throughput (L/s)	2,250	8,500
Receiving body	El Ahogado Arroyo/Santiago River (reuse of a portion of the treated effluent from the plant is planned)	Santiago River
Comment	Construction began in November 2009 and the plant is slated to be operational by May 2012	The construction phase began in January 2011.

559. Photo courtesy of the CEC Secretariat. Photographed during site visit on 1 March 2011.

560. CEA-Jalisco Memo No. GJ 304/2010 (17 June 2010) in response to Infomex-Jalisco request no. 00720910 (10 June 2010).

215. Finally, according to information provided by the Lerma-Santiago-Pacífico Watershed Authority, there are eight treatment plants under construction in the Verde River basin, though the sites are not specified.[561]

216. Studies on the impact of reclassifying the Verde and Santiago Rivers maintain that whatever the level of wastewater treatment decided for the watershed, it is imperative to have a design that makes the effort economically viable and sustainable.[562]

8.7 Other relevant information on water quality in the area of interest

217. The Submitters assert that the low water level in Lake Chapala is due to Mexico's failure to effectively enforce the environmental law at issue.[563] LGEEPA Article 5, paragraph XI, vests Semarnat with the power to regulate the sustainable use of, and to preserve, national waters. Without addressing issues of water distribution, such as concessions, distribution agreements or rules or laws for water allocation, this section includes relevant information on water levels and hydrologic balance in Lake Chapala. On this, R. G. Wetzel notes:

> The water balance of a lake is evaluated by the basic hydrological equation in which the change in storage of the volume of water in or on the given area per time is equal to the rate of inflow from all sources less the rate of water loss.[564]

218. The water level in Lake Chapala has fluctuated significantly over time.[565] The fluctuations are due to cyclical climatic conditions and to anthropogenic activities involving diversion or abstraction of water.

219. Anthropogenic pressures on the water level in the lake are due to two main factors: 1) decreased water flow from the Lerma River into the lake, since this is the lake's main tributary (65 percent), and 2) increased water demand by the city of Guadalajara.[566] Thus, Lake Chapala is subjected to pressures deriving from use of water from the Lerma River, one of the most heavily used watersheds in Mexico.[567] It has been reported that the continual increase in use of water from the Lerma River basin since the early 1970s has caused the water level in the lake to fluctuate more radically.[568] Similarly, it has been demonstrated that the low levels of Lake Chapala "are not explainable exclusively by periods of natural drought but rather, at least in part, by demand for water [...]."[569] Water storage capacity of the reservoirs in the Lerma basin increased from 740 Mm^3 in 1934 to 3,678 Mm^3 after 1978.[570]

220. More recently, it has been reported that inflow from the Lerma River is less important (23 percent contribution) to the water balance of Lake Chapala than other sources, such as precipitation over the lake and inflow from the lake's own watershed (76 percent).[571]

221. Noting that the water balance of the lake can display "a high level of uncertainty because some of its components are not categorized with enough detail or precision," a 2006 paper presented a comparative assessment of water balances of Lake Chapala, and concluded that the role of evaporation in the water balance had previously been underestimated by 16 percent.[572]

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561. Director General of the Lerma-Santiago-Pacífico Watershed Authority, *supra* note 386.
562. AyMA Ingeniería y Consultoría (2007), *supra* note 128, ch. 8, p. 17.
563. Submission, *supra* note 3 at 3.
564. R. G. Wetzel, *supra* note 196.
565. F. de P. Sandoval, *supra* note 183.
566. J. Aparicio *et al.*, *supra* note 166.
567. *Idem.*
568. F. de P. Sandoval, *supra* note 183; J. Aparicio, *supra* note 166; R. Barker *et al.*, "Global water shortages and the challenge facing Mexico," *International Journal of Water Resources Development*, 16(4), 2000 at 525-542, <http://goo.gl/qSCnT> (viewed 21 March 2012).
569. J. Aparicio *et al.*, "Balance hídrico del lago de Chapala, México," *Ingeniería Hidráulica en México*, XXI(1), enero-marzo, 2006 at 5-16, <http://goo.gl/ndUIk> (viewed 21 March 2012).
570. F. de. P. Sandoval, *supra* note 183.
571. J. Aparicio, *supra* note 166.
572. J. Aparicio *et al.*, *supra* note 569.

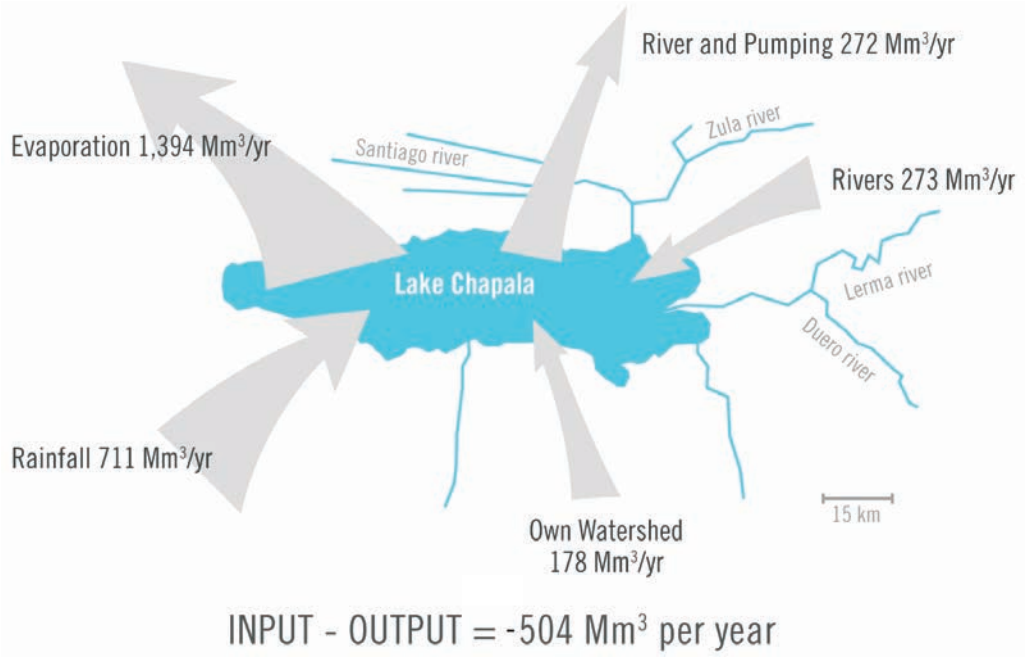
Table 31: Comparison of water balances in Lake Chapala, May 1997–April 1998 (Mm^3)[573]

	Conventional method	Proposed method
Change in storage	- 949	- 949
Inflows		
Rivers	186	180
Rainfall	711	722
Lake's own watershed	325	232
Total	1,222	1,134
Outflows		
Rivers	80	80
Abstraction for irrigation and drinking water	254	249
Evaporation	1,394	1,613
Total	1,728	1,942
Uncontrolled volume	- 444	- 141

Note: The term "uncontrolled volume" refers to the net volumes of water that cannot be explained through measurements or calculation and is determined as a residue in the balance equation.[574]

222. All things considered, evaporation is the principal cause of water loss from the lake (1,400 Mm^3), compared with water drawn for the city of Guadalajara (192 Mm^3) and for irrigation (70 Mm^3).[575] The following figure illustrates the estimated water balance of Lake Chapala for the period 1990–2000.

Figure 25: Annual water balance of Lake Chapala[576]



573. *Idem.*

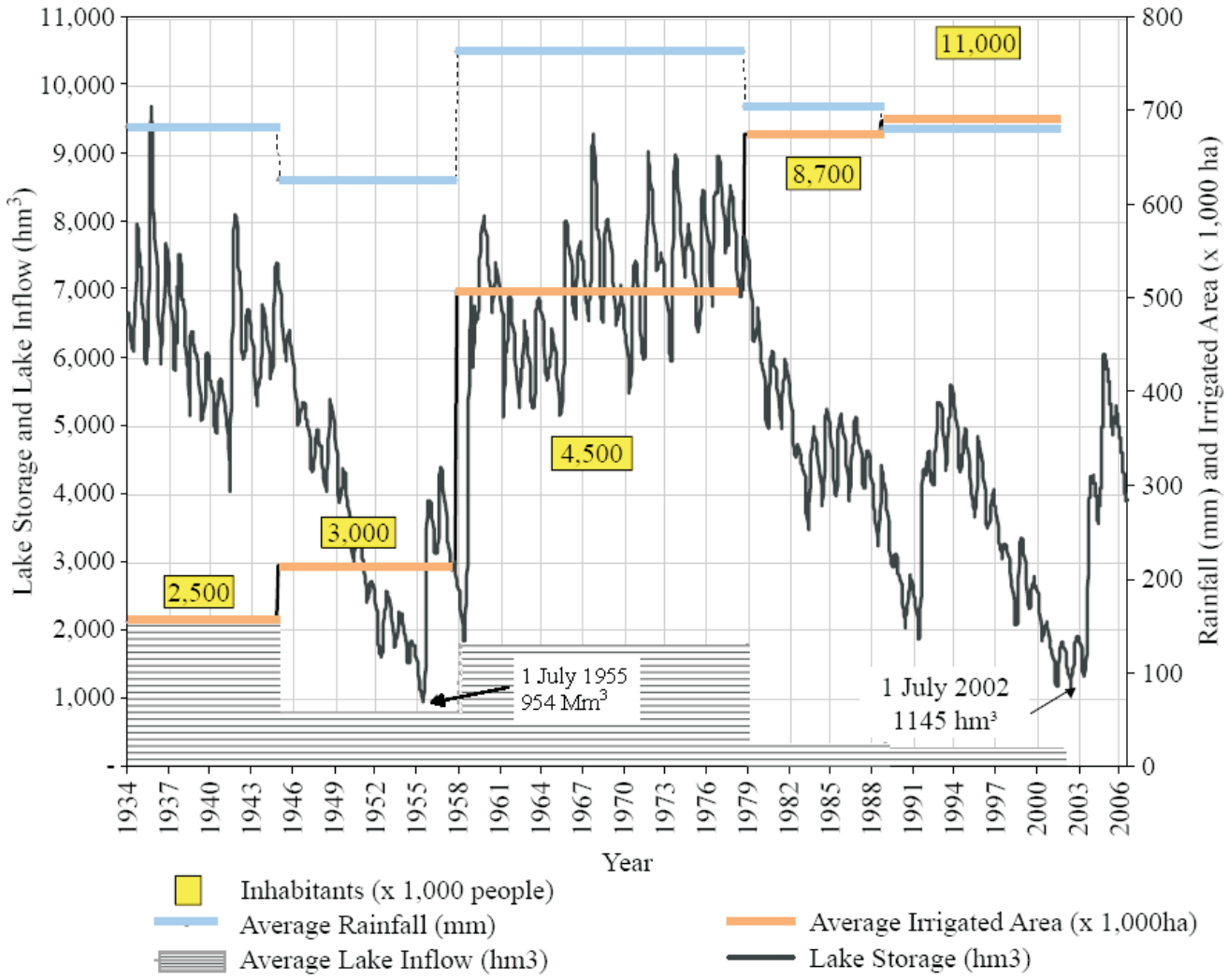
574. J. Aparicio, e-mail to the CEC Secretariat (30 August 2011).

575. Aparicio *et al.*, *supra* note 572. See also: A López-Caloca *et al.*, *supra* note 192.

576. J. Aparicio, *supra* note 166; version translated into Spanish in A. Hansen and M van Afferden, "El lago de Chapala: Destino final del Río Lerma" in B. Jiménez and L. Marín, eds., *El agua en México vista desde la Academia* (Mexico City: Academia Mexicana de Ciencias, 2004), <http://goo.gl/nyeiq> (viewed 21 March 2012).

223. Studies indicate that the groundwater in the watershed has little influence on the water balance of the lake.[577] The main indicators of water volumes in Lake Chapala are presented in Figure 26 along with changes in the morphology of the lake (Figure 27).

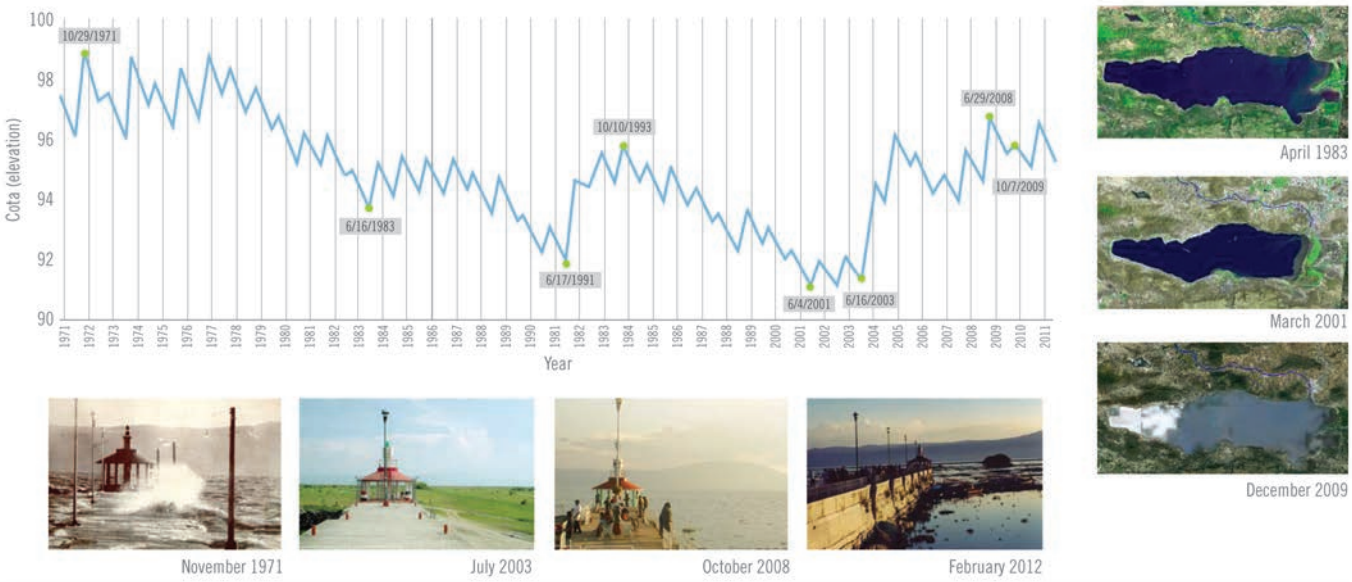
Figure 26: Historical water volumes of Lake Chapala (1934-2006)[578]



577. L. González-Hita *et al.*, *Estudio Hidrogeoquímico e Isotópico de la Zona de Toluquilla, Ocotlán-La Barca en el estado de Jalisco*, technical report, IMTA, Mexico, 1993; L. González Hita, *Localización y evaluación de agua subterránea en el Lago de Chapala*, technical report, IMTA, Mexico, 1999, cited in A. Hansen and M. van Afferden, *supra* note 576.

578. P. Wester *et al.*, "Negotiating Surface Water Allocations to Achieve a Soft Landing in the Closed Lerma-Chapala Basin, Mexico," *Water Resources Development*, 24(2), 2008 at 275-288. The author notes the following regarding the historic levels of Lake Chapala:
Starting in 1945, water storage in the lake declined sharply, from an average of 6,429 hm³ [ed.: hereafter Mm³] between 1935 and 1945 to 954 Mm³ in July 1955, due to a prolonged drought combined with significant abstractions from the lake for hydroelectricity generation (de P. Sandoval, 1994). During this period approximately 214,000 ha were irrigated in the basin, mainly with surface water, and the constructed storage capacity in the basin was 1,628 Mm³. However, because of good rains towards the end of the 1950s, the lake recuperated, and storage averaged 7,094 Mm³ from 1959 to 1979.
In 1980, a second period of decline set in. By this time, constructed storage capacity in the basin had increased to 4499 Mm³ and the average irrigated area had grown to around 680,000 ha, with a significant increase in groundwater irrigation. Although abstractions from the lake for hydropower generation had ceased, Guadalajara City started drawing large amounts of its urban water supply directly from the lake. The combination of these factors, plus around 8% less rainfall (705 mm from 1979 to 1988) than in the preceding wet period (764 mm from 1958 to 1978), resulted in declines in the lake level, from 5,944 Mm³ at the start of 1980 to 2,029 Mm³ in June 1990. After a modest recuperation in the early 1990s, lake levels started declining again. Between October 1993 and June 2002 the volume of water stored in Lake Chapala dropped from 5,586 Mm³ to 1,145 Mm³ (68% to 14% of maximum storage), the lowest level measured since 1955.

Figure 27: Lake Chapala surface water elevation, morphometry, and satellite images (1983–2010)[579]



Date	29/10/1971	16/6/1983	17/6/1991	10/10/1993	4/6/2001	16/6/2003	29/9/2008	7/10/2009	10/2/2012
Cota (elevation see note 581)	98.81	93.71	91.91	95.77	91.13	91.3	96.72	95.83	94.78
Volume (Mm^3)	9,060	3,410	1,780	5,598	1,182	1,307	6,666	5,664	4,516
Area (ha)	115,622	99,177	80,262	111,352	72,297	74,381	113,328	111,561	106,840

224. A 2002 study on the interaction between water quality and quantity in Lake Chapala concluded that in order to maintain water quality, the water level in the lake must be maintained above 1,521 m.a.s.l.,[580] corresponding to *cota*[581] 95 and a storage volume of 4,751 Mm^3.[582] According to data available on the CEA-Jalisco website, the maximum capacity of the lake was determined to be at *cota* 97.80 (1523.80 m.a.s.l.), which corresponds to a volume of 7,897 Mm^3.[583] In November 2010, CEA-Jalisco informed in its website that the level of Lake Chapala was at *cota* 96.41 with a storage volume of 6,315 Mm^3.[584]

225. Various studies have noted the environmental risks associated with falling water levels in Lake Chapala. The "Toxic Substances, Sources, Accumulation and Dynamics" study in Lake Chapala concluded that:

579. CEA-Jalisco, *supra* note 191. Images obtained from: Google Earth, 2009 and United Nations Environment Programme, Global Resource Information Database – Sioux Falls, "Lake Chapala," <http://goo.gl/pSJ7t> (viewed 21 March 2012). Photographs obtained from: Conagua, CEA-Jalisco, gobierno del estado de Jalisco, *supra* note 76, and CEA-Jalisco, "Chapala enfrenta un escenario dificil," CEA-Jalisco, 10 February 2012, <http://goo.gl/swR5M> (viewed 21 March 2012).

580. O. Lind and L. Dávalos Lind, *supra* note 258. Both authors note that "when the water level declines sufficiently – albeit with increasing resuspension of clay – so that the algae have sufficient light energy, the excessively high nutrient concentrations support blooms."

581. The word *cota* (elevation) has a special use in the case of Lake Chapala, which is described on the CEA-Jalisco website (CEA-Jalisco, *supra* note 190):

> Elevation is a numerical value indicating height with respect to an arbitrarily fixed height of 0.00. Sea level is universally used as the value of 0.00 m. The level of [Lake Chapala] is measured with respect to an arbitrary elevation of 100.00 defined in 1910 by Luis P. Ballesteros, a hydraulic engineer, as a fixed point situated on the old Cuitzeo Bridge on the Santiago River at the entrance to the town of Ocotlán. This elevation of 100.00 corresponds to 1,526.80 m above sea level.
>
> In 1981, the Ministry of Agriculture and Water Resources (*Secretaría de Agricultura y Recursos Hidráulicos*—SARH) adjusted the Ballesteros elevation, reducing it by 80 cm to 1,526 m.a.s.l. The maximum capacity of the lake was thus established at *cota* 97.80 (1,523.80 m.a.s.l.), with a mean depth of 8 m and maximum storage of 7,897 Mm^3.

582. CEA-Jalisco, *supra* note 191.

583. *Idem*.

584. CEA-Jalisco, *supra* note 190.

> [...] the results clearly demonstrate that decreasing water levels in Lake Chapala represent a risk of accumulation of dissolved heavy metals in the lake water, which in the future may affect the ecological integrity of the water resource.[585]

226. A 1998 paper called attention to cadmium and lead concentrations in Lake Chapala, noting that concentrations appear higher during the dry season when the water levels are low.[586] An alert system has been devised for heavy metals in drinking water drawn from Lake Chapala, in which metal concentrations are estimated as a function of seasonal water levels. It has been noted, however, that there is no direct heavy metal monitoring.[587]

227. A study published in 2000 on total copper, chromium, nickel, lead, cobalt, zinc, iron, and aluminum concentrations in Lake Chapala sediments found that metal bioavailability is due to sediment resuspension.[588] In this study, two zones of the lake were identified: 1) the Lerma River delta, with higher metal concentrations, and 2) the central and western lacustrine zone, with lower metal concentrations.[589] A 2002 paper noted the importance of suspended clay in the lake as a barrier to light penetration, as the basis of the food chain, and as a possible direct contributor of pollutants to the food chain.[590]

228. A 2004 paper reported increased cadmium concentrations at times of low water levels in Lake Chapala and developed a model to forecast increased cadmium concentrations as a function of water levels.[591] Other studies measured peak concentrations of metals such as arsenic, chromium, zinc, nickel, and copper that were apparently caused by higher water levels entering from the Lerma River during the rainy season.[592] These measurements included Common Water Hyacinth (*Eichhornia crassipes*) plant matter, since there was considerable metal buildup in the plant roots. Other measurements in this study performed on the livers of fish such as tilapia and carp yielded copper concentrations in excess of 2,000 μg/g and of zinc in excess of 100 μg/g in water samples from both the lake and the Santiago River.[593]

229. A 1996 study of metal concentrations in Lake Chapala (cadmium, copper, nickel, lead, zinc and mercury) identified mercury concentrations (0.217—8.149 μg/g dry weight) in *Chirostoma spp.*, with the highest concentrations of mercury found at the eastern end of the lake at the mouth of the Lerma River.[594]

230. As noted above, the route of entry of metals into the lake's fish populations is via direct consumption of clay-organic-bacteria aggregates (COBA), whose importance in the Lake Chapala food chain has been explored by measuring COBA consumption by *Oreochromis niloticus* (Nile tilapia), *Goodea atripinnis* (Blackfin goodea), and *Chirostoma spp*.[595] It was found that both *O. niloticus* and *G. atripinnis* are unable to feed on COBA, preferring other food types (i.e., zooplankton). In contrast, *Chirostoma spp*. was able to feed on the aggregates. Clay aggregates play several roles in the lake's processes: they protect it from eutrophication, serve as an alternative food source, and carry pollutants directly to the fish.[596]

231. It has been found that critically low water volumes put stress on the trophic relations of fish in Lake Chapala, causing potentially significant drops in egg production.[597] It has been thus recommended that fishing be reduced during periods of critically

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585. A. Hansen and M. Afferden, "Toxic substances, sources, accumulation and dynamics," *supra* note 166 at 95-121.
586. J.P. Shine, D.K. Ryan and T.E. Ford, "Annual cycle of heavy metals in a tropical lake: Lake Chapala," *Journal of Environmental Science and Health, Part A*, 33(1), 1998 at 23-43, <http://goo.gl/GLMQe> (viewed 21 March 2012).
587. M. van Afferden and A. Hansen, "Forecast of lake volume and salt concentration in Lake Chapala, Mexico," *Aquatic Sciences-Research Across Boundaries*, 66(3), 2004 at 257-265, <http://goo.gl/PJId8> (viewed 21 March 2012).
588. L. Rosales Hoz *et al.*, "Heavy metals in sediments of a large, turbid tropical lake affected by anthropogenic discharges," *Env. Geol.*, 39(3-4), 2000 at 378-383, <http://goo.gl/v1IDC> (viewed 21 March 2012).
589. *Idem.*
590. O. Lind and L. Dávalos Lind, *supra* note 258.
591. A. Hansen and M. van Afferden, "Modeling cadmium concentration in water of Lake Chapala, Mexico," *Aquat. Sci.*, 66(3), 2004 at 266-273, <http://goo.gl/DW5u6> (viewed 21 March 2012).
592. J.P. Shine, D.K. Ryan and T.E. Ford, *supra* note 586.
593. O. Lind and L. Dávalos Lind, *supra* note 258.
594. T. Ford *et al.*, *supra* note 289.
595. O. Lind *et al.*, *supra* note 293.
596. *Idem.*
597. R. Moncayo, *supra* note 285.

low-water levels in order to allow for greater egg production, since under stress conditions, produced fish eggs are reabsorbed instead of released for spawning.[598]

9. Measures taken by Mexico to enforce LGEEPA, Articles 5, paragraph XVI, 18, and 157 regarding guarantees of effective civic participation in matters of water quality

232. The Submitters assert that Mexico is failing to guarantee effective civic participation in environmental policy and planning. They maintain that measures to resolve the water quality problem in the watershed have not yielded effective results.[599] The Submitters cite as an example a forum held in 2001 by the Senate of the Republic focusing on the problems of the watershed and of Lake Chapala, which gave rise to a sustainability program for the Lerma-Chapala watershed. That program was proposed by Semarnat in December 2001, but the Submitters note that they do not know if there was any follow-up to it.[600] The Submitters state that meetings were held to establish regulations for the Lerma-Chapala watershed, but they assert that results and follow-up from these meetings are also still awaited.[601]

233. In its Response (see Section 3.2 of this Factual Record),[602] Mexico maintains that with respect to LGEEPA Article 157 "[civic] participation is made possible through the Democratic Planning System established in the Mexican Constitution."[603] The Water Program for Region VIII, Lerma-Santiago-Pacífico forms part of such system.[604] That program is divided on the basis of watersheds and subdivided into the Lerma, Santiago and Pacífico subregions.[605]

234. LGEEPA Article 5, paragraph XVI, provides that the Federation has the authority to "promote societal participation in environmental matters, pursuant to the provisions of this Act." Likewise, LGEEPA Article 18 provides that in the development of programs for the preservation and restoration of ecological balance, the federal government "shall promote the participation of the various social groups," while LGEEPA Article 157 provides that the federal government shall promote the "jointly responsible participation of society in the planning, implementation, evaluation, and vigilant monitoring of environmental and natural resource policy."

235. Concerning water quality, as noted above, civic participation includes participation in a set of coordination, consensus building, support, and consultation fora known as watershed councils.[606] These fora are multi-stakeholder bodies[607] made up of authorities of the three levels of government, water users, and civic and nongovernmental organizations.[608] The watershed councils are neither subordinate to Conagua nor to the watershed authorities,[609] and their primary purpose is the formulation and implementation of programs and measures "for better administration of water, development of water infrastructure and corresponding services, and preservation of watershed resources."[610]

236. Since their powers do not extend to the making of binding recommendations on government bodies

598. *Idem.*
599. Submission, *supra* note 3 at 8.
600. *Ibid.* at 3-4.
601. *Ibid.* at 4.
602. Alternatively, the reader may also consult pp. 39-49 of the Response.
603. Response, *supra* note 10 at 39.
604. *Ibid.* at 48-49.
605. *Ibid.* at 48.
606. LAN, *supra* note 144, Art. 3, para. XV.
607. *Idem.*
608. *Ibid.*, Art. 13 *bis.*
609. *Ibid.*, Art. 13 *bis* 1, para. D.
610. *Ibid.*, Art. 13.

and users, the watershed councils can only issue recommendations without legal force unless such recommendations were to be implemented by Conagua or any of its watershed authorities by means of an "act of authority."[611]

237. In gathering information on the effective enforcement of the laws at issue, the Secretariat consulted the Vision 2030 Water Program for the State of Jalisco (the "Vision Program"),[612] which encompasses the area of interest among others.[613] This Vision Program summarizes the various water uses designated for several subregions within the State of Jalisco, including the Bajo Lerma and Alto Santiago subregions, though it does not state whether any environmental use has been designated.[614] The Vision Program states that in order to ensure the currency of the Program, a series of "thematic" meetings were held, including one meeting in Ocotlán, Jalisco, on the prevailing conditions of Lake Chapala, concerning agricultural use, fishing, and pollution.[615] The Vision Program states that the goal is "to strive for the balanced and sustainable use of water resources, seeing to the preservation of their quantity and quality."[616] The Vision Program also considers municipal wastewater treatment and reuse to be one of its specific objectives,[617] while another is to promote the integrated and sustainable management of water in watersheds and aquifers, as well as to restore and conserve surface water and groundwater quality. The Vision Program moreover specifies that the strategy adopted in this regard is:

> [...] promoting better knowledge of the workings of the systems of [water] use, in terms of both quantity and quality, with a view to improving their management.[618]

238. The Submitters assert that Mexico is failing to provide for the effective participation of society not only in the planning but also in the implementation of environmental policy for the Lerma-Chapala watershed.[619] The Submitters assert that although they have participated in various meetings of the watershed council, matters concerning protection of ecosystems and restoration in the area of interest are not given serious consideration or follow-up.[620]

239. In reviewing the fora for civic participation in the area of interest, the Secretariat found that the Water Program of the State of Jalisco indicates that the government of the State of Jalisco and the representatives of national water users participate through the Lerma-Chapala and the Santiago River Watershed Councils.[621] The Vision Program document states that:

> Through the participation of the various sectors of society, the planning process shall give consideration to the aspirations and demands of society so as to incorporate them into the plan and the development programs.[622]

240. The Submitters assert that they have participated in watershed council meetings[623] and that in one case they noted that "irrigation often takes priority in prejudice of use for human consumption and for conservation which should be assigned for Lake Chapala."[624] Concerning this assertion, it was observed that a state-level body called the State Development Planning Committee (*Comité de Planeación para Desarrollo del Estado*—Coplade) gives consideration to observations on "wastewater treatment" and "contamination of watersheds, rivers, and aquifers," which are incorporated into

611. *Ibid*., Arts. 12 *bis* 2, para. VI and 13 *bis* 3, para. XX.
612. Conagua, *supra* note 395 at 6.
613. *Ibid.*
614. *Ibid.* at 64-66.
615. *Ibid.* at 12.
616. *Ibid.* at 13.
617. *Ibid.* at 15.
618. *Ibid.* at 14.
619. Submission, *supra* note 3 at 8.
620. *Idem*.
621. Conagua, *supra* note 395 at 76.
622. *Ibid*. at 44.
623. Submission, *supra* note 3 at 8.
624. *Ibid*. at 13-14.

the Vision 2030 Water Program for the State of Jalisco.[625]

241. In conducting a search for mechanisms that would allow civic participation in environmental planning, the Secretariat identified one in the "General Strategy for Recovery and Sustainability of the Lerma-Chapala Watershed."[626] As Lake Chapala is a part of the area of interest, this strategy can be considered an applicable planning instrument.[627]

242. The strategy calls for promotion of itself to the status of a regional sustainable development program for the watershed with the goal of making it an integral part of the National Development Plan.[628] Furthermore, the coordination of interest group representatives in decision-making processes forms a central part of the general strategy.[629] The strategy document proposes that coordination be effected through the special sustainability group within the Lerma-Chapala Watershed Council, with subsequent identification of priority measures.[630] In the planning strategy, the document devotes a chapter to coordination of civic participation in which the following list of entities for consultation appears (see Table 32):

625. Conagua, *supra* note 395 at 77.

626. IMTA, "Estrategia general para el rescate ambiental y sustentabilidad de la cuenca Lerma-Chapala," Semarnat, Mexico, 2009, <http://goo.gl/yWujl> (viewed 21 March 2012).

627. Ucpast, file no. SEMARNAT/UCPAST/UE/005/11 (11 January 2011) in response to Infomex-Federal request no. 0001600311310 (26 November 2010).

628. IMTA, *supra* note 626 at 2.

629. *Idem.*

630. *Ibid.* at 192.

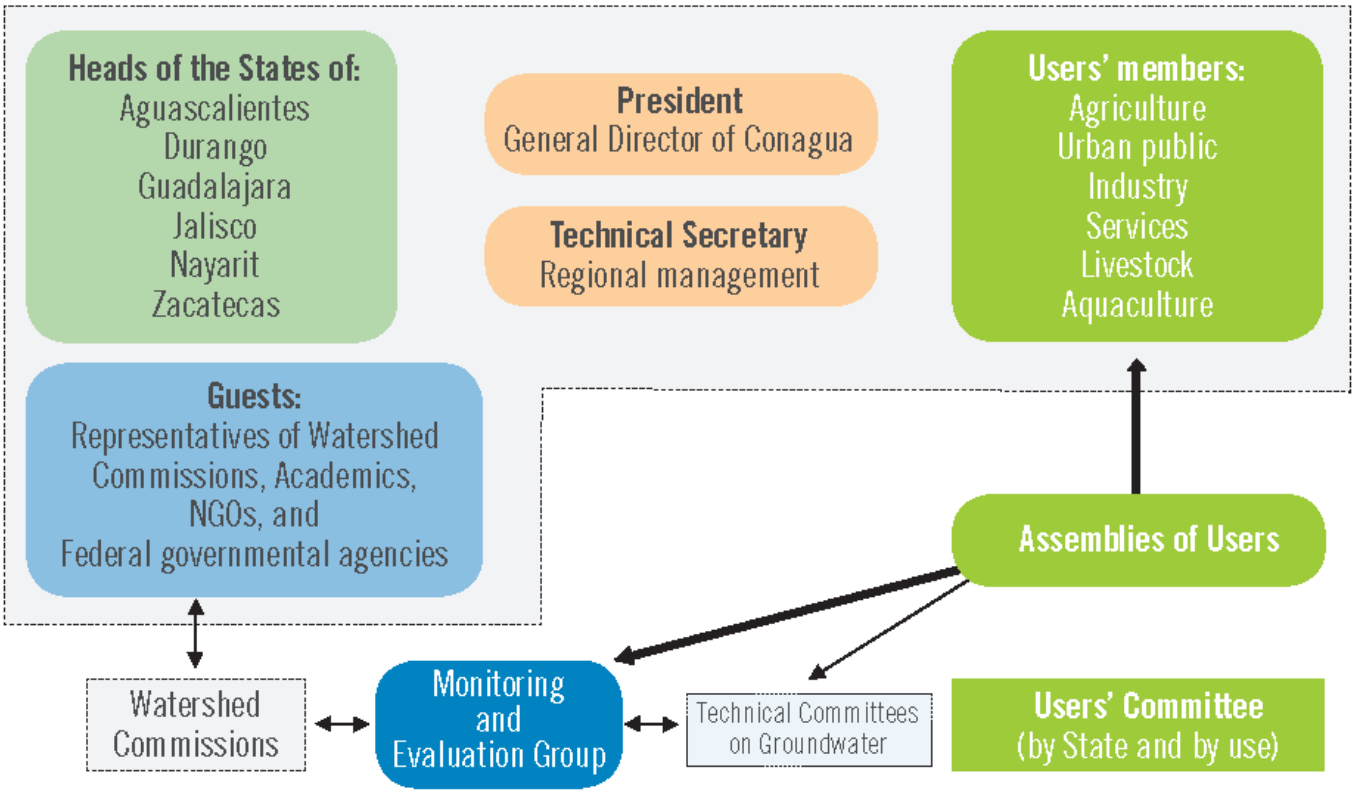
Table 32: List of Entities for Consultation as per the General Strategy for Recovery and Sustainability of the Lerma-Chapala Watershed[631]

State level		Organized civil society		Federal level	
Governments of the five states making up the Lerma-Chapala Watershed	State of Mexico Guanajuato Jalisco Michoacán Querétaro	Agricultural sector	National Union of Regional Small Farmers' Organizations (*Unión Nacional de Organizaciones Regionales Campesinas Autónomas*—UNORCA); fishing unions and cooperatives; *ejidos* [communal land] and agricultural communities	Congress of the Union	Lerma-Chapala Watershed Committee
State government departments responsible for environmental issues	State water commissions State environmental protection commissions State attorneys for environmental protection	Irrigation districts	Water users' associations (intra-governmental entities) 11 irrigation districts	Ministry of Finance and Public Credit (*Secretaría de Hacienda y Crédito Público*—SHCP); Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (*Secretaría de Agricultura, Desarrollo Rural y Pesca*—Sagarpa); Ministry of Social Development (*Secretaría de Desarrollo Social*—Sedesol); Ministry of Energy; Ministry of Economy; Ministry of Health	Central office representatives and their respective State offices
State government departments of agriculture and rural development		Commerce and services sector	National, regional, state and municipal business organizations	Semarnat	National Forestry Commission (*Comisión Nacional Forestal*—Conafor) National Protected Natural Areas Commission (*Comisión Nacional de Áreas Naturales Protegidas*—Conanp) National Biodiversity Commission (*Comisión Nacional para el Conocimiento y Uso de la Biodiversidad*—Conabio) Profepa Semarnat State offices IMTA National Institute of Ecology (Instituto Nacional de Ecología—INE)
Municipal level		Industrial sector			National, regional, state and municipal business organizations
205 municipalities making up the Lerma-Chapala watershed (municipalities whose territory lies partly or wholly within the watershed)	Municipal representatives responsible for environmental issues	Universities, research centers, environmental nonprofits	Red-Lerma		
Water utilities of main municipalities and metropolitan areas	Guadalajara, León, Toluca, Celaya, Salamanca, Irapuato	Civil society organizations	Salvemos el Río Laja (Ignacio Allende subwatershed) Ecosystem Science (municipality of San Miguel de Allende, Guanajuato) Chapala, Alzate, Pátzcuaro and Cuitzeo subwatershed associations	Conagua	Lerma-Santiago-Pacifico Watershed Authority Local offices
				Regional level	
				Lerma-Chapala Watershed Council	Special Sustainability Group and auxiliary bodies of the Council formed to date
				Rural Development Districts in the watershed	Associations of federal, state and municipal authorities and of regional producers.
				Governmental agencies of local representation	Chapala Lakeshore Mayors' Group (*Frente de Alcaldes de la Ribera de Chapala*)

631. *Ibid.* at 14-15.

243. The Secretariat did not identify, in regard to the Verde and Santiago River basins, any proposed structure similar to the one put forward in the General Strategy for Recovery and Sustainability of the Lerma-Chapala Watershed. Nevertheless, it was possible to examine the organizational structure of the Santiago River Watershed Council, which provides for nongovernmental organizations and members of academia to participate as "guests":

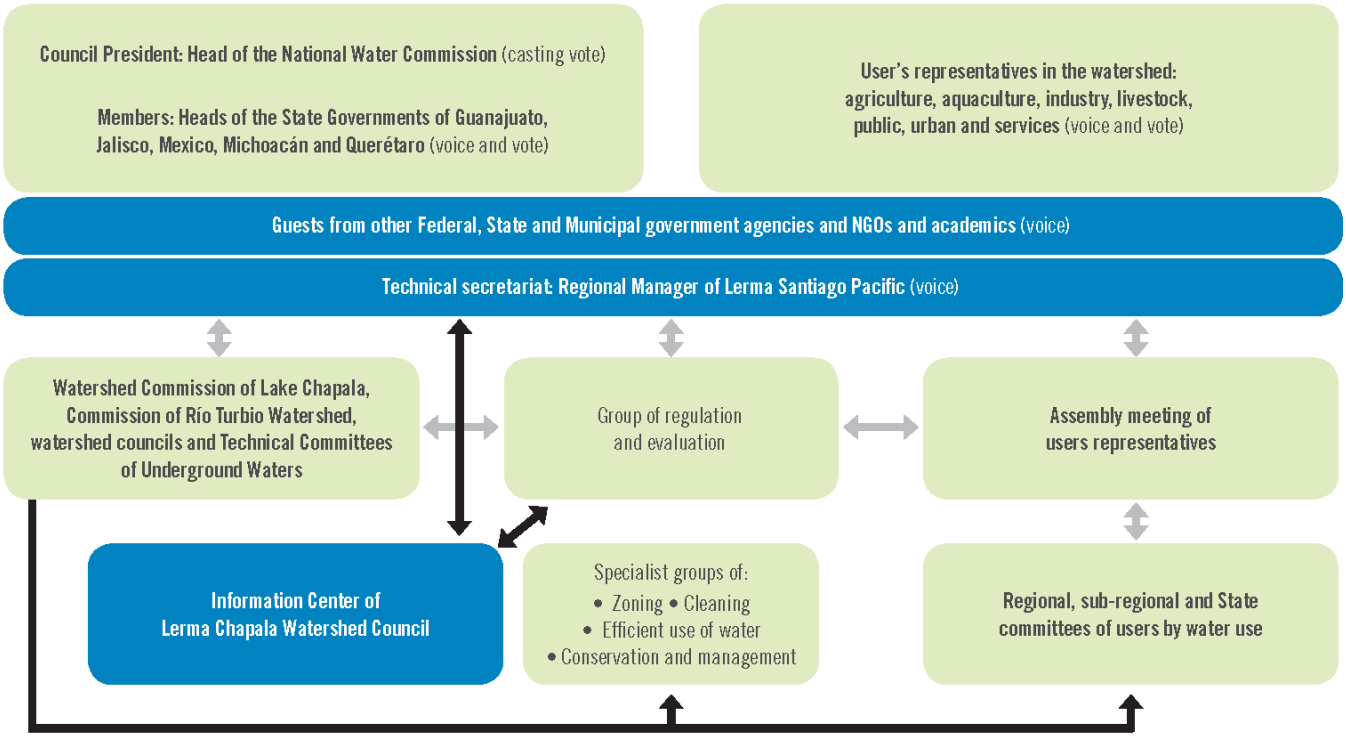
Figure 28: Structure of the Santiago River Watershed Council[632]



632. Conagua, Semarnat, *supra* note 165 at 9.

244. As for the Lerma-Chapala Watershed Council,[633] the following structure was found, in which nongovernmental organizations and academia appear under the category of "Guests":

Figure 29: Structure of the Lerma-Chapala Watershed Council[634]



245. Participation in decision making as a "guest" of watershed councils discussed above, is defined by LAN Article 15, paragraph III:

> Any Watershed Councils established under the Technical Council of "The Commission" agreement, may have the territorial extent comprising the geographical area of the watershed or watersheds in which they are constituted. The Watershed Councils shall be constituted in the following manner:
>
> [...]
>
> III. The Watershed Councils may invite to their sessions such agencies and entities of the federal government or the state governments and the municipalities, as well as such institutions, organizations, and representatives of various interested groups of society whose participation may be considered relevant to the better operation thereof, which shall have a voice only.[635]

The Submitters participated as "guests" of the Lerma Chapala Watershed Council on occasion.[636]

633. Conagua, "Consejo de Cuenca Lerma Chapala," <http://goo.gl/js3pW> (viewed 21 March 2012).

634. *Ibid.* at 19.

635. LAN, *supra* note 144, Art. 15, para. III.

636. Submission, *supra* note 3 at 5. The Submitters assert that they have "[...] participated in all forums addressing the issue of the basin, in the Watershed Council meetings, and in consultation meetings regarding the various programs that the authorities chose to establish for the conservation, preservation and restoration of the watershed which meant nothing other than good intentions," Submission, *supra* note 3 at 8.

10. Measures taken by Mexico to enforce LGEEPA Articles 161 and 170 and LAN Article 9, paragraphs I and XIII, regarding inspection and vigilant monitoring

246. The Submitters assert that Mexico is failing to effectively enforce the version of LAN Article 9, paragraph XIII that was in force in 2003.[637] In particular, they assert that Conagua is failing to exercise its powers in the area of water quality inspection and vigilant monitoring.[638] In its Response, Mexico maintains that between 2001-2003 it conducted 635 inspection visits to national water users in Jalisco;[639] that in 2001 it reviewed compliance for 25 wastewater discharges into national waters;[640] that out of these, 22 users exceeded standards for maximum allowable limits and thus implemented administrative proceedings;[641] and, that between 1998 and 2003 Profepa conducted 125 inspection visits to industries discharging into the Santiago River.[642]

247. Conagua has responsibility for performing inspection and verifying compliance with the provisions of the NOM(s); containing applicable water quality parameters, with a view to preserving the quality of national waters.[643] Conagua is responsible for ensuring that inspection and vigilant monitoring are carried out in accordance with applicable NOMs and regulations.[644]

248. According to Conagua, inspection and verification visits are the main means of coercive law enforcement at its disposal.[645] The Inspection and Measurement Branch (*Gerencia de Inspección y Medición*) is the unit within Conagua whose function is to verify that users of national waters and associated public lands comply with the provisions of the LAN, its regulation, and any other applicable legal provisions.[646] In order to verify user compliance, inspections and verifications[647] are carried out in the form of the administrative procedures for inspection and vigilant monitoring.[648]

249. In its Response, Mexico states that Conagua is responsible for ensuring inspection and vigilant monitoring in the State of Jalisco.[649] Mexico states that in the years 2000 and 2001, 25 inspection visits were carried out in the state with the object of verifying compliance with NOM-001-SEMARNAT-1996.[650] Mexico indicates that three of the 25 establishments visited were in compliance with the maximum allowable limits.[651]

250. The Water Program of the State of Jalisco sets out the water quality goals for the period 2007–2012, which include inspection visits to users of national waters as one of the indicators of its implementation.[652] The latter Program states that it does not possess data on the number of site visits performed in the state in 2006:

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637. *Ibid*. at 7.
638. *Ibid*. at 9.
639. Reponse, *supra* note 10 at 73, table IV.1 Inspection visits conducted in 2001–2003.
640. *Ibid*. at 74.
641. *Idem*.
642. *Idem*.
643. LAN, *supra* note 144, Art. 86, para. V.
644. Regulation of the National Waters Act (*Reglamento de la Ley de Aguas Nacionales*—RLAN), DOF 12 January 1994, Art. 182, para. III.
645. Conagua, *Compendio estadístico de administración del agua (CEAA), edición 2009*, Comisión Nacional del Agua, 2009 at 41, <http://goo.gl/sBnLE> (viewed 21 March 2012).
646. RLAN, *supra* note 644, Art. 182.
647. LAN, *supra* note 144, Art. 86, para. V.
648. RLAN, *supra* note 644, Art. 183.
649. Response, *supra* note 10 at 62.
650. *Idem*.
651. *Idem*. Mexico adds that "439 inspection visits were conducted in the state of Jalisco in 2003." However, these visits do not correspond with vigilant monitoring of compliance with the NOM in question. Mexico adds that Profepa conducted 125 inspection visits between 1998 and 2003 at facilities located in the area of interest, but it does not specify whether these acts of inspection focused on matters relating to the quality of wastewater discharges.
652. Conagua, *supra* note 395.

Table 33: Indicators and goals of the Water Program of the State of Jalisco (excerpt)[653]

	Indicator	Goal	Inspections in 2006	Goal for 2007-2012	Cumulative goal to 2012
8.4.1	**Inspection visits to users of national waters and inherent public lands**	430	Not available	430	430

251. From the information obtained by the Secretariat concerning the number of inspection visits carried out by Conagua in the State of Jalisco to verify compliance with Mexican Official Standard NOM-001-SEMARNAT-1996,[654] the Secretariat notes that records are available for the visits conducted in 2007 and 2008: 19 and 7 visits, respectively.[655] In this two-year period, of 26 inspection visits, 9 gave rise to an administrative proceeding and, of these, four culminated in the application of administrative sanctions.[656]

252. In response to the recommendations issued by the Office of the Auditor General of the Federation (*Auditoría Superior de la Federación*) in the Report of Results of the Audit and Review of Public Accounts 2005 (*Informe de Resultados de la Revisión y Fiscalización Superior de la Cuenta Pública 2005*), Conagua reported the following:

> The Director of Determination of Violations, Analysis, and Evaluation [...] requests from the Directors General of the Watershed Authority and the Local Directors that they instruct the relevant parties that, in cases where inspection visits are conducted and it is detected that users are discharging over and above the maximum allowable limits, prior to initiating the administrative proceeding for application of sanctions, there must be implementation of urgent measures ordering the suspension of the wastewater discharges and granting a period of 15 days in which to comply with the quality levels set out in the standard.[657]

253. The general management of the Lerma-Santiago-Pacífico Watershed Authority notes in a letter to the Secretariat that "the main control program is that of inspection and measurement, which is carried out by the water administration area" and mentions as a goal that "by 2009, at least 100 inspection visits to wastewater discharges are planned."[658]

254. According to information from Conagua, the number of staff members certified by the Lerma-Santiago-Pacífico Watershed Authority—which oversees 13 percent of the nation's territory[659]—to conduct acts of inspection and vigilant monitoring is four out of a total of 78 inspectors certified for the entire country, i.e., approximately five percent of certified personnel.[660] Conagua maintains that "the total number of these inspectors is insufficient to verify the total group of users which, in fact or by law, use national waters and their associated public lands."[661] On the number of inspectors authorized to carry out inspection duties in Jalisco, Conagua reports:

> For the purpose of discharging the inspection responsibilities, the Lerma-Santiago-Pacífico Watershed Authority has 5 (five) middle manager positions and 2 (two) general salary scale positions.
>
> The inspection and measurement project manager of this watershed authority is in charge of assign-

653. *Ibid.* at 89.

654. Request for information no. 1610100011711 of 27 January 2011 filed with Infomex.

655. Conagua Information Committee, file no. AC/CI-CONAGUA.-0012/2011 (4 February 2011) in re Infomex-Federal request no. 1610100011711.

656. Conagua, Response to Infomex-Federal request no. 1610100019211 (10 February 2011).

657. Coordinating Unit for Liaison with Supervisory Bodies (*Coordinación de Atención a Organismos Fiscalizadores*) of Conagua, File no. BOO.07.-0456 (4 June 2007).

658. Director General, Lerma-Santiago-Pacífico Watershed Authority, *supra* note 386.

659. The Lerma-Chapala-Santiago-Pacífico watershed encompasses an area of 190,438 km^2, corresponding to 13 percent of the nation's territory; it is made up of portions of the states of Mexico, Michoacán, Querétaro, Guanajuato, Jalisco, Zacatecas, Durango, and Nayarit as well as the entirety of Colima and Aguascalientes; Response, *supra* note 10 at 26. See also Figure 4 *supra*.

660. Conagua, *supra* note 645 at 44.

661. *Idem.*

ing inspectors according to the needs of the authority.[662]

255. Similarly, according to information CEA-Jalisco provided to the Secretariat concerning water quality-related capacities, CEA-Jalisco has a unit of 26 employees assigned to the Inspection and Vigilant Monitoring Branch (*Gerencia de Inspección y Vigilancia*) together with the Laboratory Branch (*Gerencia de Laboratorio*), who are in charge of performing inspection and vigilant monitoring, sampling, physicochemical and heavy metal analysis, water purification, administrative duties, and water quality control duties.[663] CEA-Jalisco does not have the power to conduct acts of inspection and vigilant monitoring of wastewater discharges into receiving bodies of water that are property of the nation, such as Lake Chapala and the Verde and Santiago Rivers in the area of interest.[664]

256. The Secretariat requested factual information on water quality-related cooperation between state and federal authorities.[665] In this regard, in March 2008 the government of the State of Jalisco, acting through Semades and CEA-Jalisco, proposed signing an agreement of cooperation with Semarnat and Conagua[666] that provided for the joint participation of federal and state entities and planned the implementation of a "program to support water quality inspection and vigilant monitoring work in the Santiago River basin."[667] The purpose of the joint activities contemplated in the agreement was to apply solutions to the problems caused by the high levels of contamination in the Santiago River basin as a result of wastewater discharges.[668]

257. Similarly, the aforementioned cooperation agreement stipulated that Conagua, using the powers vested in it by LAN, would be the entity in charge of water quality inspection and vigilant monitoring for the Santiago River basin and for wastewater discharges, while the local authorities would, among other functions, be in charge of supporting Conagua "in the development of a census of wastewater discharges into the Santiago River [...]."[669] The cooperation agreement also provided for support by CEA-Jalisco and other local bodies described therein for the performance of verification and inspection visits and the taking of samples from existing discharges, reserving to Conagua the power to initiate any administrative proceedings ensuing from them.[670]

258. However, as appears from the information gathered by the Secretariat, in April of the same year (2008), the entities did not sign the cooperation agreement. Conagua stated that it would continue the "interdisciplinary coordination that has taken place to date, to which each of the entities, within the scope of its powers, is contributing with a view to improving the quality of the wastewater discharges within the scope of municipal, state, and federal jurisdiction, as the case may be".[671]

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662. Conagua, Response to Infomex-Federal request no. 1610100148909 (28 October 2009).

663. CEA-Jalisco, unnumbered communication (31 March 2011), Appendix 5: Description of capacities of CEA-Jalisco for formation of brigades for the taking and securing of wastewater discharges (27/7); and, Description of capacities of the CEA-Jalisco laboratory.

664. CEA-Jalisco, *supra* note 129, Appendix 1: file no. BOO.00.02.-476 of 23 April 2008, issued by the Director General of the Lerma Santiago Pacífico Watershed Authority.

665. CEC Secretariat, e-mail to CEA-Jalisco of 7 March 2011.

666. CEA-Jalisco, *supra* note 129, Appendix 1: Note dated 15 March 2011, on the history and follow-up to Specific Joint Activities Agreement between CEA and Conagua.

667. *Idem.*

668. *Idem.*

669. *Ibid.*, Appendix 1: Draft of the Specific Joint Activities Agreement between CEA and Conagua, clause sixth.

670. *Idem.*

671. *Ibid.*, Appendix 1: file no. BOO.00.02.-200 of 25 April 2008, issued by the Director General of the Lerma Santiago Pacífico Watershed Authority.

11. Measures taken by Mexico to enforce LGEEPA Article 78 regarding the formulation of ecological restoration programs

259. The Submitters assert that Mexico is failing to effectively enforce provisions that give Semarnat the power to establish ecological restoration programs.[672] They state that the Senate of the Republic, on 3 December 2002, approved a report[673] recommending the passage of a regulatory law intended to establish an ecological restoration zone for the Lerma-Chapala-Santiago-Pacífico basin.[674] At the time of preparation of this factual record, the draft regulatory law mentioned by the Submitters was still under consideration by the legislative branch of Mexico.[675] Thus, given that this matter refers to the passage of legislation by one of the Parties—which is not contemplated as part of the NAAEC Article 14 and 15 submission mechanism[676]—no further information is presented about the legislative process surrounding the draft regulatory law in question.

260. LGEEPA Article 78 provides as follows:

> [...] in those areas that exhibit processes of degradation or desertification, or severe ecological instability, the Ministry shall formulate and implement programs with a view to guaranteeing that the measures necessary to restore and reestablish the conditions conducive to the evolution and continuity of the natural processes occurring there are taken. In the formulation, implementation, and furtherance of such programs, the Ministry shall promote the participation of landowners, landholders, social, public, or private organizations, indigenous peoples, local governments, and other interested parties.

261. Mexico notes that a coordination agreement was signed on 22 March 2004,[677] between the federal government and the governors of five states, to embark upon comprehensive restoration work for the Lerma-Chapala watershed.[678] The object of the indefinite-term agreement is coordination between the parties of restoration work on the watershed.[679] The agreement sets out measures relating to the institutional legal framework, the water quality measurement and information system, water sustainability and administration, and ecological rehabilitation.[680] However, the latter agreement only covers the portion of the area of interest including Lake Chapala. Furthermore, Mexico notes that in 2001 it initiated a consultation with the governments of the states involved in order to develop a master plan for recovery and sustainability of the Lerma-Chapala watershed.[681]

262. Reviewing the available information on the enforcement of LGEEPA Article 78, the Primary Sector and Renewable Natural Resources Branch (*Dirección General del Sector Primario y Recursos Naturales Renovables*) of Semarnat[682] notes that it currently has a project titled "General Strategy for Environmental Recovery and Sustainability of the Lerma-Chapala Watershed" (the "General Strategy").[683] The General Strategy is a planning instru-

672. Submission, *supra* note 3 at 7-8.

673. Report on the Draft Order to Enact Regulatory Law under Article 27 of the Constitution Establishing the Lerma-Santiago-Pacífico Region as an Ecological Restoration and Water Reserve Zone, Presented by the Joint Water Resources (*Comisiones Unidas de Recursos Hidráulicos*) and Legislative Studies (*Estudios Legislativos*) Commissions; see "Solicitudes de Excitativas a Comisiones del Senador Ramiro Hernández García," Senate Gazette (*Gaceta del Senado*), <http://goo.gl/cASJp> (viewed 21 March 2012).

674. Submission, *supra* note 3 at 4 and 9; the text of the executive order is available at <http://goo.gl/va5ZE> (viewed 21 March 2012).

675. See "Solicitudes de Excitativas a Comisiones del Senador Ramiro Hernández García," *supra* note 673.

676. In a previous determination, the Secretariat stated: "Based on our review of the Agreement, we conclude that whatever the outer bounds of 'enforcement' under Article 14(1) may be, enforcement does not include government standard-setting"; SEM-98-003 (*Great Lakes*), Determination pursuant to Article 14(1) (14 December 1998) at 3.

677. "Coordination Agreement for Recovery and Sustainability of the Lerma-Chapala Watershed," available at <http://goo.gl/4alOY> (viewed 21 March 2012).

678. Response, *supra* note 10 at 70-71. It should be clarified that the information on the Coordination Agreement was presented in response to the Submitters' assertion of an alleged failure to enforce LAN, Article 7, which declares the restoration of the water balance of national waters to be a matter of public utility.

679. Coordination Agreement, *supra* note 677.

680. *Ibid.*, seventh clause.

681. Response, *supra* note 10 at 71 (footnote 71).

682. Ucpast, file No. SEMARNAT/UCPAST/UE/005/11 (11 January 2011), in response to information request Infomex-Federal núm. 0001600311310 (26 November 2010).

683. *Idem*.

ment that serves as a guide to action on the Lerma-Chapala watershed.[684] The General Strategy forms a part of the sectoral goals for 2007-2012, and its implementation is currently in process, while its completion is slated for year-end 2012. In addition, it is clarified in the information provided by Semarnat that this is a "dynamic, flexible, adaptive [instrument], and therefore should not be considered final."[685] Given the current scope of application of the General Strategy, it encompasses Lake Chapala but not the Santiago and Verde River basins.[686]

263. The General Strategy establishes guidelines for the recovery, restoration, and conservation of the watershed. The General Strategy seeks the solution to problems[687] identified as standing in the way of short-, medium-, and long-term sustainable development.[688]

264. Among the proposals of the General Strategy is the creation of five watershed commissions, including one that would be called the Bajo Lerma-Jalisco Watershed Commission (*Comisión de Cuenca Bajo Lerma-Jalisco*) and would encompass the Zula River and Lerma River (Chapala subwatershed).[689] The General Strategy establishes that one of the main obstacles faced by the watershed is water pollution, and it therefore proposes clean-up of the bodies of water in this watershed and more treatment for municipal wastewater discharges.[690] The General Strategy also discusses monitoring and verification of the conditions of service as a way to control effluent quality.[691]

265. Furthermore, the General Strategy highlights the need for enforcement of the applicable law, the installation of water treatment plants, and the strengthening of environmental auditing.[692] In view of observed deficiencies in natural resource governance, reinforcement of good administrative practices is proposed in the General Strategy, as well as concluding agreements with institutions of higher education, and awarding an annual prize designed as an incentive for the training of municipal public servants.[693] Finally, the General Strategy proposes strengthening civic participation through the formation of planning councils for municipal development, as well as bringing the state legal frameworks fully up to date.[694]

266. On 3 May 2007, CEA-Jalisco made a formal request that Conagua consider issuing "a classification declaration for national bodies of water pursuant to LAN Article 87"[695] and submitted water quality studies in support of its request.[696] CEA-Jalisco also stated that, "[...] this Declaration would be an indispensable forensic instrument."[697] However, it must be noted that this request, contemplated in LAN Article 87, is related to the reservoir that would have been created by the Arcediano Project, and therefore this matter is not treated further in this factual record.[698]

267. The Secretariat could not identify factual information on the alleged implementation of an ecological restoration program by means of a declaration issued by Semarnat in the manner prescribed by LGEEPA Article 78, nor any instrument setting water quality goals in the area of interest.

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684. IMTA, *supra* note 626 at 191.
685. *Idem.*
686. *Ibid*. at 17.
687. IMTA identifies nine obstacles to the development of the Lerma-Chapala watershed, three of them applicable to the Lerma-Jalisco subregion: (i) deficiencies in the social governability of natural resources; (ii) water, air, and soil pollution as well as final disposal of hazardous solid waste, and (iii) degradation and depletion of natural resources. *Ibid*. at 178.
688. *Ibid.* at 191.
689. *Ibid.* at 193.
690. *Ibid.* at 197.
691. *Idem.*
692. *Ibid.* at 184.
693. *Ibid.* at 214.
694. *Idem*.
695. *Supra* §70.
696. CEA-Jalisco, file no. DG-430/2007 (3 May 2007), <http://goo.gl/1tE91> (viewed 21 March 2012).
697. *Idem.*
698. *Idem*.

12. Final Note

268. Factual records provide detailed information regarding assertions of failures to effectively enforce environmental laws in North America. The information that forms part of a factual record may assist submitters, the Parties to NAAEC and members of the public interested in the matters addressed in the factual record. This factual record draws no conclusions regarding the Submitter's asserted failures of Mexico to effectively enforce its environmental law, nor regarding the effectiveness of Mexico's enforcement efforts.

269. This factual record includes information about systematic and ongoing monitoring in the area of interest as well as information on water quality studies[699] so as to contribute to an understanding of the efforts made and the challenges faced in identifying the main sources of water pollution and their characteristics, in line with Council Resolution 08-01. The factual record also includes information on the construction and operation of wastewater treatment plants,[700] since the primary purpose of such measures is the preservation of water quality in the area of interest. Furthermore, this factual record presents information on the watershed councils with a view to identifying the mechanisms for civic participation in the area of interest.[701] In addition, the factual record presents relevant information on the total numbers of inspection visits and accredited inspectors, as well as information on coordination efforts between the federal and State of Jalisco authorities.[702] The factual record, moreover, contains a section on the formulation of ecological restoration programs,[703] since the recovery of the watershed in the area of interest is a central issue raised in submission SEM-03-003.[704] Finally, the factual record presents a comprehensive description of the area of interest, focusing on the special characteristics of Lake Chapala.[705]

270. In accordance with NAAEC Article 15(3), this factual record is "without prejudice to any further steps that may be taken" with respect to the submission SEM-03-003 (*Lake Chapala II*).

699. See *supra* Section 8, "Measures taken by Mexico to enforce LGEEPA, Articles 5, paragraph XI and 133, in relation to preservation of the quality of national waters and to water quality monitoring in the area of interest."

700. See *supra* Section 8.6, "Wastewater treatment projects."

701. See *supra* Section 9, "Measures taken by Mexico to enforce LGEEPA, Articles 5, paragraph XVI, 18 and 157, as regards guaranteeing effective civic participation in matters of water quality."

702. See *supra* Section 10, "Measures taken by Mexico to enforce LGEEPA, Articles 161 and 170 and LAN, Article 9, paragraphs I and XIII, in regard to acts of inspection and vigilant monitoring."

703. See *supra* Section 11, "Measures taken by Mexico to enforce LGEEPA, Article 78 in relation to the formulation of programs for ecological restoration zones."

704. Submission, *supra* note 3 at 4, 7, 8, 9, 11.

705. See *supra* Section 7, "Description of the area of interest."

APPENDIX 1

Council Resolution 08-01. Instruction to the Secretariat of the Commission for Environmental Cooperation regarding the assertion that Mexico is failing to enforce Articles 1, 2, 5, 18, 78, 79, 80, 83, 88, 89, 133, 157, 161, 162, 163, 164, 165, 167, 168, 169 and 170 of the General Law on Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*) and 3 of its Environmental Impact Regulations (*Reglamento en materia de impacto Ambiental*) [*sic*]; 1, 2, 3, 4, 7 and 9 of the National Water Law (*Ley de Aguas Nacionales*) and 2 of its Regulations; as well as Article 44 of the Internal Regulations of the Secretariat of the Environment and Natural Resources (*Reglamento Interior de la Secretaría de Medio Ambiente y Recursos Naturales*) (SEM-03-003).

30 May 2008

COUNCIL RESOLUTION: 08-01

Instruction to the Secretariat of the Commission for Environmental Cooperation regarding the assertion that Mexico is failing to enforce Articles 1, 2, 5, 18, 78, 79, 80, 83, 88, 89, 133, 157, 161, 162, 163, 164, 165, 167, 168, 169 and 170 of the General Law on Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*) and 3 of its Environmental Impact Regulations (*Reglamento en materia de impacto Ambiental*) [*sic*]; 1, 2, 3, 4, 7 and 9 of the National Water Law (*Ley de Aguas Nacionales*) and 2 of its Regulations; as well as Article 44 of the Internal Regulations of the Secretariat of the Environment and Natural Resources (*Reglamento Interior de la Secretaría de Medio Ambiente y Recursos Naturales*) (SEM 03-003).

THE COUNCIL:

SUPPORTIVE of the process provided for in Articles 14 and 15 of the North American Agreement on Environmental Cooperation (NAAEC) regarding submissions on enforcement matters and preparation of factual records;

CONSIDERING the submission filed on 23 May 2003, by the *Fundación Lerma-Chapala-Santiago-Pacífico A.C., Sociedad Amigos del Lago de Chapala A.C., Instituto de Derecho Ambiental, A.C.,* residents of the community of Juanacatlán, Jalisco, *Comité Pro-Defensa de Arcediano A.C., Amigos de la Barranca, A.C., Ciudadanos por el Medio Ambiente, A.C., AMCRESP, A.C.,* and *Red Ciudadana, A.C.,* and the response provided by Mexico on 30 March 2004;

HAVING REVIEWED the notification of 15 May 2005, submitted to the Council by the Secretariat, recommending the development of a factual record with respect to the submission;

MINDFUL that Mexico notified the Secretariat, in accordance with Article 14(3) of NAAEC, that there were three administrative proceedings, one of which has since been closed, and one judicial proceeding pending resolution;

ALSO MINDFUL that Mexico notified the Secretariat that it considers that the subject of water distribution should not be the subject of a submission as it is not environmental law as defined by Article 45(2) of NAAEC;

FURTHER CONSIDERING that it was clarified to the Secretariat in the Party's response that the Lerma-Chapala-Santiago-Pacífico basin comprises an area of 190,438 km^2 and represents 13 percent of Mexican territory, which does not coincide with the area covered by the allegations of the submission, since those allegations address the Lerma-Chapala watershed (Lerma subregion), corresponding to one part of the basin located in the state of Jalisco;

HEREBY UNANIMOUSLY

INSTRUCTS the Secretariat to develop a factual record in accordance with the above-noted considerations, as well as Article 15 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation,* except in the following ongoing proceedings: 120/2003 (*Guadalupe Lara Lara*), 41/2004 (*Sociedad Cooperativa de Producción Insurgentes de la Isla de Mezcala, S.C.L.*) and 67/2004 (*Guadalupe Lara Lara*);

REQUESTS the Secretariat to describe actions undertaken by Mexico in compliance with the regulations cited in the title of this decision, but to refrain from including any form of assessment of the effectiveness of the Party's policies or legislation;

FURTHER REQUESTS that the Secretariat limit the factual record to the area containing the Arcediano dam, within the Lerma-Chapala watershed (Lerma subregion) in the State of Jalisco, as identified in the Submission;

ALSO REQUESTS the Secretariat to refrain from consideration of legislation, or provisions thereof, primarily addressing issues of water distribution;

DIRECTS the Secretariat to provide the Parties with its overall work plan for gathering relevant facts and with the opportunity to comment on that plan, and

FURTHER DIRECTS the Secretariat to consider, in developing a factual record in respect of allegations that the Party is failing to enforce the aforementioned sections of its law, the relevant facts since the entry into force of the NAAEC on 1 January 1994. Facts prior to 1 January 1994 may be included if necessary for the development of the history presented in the factual record and if directly related to the submission.

APPROVED IN THE NAME OF THE COUNCIL:

_____
David McGovern
Government of Canada

_____
Enrique Lendo Fuentes
Government of the United Mexican States

_____
Scott Fulton
Government of the United States of America

APPENDIX 2

Submission SEM-03-003 (*Lake Chapala II*)

A14/SEM/03-003/01/SUB
DISTRIBUTION: General
ORIGINAL: Spanish

[NON-OFFICIAL TRANSLATION]

To: NORTH AMERICAN COMMISSION FOR ENVIRONMENTAL COOPERATION

FUNDACIÓN LERMA-CHAPALA-SANTIAGO-PACIFICO A.C., SOCIEDAD AMIGOS DEL LAGO DE CHAPALA A.C., INSTITUTO DE DERECHO AMBIENTAL, A.C., VECINOS DE LA COMUNIDAD DE JUANACATLÁN, JAL., COMITE PRO-DEFENSA DE ARCEDIANO A.C., AMIGOS DE LA BARRANCA, A.C., CIUDADANOS POR EL MEDIO AMBIENTE, A.C., AMCRESP, A.C., and RED CIUDADANA, A.C., identified by attached certified copies of the charters of each of the undersigned civic associations, domiciled for the purposes of receiving notices of all kinds at Misión de San Felipe Módulo 13 Departamento 10, Colonia Residencial Guadalupe, C.P. 45040, city of Zapopan, Jalisco, Mexico, and authorizing Attorneys Raquel Gutiérrez Nájera and/or Yolanda García del Ángel, jointly and severally, to receive them on our behalf, we attest as follows:

That we hereby, invoking Articles 14, 15, 45.2(a), (b), and (c), and 45.3 as well as any other relevant and applicable articles of the North American Agreement on Environmental Cooperation signed by the Government of the United Mexican States, the Government of Canada, and the Government of the United States of America in December 1993, which took effect in January 1994:

Denounce the failure to effectively enforce the National Waters Act (*Ley de Aguas Nacionales*), the General Ecological Balance and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*–LGEEPA), the Regulation to the General Ecological Balance and Environmental Protection Act respecting Environmental Impact (*Reglamento de la Ley General del Equilibrio Ecológico y la Protección al Ambiente en Materia de Impacto Ambiental*), the Regulation to the National Waters Act, and the Internal Regulation of the Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*–Semarnat), which provisions refer to the management, protection, preservation, use, and quality of water in Mexico, in the case of the Lerma-Chapala-Santiago-Pacífico watershed, the consequence of which failure to enforce is the severe environmental degradation and water imbalance of the watershed as well as the risk that Lake Chapala and the migratory bird habitat it provides could disappear. In conformity to the specific stipulations of Articles 14 and 15 of the Agreement, we state as follows:

I. Reason for the submission: Failure to effectively enforce the aforementioned environmental laws in the case of the Lerma-Chapala-Santiago-Pacífico watershed (Hydrological Region XII).

II. Authorities responsible for the failure to effectively enforce the environmental laws: The Ministry of Environment and Natural Resources (Semarnat), and the National Water Commission (*Comisión Nacional del Agua*–CNA), a deconcentrated body thereof.

III. Object of the submission: To request that the Commission for Environmental Cooperation allow this submission and address the matters to which it refers, since it coincides with the following objectives set out in Article 1 of the North American Agreement on Environmental Cooperation:

f) strengthen cooperation on the development and improvement of environmental laws, regulations, procedures, policies and practices;

g) enhance compliance with, and enforcement of, environmental laws and regulations.

IV. Background and facts

IV.I. Background

1.- Submission filed with the CEC by Instituto de Derecho Ambiental A.C. in 1997, which is on file with the CEC.

2.- Request of 29 June 2001, to the attention of members of the Joint Public Advisory Committee of the CEC in Guadalajara, Jalisco, denouncing the severe problem affecting Lake Chapala and the Lerma-Santiago-Pacífico watershed.

3.- Response dated 9 July 2001 signed by Liette Vasseur, President of JPAC, to Janine Ferretti, Executive Director, Commission for Environmental Cooperation, in which JPAC recommends that the Secretariat prepare a factual record or any other appropriate form of communication in regard to measures that may be taken to restore these resources (Appendix I).

4.- Citizen complaint filed by the Fundación in 2001 with Profepa (Appendix II).

IV.II. Facts:

A). In re the development of environmental laws, regulations, procedures, policies and practices:

In this section we present the environmental policy documents and the actions taken with the participation of civil society with a view to granting long-term legal protection to the Lerma-Chapala-Santiago-Pacífico Hydrological Region in order to guarantee the sustainability of the water and of Lake Chapala in the central and western zone of the country.

1.- There is a decree dating from 3 January 1934 declaring a Forest Protection Zone for the upper portion of the Lerma River watershed (Appendix III).

2.- The Executive Branch issued a decree declaring a Forest Protection Zone for various mountains located in Guadalajara, Jalisco, which was published in the Official Gazette of the Federation (*Diario Oficial de la Federación*–DOF) on 7 December 1934 (encompassing the environs of the Santiago River and including the river channel itself (Appendix IV).

3.- Subsequently, the CNA has noted the existence of various decrees establishing a perpetual ban on groundwater pumping in the zones of Silao, Irapuato, and Salamanca, Guanajuato (1957 and 1958); the municipalities of Morelia and Charo, Michoacán (1964); Querétaro, state of Querétaro; San José Iturbide, Dr. Mora, and San Luis de la Paz, Guanajuato, four municipalities of the states of Guanajuato and Querétaro (1964); the zone of the El Rosario-El Mezquite Irrigation District, Jalisco (1970); various municipalities of the state of Jalisco (1987); the valleys of Querétaro and San Juan del Río, Querétaro (1958); the Bajío Region, Celaya Zone (1952), and La Caldera en Abasolo spring, Guanajuato (1949).[1]

4.- Further to the problems relating to the low water level and degradation of Lake Chapala, the following legal instruments were adopted:

- Coordination agreement between the Federal Executive Branch and the executive branches of the states of Guanajuato, Jalisco, México, Michoacán, and Querétaro to implement a water use and water treatment planning program for the Lerma-Chapala watershed, signed 13 April 1989 (Appendix V).
- Coordination agreement constituting an advisory council for assessment and monitoring of the commitments undertaken in the coordination agreement between the Federal Executive Branch and the executive branches of the states of Guanajuato, Jalisco, México, Michoacán, and Querétaro to implement a water use and water treatment planning program for the Lerma-Chapala watershed, signed 1 September 1989 (Appendix VI).
- Coordination agreement between the Federal Executive Branch and the executive branches of the states of Guanajuato, Jalisco, México, Michoacán, and Querétaro to implement a special coordination program on availability, apportionment, and use of nationally owned surface waters contained within the Lerma-Chapala watershed, signed August 1991 (Appendix VII).

1. Technical studies for regulation of the Lerma-Chapala watershed, pp. 37–38.

- Coordination agreement between the Federal Executive Branch, acting by its Ministry of the Treasury and Public Credit (*Secretaría de Hacienda y Crédito Público*), Ministry of Social Development (*Secretaría de Desarrollo Social*), Ministry of Auditing and Control (*Secretaría de Contraloría General de la Federación*), Ministry of Agriculture and Water Resources (*Secretaría de Agricultura y Recursos Hidráulicos*), Ministry of Health (*Secretaría de Salud*), Ministry of Fisheries (*Secretaría de Pesca*), Federal Electricity Commission (*Comisión Federal de Electricidad*), Petróleos Mexicanos, and the executive branches of the states of Guanajuato, Jalisco, México, Michoacán, and Querétaro, for the purpose of implementing a special coordination program governing the use, exploitation, and enjoyment of the groundwater of the Lerma-Chapala watershed, develop the second phase of the watershed cleanup program, plan water usage, and take measures for the promotion of fishing and aquaculture, clean water, efficient water use, and watershed management, signed 28 January 1993 (Appendix VIII).

5.- Subsequently, Semarnat published its "Chapala Work Program 2000," of which the results and evaluation are unknown.

6.- In 2001, facing public criticism by civic organizations concerning the critical status of Lake Chapala, which is now at its lowest levels in history, the Senate of the Republic held a forum on the problems affecting the watershed and the lake. At this forum, Semarnat proposed a sustainability program for the Lerma-Chapala watershed, of which a number of organizations including the undersigned obtained copies, but of which we have heard nothing since (December 2001, Semarnat, Appendix IX).

7.- The following year, we were invited to a consultation in a letter of 16 July 2002 from Regina Barba concerning a technical study for regulation of the Lerma-Chapala watershed; at this meeting, we and others discussed the type of appropriate legal instrument and noted that we were being consulted on technical studies for declaration of the regulated zone of the Lerma-Chapala watershed, a situation that was ultimately accepted by the CNA itself, and this declaration too remained pending (Appendix X).

8.- Recently, the Federal Executive Branch, by decree, declared a protected natural area having the character of a wildlife protection area for the area known as Ciénegas del Lerma, located in the municipalities of Lerma, Santiago Tianguistenco, Almoloya del Río, Calpulhuac, San Mateo Atenco, Metepec, and Texcalyacac, state of México, with a total area of 3,023-95-74.005 hectares (Appendix XI).

12.- Also further to the Ajijic Forum, Dr. Gutiérrez, President of IDEA A.C. and member of the Fundación, proposed a Regulatory Law to Article 27 of the Constitution for restoration and reserve of the waters of the Lerma-Chapala-Santiago-Pacífico watershed, a proposal for which the report was approved by the Senate of the Republic in the LVIIIth Legislature on 3 December 2002 (Appendix XII).

13.- That year, a resolution was issued indicating the boundaries of the 188 aquifers of the United Mexican States, the results of studies done to determine mean annual water availability, and corresponding locator maps; DOF, 31 January 2003 (Appendix XIII).

14.- It should be clarified as well that a protected natural area with the character of an ecological conservation zone was declared for Barranca de Oblatos-Huentitán, located in the municipality of Guadalajara, Jalisco, on 12 June 1997 (presented 5 June 1997) (Appendix XIV).

15.- Public announcement by the national director of the CNA concerning construction of the Arcediano Dam on the Santiago River in the channel of the river of the same name (Arcediano appendix), contradicting the conservation, preservation, and restoration policy for the watershed (Appendix XV).

B). Concerning compliance with, and enforcement of, environmental law:

The facts discussed below concern legal action taken by Fundación Cuenca Lerma-Chapala-Santiago Pacífico in relation to the apportionment of surface water from the watershed, the deterioration of Lake Chapala, and alerting the authorities to the loss of migratory bird habitat, with a view to ascertaining what measures the authorities took and challenging those measures through the appropriate legal channels.

1.- In a letter dated 26 November 2001, the Fundación filed an action in revocation of the resolutions adopted at the LVI Meeting of the Monitoring Group of the Lerma-Chapala Watershed Council in the city of Querétaro on 6 November 2001, arguing that the resulting water apportionment violated the water apportionment agreements and that the decision was not made in accordance with the National Waters Act and its regulation (Appendix XVI).

2.- Under file no. BOO.E.09.08/0050092 of 16 January 2002, the CNA ruled on the action in revocation filed by Manuel Villagómez Rodríguez in his capacity as President of the Fundación Cuenca Lerma-Chapala-Santiago-Pacífico A.C. against the resolutions adopted at the LVI Meeting of the Monitoring Group of the Lerma-Chapala Watershed Council in the city Querétaro on 6 November 2001, holding that the action was invalid because the Watershed Council is not "a water-related authority" but merely a coordinating body, and that authority for the purposes of the National Waters Act is vested in the CNA (Appendix XVII).

3.- Subsequently, in a letter of 11 February 2002, the Fundación requested from the Regional Office (*Gerencia Regional*), headquartered in Guadalajara, Jalisco, the following:

Certified copy of the resolution whereby the CNA found applicable the agreements of the LVI meeting of the Monitoring Group of the Lerma-Chapala Watershed Council, issued in the city of Querétaro, state of Querétaro, as well as the date and medium of publication (Appendix XVIII), in order to be able to take cognizance of the act of authority.

4.- Response to this request by the CNA, reproduced as follows:

> "In regard to the request for a certified copy of the RESOLUTION OF THE LVI MEETING OF THE MONITORING AND ASSESSMENT GROUP OF THE LERMA CHAPALA WATERSHED COUNCIL, dated 6 November 2001, pursuant to the provisions of Article ————————- of the Federal Administrative Procedure Act, certified copy is hereby issued to Manuel Villagomez Rodríguez of the RESOLUTION OF THE LVI MEETING OF THE MONITORING AND ASSESSMENT GROUP OF THE LERMA CHAPALA WATERSHED COUNCIL, dated 6 November 2001, upon payment of fees as prescribed by the Federal Administrative Fees Act (*Ley Federal de Derechos*).
>
> As regards publication of this resolution, be it noted that this was done in bulletin number 11 of the Monitoring and Assessment Group of the Lerma Chapala Watershed Council, a copy of which is annexed to the said document" (Appendix IXX).

5.- Subsequently, on 14 November 2002, a meeting of the Watershed Council was held concerning apportionment of surface waters in the city of Metepec, state of México, in which we participated and presented a brief for discussion and guidance on the interpretation of the resolution and the Waters Act (*Ley de Aguas*) in preparation for making a decision (Appendix XX).

6.- Since the quantities of water that would be allowed to flow toward Chapala remained pending after that meeting, on 10 January 2003 the Fundación requested the following information from the Regional Office of the Lerma Chapala System (Appendix XXI):

I. Watershed Council minutes for the session held 14 November 2002 in the city of Metepec, state of México.

II. Resolution by the CNA concerning the apportionment of water availability in the Lerma-Santiago-Pacífico watershed of which Lake Chapala forms a part, mentioning quantities and reservoirs from which water will be taken for the various water uses in the watershed.

III. Legal action filed against the government of the state of Jalisco concerning its request to transfer water from the watershed to Lake Chapala, a point on the agenda of the Watershed Council meeting held 14 November 2002 for which a response remained pending from the CNA in its capacity as the deconcentrated body of Semarnat in charge of water management in Mexico.

7.- To this request, the CNA responded under file no. ST001 00493 of 28 January 2003 as follows:

> "In regard to your letter to the undersigned dated the tenth of this month and requesting the minutes of the Watershed Council meeting of 14 November 2002 in Metepec, state of México, as well as the published and unpublished resolu-

tions concerning the apportionment of water availability in the Lerma Santiago Pacifico watershed, and the dispute filed against the government of the state of Jalisco:

"Concerning point I, a copy of the minutes of the LXV session of the Monitoring and Assessment Group of the Lerma-Chapala Watershed Council is attached.

Concerning points I and III, attached is bulletin no. 12 (official publication of the Watershed Council) containing information on precipitation, the status of the water reserves, the water uses recorded in the 2001-2001 [*sic*] cycle, the surface water policy for the 2002-2003 cycle, the amount of surface runoff, the volumes assigned, and the minutes of the session held at the Lerma, Chapala, Pacífico Regional Office of the CNA, which reported to the government of the state of Jalisco, represented by Felipe Tito Lugo Arias, the volumes and dates of the transfer of 280 million cubic meters from the reservoirs of Jalisco, México state, and Guanajuato, detailing both the volumes and the dates of transfer."

8.- Subsequently, in view of the severity of the problem affecting Lake Chapala, the Fundación wrote a letter to the President of the Republic dated 19 July 2002, to which replies were received from both the Regional Office of the CNA and the Assistant Attorney for Natural Resources, Office of the Federal Attorney for Environmental Protection (Profepa). The relevant fact to be derived from both letters is the absence of a clear sensitivity to a known public problem, to wit, the crisis and the environmental deterioration affecting Chapala as a consequence of mismanagement of the Lerma-Chapala and Santiago-Pacífico watershed (Appendix XXII).

9.- The failure by the environmental authorities of Mexico to exercise their powers, particularly the power to enforce the National Waters Act, is so striking that on October 4 the Fundación asked whether the development of golf courses, soccer fields, and tree plantations on land within the Lake Chapala watershed had been authorized and the CNA only responded that it had not, but never exercised its authority to verify serious facts that are in the public domain (is there a water authority in Mexico?) (Appendix XXIII).

9.- The situation became so serious that local newspapers including *El Público* and *Ocho Columnas* extensively reported on the dire wintering conditions for the white pelican, a migratory bird from Canada and the United States that winters on Lake Chapala. The CNA, Semarnat, and Profepa turned a deaf ear to these reports, taking no urgent action or measure in response (Appendix XXIV). Photographs are annexed.

10.- Copy of the citizen complaint filed 7 March 2001 by the Fundación with the Profepa officer in the state of Jalisco, and copy of the allegations pursuant to Article 197; all that is missing is the officer's recommendation on the facts presented (see Appendix II).

11.- Various representations have been made and official complaints filed by residents of Juanacatlán, Jalisco with the environmental authorities concerning the severe degradation of the Santiago River, citing the bad quality of water caused by municipal, industrial, and all manner of other discharges, and the impacts of the situation on the health of Juanacatlán residents (Appendix XXV, complaints and photos of Juanacatlán, Jalisco).

V. Failures to enforce the environmental law: side agreement and Mexican law

V.I. The following provisions of the North American Agreement on Environmental Cooperation between the governments of the United Mexican States, Canada, and the United States of America are not being enforced:

Governmental measures to enforce laws and regulations; Articles 1(a), (b), (f), (g), (h), (i), (j); 5.1(b), (j), (l); 5.2; 6.1; 6.2; 6.3; 7; 8; 9.

V.II. Mexican environmental law that is not being enforced

- General Ecological Balance and Environmental Protection Act (LGEEPA) Articles 1; 2; 5 paragraphs III, IV, XVI, XI, XIX; 18; 78; 79 paragraphs I, III; 80 paragraphs I, VII; 83; 88 paragraphs I, II, III; 89; 133; 157; 161-170.

- Article 3 paragraphs III, IV, V, VI,VII, VIII, IX of the Regulation to the General Ecological Balance and Environmental Protection Act respecting Environmental Impact.

- National Waters Act Articles 1; 2; 3 paragraphs IV, V; 4; 7 paragraphs II, IV, VIII; 9 paragraphs I, XIII.

- Article 2 paragraphs IV, V, VIII, XII, XIV, XVI, XVII, XVIII, XIX, XX, XXI, XXII, XXIII, XXIV, XXV of the Regulation to the National Waters Act.

- Article 44 of the Internal Regulation of the Ministry of the Environment and Natural Resources.

In the case at hand, the authorities failed to enforce the above-cited LGEEPA provisions in a timely manner in two respects. First, they failed to enforce the provisions guaranteeing effective civic participation in Mexican environmental policy and joint responsibility of citizens for environmental protection, as required by the following legal provisions:

> The "Object" section of the LGEEPA specifies that the provisions of the act are intended to support the public good and the societal interest, and that their object is to lay the foundations for:
>
> ...
>
> IV. The sustainable enjoyment, preservation and, as applicable, restoration of soil, water, and other natural resources so that the provision of economic benefits and the activities of society remain compatible with the preservation of ecosystems.
>
> V. Providing for the joint responsibility of persons, as individuals and as groups, in the preservation and restoration of ecological balance and environmental protection.
>
> ...

Clearly, one relevant aspect of the LGEEPA in this connection is that of civic participation in the planning of environmental policy programs and instruments, to such an extent that one principle of the LGEEPA, stated in Article 15, holds that authorities and citizens are jointly responsible for environment protection, not to mention the chapter of the LGEEPA governing civic participation in environmental matters.

The authorities failed to enforce the above-mentioned provisions to the detriment of a society that is interested and involved in the case of the Lerma-Chapala and Santiago-Pacífico watershed, as is evident from all the activities in which organized society has participated in a highly proactive spirit, always striving to point out the problem, but even further, to make proposals for solving it. In illustration of this, civic groups have participated in all the forums relating to watershed issues, the meetings of the Watershed Council, consultations on the various watershed conservation, preservation, and restoration programs proposed by the authority, which never went beyond "good intentions" and whose innumerable drafts are now in the archives of the Minister of the Environment or the general and regional directors of the National Water Commission. This is evident from the events, programs, and proposals in which civil society has effectively participated with the sole aim of helping to save one of Mexico's most polluted watersheds, a watershed that supplies water directly or indirectly to the entire population of the central part of the country. Thus, there has been a failure to effectively enforce the environmental law by providing for effective public participation in policy planning and implementation in Mexico, as provided by LGEEPA Article 18:

> **"The Federal Government shall provide for the participation of all social groups in the development of programs for the preservation and restoration of ecological balance and environmental protection, as set out in this Act and other applicable provisions."**

Secondly, there has been a failure to effectively enforce environmental instruments and policy in Mexico in terms of authorizations, or performance of works and actions to restore the watershed and Lake Chapala, considering the following items related to the facts we present here concerning programs, policies, and practices:

Regarding the aforementioned water and environmental policy instruments, we can mention three eras of management of the Lerma-Santiago-Pacífico watershed of which Lake Chapala forms a part:

a).- The era of conservation of the forest and water resources of the Lerma and Santiago Rivers (1934)
This era was characterized by concern for the forest resources associated with water production; as such, limitations were imposed on the use of forests found throughout the watershed, including those of the Santiago River.

b).- The era of limitations on water use (1957–1970).
The limitations on the exploitation of groundwater established during this era are still in force today. These limitations were reinforced by the recent declaration on groundwater availability of 3 January 2008, which attests that the groundwater in the watershed made up of the Lerma and Santiago River aquifers is overexploited, causing a negative water balance.

c).- The era of sustainable water management (1990 to date)
This corresponds to a policy of conservation, preservation, restoration, and protection[2] of resources and habitat, in which water resources are managed within scenarios of deterioration and scarcity due to the severe environmental deterioration of the Lerma and Santiago rivers. An indicator of this was the crisis affecting Lake Chapala due to pollution and water scarcity caused by systemic watershed management problems. The consequence has been a series of attempts by institutions and civil society to find solutions to this serious problem. As a reflection of these efforts, various instruments have been adopted with a view to placing limitations on water use in the watershed, the goal being to restore and establish the sustainability of the watershed (master plan, studies supporting the declaration of a regulated zone for the watershed, Regulatory Law to Article 27 of the Constitution, municipal protection decrees, etc.).

Thus, the authorities fail to enforce these provisions for the management of water resources when the National Water Commission and the water authority of the state of Jalisco (CEAS) announce their intention to build the Arcediano Dam on the Santiago River without first restoring ecological balance to the river, despite the environmental policy that is explicitly laid out in various legal instruments applicable to this watershed.

In particular, Semarnat is failing to enforce the provisions governing sustainable water use and aquatic ecosystems of LGEEPA Articles 88–91. It intends to build a dam to supply water to the Guadalajara metropolitan area through the Huentitán ravine, which is covered by a declaration of protection from the municipal government of Guadalajara establishing that the Arcediano area is intangible [*sic*], only to be used for research and monitoring, and incompatible with a dam such as the one that the authorities intend to build (Appendix XXVI, Water supply to the Guadalajara metropolitan area).

To make this point even stronger, the pollution of the Santiago River is so severe that the water in the river is not even recommended for industrial uses, let alone residential uses.

The authorities have failed to effectively enforce the law as regards compliance with, and enforcement of, the environmental laws:

In the Submitters' opinion, in the case of the Lerma-Chapala and Santiago-Pacífico watershed, there exists an "absence of authority" impeding the generation of acts of authority that are subject to being challenged before and struck down by administrative tribunals. Furthermore, there has been a failure to exercise the powers granted to the authorities by the LGEEPA, the National Waters Act, and other water-related provisions to enforce the laws of Mexico, in terms of the inspection and monitoring procedure as well as the revocation of water-related concessions and authorizations.

Indeed, under the Internal Regulation of Semarnat in both its current version and the version in force prior to revision, Semarnat exercises its water-related powers through the CNA. The CNA is a deconcentrated body of Semarnat and its responsibility is to oversee compliance with, and enforcement of, the National Waters Act in Mexico (Article 44 of the Internal Regulation of Semarnat). This being the case, the CNA must exercise its authority over water apportionment and use in Mexico. To date it has failed to do so. It has repeatedly hidden behind the Watershed Council as a means of evading its responsibility under the National Waters Act for enforcing the provisions governing water use and apportionment. This is evident from the replies given to two different petitions filed by the Fundación seeking to ascertain the act of authority that was being prepared in relation to water apportionment, and particularly water apportionment from Lake Chapala, in letters dated 26 November 2001, 11 February and 14 November 2002, and 10 January 2003. To these the CNA replied evasively, washing its hands of the matter. When it saw fit to evade its responsibility, it said that the Watershed Council is not an authority, yet when an act of authority was requested, it said that the matter had been decided by the Watershed Council. In this way, it repeatedly and with impunity

2. Cf. LGEEPA Article 3 paragraphs XIV, XVI.

violated Article 4 of the Federal Administrative Procedure Act (*Ley Federal del Procedimiento Administrativo*–LFPA), applicable where the National Waters Act is silent on any matter and providing as follows:

> **"Administrative acts of a general nature, such as decrees, circulars, and the like, shall be published in the Official Gazette of the Federation in order for them to produce legal effects, and those of an individual nature shall be published in the same publication where the laws so prescribe.**
>
> **Where established by laws, draft regulations, decrees, resolutions, and other administrative acts of a general nature, where these affect the public interest they shall be published in the Official Gazette of the Federation in order to give interested parties an opportunity to make observations on the measures proposed within the period provided by law for such purpose and, by right, within 60 days of publication."**

Clearly, in the specific case at hand, it is the first situation that applies. Apportioning water from the Lerma-Chapala-Santiago-Pacífico watershed would entail issuing a resolution of a general nature. This is our understanding of the matter given that its effects apply to an undetermined number of citizens. In the case at hand, five states of the Republic are at issue in addition to the population of the Federal District. Therefore, any such resolution takes on the characteristics of a provision of this nature.

Moreover, the resolution issued (if in fact there was one) would affect the public interest, since its purpose would be to apportion the rights to use and enjoy national waters from the Lerma-Chapala watershed, whereas Article 7 of the National Waters Act provides:

> **The following are declared matters of public utility: II. The protection, improvement, and conservation of watersheds, aquifers, river channels, lakes, and other nationally owned bodies of water, as well as water infiltration for aquifer recharge and water diversion from one watershed or hydrological region to another; and IV. Restoring the water balance to nationally owned surface water or groundwater, including limitations on extraction, usage prohibitions, reserves, and changes in water use for residential users.**

Furthermore, Article 13 of the National Waters Act acknowledges the existence of the Watershed Councils in the following terms:

> **Article 13.- The Commission, on the advice of its technical council, shall establish watershed councils as coordinating and consensus building bodies between the Commission; federal, state or municipal agencies and entities, and representatives of users of the respective watersheds, with a mandate to formulate and implement programs and activities for better water administration, development of water-related infrastructure and corresponding services, and preservation of watershed resources.**
>
> **The Commission shall, in conjunction with the users, within the purview of the watershed councils, determine any limitations arising from emergency, extreme shortage, overexploitation, or reserve. In these cases, residential use shall have priority.**

Along these lines, it is clear that any putative resolution made by the Watershed Council and/or by a monitoring group (in the case at hand) formed within the Watershed Council is null and void pursuant to Article 5 of the LFPA, which is applicable where the National Waters Act is silent, since such a resolution would not fit the criteria or requirements for an administrative act set out in the LFPA, which stipulates in Article 3 that:

I. **It must be issued by the competent body through a public servant and, where the said body is a collegial body, its issuance must conform to the formalities of the applicable law or decree.** In the case at hand, the body competent under the National Waters Act to issue the act is without question not the Lerma-Chapala Watershed Council, and therefore the Monitoring and Assessment Group, under the applicable law, has no legal capacity to issue a resolution of a general nature such as this resolution; therefore, its resolutions must be ratified, modified, or revoked by the Watershed Council.

II. **It must have a purpose that can be the subject of an administrative act; determined or determinable, specific as to circumstances of time and place, and contemplated by law.** In the case at hand, it is clear that the purpose of the resolutions issued must have as a legal referent Article 27 of the Constitution, the National Waters Act, and the special coordination agreement for apportionment, use, and availability of the nationally owned surface waters within the Lerma-Chapala watershed. In this context, the purpose of

the resolution issued is unlawful, since it was not issued in accordance with the applicable laws, and therefore violates the framework of the law.

III. **It must serve the public interest as governed by the provisions under which it is issued, and may not pursue other separate ends.** In this instance, this requirement clearly is not met, since the actual apportionment of water from the Lerma-Santiago-Pacífico watershed under the agreement of 1992 does not prioritize residential uses, much less the conservation and restoration of Lake Chapala, as per the object of the aforementioned agreement and clauses 3, 6, and 8 of the coordination agreements of 1991, as well as Article 7 paragraphs II and IV of the National Waters Act.

IV. **It must be given in writing with the handwritten signature of the issuing authority, except in those cases where the law authorizes another form.** In this case, this requirement is not met, since although the Watershed Council is a collegial body, the act does not emanate from it but rather from an auxiliary group. Therefore, there is no act of authority, and the National Water Commission has evaded the fulfillment of its responsibility to the detriment of the sustainability of one of the country's most strategic resources: water.

V. **It must have a basis in law and fact.** This criterion is not met since in order to specify each and every resolution, reference had to be made to the legal framework that served as a basis for it; nor was the factual basis taken into account, in terms of the existence of Lake Chapala and the critical situation of deterioration, waste, overexploitation, and loss of biodiversity prevailing in the entire Lerma-Chapala-Santiago-Pacífico hydrological region.

VI. **...**

VII. **...**

VIII. **...**

IX. **...**

X. **It must mention the body from which it emanates.** This requirement is not met, since the Technical Support Group, or failing that the Watershed Council, are not authorities as defined by Article 4 of the National Waters Act: "Authority and administrative responsibility over nationally owned bodies of water and the public property from which they are inseparable is vested in the Federal Executive Branch, which shall exercise this power directly or through the Commission."

Taking this point further, Semarnat and the National Water Commission have utterly failed in their duties and have been insensitive to the problem of which the residents of Juanacatlán have constantly been complaining as a result of the pollution of the Santiago River and its health impacts. These entities have failed to enforce LGEEPA Article 133, which provides: **"The Ministry, with the participation of the Ministry of Health in those cases where required by other legal provisions, shall conduct systematic and ongoing monitoring of water quality to detect the presence of contaminants or excess organic waste, and shall take the appropriate measures."**

Along these lines, the environmental authority of Mexico has failed to enforce the environmental law as regards providing for civic participation in the design of environmental policy instruments in Mexico, as provided by LGEEPA Articles 1; 18; 4 paragraphs XVI, XIX, XX; 157, and 158 in relation to Article 1(h) of the North American Agreement on Environmental Cooperation.

Additionally, the Authority has failed to exercise the powers vested in it by the National Waters Act and the criteria set out in the LGEEPA for management and protection of aquatic ecosystems. The result has been a systematic absence of environmental law enforcement and, consequently, the material impossibility for the complainants to exercise the procedural guarantees for access to justice in regard to the legality of water-related acts of authority in Mexico, thereby additionally violating the aforementioned applicable provisions of the North American Agreement on Environmental Cooperation: Articles 1(g); 5(1)(b), (j), and (l); 5(2); 6(1); 6(2); 6(3)(b) and (c), and 7.

In conclusion, the facts addressed by this submission constitute a set of systematic failures by the competent authority to effectively enforce the National Waters Act in terms of the exercise of acts of authority. The consequence is an absence of legal acts that would allow for us, as the affected parties, to exercise our rights relating to the conservation, sustainable management, preservation, and sustainable enjoyment of natural resources; in the case at hand, this refers to the water in the Lerma-Chapala-Santiago-Pacífico watershed, the migratory birds using Lake Chapala as a habitat, and the possible disappearance of Lake Chapala if the Mexican authorities persist with this environmental policy and with their failure to enforce the water-related laws of Mexico.

VI. Fulfillment of the requirements of NAAEC Article 14(1)

We believe that this submission must be analyzed by the Secretariat since it meets the requirements of NAAEC Article 14(1):

a) It is presented in writing in Spanish.

b) It clearly identifies the Submitter.

c) It provides sufficient information to allow the Secretariat to review it.

d) It is aimed at promoting law enforcement and not at harassing industry.

e) It indicates that the matter has been communicated in writing to the relevant authorities of the Party and indicates the Party's responses.

f) It is filed by civic associations established in the territory of a Party.

VII. Communication of the matter in writing to the competent authorities:

The narrative of the facts relating to enforcement of, and compliance with, the laws of Mexico shows that the citizens have repeatedly, on an individual and collective basis, submitted these matters to:

The National Water Commission (CNA).
The Federal Attorney for Environmental Protection (Profepa).
The Minister of the Environment of Mexico, Víctor Lichtinger.
The President of the Republic, Vicente Fox Quezada.
The LVII Congress of the Union.
The Governor of the State of Jalisco.

Indeed, the Fundación Cuenca Lerma-Chapala-Santiago-Pacífico, in view of the grave deterioration of this watershed, and in particular Lake Chapala, applied to the National Water Commission for the purpose of requesting the acts of authority concerning water apportionment from the watershed, as well as copies of the resolutions or decisions determining water apportionment throughout the watershed (documentary appendices, stamped received by the CNA, discussed in the facts section of this submission).

The Fundación submitted a document to the Regional Office of the National Water Commission dated 14 November 2001 at the meeting of the Watershed Council of Metepec, state of México, calling for an appropriate apportionment of national waters from the watershed, given that irrigation was being prioritized to the detriment of the human and conservation uses that should be assigned in order to restore Lake Chapala (documentary appendix).

Moreover, in 2001 the Fundación filed a citizen complaint concerning the severe deterioration of Lake Chapala and the Lerma-Chapala-Santiago-Pacífico watershed, which have now plunged this extremely important ecosystem into one of the gravest crises of its history. This citizen complaint, pursuant to the LGEEPA, has no binding effect and could only result in a relevant recommendation (documents discussed in the facts section).

VIII. Mexican authorities that have failed to enforce the environmental law: side agreement and Mexican law

The authorities listed in the preceeding section.

IX. Other evidence supporting the submission (Appendix XXVII)

Press clippings binder
Document titled, "Chapala y su ribera" (Chapala and its banks).

X. Petitions:

1. **That the CEC allow this submission and initiate an investigation to corroborate the failure to enforce the environmental laws in the case of the Lerma-Santiago-Pacífico Hydrological Region, administratively composed of the Lerma-Chapala watershed and the Santiago-Pacífico watershed.**

2. **That on the basis of Articles 14 and 15 of the North American Agreement on Environmental Cooperation, and in reference to the failure to effectively enforce Mexican environmental law, a factual record be prepared with a view to corroborating the assertions contained in this submission.**

As a corollary, the undersigned Mexican organizations wish to emphasize that at various meetings and in various submissions we have applied to this body for help in saving Chapala. As of today, we still have evidence of an ambiguous position concerning the sustainable management of one of the country's most important watersheds. Today once again, we place in your hands the water that supplies 23 million Mexicans, the health of the residents of Juanacatlán and Salto, Jalisco, the business of saving Chapala from extinction, and the business of saving the migratory bird habitat found throughout the watershed and in the severely endangered Lake Chapala itself. Let's give Chapala a chance.

Sincerely,

RAQUEL GUTIÉRREZ NAJERA
President, IDEA A.C.

MANUEL VILLAGOMEZ RODRIGUEZ
President of the Fundación

LUIS AGUIRRE.
President, Sociedad Amigos del Lago A.C.

ESTELA CERVANTES

RODRIGO SALDAÑA

Residents of Juanacatlán

MA. GUADALUPE LARA
Comité Pro Defensa de Arcediano, A.C.

ALFREDO MENCHACA PADILLA
Amigos de la Barranca, A.C.

JAIME ELOY
President, CIMA, A.C.

JOSÉ DE JESÚS GUTIÉRREZ RODRÍGUEZ
President, Red Ciudadana, A.C.

OSCAR CORDERO VIRAMONTES
AMCRESP, A.C. Secc. Occidente

Guadalajara, Jalisco, 15 May 2003
"For a Culture of Water"

APPENDIX 3

Overall Plan to Develop a Factual Record with Regard to Submission SEM-03-003

Secretariat of the Commission for Environmental Cooperation

Overall Plan to Develop a Factual Record

Submission I.D.: **SEM-03-003 (*Lake Chapala II*)**

Submitter(s): Fundación Lerma-Chapala-Santiago-Pacífico, A.C.
Sociedad Amigos del Lago de Chapala, A.C.
Instituto de Derecho Ambiental, A.C.
Residents of the community of Juanacatlán, Jalisco State
Comité Pro-Defensa de Arcediano, A.C.
Amigos de la Barranca, A.C.
Ciudadanos por el Medio Ambiente, A.C.
AMCRESP, A.C.
Red Ciudadana, A.C.

Represented by: Raquel Gutiérrez Nájera
Yolanda García del Ángel

Party: Mexico

Date of this plan: 9 July 2008

Background

On May 23, 2003 the Submitters listed above filed a submission before the Secretariat of the Commission for Environmental Cooperation (CEC) pursuant to article 14 of the North American Agreement on Environmental Cooperation (NAAEC). The Submitters assert that Mexico is failing to effectively enforce its environmental law with respect to the management of water resources in the Lerma-Chapala-Santiago-Pacífico watershed, resulting in serious environmental degradation and water imbalance of the watershed as well as the risk that Lake Chapala and the habitat it provides for migratory birds could disappear. Likewise, the Submitters assert that Mexico is failing to guarantee effective citizen participation in environmental policymaking with regard to decisions about the watershed. The Submitters further affirm that the Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*–Semarnat) is failing to effectively enforce Article 133 of the General Law of Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*–LGEEPA) by failing to conduct ongoing, systematic monitoring of water quality in the Santiago River. They further assert that Semarnat is failing to apply LGEEPA Article 88 criteria for the sustainable use of water and aquatic ecosystems by permitting the construction of the Arcediano Dam on the Santiago River.

The Submitters maintain that the National Water Commission (*Comisión Nacional del Agua*– CNA) is delegating decisions on water use and distribution in the area to the watershed council (*consejo de cuenca*) and hence is failing to effectively enforce the provisions of the National Water Law (*Ley de Aguas Nacionales*– LAN) which invest the CNA with the authority and responsibility to make the relevant decisions.

In March 2004, Mexico filed a response to the submission in which it stated that it is monitoring the Santiago River through the National Water Quality Monitoring Network (*Red Nacional de Monitoreo de la Calidad del Agua*) and that it has a comprehensive cleanup program for the entire watershed. Mexico alleges that the submission overstates the geographical magnitude of the problem because the facts mentioned are concentrated primarily in the areas of Lake Chapala, Arcediano and Juanacatlán, including the part corresponding to the Santiago and Verde Rivers. This territory comprises only the Lerma-Chapala portion of the entire basin (Lerma subregion) and not the Santiago and Pacífico subregions, such that the problem is limited to the part of the watershed comprised within the state of Jalisco. Concerning the Arcediano dam project, Mexico also asserts that the environmental impact assessment took sustainable water use criteria into account. Mexico states that it is enforcing the water-related laws through the Office of the

Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección al Ambiente*–Profepa) and the CNA. Concerning the watershed councils, Mexico notes that they do not make decisions of a legal nature on behalf of the authorities.

After reviewing the submission in light of Mexico's response, the Secretariat notified the Council that the development of a factual record is warranted. The Secretariat found that the submission raises central questions on the Mexican government's effective enforcement of the environmental laws on the operation of the Lerma-Chapala watershed council, on whether the watershed council's decisions are given authoritative effect without formal action by the National Water Commission, and on what measures have been adopted to restore the balance of the Santiago River ecosystem based on the monitoring of the river's water quality. With respect to the geographical magnitude of the problem, the Secretariat considered – as alleged by Mexico in its response – that the factual record would focus on those areas of the watershed that include Lake Chapala, Arcediano, Juanacatlán, the Santiago River and the Verde River, including consideration of the Arcediano Dam project as appropriate, along with general information regarding the entire watershed as necessary and relevant.

On 30 May 2008, the Council, by means of Resolution 08-01, unanimously decided to instruct the Secretariat to develop a factual record with respect to Submission SEM-03-003 (*Lake Chapala II*). The Council requested the Secretariat to limit the factual record to the area containing the Arcediano dam, within the Lerma-Chapala watershed (Lerma subregion) in the State of Jalisco.

The Council directed the Secretariat to provide the Parties with an overall work plan for gathering relevant facts and to provide the Parties with an opportunity to comment on the plan. The Council also directed the Secretariat that in preparing the factual record, it may include any relevant facts that existed before the entry into force of the NAAEC on 1 January 1994.

Under Article 15(4) of the NAAEC, in developing a factual record, "the Secretariat shall consider any information furnished by a Party and may consider any relevant technical, scientific or other information: (a) that is publicly available; (b) submitted by interested nongovernmental organizations or persons; (c) submitted by the Joint Public Advisory Committee (JPAC); or (d) developed by the Secretariat or by independent experts."

Overall Scope of the Fact Finding

To prepare the factual record, the Secretariat will gather and develop factual information relevant to the alleged failure to effectively enforce LGEEPA articles 1, 2, 5, 18, 78, 79, 80, 83, 88, 89, 133, 157, 161, 162, 163, 164, 165, 167, 168, 169 and 3 of its Environmental Impact Regulations (*Reglamento en Materia de Impacto Ambiental*–REIA); 1, 2, 3, 4, 7 and 9 of the National Water Law (*Ley de Aguas Nacionales*–LAN) and article 2 of its Regulations (RLAN), as well as article 44 of the Internal Regulations of the Ministry of the Environment and Natural Resources (*Reglamento Interior de la Secretaría de Medio Ambiente y Recursos Naturales*). The Secretariat will gather information with regards to the assertions made in the submission, taking into account the area containing the Arcediano dam, within the Lerma-Chapala watershed (Lerma subregion) in the State of Jalisco.

Overall Plan

The execution of the overall plan, prepared in accordance with Council Resolution 08-01, will begin as of July 21, 2008. All other dates mentioned are best estimates. The overall work plan is as follows:

- Through public notices or direct requests for information, the Secretariat will invite the Submitters; JPAC members; members of the involved region; the general public; and municipal, state and federal government officials to submit information relevant to the scope of fact-finding outlined above. The Secretariat will explain the scope of the fact finding, providing sufficient information to enable interested nongovernmental organizations or persons or the JPAC to provide relevant information to the Secretariat (section 15.2 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation*). **[July-October 2008]**

- The Secretariat will request information relevant to the factual record from municipal, state and federal government authorities of Mexico, as appropriate, and shall consider any information furnished by a Party (NAAEC Articles 15(4) and 21(1)(a)). **[July-October 2008]**

- The Secretariat will hold meetings with the parties interested in submitting information related to relevant facts. **[September through December 2008]**

- The Secretariat will gather relevant technical, scientific or other information that is publicly available, including from existing databases, public files, information centers, libraries, research centers and academic institutions. **[July through December 2008]**

- The Secretariat, as appropriate, will develop, through independent experts, technical, scientific or other information relevant to the factual record. **[October 2008 through January 2009]**

- The Secretariat, as appropriate, will collect relevant technical, scientific or other information for the preparation of the factual record, from interested nongovernmental organizations or persons, the JPAC or independent experts. **[August 2008 through January 2009]**

- In accordance with Article 15(4), the Secretariat will prepare the draft factual record based on the information gathered and developed. **[January through April 2009]**

- The Secretariat will submit a draft factual record to Council, and any Party may provide comments on the accuracy of the draft within 45 days thereafter, in accordance with Article 15(5). **[End of April 2009]**

- As provided by Article 15(6), the Secretariat will incorporate, as appropriate, any such comments in the final factual record and submit it to Council. **[July 2009]**

- The Council may, by a two-thirds vote, make the final factual record publicly available, normally within 60 days following its submission, according to Article 15(7).

Additional Information

The submission, the Party's response, the Secretariat's determinations, the Council Resolution, and a summary of these are available in the Registry on Citizen Submissions on the CEC home page <www.cec.org>, or upon request to the Secretariat at the following address:

Secretariat of the CEC Submissions on
Enforcement Matters Unit (SEM Unit)
393 St-Jacques St. West
Suite 200
Montreal, QC H2Y 1N9
Canada

CEC / Mexico Liaison Office:
Atención: Unidad sobre Peticiones
Ciudadanas (UPC)
Progreso núm. 3,
Viveros de Coyoacán
México, D.F. 04110
México

APPENDIX 4

Request for Information Describing the Scope of the Information to be Included in the Factual Record and Giving Examples of Relevant Information

Secretariat of the Commission for Environmental Cooperation

REQUEST FOR INFORMATION
for Development of a Factual Record
Submission SEM-03-003 (*Lake Chapala II*)
4 September 2008

I. The factual record process

The Commission for Environmental Cooperation of North America (CEC) is an international organization created under the North American Agreement on Environmental Cooperation (NAAEC) by Canada, Mexico and the United States. The CEC operates through three organs: a Council, made up of the highest-level environmental official in each member country; a Joint Public Advisory Committee (JPAC), composed of five citizens from each country; and a Secretariat located in Montreal.

Article 14 of the NAAEC allows residents in North America to inform the Secretariat, in a submission, that any member country (hereinafter, a Party) is failing to effectively enforce its environmental law. This initiates a process of review of the submission, in which the Council may instruct the Secretariat to prepare a factual record in connection with the submission. A factual record seeks to provide detailed information to allow interested persons to assess whether a Party has effectively enforced its environmental law with respect to the matter raised in the submission.

Under Articles 15(4) and 21(1)(a) of the NAAEC, in developing a factual record, the Secretariat shall consider any information furnished by a Party and may ask a Party to provide additional information. The Secretariat also may consider any information that is publicly available; provided by the JPAC, the Submitters or other interested persons or non-governmental organizations; or developed by the Secretariat or independent experts.

On 30 May 2008, the Council unanimously decided in Resolution 08-01 to instruct the Secretariat to prepare a factual record with respect to submission SEM-03-003 (*Lake Chapala II*), the Council decided unanimously to instruct the Secretariat to develop a factual record, in accordance with Articles 14 and 15 of the NAAEC and the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the NAAEC (Guidelines)*. The Secretariat now requests relevant information relating to the matters to be addressed in the factual record. The following sections provide the submission's background and describe the type of information sought.

II. Submission SEM-03-003 (*Lake Chapala II*) and Council Resolution 08-01

On 23 May 2003, the Secretariat received a submission in accordance with NAAEC Articles 14 and 15. The Submitters assert that Mexico is failing to effectively enforce its environmental laws with respect to the management of water resources in the Lerma-Chapala-Santiago-Pacífico hydrological basin, which they assert has caused serious environmental impairment and a water imbalance in the basin, as well as the risk of disappearance of Lake Chapala and the habitat of migratory birds that inhabit it. The Submitters further assert that Mexico is not effectively guaranteeing citizen participation in environmental policy, with respect to the determinations regarding the basin.

The Submitters state that the Secretariat of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat) is failing to effectively enforce Article 133 of the General Ecological Balance and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA) by not carrying out the systematic and permanent monitoring of water quality in the Santiago River, asserting that Semarnat fails to apply criteria for the sustainable use of water and aquatic ecosystems in accordance with Article 88 of the LGEEPA, by allowing the construction of the Arcediano dam on the Santiago River.

The Submitters also assert that the National Water Commission (*Comisión Nacional del Agua*—CNA) is delegating decision-making authority with respect to water use and distribution in the region to the basin council, thereby failing to effectively enforce the provisions of the National Waters Act (*Ley de Aguas Nacionales*—LAN) which confer such decision-making authority and responsibility upon it.

On 19 December 2003, the Secretariat determined that the submission met the requirements of NAAEC Article 14(1) and requested the response of the party involved (Mexico) under Article 14(2).

Mexico submitted its response on 30 March 2004, asserting that it does monitor the Santiago River through the National Water Quality Monitoring Network (*Red Nacional de Monitoreo de la Calidad del Agua*), and that it has a comprehensive sanitation program throughout the basin. Mexico asserts that the submission overstates the territorial aspect, as the facts claimed are concentrated in the Lago de Chapala, Arcediano and Juanacatlán zone, including the corresponding part of the Santiago and Verde Rivers, which encompasses only the Lerma-Chapala basin (Lerma subregion) and not the Santiago and Pacífico subregions, and the problem is limited accordingly to the part of the basin in the State of Jalisco. As regards the Arcediano dam project, Mexico asserts that the environmental impact assessment did consider sustainable water use criteria, and further notes that enforcement of water law is handled by the Office of the Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección al Ambiente*–Profepa) and the CNA. With respect to basin councils, Mexico stresses that such council do not make legal decisions in the name of the authorities.

On 18 May 2005, the Secretariat informed that CEC Council that in light of Mexico's response, the preparation of a factual record was warranted.

On 30 May 2008, in Resolution 08-01, the Council unanimously decided to instruct the Secretariat to develop a factual record with respect to the matters raised in submission SEM-03-003 (*Lake Chapala II*), in accordance with Article 15 of the NAAEC and the Guidelines. The Council requested that the Secretariat limit the factual record to the area including the Arcediano dam in the Lerma-Chapala basin (Lerma subregion) in the State of Jalisco.

The Council ordered the Secretariat to provide the Parties with its overall plan to collect relevant facts and to provide the opportunity to present their respective comments. The Council further instructed that, in developing the factual record, the Secretariat should take account of the considerations set forth in Council Resolution 08-01, including the possibility of incorporating pertinent facts from before the 1 January 2004 entry into force of the NAAEC.

Under Article 15(4) of the NAAEC, in preparing a factual record, "the Secretariat shall consider any information furnished by a Party and may consider any relevant technical, scientific or other information: (a) that is publicly available; (b) submitted by interested non-governmental organizations or persons; (c) submitted by the Joint Public Advisory Committee; or (d) developed by the Secretariat or by independent experts.

III. Request for information

Given the instructions received through Council Resolution 08-01, the Secretariat notes that the scope of the factual record is limited to the area of influence of the Arcediano dam project in the Lerma-Chapala basin (Lerma subregion). Therefore, the information to be considered in the development of this factual record should relate to the zones of Lago de Chapala, Arcediano, Juanacatlán and the corresponding part of the Santiago and Verde Rivers. The Secretariat of the CEC requests:

i) With respect to the assertions in the submission on the area of influence of the dam, information on the alleged violations of LGEEPA Articles 1, 2, 5, 18, 78, 79, 80, 83, 88, 89, 133, 157, 161, 162, 163, 164, 165, 167, 168, 169 and 170 and Article 3 of the Environmental Impact Regulations thereunder; LAN Articles 1, 2, 3, 4, 7 and 9 and Article 2 of its Regulation; and Article 44 of the Semarnat Internal Regulations;

ii) With respect to the assertion that the CNA is delegating water distribution decision-making authority to the basin council, information on the operation of the basin council in the Arcediano dam area of influence and how the council's rulings have or may have the effect of acts of the authority;

iii) With respect to the alleged failure to enforce citizen participation mechanisms in the decision-making process, information on the forms of participation available to the public to take part in the planning of basin resource management and the zones at issue, and how such participation is considered in the drafting and implementation of water quality policies;

iv) With respect to the alleged environmental impairment and water imbalance in the Lerma-Chapala basin (Lerma subregion) and the alleged lack of effective monitoring of water quality, information on the adoption of appropriate measures with respect to or deriving from such monitoring in the area of influence of the Arcediano dam;

v) Information on the alleged failure to effectively enforce criteria for the sustainable use of water and ecosystems, in the authorization of the environmental impact assessment for the Arcediano dam project.

IV. Examples of relevant information

1. Information on the management, enforcement, protection, preservation, use and quality of water in the Lerma-Chapala basin (Lerma subregion) and specifically in the zones that may be influenced by the Arcediano dam project (Lake Chapala, Arcediano, Juanacatlán and part of the Santiago and Verde Rivers).

2. Information on the environmental impairment and water imbalance of Lake Chapala and its migratory bird habitat, as well as that of the Lerma-Chapala basin (Lerma subregion), in particular, Arcediano, Juanacatlán and part of the Santiago and Verde Rivers.

3. Information on the operation of a basin council in the area in question, as to whether its rulings have or may have the effect of official rulings of the authority.

4. Information on the means of citizen participation available with respect to water planning and how such participation was considered in the drafting and implementation of water distribution policies and rulings.

5. Information on the operation of the National Water Quality Monitoring Network, specifically its operation in the basin in question and any measures taken with respect to such monitoring.

6. Information on any water quality monitoring in the basin, and any measures taken with respect to such monitoring.

7. Information on the operation of wastewater treatment plants and projects to build new treatment plants or other public investment projects directly or indirectly affecting basin water quality.

8. Information on the environmental impact assessment procedure for the Arcediano dam, additional to the response from Mexico, including the environmental impact statement, additional or supplemental information requests, information on any public consultation or technical opinion involving the project, filings with and rulings by the respective authority, and/or the environmental impact or land-use change ruling.

9. Current status of the Arcediano dam project, in particular the alleged absence of sustainable water management criteria, the alleged failure to assess the environmental impact of the project with respect to restoring the ecological balance and sustainable use of Santiago River waters and the rest of the basin, and the project's environmental impact on ecosystems during site preparation, construction, reservoir filling and operation of the Arcediano dam.

10. Information on the adoption of a comprehensive vision with respect to the natural resources in the Lerma-Chapala-Santiago-Pacífico basin in national planning (*e.g.*, National Hydraulic Program and National Development Plan), and on the conservation and restoration of ecosystem integrity, human health protection and sustainable development in the basin.

11. Information on the plans drafted by municipal, state and federal authorities for the restoration of the Santiago River and the rest of the zone at issue (Juanacatlán, Lago de Chapala).

12. Information on the establishment of and compliance with any environmental conditions in the national water concessions issued for the construction of the Arcediano dam and the components thereof (rerouting, cofferdams, curtaining, etc.) and associated works (access roads, camps, etc.).

13. Information on compliance with the conditions included in the environmental impact ruling for the construction of the Arcediano dam with respect to the adoption of measures to protect migratory bird species endangered by the project.

14. Information on the forms of citizen participation available throughout the environmental impact assessment procedure for the Arcediano dam project and the consideration given to such participation upon authorizing the project.

15. Any other technical, scientific or other information that may be relevant for the development of this factual record.

V. Additional background information

The submission, Mexico's response, the Secretariat's determinations, the Council Resolution, the overall plan to develop the factual record and other information are available in the Registry and Public Files in the Citizen Submissions on Enforcement Matters section of the CEC website at <http://www.cec.org>. These documents may also be requested from the Secretariat.

VI. Where to send information

Relevant information for the development of the factual record, including information to be submitted electronically, may be sent to the Secretariat until 31 December 2008, at either of the following addresses:

Secretariat of the CEC
Submissions on Enforcement
Matters Unit (SEM Unit)
393, rue St-Jacques Ouest
bureau 200
Montreal QC H2Y 1N9
Canada
Tel. (514) 350-4300

CCA / Mexico Liaison Office
Atención: Unidad sobre Peticiones
Ciudadanas (UPC)
Progreso núm. 3
Viveros de Coyoacán
México, D.F. 04110
México
Tel. (5255) 5659-5021

Please refer to submission SEM-03-003 (*Lake Chapala II*) in your correspondence.

Should you have any questions or comments, or if you wish to submit information electronically, please contact Paolo Solano at <rblandon@cec.org>.

APPENDIX 5

Information Requests to Mexican Authorities

Letter to the Party requesting information for development of the factual record for SEM-03-003

4 September 2008

Re: Development of the factual record for submission SEM-03-003 (*Lake Chapala II*)

The Secretariat hereby requests from Mexico relevant information to develop the factual record for the submission SEM-03-003 (*Lake Chapala II*), in accordance with NAAEC Articles 15(4) and 21(1)(a).

As you are aware, on 30 May 2008, the Council of the Commission for Environmental Cooperation of North America unanimously resolved to instruct the Secretariat to develop a factual record, in accordance with Article 15 of the NAAEC and the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the NAAEC (Guidelines)*, with respect to the assertions stated in the submission referred to above.

Under Articles 15(4) and 21(1)(a) of the NAAEC, in developing a factual record, the Secretariat shall consider any information furnished by a Party, and may also request additional information. As well, the Secretariat shall consider information publicly available and provided by the Joint Public Advisory Committee (JPAC), submitters or other interested nongovernmental organizations or persons, as well as information developed by the Secretariat or independent experts.

Attached you will find the list of matters on which information is requested of Mexico for developing this factual record. Please respond to this request no later than 30 November 2008. If any clarification is needed, questions may be sent to the following electronic mail address, to the attention of Paolo Solano: <psolano@cec.org>.

Thank you in advance for your attention to this matter.

Sincerely,

Secretariat of the Commission for Environmental Protection

Interim Director
Submissions on Enforcement Matters Unit

Attachment

cc: [Environment Canada]
[US EPA]
CEC Executive Director

Secretariat of the Commission for Environmental Cooperation

Request for Information from the Mexican Party for the Development of a Factual Record on Submission SEM-03-003 (*Lago de Chapala II*) 4 September 2008

On 23 May 2003, the Secretariat received submission SEM-03-003 (*Lago de Chapala II*) in accordance with Articles 14 and 15 of the North American Agreement on Environmental Cooperation (NAAEC). The Submitters assert that Mexico is failing to effectively enforce its environmental laws with respect to the management of water resources in the Lerma-Chapala-Santiago-Pacific hydrological basin, which they claim has led to the serious environmental impairment and water imbalance in the basin, and the risk that Lake Chapala will disappear, along with its migratory bird habitat. The Submitters also assert that Mexico does not effectively guarantee citizen participation in environmental policy concerning determinations regarding the basin.

The Submitters assert that the Secretariat of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat) is failing to effectively enforce Article 133 of the General Ecological Balance and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA) by not conducting the systematic and permanent monitoring of water quality in the Santiago River, and that Semarnat is failing to enforce the sustainable use criteria for water and aquatic ecosystems pursuant to LGEEPA Article 88, by allowing the construction of the Arcediano dam on the Santiago River.

The Submitters further assert that the National Water Commission (*Comisión Nacional del Agua*—CNA) is delegating decisions on the use and distribution of water in the area to the Basin Council (*Consejo de Cuenca*), thereby failing to effectively enforce the provisions of the National Water Act (*Ley de Aguas Nacionales*—LAN) that confer its respective decision-making authority and responsibility.

On 30 May 2008, the Council unanimously decided in Resolution 08-01 to instruct the Secretariat to prepare a factual record under NAAEC Article 15 with respect to the issues raised in submission SEM-03-003 (*Lago de Chapala II*). The Council asked the Secretariat to limit the factual record to the area comprising the Arcediano dam within the Lerma-Chapala basin (Lerma subregion).

Given the instructions received in Council Resolution 08-01, the Secretariat notes that the scope of the factual record is limited to the area of influence of the Arcediano dam project in the Lerma-Chapala basin (Lerma subregion). Therefore, the information considered to develop this factual record must relate to the areas of Lake Chapala, Arcediano, Juanacatlán and the corresponding part of the Santiago and Verde Rivers.

The Secretariat of the CEC hereby requests from Mexico information on the alleged violations of LGEEPA Articles 1, 2, 5, 18, 78, 79, 80, 83, 88, 89, 133, 157, 161, 162, 163, 164, 165, 167, 168, 169 and 170 and Article 3 of the Environmental Impact Regulations thereunder; LAN Articles 1, 2, 3, 4, 7 and 9 and Article 2 of its Regulation; and Article 44 of the Semarnat Internal Regulations, particularly in respect of:

i) **Impairment of the Basin Area**

a. Information on the adoption of a comprehensive approach to the natural resources of the Lerma-Chapala-Santiago-Pacific basin in national planning and the conservation and restoration of ecosystem integrity, the protection of human health and the sustainable development of the basin in question.

b. Information on any plans formulated by municipal, state and federal authorities to restore the Santiago River and the rest of the zone in question (Juanacatlán, Lake Chapala).

c. Information on the environmental impairment and hydrological imbalance of Lake Chapala and its migratory bird habitat, as well as the Lerma-Chapala basin (Lerma subregion), especially the areas of Arcediano, Juanacatlán and part of the Santiago and Verde Rivers.

ii) **Water Quality and Monitoring**

a. Information on the management, stewardship, protection, preservation, use and quality of water in the Lerma-Chapala basin (Lerma subregion), specifically in the zones influenced by the Arcediano dam project (Lake Chapala, Arcediano, Juanacatlán and part of the Santiago and Verde Rivers).

b. Information on the operation of the National Water Quality Monitoring Network (*Red Nacional de Monitoreo de la Calidad del Agua*), specifically its operation in the basin at issue, and any measures adopted in light of such monitoring.

c. Information on the operation of wastewater treatment plants and projects for the construction of new treatment plants or other public investment projects directly or indirectly affecting water quality in the respective basin zone.

iii) **Basin Councils and Citizen Participation**

a. Information on the means of participation available to the public to take part in the planning of basin resource management in the areas in question, and how such participation is considered in the drafting and implementation of water quality policies.

b. Information on the assertion that the CNA is delegating decision-making authority on the use and distribution of area waters to the Council; information on the operation of the Basin Council in the zone of influence of the Arcediano dam; and how the Council rulings have or may have the effect of official acts.

iv) **Arcediano Dam**

a. Information on the area of influence of the Arcediano dam project.

b. Information on the environmental impact assessment procedure for the Arcediano dam, in addition to the information included in Mexico's response, including: environmental impact statement, requests for further or additional information, information on any public consultation or technical opinion with respect to the project, writs submitted by the filer and rulings issued by the respective authority, and the environmental impact or land-use change ruling and any extensions or amendments thereto.

c. Current information on sustainable water use rules; the environmental impact assessment of the project as to the restoration of the ecological balance and sustainable use of water in the Santiago River and the rest of the basin in question; and the environmental impact of the project on ecosystems during site preparation, construction, reservoir filling and operation of the Arcediano dam.

d. Information on the effective enforcement of sustainable use rules for water and aquatic ecosystems in the authorization of the environmental impact of the Arcediano dam construction.

e. Information on the establishment of and compliance with environmental conditions in the national water concessions.

f. Information on the imposition of conditions in the environmental impact ruling for the construction and operation of the Arcediano dam and its components (rerouting, cofferdams, curtains, etc.) and associated works (access roads, camps, etc.), in addition to information on the adoption of measures to protect migratory bird species endangered by the project.

g. Information on the means of citizen participation existing throughout the environmental impact assessment procedure for the Arcediano dam project and how it was considered upon authorizing the project.

v) **Other information.** Any further technical, scientific or other information that may be relevant to preparing the factual record.

Mexican authorities who received a request for information for preparation of the factual record in regard to submission SEM-03-003

Federal public sector

Federal Electricity Commission (*Comisión Federal de Electricidad*)

Environmental Protection Office (*Gerencia de Protección Ambiental*)

Federal Commission for Protection against Health Risks (*Comisión Federal para la Protección contra Riesgos Sanitarios*—Cofepris)

Commissioner

National Water Commission (*Comisión Nacional del Agua*—Conagua)

Director General
Director General, Lerma-Santiago-Pacífico Watershed Agency, Conagua

National Institute of Ecology (*Instituto Nacional de Ecología*—INE)

President

Mexican Institute of Water Technology (*Instituto Mexicano de Tecnología del Agua*—IMTA)

Director General
Coordinator, Hydrology

Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat)

Minister
Director, International Affairs Coordinating Unit (*Unidad Coordinadora de Asuntos Internacionales*—UCAI)
Director, Legal Affairs Coordinating Unit (*Unidad Coordinadora de Asuntos Jurídicos*—UCAJ)

Office of the Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección al Ambiente*—Profepa)

Officer in the state of Jalisco

Ministry of Health

Minister
Jalisco office
Director General, Public Health

State of Jalisco public sector

State of Jalisco Water Commission (*Comisión Estatal del Agua de Jalisco*—CEA-Jalisco)

Office of the State Attorney For Environmental Protection (*Procuraduría Estatal de Protección al Ambiente*—Proepa)

Attorney

Ministry of Health

Jalisco office
Director General, Public Health

Municipal public sector

Municipality of Atequiza
Municipal president

Municipality of Chapala
Municipal president

Municipality of Guadalajara
Municipal president

Municipality of Juanacatlán
Municipal president

Municipality of Ocotlán
Municipal president

Municipality of Poncitlán
Municipal president

Municipality of Puente Grande
Municipal president

Municipality of Tonalá
Municipal president

Municipality of Tlaquepaque
Municipal president

Municipality of Zapopan
Municipal president

Municipality of Zapotlán del Rey
Municipal president

APPENDIX 6

Information Request to NGOs, JPAC and other Parties to the NAAEC

Form Letter to NGOs

4 September 2008

Re: Request for information relevant to the factual record for Submission SEM-03-003 (*Lake Chapala II*)

The Secretariat of the Commission for Environmental Cooperation of North America (CEC) recently began the process of preparing a "factual record" regarding the assertion that Mexico is failing to effectively enforce its environmental laws with respect to the management of water resources in the Lerma-Chapala-Santiago-Pacífico watershed, consistent with Council Resolution 08-01.

I am writing to invite you to submit information relevant to the factual record. The attached Request for Information explains the citizen submissions and factual records process, gives background on the submission referred to as SEM-03-003 (*Lake Chapala II*), describes the scope of the information to be included in the factual record for this submission, and provides examples of information that might be relevant. We will accept information for possible consideration in connection with the factual record **until 31 December 2008.**

We appreciate your consideration of this request and look forward to any relevant information you are able to provide. Please feel free to contact the Secretariat if you have questions. Contact information is provided at the end of the Request for Information.

Sincerely,

Interim Director
Submissions on Enforcement Matters Unit

Attachment

Memorandum to the Joint Public Advisory Committee

Memorandum

DATE: 4 September 2008

À / PARA / TO: Chair, JPAC

CC: JPAC Members, CEC Executive Director, JPAC liaison Officer

DE / FROM: Interim Director, Submissions on Enforcement Matters Unit

OBJET / ASUNTO / RE: Request for information relevant to the factual record for submission SEM-03-003 (*Lake Chapala II*)

As you know, the CEC Secretariat recently began the process of preparing a factual record for the submission SEM-03-003 (*Lake Chapala II*). This submission was filed with the Secretariat in May 2003 by Raquel Gutiérrez Nájera and Yolanda García del Ángel on behalf of nine non-governmental organizations. Consistent with Council Resolution 08-01, the factual record will focus on the assertion that Mexico is failing to effectively enforce its environmental laws with respect to the management of water resources in the Lerma-Chapala-Santiago-Pacífico watershed, resulting in serious environmental degradation and water imbalance of the watershed as well as the risk that Lake Chapala and the habitat it provides for migratory birds could disappear. The Council requested that the Secretariat limit the factual record to the area including the Arcediano dam in the Lerma-Chapala basin (Lerma subregion).

I am writing to invite the JPAC to submit information relevant to the factual record, consistent with Article 15(4)(c) and Article 16(5) of the NAAEC. For example, in addition to providing information directly responsive to this request, JPAC members might be able to identify sources of information that the Secretariat could pursue in connection with the factual record. The attached Request for Information, which is posted on the CEC website, gives background about the Lake Chapala II submission, describes the scope of the information to be included in the factual record, and provides examples of information that might be relevant. We will accept information for possible consideration in connection with the factual record until December 31, 2008.

We appreciate your consideration of this request and look forward to any relevant information you are able to provide. Please feel free to contact me at (514) 350-4321 or <psolano@cec.org> if you have questions regarding this request or the factual record process.

Letter to the Other Parties of the NAAEC (Canada and US)

4 September 2008

Re: Invitation to provide information relevant to the factual record for submission SEM-03-003 (*Lake Chapala II*)

As you know, the CEC Secretariat recently began the process of preparing a factual record for submission SEM-03-003 (*Lake Chapala II*), consistent with Council Resolution 08-01. I am writing to invite the [Canadian][the United States] Party to submit information relevant to the factual record, in accordance with Article 15(4) of the NAAEC.

The attached Request for Information, which has been posted on the CEC website, provides background information on the Lake Chapala II submission, describes the scope of the information to be included in the factual record, and provides examples of information that might be relevant. We will accept information for consideration in connection with the factual record **until 31 December 2008.**

We appreciate your consideration of this request and look forward to any relevant information you are able to provide. For any questions, please send an email to the attention of Paolo Solano, at <psolano@cec.org>.

Sincerely,

Interim Director
Submissions on Enforcement Matters Unit

cc: [US EPA]
Semarnat
[Environment Canada]
CEC Executive Director

Enclosure

Nongovernmental organizations and persons who received a request for information for preparation of the factual record in regard to submission SEM-03-003

Nongovernmental organizations

AMCRESP, A.C.

Agrupación Un Salto de Vida, A.C.

Amigos de la Barranca, A.C.

Asociación Mexicana de Hidráulica

Ciudadanos por el Medio Ambiente (CIMA), Movimiento Todos por Chapala

Colegio de Ingenieros Civiles

Comité Pro-Defensa de Arcediano, A.C.

Consejo Ciudadano del Agua, A.C.

Dilo, A.C.

Fraternidad Socialista Berzón

Fundación Cuenca Lerma-Chapala-Santiago, A.C.

Instituto de Derecho Ambiental, A.C. (IDEA)

Instituto de Valores Integrales y Desarrollo Ambiental

Instituto Vida, A.C.

Red Ciudadana, A.C.

Sociedad Amigos del Lago de Chapala, A.C.

Private sector

Federación Estatal Agronómica
Sector Libertad

Microanálisis de Occidente, S.C.

Sistemas Jurídicos Integrales

Academic sector

Centro de Investigación y Adiestramiento Tecnológico del Estado de Jalisco (CIATEJ)
General management

Centro Universitario de Ciencias Biológicas y Agropecuarias
Office of the Instituto de Limnología Chapala, Jalisco

Instituto de Ingeniería
Director

Instituto Tecnológico y de Estudios Superiores de Occidente (ITESO)
Rector's office
Environmental researcher

Universidad Autónoma de San Luis Potosí
Rector's office

Universidad Autónoma de Guadalajara
Rector's office

Universidad de Guadalajara
Coordinator, Integrated Watershed Management

Universidad Nacional Autónoma de México (UNAM)
Rector's office

Universidad Panamericana
Rector's office

Persons

Aida Alejandra Guerrero de León
Arcadia Lara
María Concepción Gómez
Diego Ursúa Barbosa
Estela Cervantes
Inchátiro Mendoza Limón
Isela Carolina Quezada
Javier Lorenzo Solís
José Antonio Gómez Reyna
Liborio Saldaña S.
Manuel Piedra
Mireya Acosta
Rebeca Reyes Rincón

APPENDIX 7

Public Invitation to a Fact-Gathering Meeting in Regard to the Factual Record for Submission SEM-03-003 (*Lake Chapala II*)

Secretariat of the North American Commission for Environmental Cooperation

Public Invitation to a Fact-Gathering Meeting in Regard to the Factual Record for Submission SEM-03-003 (*Lake Chapala II*)

To the general public:

The Secretariat of the Commission for Environmental Cooperation (CEC) hereby invites interested persons to provide any publicly available information of a technical, scientific, or other nature that is relevant to the preparation of the factual record in regard to submission SEM-03-003 (*Lake Chapala II*).

For this purpose, the Secretariat has convened a session that will take place at the Villa Montecarlo hotel in the city of Chapala, Jalisco at 9:00 a.m. on **17 November 2008**. The purpose of this event is to gather information relevant to the factual record. It will give interested persons and nongovernmental organizations who make their request in advance an opportunity to make oral presentations on the information they intend to provide to the Secretariat. The deadline for sending information and requesting an oral presentation is shown at the end of this document. Anyone wishing to attend the oral presentations should register prior to the date of the event.

I. The *Lake Chapala II* factual record

On 23 May 2003, the Secretariat received a submission in accordance with Articles 14 and 15 of the North American Agreement on Environmental Cooperation (NAAEC) asserting that Mexico is failing to effectively enforce its environmental law in connection with the management of water resources in the Lerma-Chapala-Santiago-Pacífico watershed, resulting in serious environmental degradation and water imbalance in the watershed as well as the risk that Lake Chapala and the migratory bird habitat it represents could disappear. Furthermore, the submission contends that Mexico is failing to effectively guarantee citizen participation in environmental policymaking with regard to decisions concerning the watershed. It asserts that the Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat) is failing to effectively enforce Article 133 of the General Ecological Balance and Environmental Protection Act (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA) by failing to conduct systematic and ongoing monitoring of water quality in the Santiago River. It asserts that Semarnat is failing to apply the criteria for the sustainable use of water and aquatic ecosystems set out in LGEEPA Article 88 by permitting the construction of the Arcediano dam.

In Resolution 08-01 of 30 May 2008, the CEC Council instructed the Secretariat to develop a factual record with respect to submission SEM-03-003 (*Lake Chapala II*). This resolution specifies that the factual record must focus on the area encompassing the Arcediano dam within the Lerma-Chapala watershed (Lerma subregion).

II. Background

The North American Commission for Environmental Cooperation is an international organization created under NAAEC, signed by Canada, Mexico and the United States in 1994. The CEC operates through three bodies: a Council, made up of the highest-level environmental official in each member country; a Joint Public Advisory Committee, and a Secretariat headquartered in Montreal, Canada.

NAAEC Article 14 allows residents in North America the right to submit to the Secretariat an assertion that a member country (a «Party») is failing to effectively enforce its environmental law. This initiates a review process in which the Council may instruct the Secretariat to develop a factual record. A factual record seeks to provide relevant information in the consideration whether the Party is failing to effectively enforce its environmental law in connection with the matter raised in the submission.

Under NAAEC Articles 15(4) and 21(1)(a), in the preparation of a factual record the Secretariat may take into account all relevant, publicly available information of a technical, scientific, or other nature.

On 2 September 2008 the Secretariat made public the request for information, which contains a description and examples of information relevant to the preparation of the factual record in question.

III. Additional information

The submission, Mexico's response, the Secretariat's determinations, the Council Resolution, the overall workplan for the factual record, and other information are available on the CEC website at <http://www.cec.org/citizen> or may be requested from the Secretariat.

Should you wish to participate in this session with an oral presentation on the information you intend to provide to the Secretariat, please complete the form below and e-mail it along with an abstract of the information no later than **31 October 2008,** to <rblandon@cec.org>.

Persons interested in attending the oral presentations or simply providing information during the session should register no later than **7 November 2008**.

Meeting attendees who have not completed a registration form in advance may register on the site (**subject to space availability**).

Any other information relevant to the preparation of the factual record that you may wish to provide subsequent to this session may be e-mailed no later than 31 December 2008 to <rblandon@cec.org> or sent by courier to the Secretariat's office at either of the following addresses:

CEC Secretariat
Submissions on Enforcement Matters Unit
393, rue St-Jacques Ouest, bureau 200
Montreal (QC) H2Y 1N9
Canada
Phone: (514) 350-4300

CEC/Mexico Liaison Office
Attention: Submissions on Enforcement Matters Unit
Progreso núm. 3
Viveros de Coyoacán
México, D.F., 04110, Mexico
Phone: (55) 5659-5021

Please refer to SEM-03-003 (*Lake Chapala II*)
in all correspondence

For clarification or comment, please send e-mail to the attention of Paolo Solano at the following address: <rblandon@cec.org>.

APPENDIX 8

Experts' Declarations of Acceptance and Statements of Impartiality and Independence for SEM-03-003 (*Lake Chapala II*)

EXPERT'S DECLARATION OF ACCEPTANCE AND STATEMENT OF IMPARTIALITY AND INDEPENDENCE FOR SUBMISSION SEM-03-003 (*Lake Chapala II*)

I, the undersigned,

Last Name: **DA**VALOS First Name: LAURA

NON-ACCEPTANCE

☐ hereby declare that **I decline** to serve as expert in the subject file. (If you wish to state the reasons for checking this box, please use a separate sheet of paper, attaching that to this declaration.)

ACCEPTANCE

☑ hereby declare that **I accept** to serve as expert in the instant matter. In so declaring, I confirm that I have familiarized myself with the requirements of Articles 14 and 15 of the North American Agreement on Environmental Cooperation ("NAAEC") and the matters raised in the above submission, and that I am competent, reliable, and available to serve as an expert on questions about Mexico's environmental laws.

☐ **IMPARTIALITY AND INDEPENDENCE**
(***If you accept to serve as expert***, *please also check one of the two following boxes. The choice of which box to check will be determined after you have taken into account, inter alia, whether there exists any past or present relationship, direct or indirect, with any of the submitters or their counsel, or the Party concerned, whether financial, professional or of another kind and whether the nature of any such relationship is such that disclosure is called for pursuant to the criteria set out below. Any doubt should be resolved in favor of disclosure*.)

☐ **I am impartial and independent** with respect to the Submitters of SEM-03-003 (*Lake Chapala II*), and with the NAAEC Party, *Government of Mexico*, and intend to remain so; to the best of my knowledge, there are no facts or circumstances, past or present that need be disclosed because they are likely to give rise to justifiable doubts as to my impartiality or independence.

OR

☑ **I am impartial and independent** with respect to the contents of SEM-03-003 (*Lake Chapala II*), and with the NAAEC Party, *Government of Mexico*, and intend to remain so; **however**, I wish to call your attention to the following facts or circumstances which I hereafter disclose because they might be of such a nature as to give rise to justifiable doubts as to my impartiality or independence. (Use separate sheet and attach.)

Date: 20 July 2009 Signature: (*original signed*)

Xalapa, Veracruz, Mexico 20 July 2009

Commission for Environmental Cooperation of North America

This is issued as part of the Declaration of Advisor's Acceptance, Impartiality, and Independence with Respect to Submission SEM-03-003 *(Lake Chapala II*) with a view to informing interested parties that I met Mr. Manuel Villagómez, a representative of one of the submitters of the above-mentioned submission, a few years ago.

I met him through Raymundo Gómez Flores (then senator from Jalisco). The purpose of my visit was to request his support in holding a work session among limnology experts to discuss problems and possible solutions in the case of Lake Chapala. Mr. Gómez Flores asked me to visit the office of Mr. Villagómez and explain my proposal to him, which I did. It should be noted that the proposal I presented on the two visits was not of interest to the above-mentioned persons. Since then I have had no further contact with Mr. Villagómez.

Sincerely,

Laura Davalos-Lind, M.C.

EXPERT'S DECLARATION OF ACCEPTANCE AND STATEMENT OF IMPARTIALITY AND INDEPENDENCE FOR SUBMISSION SEM-03-003 (*Lake Chapala II*)

I, the undersigned,

Last Name: VERA MORALES First Name: LUIS REYNALDO

NON-ACCEPTANCE

☐ hereby declare that **I decline** to serve as expert in the subject file. (If you wish to state the reasons for checking this box, please use a separate sheet of paper, attaching that to this declaration.)

ACCEPTANCE

☒ hereby declare that **I accept** to serve as expert in the instant matter. In so declaring, I confirm that I have familiarized myself with the requirements of Articles 14 and 15 of the North American Agreement on Environmental Cooperation («NAAEC») and the matters raised in the above submission, and that I am competent, reliable, and available to serve as an expert on questions about Mexico's environmental laws.

☐ **IMPARTIALITY AND INDEPENDENCE**
(***If you accept to serve as expert***, *please also check one of the two following boxes. The choice of which box to check will be determined after you have taken into account, inter alia, whether there exists any past or present relationship, direct or indirect, with any of the submitters or their counsel, or the Party concerned, whether financial, professional or of another kind and whether the nature of any such relationship is such that disclosure is called for pursuant to the criteria set out below. Any doubt should be resolved in favor of disclosure.*)

☒ **I am impartial and independent** with respect to the Submitters of SEM-03-003 (*Lake Chapala II*), and with the NAAEC Party, *Government of Mexico*, and intend to remain so; to the best of my knowledge, there are no facts or circumstances, past or present that need be disclosed because they are likely to give rise to justifiable doubts as to my impartiality or independence.

OR

☐ **I am impartial and independent** with respect to the contents of SEM-03-003 (*Lake Chapala II*), and with the NAAEC Party, *Government of Mexico*, and intend to remain so; **however**, I wish to call your attention to the following facts or circumstances which I hereafter disclose because they might be of such a nature as to give rise to justifiable doubts as to my impartiality or independence. (Use separate sheet and attach.)

Date: 7 July 2009 Signature: (*original signed*)

APPENDIX 9

Comparative Table of Environmental Law in Question in Force and its Reforms

Appendix 9

Part I
Comparative Table of the Environmental Law in Question in Force and its Reforms[1]

Ecological Balance and Environmental Protection Act

Article 5 of the Ecological Balance and Environmental Protection Act

Text published in the DOF on 28 January 1988	Text of the reform published in the DOF on 13 December 1996	Text of the reform published in the DOF on 25 February 2003
The following are matters of broad national scope or Federal interest:	The following are powers of the Federation:	The following are powers of the Federation:
XI. The creation and administration of protected natural areas of Federal interest, with the participation of the local authorities, where this and other acts so provide;	XI.- The regulation of the sustainable enjoyment, protection, and preservation of forest resources, soil, national waters, biodiversity, flora, fauna, and any other natural resources under its jurisdiction;	XI. The regulation of the sustainable enjoyment, protection, and preservation of national waters, biodiversity, fauna, and any other natural resources under its jurisdiction.
XVI. General environmental land use planning for the nation's territory;	XVI.- The promotion of societal participation in environmental matters, in accordance with the provisions of this Act;	XVI.- [No change]

Article 18 of the Ecological Balance and Environmental Protection Act

Text in force, published in the DOF on 28 January 1988
The Federal Government shall promote the participation of the various social groups in the development of programs whose purpose is the preservation and restoration of ecological balance and environmental protection, as set out in this and other applicable acts.

1. Only included are those provisions whose effective enforcement is discussed in this factual record, not the entirety of the articles cited in submission SEM-03-003. See chapter 4 on the scope of the factual record.

Article 78 of the Ecological Balance and Environmental Protection Act

Text published in the DOF on 28 January 1988	Text of the reform published in the DOF on 13 December 1996
With the purpose of preserving the natural heritage of the nation, and pursuant to any basis of coordination established pursuant to Article 25 of the Federal Public Administration Act, the competent bodies of the federal public administration shall incorporate into the management rules for the protected natural areas under their administration such rules as the Ministry shall determine in order to provide effectively for the protection of ecosystems and their components. The Ministry shall arrange with the local authorities for their adoption of management arrangements regulating the conservation, administration, development, and surveillance of natural areas in the national system. It may likewise enter into coordination agreements with interested social groups and individuals to facilitate the achievement of any ends for which the natural areas of the national system were established.	In those areas exhibiting processes of degradation or desertification, or serious ecological instability, the Ministry shall formulate and implement ecological restoration programs, with the purpose of ensuring that the necessary measures are taken for recovery and reestablishment of conditions conducive to the evolution and continuity of the natural process that were taking place therein. In the formulation, application, and monitoring of such programs, the Ministry shall promote the participation of property owners; property holders; social, public, and private organizations; indigenous peoples; local governments, and other interested persons.

Article 133 of the Ecological Balance and Environmental Protection Act

Text published in the DOF on 28 January 1988	Text of the reform published in the DOF on 13 December 1996
The Ministry and the Ministry of Agriculture and Water Resources, with the participation of the Ministry of Health as applicable, pursuant to other legal provisions, shall perform or, as applicable, provide for the performance of systematic and ongoing monitoring of water quality in order to detect the presence of contaminants or excess organic waste and apply the relevant measures. In cases of waters under local jurisdiction, the Ministries shall coordinate with the state and municipal authorities.	The Ministry, with the participation of the Ministry of Health as applicable, pursuant to other legal provisions, shall conduct systematic and ongoing monitoring of water quality in order to detect the presence of contaminants or excess organic waste and apply the relevant measures. In cases of waters under local jurisdiction, it shall coordinate with the state, Federal District, and municipal authorities.

Article 157 of the Ecological Balance and Environmental Protection Act

Text published in the DOF on 28 January 1988	Text of the reform published in the DOF on 13 December 1996
The Federal Government shall promote societal participation in and responsibility for the formulation of ecological policy, the application of the relevant instruments in the context of information and surveillance measures and, in general, in the ecological measures it undertakes.	The Federal Government shall promote joint societal participation in the planning, implementation, evaluation, and surveillance of environmental and natural resource policy.

Article 161 of the Ecological Balance and Environmental Protection Act

Text published in the DOF on 28 January 1988	Text of the reform published in the DOF on 13 December 1996	Text of the reform published in the DOF on 31 December 2001
The federative entities and the municipalities may conduct acts of inspection and surveillance for verification of compliance with this Act in matters within the federal ambit. For such purpose, the Federation and the federative entities, and with the latter's involvement the municipalities, shall enter into the relevant coordination agreements.	The Ministry shall conduct acts of inspection and surveillance of compliance with the provisions of this Act and any provisions ensuing from it.	The Ministry shall conduct acts of inspection and surveillance of compliance with the provisions of this Act and any provisions ensuing from it. In Mexican marine zones, the Ministry, alone or acting by the Ministry of the Marine, shall conduct acts of inspection and surveillance and, as applicable, shall apply sanctions in cases of violation of the provisions of this Act.

Article 170 of the Ecological Balance and Environmental Protection Act

Text published in the DOF on 28 January 1988	Text of the reform published in the DOF on 13 December 1996
Where there is an imminent risk of ecological imbalance or cases of contamination with dangerous implications for ecosystems, their components, or public health, the Ministry may, as a safety measure, order the seizure of polluting materials or substances and the temporary partial or total closing of the corresponding pollution sources, and may arrange with the competent authority, in accordance with the applicable laws, for the application of any of the safety measures set out therein.	Where there is an imminent risk of ecological imbalance, or of serious harm to or deterioration of natural resources, cases of contamination with dangerous implications for ecosystems, their components, or public health, the Ministry may, with justification, order any of the following safety measures: I.- The temporary partial or total closing of pollution sources as well as facilities managing or storing specimens, products, or subproducts of wildlife species or forest resources or carrying out activities giving rise to the circumstances contemplated in the first paragraph of this article; II.- The seizure of hazardous materials and wastes as well as specimens, products, or subproducts of wildlife species or their genetic material, forest resources, as well as property, vehicles, tools, and instruments directly related to the conduct giving rise to the application of the safety measure, or III.- Neutralization or any similar action that prevents the hazardous materials or wastes from having the effects contemplated in the first paragraph of this article. Likewise, the Ministry may arrange with the competent authority for the application of any of the safety measures set out in other legal provisions.

Article 9 of the National Waters Act

Text published in the DOF on 1 December 1992	Text of the reform published in the DOF on 29 April 2004
The following are powers of "the Commission":	[Provision identical to paragraph XXXVI cited in submission SEM-03-003] "The Commission" is a deconcentrated body of "the Ministry" that is regulated by the provisions of this Act and its regulations, the Federal Public Administration Act, and its own bylaws. "The Commission" has the object of exercising the powers vested in the water authority and establishing itself as the highest technical, standards, and advisory body of the Federation in the area of comprehensive management of water resources, including the administration, regulation, control, and protection of water resources in the public domain. In exercising its powers, "the Commission" shall be organized into two modalities: a. The National Level, and b. The Regional Water Administration Level, through its Watershed Bodies. The specific operational, executive, administrative, and judicial powers, responsibilities, and activities relating to federal jurisdiction over national waters and their management shall be exercised or carried out through the Watershed Bodies, except as provided in this Act. The following are powers of "the Commission" at its National Level:
I.- To exercise the powers vested in the water authority in accordance with this Act, within the scope of federal jurisdiction, except those that shall be exercised directly by the Federal Executive; ...	I. To function as the Authority for water quantity and quality and for water management throughout the nation's territory and to exercise accordingly the powers vested in the water authority in accordance with this Act, within the scope of federal jurisdiction, with adherence to decentralization of the water sector, except those powers that shall be exercised directly by the Federal Executive or "the Ministry" and those under the responsibility of the state, Federal District, or municipal governments; ...
XIII.- To oversee compliance with and enforcement of this Act, to interpret it for administrative purposes, to apply sanctions, and to exercise relevant acts of authority that are not reserved to the Federal Executive;	XXXVI. To oversee compliance with and enforcement of this Act, to interpret it for administrative purposes, to apply sanctions, and to exercise relevant acts of authority that are not reserved to the Federal Executive;

Part II
Other provisions cited in submission SEM-03-003

Ecological Balance and Environmental Protection Act

Article 5: paragraphs III, IV and XIX.

The following are powers of the federation:

[...]
III. Attention to matters affecting ecological stability in the nation's territory or in areas under the sovereignty and jurisdiction of the nation, originating in the territory or areas under the sovereignty or jurisdiction of other states, or in areas that are beyond the jurisdiction of any state;
IV. Attention to matters which, originating on the nation's territory or in areas under the sovereignty or jurisdiction of the nation affect the ecological stability of the territory, areas under the sovereignty or jurisdiction of other states, or areas beyond the jurisdiction of any state;
XIX. Vigilant monitoring and promotion, within the scope of its jurisdiction, of compliance with this Law and other legal provisions arising from it.

Article 79: paragraphs I and III.

For the preservation and sustainable enjoyment of flora and fauna, the following criteria shall be considered:

I. The preservation and conservation of biodiversity and the natural habitat of the species of flora and fauna found on the nation's territory and in areas under the nation's sovereignty and jurisdiction; [...]
III. The preservation of endemic, threatened and endangered species as well as those subject to special protection [...].

Article 80: paragraphs I and VII.

The criteria for the preservation and sustainable enjoyment of flora and fauna, referred to in Article 79 of this Act shall be considered in:

I. The granting of concessions, permits and, in general, all manner of authorizations for the enjoyment, use, possession, management, conservation, repopulation, propagation, and development of wild flora and fauna;[...]
VII. The creation of refuge areas to protect any aquatic species that may require such protection.

Article 83.

The exploitation of natural resources in areas that are the habitat of wild flora or fauna species, especially endemic, threatened, or endangered species, shall be performed in a manner that does not alter the conditions necessary for the survival, development and evolution of these species.
The Ministry shall promote and support the management of wild flora and fauna based on traditional biological knowledge and on technical, scientific and economic information, with the aim of making sustainable use of species.

Article 88: paragraphs I, II and III.

For the sustainable enjoyment of water and aquatic ecosystems, the following shall be considered criteria:

I. The State and society are responsible for the protection of aquatic ecosystems and for the balance of the natural elements involved in the hydrological cycle;
II. The sustainable use of natural resources that comprise aquatic ecosystems shall be conducted in a manner not affecting their ecological stability;
III. To maintain the integrity and stability of the elements involved in the hydrological cycle, the protection of soils and forested areas, as well as the maintenance of basic flows in watercourses and the recharge capacity of aquifers, shall be considered.

Article 89.

The criteria for the sustainable use of water and aquatic ecosystems shall be considered in:

I. The formulation and preparation of the National Water Program;
II. The granting of concessions, permits and, in general, all manner of authorizations for the use of natural resources or the performance of activities that affect or may affect the hydrological cycle;
III. The granting of permits for diversion, or abstraction of national waters;
IV. The establishment of regulated, closed or reserve areas;
V. The suspension or revocation of permits, authorizations, concessions or allowances granted under the provisions of the National Waters Act, in cases of works or activities that harm national water resources or affect the ecological stability;
VI. The operation and administration of water and sewer systems serving population centers and industrial facilities;
VII. The projections contained in the "Urban Development Program for Mexico City" with respect to the policy on water reuse;
VIII. Policies and programs for the protection of endemic, threatened, endangered aquatic species or aquatic species subject to special protection;
IX. Concessions for aquaculture activities, in terms of the provisions of the Fisheries Act, and
X. The establishment and administration of fisheries protection zones;
XI. All practices in every sector of production that affect the quality of surface water and groundwater;
XII. *Repealed*.

Article 166.

The relevant authority may solicit the assistance of the law enforcement authorities to conduct a site visit when one or more persons obstruct or oppose the procedure, irrespective of any sanctions that may apply.

APPENDIX 10

Operational data of the National Quality Monitoring Network

Operational data – National Water Quality Monitoring Network

Lake Chapala			
Year	Number of Stations	Number of Samples	Number of Analyses
1982	22	91	829
1983	12	46	471
1984	22	89	1,006
1985	13	55	684
1986	15	75	724
1987	15	28	277
1988	13	50	388
1989	4	15	301
1990	12	65	1,824
1991	12	47	1,445
1992	22	84	2,752
1993	22	88	2,970
1994	23	91	3,049
1995	24	94	3,196
1996	24	263	8,894
1997	24	96	3,264
1998	23	89	3,003
1999	22	88	2,992
2000	22	87	2,272
2001	21	82	2,271
2002	21	83	2,490
2003	21	84	2,373
2004	21	84	2,335
2005	21	56	1,589
2006	21	61	1,567
2007	26	125	2,595
2008	34	109	1,829
2009	24	89	2,610

Source: Response from the Infomex system no. 1610100230710.

Operational data – National Water Quality Monitoring Network

Santiago River			
Year	Number of Stations	Number of Samples	Number of Analyses
1982	9	47	1,035
1983	9	104	2,219
1984	9	96	1,873
1985	9	104	1,630
1986	13	78	1,155
1987	13	73	1,357
1988	11	44	687
1989	5	16	360
1990	13	53	1,084
1991	13	46	1,038
1992	13	48	1,134
1993	12	41	1,111
1994	13	43	1,104
1995	13	46	1,240
1996	13	48	1,369
1997	13	62	1,907
1998	13	50	1,668
1999	13	43	1,490
2000	13	76	1,862
2001	13	54	1,588
2002	13	52	1,594
2003	13	34	1,036
2004	13	43	1,043
2005	13	39	721
2006	12	62	918
2007	12	67	1,203
2008	12	48	808
2009	12	82	1,899

Source: Response from the Infomex system no. 1610100230710.

Note: This table shows more monitoring stations than are included in the factual record. This is because the area of interest comprises only part of the Santiago River while the table above shows all the stations positioned along the whole river.

Operational data – National Water Quality Monitoring Network

Verde River			
Year	Number of Stations	Number of Samples	Number of Analyses
1982	0	0	0
1983	0	0	0
1984	3	12	213
1985	3	12	190
1986	4	27	459
1987	4	20	291
1988	6	18	245
1989	3	12	198
1990	6	18	388
1991	6	21	434
1992	6	20	391
1993	6	19	392
1994	6	21	462
1995	6	17	379
1996	6	21	543
1997	6	22	646
1998	6	21	678
1999	6	6	186
2000	5	24	545
2001	5	30	670
2002	5	15	389
2003	5	13	370
2004	3	6	194
2005	3	13	433
2006	4	19	485
2007	4	19	484
2008	4	14	319
2009	4	12	292

Source: Response from the Infomex system no. 1610100230710.

Note: This table shows more monitoring stations than are included in the factual record. This is because the area of interest comprises only part of the Verde River while the table above shows all the stations positioned along the whole river.

Operational data – National Water Quality Monitoring Network

National			
Year	Number of stations	Number of sampling events	Number of analyses
1982	363	2,781	55,351
1983	353	2,639	47,199
1984	317	1,655	31,629
1985	476	3,511	64,809
1986	504	3,673	69,949
1987	555	3,405	64,956
1988	538	2,806	49,055
1989	534	2,697	52,693
1990	567	2,927	65,115
1991	562	3,139	77,672
1992	569	2,803	75,933
1993	543	2,648	75,892
1994	529	2,778	81,674
1995	519	2,542	74,846
1996	523	3,132	89,817
1997	524	3,200	92,652
1998	511	2,751	83,741
1999	435	1,908	55,805
2000	658	3,243	80,021
2001	770	3,393	82,537
2002	780	3,175	72,713
2003	807	2,429	60,403
2004	882	2,770	60,943
2005	871	2,944	57,041
2006	993	3,428	62,429
2007	1,033	3,578	70,780
2008	1,183	3,453	71,713
2009	1,534	4,019	85,071

Source: Response from the Infomex system no. 1610100230710.

APPENDIX 11

Water Quality Results in the Santiago and Verde Rivers

Water Quality Results in Santiago and Verde Rivers

Santiago River (dry season)

Parameter	Mean result[1]	LFD, 2008*	LFD, 2009**	Conagua***
Station 1. Santiago River in Ocotlán, railroad bridge Classification in 2008: B Classification in 2009: C				
BOD_5	276.2	-	-	Highly contaminated
COD	435.7		100	Highly contaminated
TSS	126		40.0	Acceptable
Station 2. Santiago River in Corona dam Classification in 2008: B Classification in 2009: C				
BOD_5	3.4	-	-	Good quality
COD	60.5	200	100	Contaminated
TSS	7	75.0	40.0	Excellent
Station 6. Santiago River in El Salto-Juanacatlán Classification in 2008: A Classification in 2009: C				
BOD_5	23.2	-	-	Acceptable
COD	122.2	320	100	Contaminated
TSS	11	150	40	Excellent
Station 7. Santiago River downstream of Puente Grande Classification in 2008: A Classification in 2009: C				
BOD_5	5.4	-	-	Good quality
COD	86.5	320	100	Contaminated
TSS	5	150	40.0	Excellent
Station 10. Santiago River in Matatlán bridge Classification in 2008: A Classification in 2009: C				
BOD_5	15.0	-	-	Acceptable
COD	103.5	320	100	Contaminated
TSS	10	150	40.0	Excellent
Station 11. Santiago River in La Intermedia dam Classification in 2008: A Classification in 2009: C				
BOD_5	7.0	-	-	Acceptable
COD	89.9	320	100	Contaminated
TSS	8	150	40.0	Excellent
Station 12. Santiago River in Arcediano bridge Classification in 2008: A Classification in 2009: C				
BOD_5	74.4	-	-	Contaminated
COD	236.6	320	100	Highly contaminated
TSS	97	150	40.0	Acceptable

*LFD, Article 278-B (in force in 2008); **LFD, Article 278-B (in force in 2009), ***Water quality classification, Conagua.

1. Mean in mg/l from values obtained during sampling campaigns in the Santiago and Verde rivers. The author of the report notes that "[i]n some cases, variance coefficient show values over 100% indicating that the standard deviation is higher than the mean, which could be due to the sampling size is small". AyMA Ingeniería y Consultoría *Reporte de monitoreo y modelación de la calidad del agua de los ríos Verde y Santiago*, prepared for CEA-Jalisco (2003), ch. 5, p. 4 and Annex 5-1 Water Quality in Monitoring Stations.

Santiago River (rainy season)

Parameter	Mean result[2]	LFD, 2008*	LFD, 2009**	Conagua***
Station 1. Santiago River in Ocotlán Puente Ferrocarril Classification in 2008: B Classification in 2009: C				
BOD_5	62.7	–	–	Contaminated
COD	177.8	200	100	Contaminated
TSS	109	75.0	40.0	Acceptable
Station 2. Santiago River in Corona dam Classification in 2008: B Classification in 2009: C				
BOD_5	10.9	–	–	Acceptable
COD	79.2	200	100	Contaminated
TSS	11	75.0	40.0	Excellent
Station 6. Santiago River in El Salto-Juanacatlán Classification in 2008: A Classification in 2009: C				
BOD_5	24.8	–	–	Acceptable
COD	114.2	320	100	Contaminated
TSS	13	150	40.0	Excellent
Station 7. Santiago River downstream of Puente Grande Classification in 2008: A Classification in 2009: C				
BOD_5	11.7	–	–	Acceptable
COD	93.0	320	100	Contaminated
TSS	14	150	40	Excellent
Station 10. Santiago River in Matatlán bridge Classification in 2008: A Classification in 2009: C				
BOD_5	20.2	–	–	Acceptable
COD	141.6	320	100	Contaminated
TSS	525	150	40.0	Highly contaminated
Station 11. Santiago River in La Intermedia dam Classification in 2008: A Classification in 2009: C				
BOD_5	11.7	–	–	Acceptable
COD	57.8	320	100	Contaminated
TSS	152	150	40.0	Contaminated
Station 12. Santiago River in Puente Arcediano Classification in 2008: A Classification in 2009: C				
BOD_5	20.9	–	–	Acceptable
COD	108.4	320	100	Contaminated
TSS	510	150	40.0	Highly contaminated

*LFD, Article 278-B (in force in 2008); **LFD, Article 278-B (in force in 2009), ***Water quality classification, Conagua.

2. *Idem.*

Verde River (dry season)

Parameter	Mean result[3]	LFD, 2008*	LFD, 2009**	Conagua***
Station 1. Verde River in Apanico Classification in 2008: B Classification in 2009: C				
BOD_5	12.2	–	–	Acceptable
COD	72.8	200	100	Contaminated
TSS	52	75.0	40.0	Good quality
Station 4. Verde River in Temacapulín bridge Classification in 2008: B Classification in 2009: C				
BOD_5	9.4	–	–	Acceptable
COD	58.9	200	100	Contaminated
TSS	55	75.0	40.0	Good quality
Station 7. Verde River upstream of Tepatitlán River Classification in 2008: B Classification in 2009: C				
BOD_5	4.0	–	–	Good quality
COD	47.2	200	100	Contaminated
TSS	43	75.0	40.0	Good quality
Station 6. Verde River in La Cuña hydrometric station. Classification in 2008: B Classification in 2009: C				
BOD_5	4.0	–	–	Good quality
COD	67.4	200	100	Contaminated
TSS	43	75.0	40.0	Good quality
Station 10. Verde River in Purgatorio Classification in 2008: B Classification in 2009: C				
BOD_5	3.8	–	–	Good quality
COD	50.0	320	100	Contaminated
TSS	32	150	40.0	Good quality

*LFD, Article 278-B (in force in 2008); **LFD, Article 278-B (in force in 2009), ***Water quality classification, Conagua.

3. *Idem*.

Verde River (rainy season)

Parameter	Mean result[4]	LFD, 2008*	LFD, 2009**	Conagua***
Station 1. Verde River in Apanico Classification in 2008: B Classification in 2009: C				
BOD_5	10.0	–	–	Acceptable
COD	78.2	200	100	Contaminated
TSS	348	75.0	40.0	Contaminated
Station 4. Verde River in Temacapulín bridge Classification in 2008: B Classification in 2009: C				
BOD_5	10.5	–	–	Acceptable
COD	108.4	200	100	Contaminated
TSS	484	75.0	40.0	Highly contaminated
Station 7. Verde River upstream of Tepatitlán River Classification in 2008: B Classification in 2009: C				
BOD_5	11.8	–	–	Acceptable
COD	69.6	200	100	Contaminated
TSS	394	75.0	40.0	Contaminated
Station 6. Verde River in La Cuña hydrometric station. Classification in 2008: B Classification in 2009: C				
BOD_5	10.1	–	–	Acceptable
COD	78.0	200	100	Contaminated
TSS	340	75.0	40.0	Contaminated
Station 10. Verde River in Purgatorio Classification in 2008: B Classification in 2009: C				
BOD_5	10.6	–	–	Acceptable
COD	109.2	200	100	Contaminated
TSS	781	75.0	40.0	Highly contaminated

*LFD, Article 278-B (in force in 2008); **LFD, Article 278-B (in force in 2009); ***Water quality classification, Conagua.

4. *Idem*.

Santiago River

Dry	km	BOD5 x	BOD5 s	BOD5 n	BOD5 CI	BOD5 CV	COD x	COD s	COD n	COD CI	COD CV	TSS x	TSS s	TSS n	TSS CI	TSS CV
No. and name of station		mg/l	Statistical variables				mg/l	Statistical variables				mg/l	Statistical variables			
1. RS at Ocotlán Railroad bridge	0	276,2	333,4	5	414,44	121%	435,7	434,0	5	539,59	100%	126	87,3	5	108,60	69%
2. RS at Corona Dam	42	3,4	0,5	5	0,68	16%	60,5	11,7	5	14,55	19%	7	3,1	5	3,87	46%
6. RS at El Salto-Juanacatlán	64	23,2	18,5	5	22,96	80%	122,2	39,4	5	49,03	32%	11	6,4	5	7,98	59%
7. RS downstream Puente Grande	74	5,4	1,1	5	1,42	21%	86,5	15,4	5	19,11	18%	5	1,7	5	2,15	35%
10. RS at Matatlán bridge	91	15,0	11,7	5	14,50	78%	103,5	37,6	5	46,79	36%	10	9,1	5	11,34	89%
11. RS at La Intermedia dam	104	7,0	1,4	4	2,25	20%	89,9	38,4	4	61,04	43%	8	2,9	4	4,57	35%
12. RS at Arcediano bridge	107	74,4	50,0	5	62,17	67%	236,6	88,9	5	110,56	38%	97	53,5	5	66,55	55%
Rainy	km	x	s	n	CI	CV	x	s	n	CI	CV	x	s	n	CI	CV
No. and name of station		mg/l	Statistical variables				mg/l	Statistical variables				mg/l	Statistical variables			
1. RS at Ocotlán Railroad bridge	0	62,7	63,7	4	101,25	102%	177,8	69,0	4	109,71	39%	109	78	4	123,94	72%
2. RS at Corona Dam	42	10,9	7,2	5	9,00	66%	79,2	35,9	5	44,63	45%	11	4	5	5,23	39%
6. RS at El Salto-Juanacatlán	64	24,8	14,0	5	17,36	56%	114,2	36,3	5	45,15	32%	13	4	5	5,10	33%
7. RS downstream Puente Grande	74	11,7	3,8	5	4,73	33%	93,0	21,8	5	27,10	23%	14	9	5	10,75	64%
10. RS at Matatlán bridge	91	20,2	14,2	5	17,64	70%	141,6	81,9	5	101,77	58%	525	730	5	907,59	139%
11. RS at La Intermedia dam	104	11,7	5,3	5	6,63	46%	57,8	13,8	5	17,17	24%	152	146	5	182,08	96%
12. RS at Arcediano bridge	107	20,9	5,3	5	6,62	26%	108,4	24,7	5	30,71	23%	510	349	5	434,31	69%

Verde River

Dry	km	BOD5 x	BOD5 s	BOD5 n	BOD5 CI	BOD5 CV	COD x	COD s	COD n	COD CI	COD CV	TSS x	TSS s	TSS n	TSS CI	TSS CV
No. and name of station		mg/l	Statistical variables				mg/l	Statistical variables				mg/l	Statistical variables			
1. RV at Apanico	0	12,2	6,5	5	8,12	54%	72,8	17,7	5	22,05	24%	52	22	5	27,50	43%
4. RV at Temacapulín bridge	28	9,4	7,1	5	8,77	75%	58,9	20,9	5	26,02	36%	55	31	5	38,10	56%
7. RV Upstream Tepatitlán river	80	4,0	0,7	5	0,88	18%	47,2	20,4	5	25,31	43%	43	22	5	27,04	51%
6. RV at La Cuña hydrometric station	112	4,0	1,0	3	2,48	25%	67,4	39,5	5	49,14	59%	43	25	5	30,59	57%
10. RV at Purgatorio	160	3,8	0,8	5	1,04	22%	50,0	17,4	5	21,61	35%	32	19	5	24,11	60%
Rainy	km	x	s	n	CI	CV	x	s	n	CI	CV	x	s	n	CI	CV
No. and name of station		mg/l	Statistical variables				mg/l	Statistical variables				mg/l	Statistical variables			
1. RV at Apanico	0	10,0	6,0	5	7,47	60%	78,2	41,6	5	51,66	53%	348	211	5	261,95	61%
4. RV at Temacapulín bridge	28	10,5	7,1	5	8,81	68%	108,4	71,8	5	89,21	66%	484	518	5	644,21	107%
7. RV Upstream Tepatitlán river	80	11,8	10,1	5	12,53	86%	69,6	31,1	5	38,73	45%	394	263	5	327,41	67%
6. RV at La Cuña hydrometric station	112	10,1	5,6	5	7,02	56%	78,0	32,1	5	39,93	41%	340	179	5	221,97	53%
10. RV at Purgatorio	160	10,6	7,6	5	9,48	72%	109,2	44,3	5	55,06	41%	781	761	5	946,71	98%

x = Average
s = Standard deviation
n = No. of data
IC = Confidence interval
CV = Covariance coefficient
RS = Santiago River
RV = Verde River

Source:
AyMA Ingeniería y Consultoría, *Reporte de monitoreo y modelación de la calidad del agua de los ríos Verde y Santiago*, prepared for CEA-Jalisco (2003), Annex 5-3 Statistical analysis of data

Santiago and Verde Rivers (dry season)*

Sampling points

Santiago River		Verde River	
1. Station 1- Santiago River in Ocotlán railroad bridge	**4.** Station 7- Santiago River Downstream of Puente Grande	**8.** Verde River in Apanico	**11.** Station 7- Verde River usptream of Tepatitlán River
2. Station 2- Santiago River in Corona dam	**5.** Station 10- Santiago River in Matatlán bridge	**9.** Station 4- Verde River in Temacapulín bridge	**12.** Station 10- Verde River in Purgatorio
3. Station 6- Santiago River in El Salto-Juanacatlán	**6.** Station 11- Santiago River in La Intermedia dam **7.** Station 12- Santiago River in Arcediano bridge	**10.** Station 6- Río verde in La Cuña hydrometric station	

* Map prepared with information from: AyMA Ingeniería y Consultoría, *Reporte de monitoreo y modelación de la calidad del agua de los ríos Verde y Santiago*, prepared for CEA-Jalisco (2003), Ch. 5, p. 4 and Annex 5-1 Water Quality in Monitoring Stations.

Santiago and Verde Rivers (rainy season)*

Sampling points

Santiago River		Verde River	
1. Station 1- Santiago River in Ocotlán railroad bridge	**4.** Station 7- Santiago River Downstream of Puente Grande	**8.** Station 1- Verde River in Apanico	**11.** Station 7- Verde River usptream of Tepatitlán River
2. Station 2- Santiago River in Corona dam	**5.** Station 10- Santiago River in Matatlán bridge	**9.** Station 4- Verde River in Temacapulín bridge	**12.** Station 10- Verde River in Purgatorio
3. Station 6- Santiago River in El Salto-Juanacatlán	**6.** Station 11- Santiago River in La Intermedia dam **7.** Station 12- Santiago River in Arcediano bridge	**10.** Station 6- Río verde in La Cuña hydrometric station	

* Map prepared with information from: AyMA Ingeniería y Consultoría, *Reporte de monitoreo y modelación de la calidad del agua de los ríos Verde y Santiago*, prepared for CEA-Jalisco (2003), Ch. 5, p. 4 and Annex 5-1 Water Quality in Monitoring Stations.

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