World Heritage
Natural Site Nomination
for UNESCO

Lençóis Maranhenses National Park

Brazil

Ministry of Environment

Setembro 2018

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Acronym List

ADERT - Ecological Defense Association of the Tocantina Region

AER - Rapid Ecological Assessment

ALUMAR - Alumínios do Maranhão S / A

AMAVIDA - Maranhense Association for the Conservation of Amazonian Nature

ANA - National Water Agency

APA - Environmental Protection Area

APP - Permanent Preservation Area

ARIE - Area of Relevant Ecological Interest

AZE - Alliance for Zero Extinction

BNDES - National Bank for Economic and Social Development

CADASTUR - Register of Physical and Legal Persons of the Tourism Industry

CAEMA - Water and Sewage Company of Maranhão

CBD - Convention on Biological Diversity

CEADS - Center for Environmental Studies and Sustainable Development

CEFET - Federal Center for Technological Education

CEMADEN - National Center for Natural Disaster Monitoring and Alarms

CEMAR – Maranhão Energy Company

CENAD - National Center for Risk and Disaster Management

CENTRU - Rural Worker's Education Center

CHESF - São Francisco Hydroelectric Company

CIT - Intergovernmental Technical Committee for the Protection and Management of Flora and Fauna

CNRH - Water Resources National Council

CNUC - Conservation Units National Council

CNPq - National Council for Scientific and Technological Development

CODOMAR - Maranhão Docks Company of

COGUC - Management of Conservation Units Coordination

CEZEE/MA - State Ecological-Economic Zoning Commission of Maranhão

CONAMA - Environment National Council

DAP/MMA - Department of Protected Areas of the Ministry of Environment

CPDOL - Fish Collection of the Department of Oceanography and Limnology

CVRD - Vale do Rio Doce Company

DIMAN - Thematic Research Core

DISAL - Industrial District of São Luis

DSG - Directorate of the Geographic Service of the Armed Forces

EBA - Endemic Bird Area

EMATER - Rural Extension and Technical Assistance Company

EMBRAPA - Brazilian Agricultural Research Corporation

EMBRATEL - Brazilian Telecommunications Company

EMBRATUR - Brazilian Tourism Company

EPA - Environmental Protection Area

ESEC - Ecological Station

FLONA - National Forest

FNMA - National Environment Fund

FNS - National Health Fund

FUNAI - National Indian Foundation

FUNASA - National Health Foundation

FUNATURA - Pro-Nature Foundation

FURPA - Parnaíba River Foundation

GAMA - Environment Adjunct Management

GAMANÉ - Support Group for Mother Nature

GDH - Human Development Management

GEF-Mangue - Project for Effective Conservation and Sustainable Use of Mangroves in Brazil in Protected Areas

GERCO - Coastal management

GEREX / MA - State of Maranhão IBAMA Regional Management

GTA - Amazon Workgroup

IBA – Important Areas for Bird Conservation

IBAMA - Brazilian Institute of the Environment and Renewable Natural Resources

IBDF - Brazilian Institute of Forest Development

IBGE - Brazilian Institute of Geography and Statistics

ICMBio - Chico Mendes Conservation of Biodiversity Institute

IDH-M - Municipal Human Development Index

IFMA/MA - Federal Institute of Education, Science and Technology of Maranhão

INCRA - National Institute for Colonization and Agrarian Reform

INPE - National Institute for Space Research

IPEA - Institute for Applied Economic Research

IPES - Institute for Society Studies and Research

ITERMA – Maranhão Land Institute

ITTO - International Tropical Timber Organization

IUCN - International Union for Conservation of Nature

JBRJ - Rio de Janeiro Botanical Garden Research Institute

LABOHIDRO - Hydrobiology Laboratory

MacroZEE-MA - State of Maranhão Ecological-Economic Macrozoning

MCT - Science and Tourism Ministry

MDSA - Ministry of Social and Agrarian Development

MEP - Popular Ecological Movement

MMA - Environmental Ministry

NASA – National Aeronautics and Space Administration

NGO - Non-Governmental Organization

NOEPEMA - Center for Ecological Guidance, Research and Dissemination of the Environment

OLEAMA - Oleaginosa Maranhense

ONGs - Non-Governmental Organizations

UN - United Nations

PARNA - National Park

PBMC - National Assessment Report of the Brazilian Panel of Climate Change

PETROBRÁS - Petróleo Brasileiro S / A

PIB - Gross Domestic Product

PLANO MAIOR 2020 - Strategic Development Plan for Tourism of the State of Maranhão

PLNM – Lençóis Maranhenses National Park

PMABB - Brazilian Biomes Environmental Monitoring Program

PNAD - National Sample Household Survey

PNAP - National Strategic Plan for Protected Areas

PNGC - Coastal Management National Plan

PNMA - Enviromental National Policy

PNMC - National Policy on Climate Change

PNRH - Water Resources National Policy

PNUD - United Nations Development Program

PNUMA - United Nations Program for the Environment

PROBIO - Project for the Conservation and Sustainable Use of Brazilian Biological Diversity

PRONABIO - National Biological Diversity Program

PUC - Pontifical Catholic University

RADAMBRASIL – Amazonian Radar Project

RAPPAM - Rapid Assessment and Prioritization of Protected Area Management

REBIO - Biological Reserve

RESEX - Extractive Reserve

RPPN - Private Natural Heritage Reserve

SAE - Water and Sewage Service

SEBRAE - Brazilian Micro and Small Enterprises Support Service

SECTUR / MA - Secretary of State for Culture and Tourism of Maranhão

SEMA - Environment Special Secretariat

SENAC - National Service of Commercial Learning

SESC - Social Service of Commerce

SINGREH - National System of Water Resources Management

SINPDEC - National System of Civil Protection and Defense

SISNAMA - Environment National System

SNUC - National System of Protected Areas

SPU - Union's Property Department

SUBSTA - Subsidiary Body for Scientific and Technological Advice

SUDENE - Northeast Development Superintendence

SUDEPE – Fishing Superintendency and Development

UC - Conservation Unit

UEMA - Maranhão State University

UFMA - Maranhão Federal University

UHE - Hydroelectric Power Plant

UNESCO - United Nations Educational, Scientific and Cultural Organization

UNIT - Third Age University

WCS - Wildlife Conservation Society

WWF - World Wildlife Found

ZA - Buffer Zone

ZEEC - Coastal Ecological Economic Zoning

State

Brazil

State, Province or Region

Maranhão State

Name of Property

Lençóis Maranhenses National Park

Geographical Coordinates to the Nearest Second

S 2° 32' 12" S
W 43° 3' 49" W

Area of nominated property (ha.) and proposed buffer zone (ha.)

Property area: 155.000
Buffer Zone: 268,231
Total: 423,231

The Preguiças River, whose mouth marks the Northeastern limit of the National Park.

Textual Description of the Boundaries of the Nominated Property

The proposed World Heritage site is located in the north coast of Brazil, in the State of Maranhão (Map 01). The boundaries of the nominated property starts at the following geographic coordinates: latitude 02o39'29 "S and longitude 43o11'42" WGr, located at the alignment of the network of telegraph lines connecting Humberto de Campos to Barreirinhas, being that point 1; then it follows northbound, in a straight line, reaching point 2 at the geographical coordinates: latitude 2o30'00 "S and longitude 43o11'42" WGr; it then changes course into a north-west direction by means of another straight line, reaching point 3 at geographic coordinates: latitude 2o22'03 "S and longitude 43o25'34" WGr, located at the intersection of this line with Santaninha Island, in its northern part; it then follows the general southwest direction, reaching the point of geographic coordinates: latitude 2o33'11 "S and longitude 43o27'56" WGr, at point 4; it enters perpendicularly 1 kilometer into the Atlantic Ocean, rounding the coastline clockwise to the point of geographical coordinates: latitude 2o33'50 "S and longitude 42o45'00" WGr, at point 5; following then the road that connects Ponta do Mangue to Barreirinhas until the point at geographic coordinates: latitude 2o44'39 "S and longitude 42o51'11" WGr, located at the intersection of this road with the telegraph line, at point 6; it then follows this line, in the general northwest direction, reaching point 1 of this description, thus closing the perimeter (Maps 2, 3, 4, 5, 5ª, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j, 5k, 5l, 5m, 6, 6ª, 6b, 6c, 6d, 6e, 6f, 6g, 6h, 6i, 6j, 6k, 6l, 6m).

Priscila Steffen

Limits of the Buffer Zone

The buffer zone of the Lençóis Maranhenses National Park has an area of 423,231 ha. In its limits are included some of the municipalities of Humberto de Campos, Primeira Cruz, Santo Amaro do Maranhão and Barreirinhas, excluding the urban limits of these municipalities.

In the region of Primeira Cruz, the buffer zone covers areas with resting vegetation, fluvial-marine plains (mangrove, floodplain and apicum), fields of fixed dunes, recessed mesas, springs and mouths of the rivers Mirim, Miritibinha, Mananzaro, Velho and Alegre, which converge to the mouth of the river Periá, which, in turn, acts as a natural boundary between this municipality and that of Humberto de Campos. The latter has the same environment profile as Primeira Cruz, whereas in the southern sector the Ribeira River acts as natural border, holding an expressive riparian forest. In this area, therefore, the buffer zone is physically delimited by the rivers Periá to the west and Marciano to the east; to the north by limits of the Lençóis Maranhenses National Park; and to the south by the highway MA-402.

In the vicinity of Santo Amaro do Maranhão, the buffer zone is bordered by the Queixada River and the Santo Amaro Lake, while to the east is the Negro River, to the north the Lençóis Maranhenses National Park and to the south the MA-402 and the Bacabinha river. Predominant in this area are fields of mobile and (mainly) fixed dunes, recessed mesas, restinga and water courses that drain it towards the interior of the UC, like the Rio Grande and its 15 tributaries, in addition to six others that contribute to the Rio Negro. There is also the presence of sand fields in the vicinity of Santo Amaro do Maranhão, as well as riparian forest and subsistence crop areas.

In the region of Barreirinhas the buffer zone is delimited by the Negro river to the west; the Preguiças River to the east; the MA-402 highway and the source of the Mirinzal stream to the south; to the north, the boundary of the Park is the Atlantic Ocean. In this area, there is a sandy beach, a plain of wind deflation, a fixed dune field and a recessed beach in addition to restinga, followed by floodplains, riparian forest and areas for subsistence crops,

as well as mangrove fringes near the village of Mandacaru. This area presents a significant drainage network represented by the Preguiças, Juçaral, Maçangano, Sucuriju and other watercourses.

In the Atlantic Ocean, the buffer zone is equivalent to 10km stretch starting from the boundary of the Park at sea, including the stretch from the mouth of the Periá/ Barra dos Veados river in the west until its projection after Caburé, which includes part of the mouth of the Preguiças river, to the east, compriings the lower section of the municipalities of Primeira Cruz, Santo Amaro do Maranhão and Barreirinhas where artisanal fishing is practiced by the local population and trawling by large scale fishing companies.

Criteria under which property is nominated

(vii) – to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance;

(viii) - to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;

(x) – to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

Draft Statement of Outstanding Universal Value

a) Brief synthesis

Consisting of large, sweeping dunes, Lençóis Maranhenses National Park looks like an archetypal desert at first glance, but in fact it is not, as a relatively large volume of water precipitates in the wet period (between January and July) raising the water table above the soil and forming temporary lagoons between the dunes.

Located in the northeastern region of Brazil, on the eastern coast of Maranhão,

Fishing boat on the Periá River, which marks the western boundary of the PNLM. Note the riparian vegetation around the river.

Inga Steffen

Lençóis Maranhenses National Park has an area of 155,000 ha, of which about 90,000 ha are composed of an extensive dune field with temporary and perennial lagoons. Along the 80 km of its coast, are beautiful beaches followed by the deflation plains, where the removal of the sediments by the wind action, forming barchan dunes predominates. With the inward movement by the prevailing winds, these dunes take the form of long winding chains of barchans, filled in the rainy season by ponds of different colors, shapes, sizes and depths. At the end of this period, the site presents its best scenario, when the inter-dunal lagoons reach their maximum volume, attracting thousands of visitors to bathe in their crystalline waters.

The origin of the dune field is related to the great contribution of sediments by the marine transgressions and regressions, which combined with the wind action allowed the formation of the dune fields along the Quaternary. The site also stands out because it sits on a transition region between three Brazilian biomes, the Cerrado, the Caatinga and the Amazon, so that species of these three biomes can be found there, forming a unique combination. The vegetation of the park is composed of pioneer formations of restinga, mangroves and alluvial communities which, together with marine and freshwater environments, are fundamental for the conservation of a great diversity of species.

b) Justification for Criteria

Critério vii: The Lençóis Maranhenses National Park is dominated by an incomparable landscape. It is formed by successive chains of dunes interspersed by temporary and perennial lagoons that dazzle tourists from all over the world. Along the 80 km of coastline of the park, there is a flat beach with width between 600 m and 2 km that find dunes with heights between 10 and 20 m. Connected to each other, the barchan dunes form long winding chains with up to 75 km of extension that penetrate more than 20 km towards the interior. The appearance of crumpled sheets of these chains of dunes, seen from above, gave rise to the name of the site. When they receive rains during the first half of the year, these dune chains are filled by waters that rise from the water table, resulting in temporary ponds with different shapes, sizes and depths. Bathing in these freshwater lagoons is the main attraction of the site, as well as the contemplation of the majestic white dunes interspersed by green and blue lagoons, composing a landscape of unique beauty that cannot be found anywhere else in the world.

Critério viii: Lençóis Maranhenses National Park sits at the Barreirinhas Basin superimposed on sedimentary packages, whose erosive and depositional processes gave rise to the sediments that cover the region. Under wind action these sediments formed a field of mobile and fixed dunes, considered the largest in South America and one of the most significant that records the development of coastal dunes along the Quaternary. This great contribution of sediments constantly worked by the trade winds, blowing from the northeast, take the form of long chains of barchans arranged in the same direction, that increase of size as they advance inland. In the rainy season, however, the temporary ponds formed by raising the water table soften and lengthen the curves of the barchanoids, limiting also their movement and growth. It is therefore this perfect alternation between winds and rains that guarantees the extraordinary beauty of the proposed site.

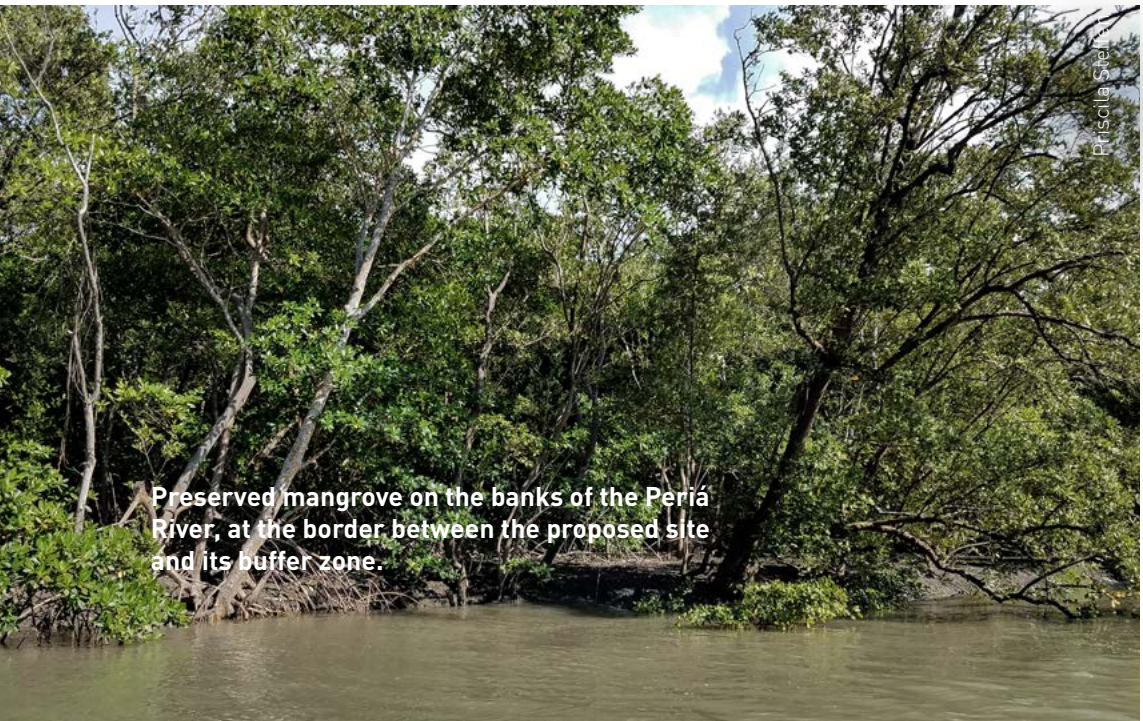
Critério x: It is characterized by pioneering formations with marine influence (restingas), fluvio-marine (mangroves) and fluvial (alluvial communities) presenting species of the Cerrado, Caatinga and Amazon. The restinga vegetation predominates in the site, located mainly in the surroundings of the field of mobile dunes, but also in the interior. This "island" of vegetation has the greatest botanical diversity of the site, as well as a phytogeographic individuality, suggesting isolation by paleoclimatic effects. The Lençóis Maranhenses National Park has a richness of 857 species and is very important for the conservation of migratory birds in North America, such as the tortoise (Calidris canutus), the trinta-réis-boreal (Sterna hirundo) and the Marreca-de-asa-azul (Anas discors) and reptiles, as it includes a single taxocenosis, which combines several species of different biomes. There

Adriano de Souza

Oceanic portion of the NLPM at the eastern end of the Park.

Priscila Steffen

Flowering in the restinga near Periá River.



Priscila Steffen

Preserved mangrove on the banks of the Periá River, at the border between the proposed site and its buffer zone.

were 857 species, of which two were endemic to the site (Hybantus solccolaris and Hyphessobrycon peorskii) and one endemic to a small coastal area between Maranhão and Piauí (Trachemys adiutrix). Thirty-one species are endangered, among them Epinephelus itajara, Dermochelys coriacea, Chelonia mydas, Trachemys adiutrix, Lontra longicaudis, Leopardus tigrinus and Trichechus manatus.

c) Statement of Integrity

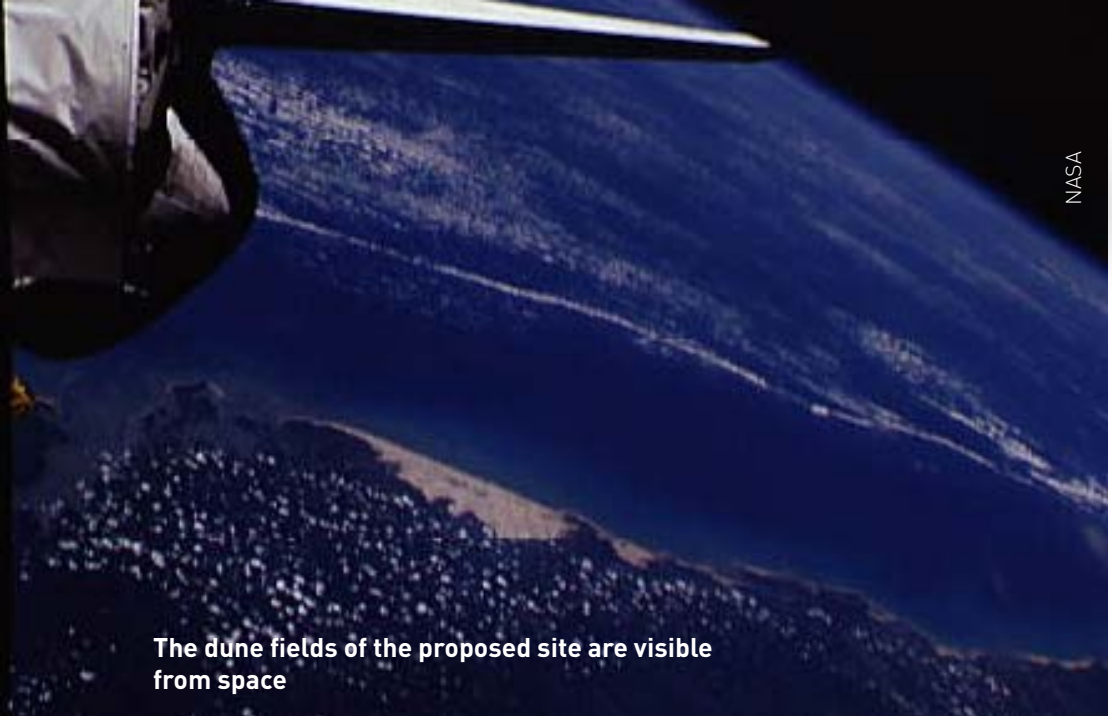
Lençóis Maranhenses National Park has an area of 155,000 ha, of which 90,000 ha is formed by fields of mobile dunes with beautiful chains of barchans intercalated by temporary and perennial lagoons. More than 40,000 ha is covered by lush restinga vegetation, which along with mangroves, lagoons, rivers, marine areas and other ecosystems support a high diversity of species. The site is therefore large enough to guarantee the representativeness of elements and processes that confer its exceptional universal value. In addition, it integrates the National System of Conservation Units, belonging to the integral protection group, where natural resources can only be used indirectly. It presents a buffer zone, with specific norms and restrictions of human activities, to minimize the negative impacts of the environment on the site. All these factors contribute to ensure the integrity of the proposed site.

d) Protection and management requirements

The Brazilian government has an elaborate institutional and legal arrangement focused on environmental protection. The National Environmental System (SISNAMA) and the National System of Water Resources Management (SINGREH) are the two essential institutional structures that comply with the constitutionally foreseen principles of environmental protection. The first being made up by the entities and institutions of federal, state and city and the Federal District environmental authorities. Its objective is to establish an articulated and decentralized set of actions for environmental management in the country, integrating and harmonizing specific rules and practices that complement each other at the three levels of Government. SINGREH aims to promote integrated water management, to arbitrate administratively on conflicts related to water resources, to promote the protection and recovery of water resources, and to control the use of water through Collection. SINGREH has different decision-making bodies, with space for participation of several sectors of society. In this system, the hydrographic basins are the territorial unit for the management of water resources through the committees that come to represent an organization of the State with administrative political function.

The Ecological Economic Coastal Zoning is an instrument of coastal management, which must be elaborated in a participatory manner and establish environmental goals and directives capable of ordering space, also functioning as a mechanism to support the actions of monitoring, licensing, inspection and environmental management

Among the instruments of territorial management that aim at environmental protection and conservation of biodiversity, however, the National System of Protected Areas (SNUC) can be considered the most important. The SNUC was created by Law 9.985/2000 and Decree No. 4,340/2002, which regulates it, establishing criteria and standards for the creation, implementation and management of protected areas. The Protected Areas of the SNUC are divided into two groups with specific characteristics: the Strict protection protected areas, whose basic objective is nature conservation, with only the indirect use of their natural resources; and the Sustainable Use, whose aim is the compatibility and conservation of nature with the sustainable use of its natural resources. The group of Strict Protection is composed of the five categories, ncluding National Parks, such as Lençóis Maranhenses National Park. The Sustainable Use group is composed of seven categories, including Environmental Protection Area, Extractive Reserve and Private Natural Heritage Reserve, categories that have Protected Areas inserted in the proposed site's Buffer Zone and in its surroundings.

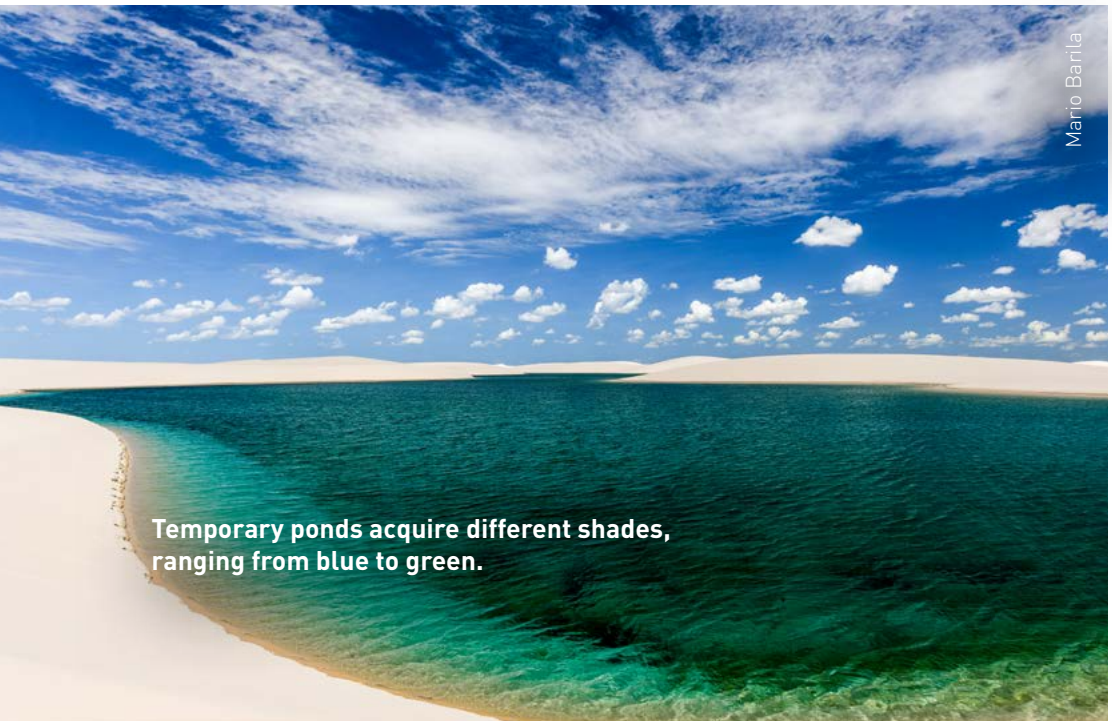


NASA

The dune fields of the proposed site are visible from space

Drone 2

Photo of the dry Azul Lagoon in the dry season. season



Mario Barila

Temporary ponds acquire different shades, ranging from blue to green.

In addition to the protected areas officially recognized by different governmental spheres, Brazil has in the Law of Protection of Native Vegetation (Law no. 12,651, of May 25, 2012) a legal instrument that deals with the protection, conservation, possible removal and use of natural areas. This Act defines as rural properties that need to be maintained and protected in the territory. They are of two natures: (a) Permanent Preservation Area (APP), which must be protected due to physical and ecological fragility, determining its location by the geography of properties, such as the marginal ranges of any watercourse and slopes;

(b) Legal Reserve, which constitutes a proportion of the area of property that must maintain native vegetation to, together with the PPAs, contribute to the conservation of biodiversity.

The network of protected areas in the proposed area also interacts with other levels of environmental management and government development plans.

The proposed preliminary management plan for the site includes a framework and mechanisms to ensure the effective integrated action of these bodies. It also proposes a management chart, which includes and organizes the participation of stakeholders, through two management committees: the executive committee, composed of institutions directly and closely related to the proposed World Heritage Site; and the advisory council, larger and composed of a set of entities that interface with the management of the site (see Annex 11: Management plan). The advisory council will strengthen and integrate the action of those who are involved in the integrated management practice in the region, and it aims to increase the integration of local management entities in the protection and monitoring of the site, based on the protection of outstanding universal values of the site.

A logical framework was developed, establishing plans and conservation projects, communication, and site management, with short, medium and long- term commitments.

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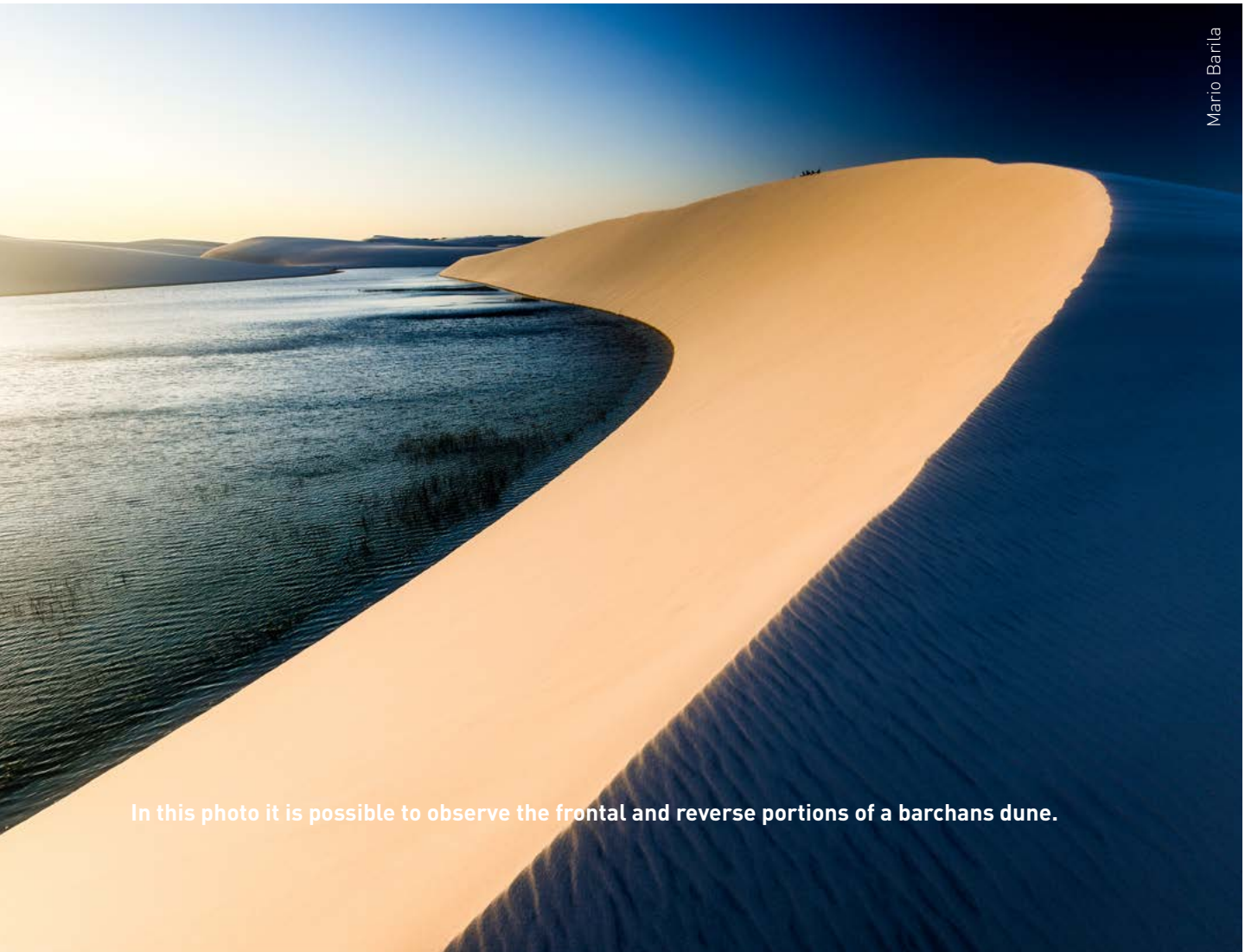
DDD (61) Phones / Fax: 2028-2039 / 2028-2192 / 2028-2056

E-mail: jose.pedro@mma.gov.br;

Web address: http://www.mma.gov.br

Mario Barila

Temporary lagoon on the way to Queimada dos Britos, during the flood season, with dunes barchans in the background.



Mario Barila

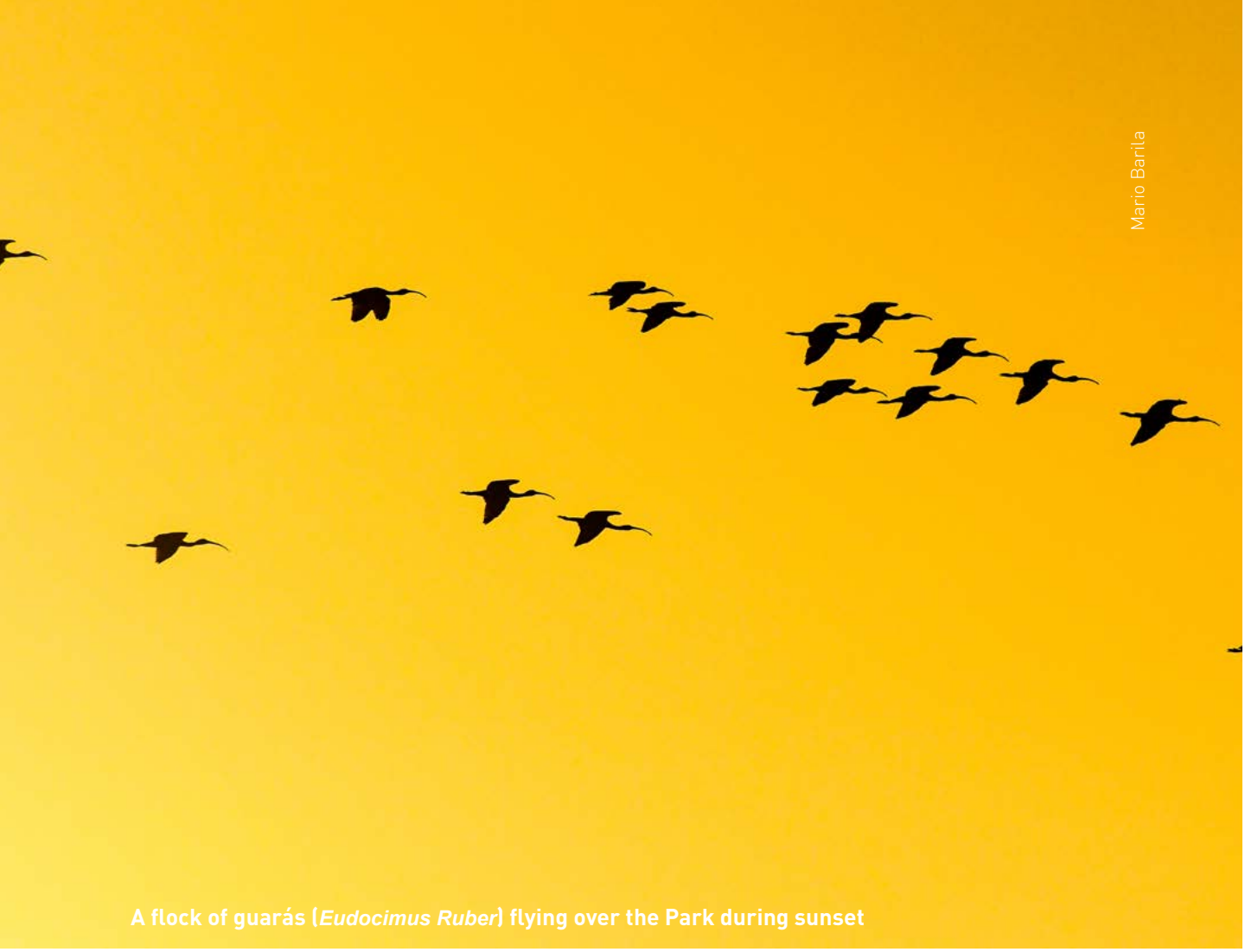
In this photo it is possible to observe the frontal and reverse portions of a barchans dune.

Mario Barila

Aerial view during the rainy season showing the alignment and coalescence of the barchan dunes due to the large amount of material available for movement.

Mario Barila

Queimada dos Britos aerial photo taken during the wet season, one of the two large areas located in the primitive zone of the park that shelters restinga vegetation and permanent lagoons. In the background, the Atlantic Ocean.



Mario Barila

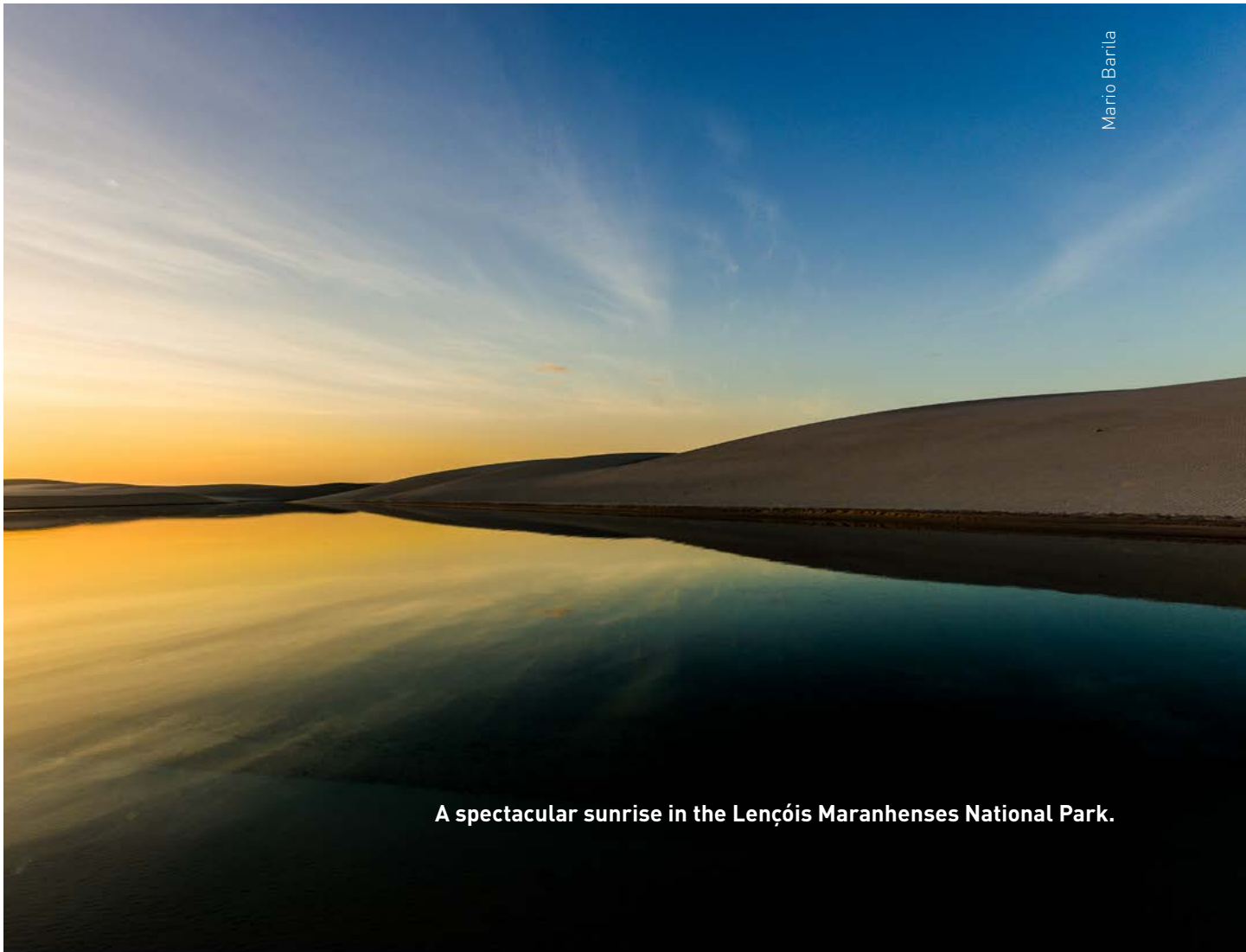
A flock of guarás (*Eudocimus Ruber*) flying over the Park during sunset

Mario Barila

A spectacular sunset by Lençóis Maranhenses beach. The scenic set of the Park is one of its main attractions.

Drone

Dune field during the dry season. Temporary ponds completely disappear, making the landscape resemble a desert.



Mario Barila

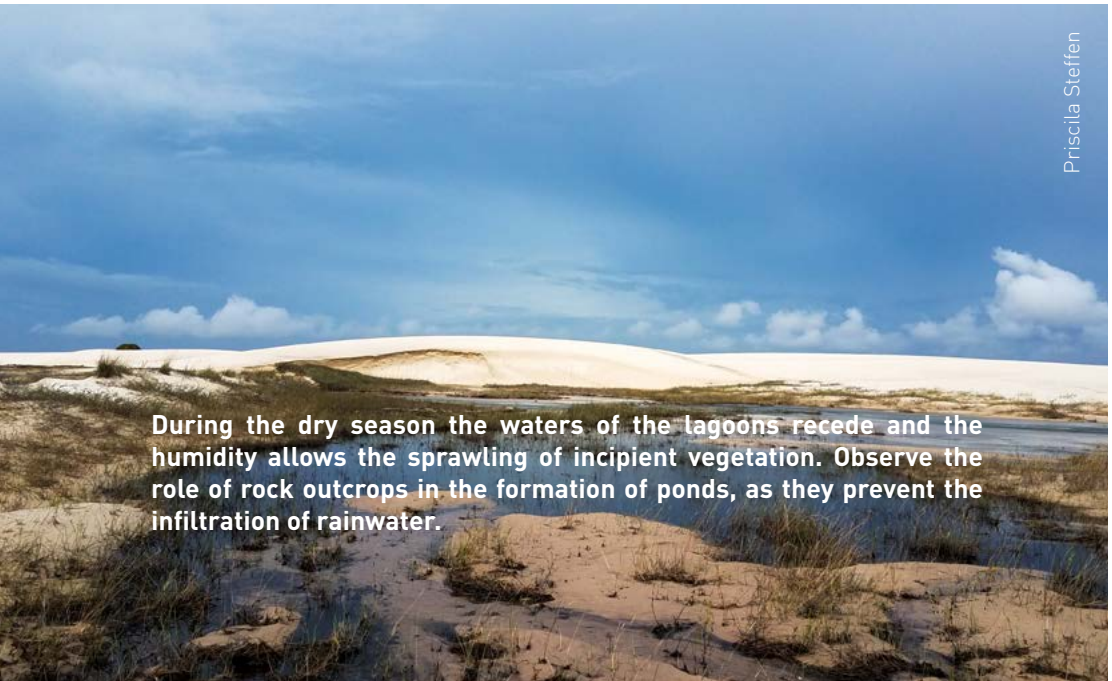
A spectacular sunrise in the Lençóis Maranhenses National Park.

Priscila Steffen

Restinga vegetation located inside the Lençóis Maranhenses National Park, bordering the dunes field.

Priscila Steffen

Boundary between restinga vegetation and the dune fields.



Priscila Steffen

During the dry season the waters of the lagoons recede and the humidity allows the sprawling of incipient vegetation. Observe the role of rock outcrops in the formation of ponds, as they prevent the infiltration of rainwater.

Priscila Steffen

Aspect of an inter-dunal pond during the dry period.

Adriano Souza

Waterfall formed by rocky outcropping in a river that crosses the dune field.

Priscila Steffen

Photo showing rock outcropping on the bottom of a temporary pond during the dry season. This layer of rock prevents the infiltration of rainwater leading to the formation of lagoons.

Mario Barila

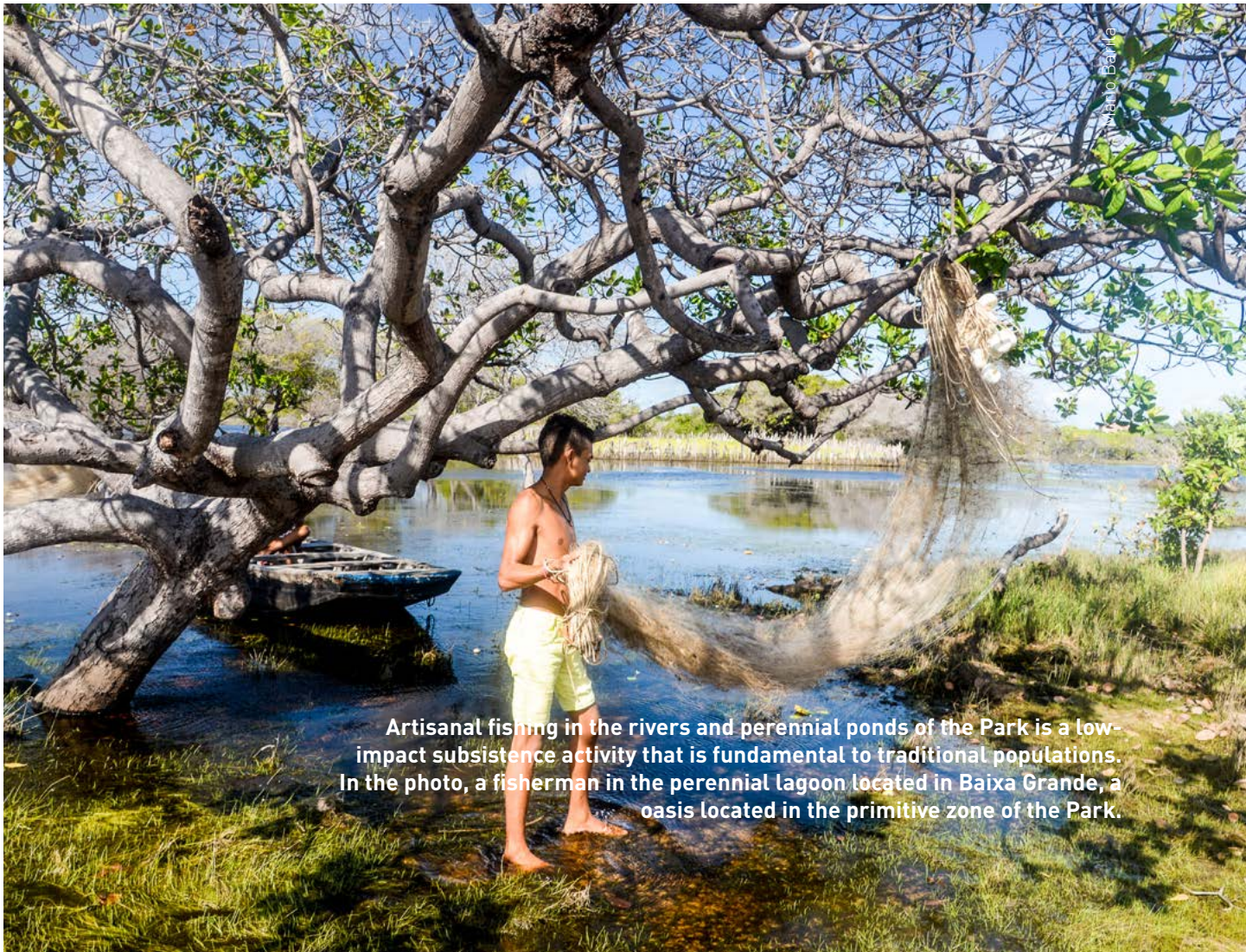
The complex of temporary ponds is formed by the Rainfall between January and July, which is retained by a layer of impermeable rock located below the dunes.

Mario Barila

Panoramic view of the dune field, with several temporary lagoons that form between the dunes, and part of one of the permanent lagoons located in Queimada dos Britos. The latter is easily identifiable in the middle of the temporary lagoons, both by the vegetation in the surroundings and in its interior, as it is not located between the barchan dunes.

Mario Barila

The Park receives constant rainfall in the period between January and July due to its proximity to the Intertropical Convergence Zone (ZCIT).



Mario Barila

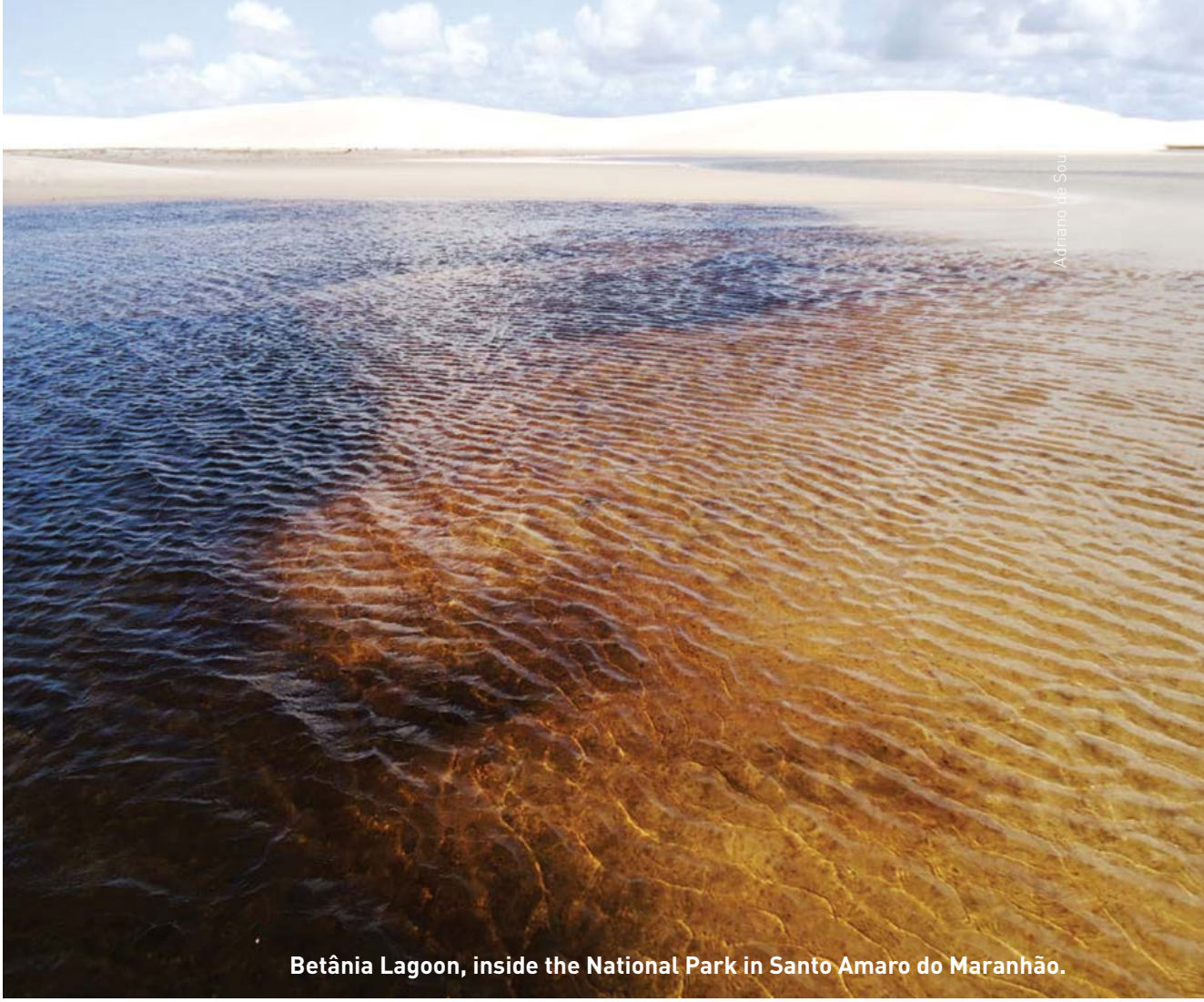
Artisanal fishing in the rivers and perennial ponds of the Park is a low-impact subsistence activity that is fundamental to traditional populations. In the photo, a fisherman in the perennial lagoon located in Baixa Grande, a oasis located in the primitive zone of the Park.

Adriano de Souza

Sunset at the National Park.

Mario Barila

Isolated lagoons are commonly formed between the dunes and are true open-water freshwater pools



Adriano de Souza

Betânia Lagoon, inside the National Park in Santo Amaro do Maranhão.

Adriano de Souza

Grande Lençóis beach, in Barreirinhas

Secretaria Estadual de Turismo - MA

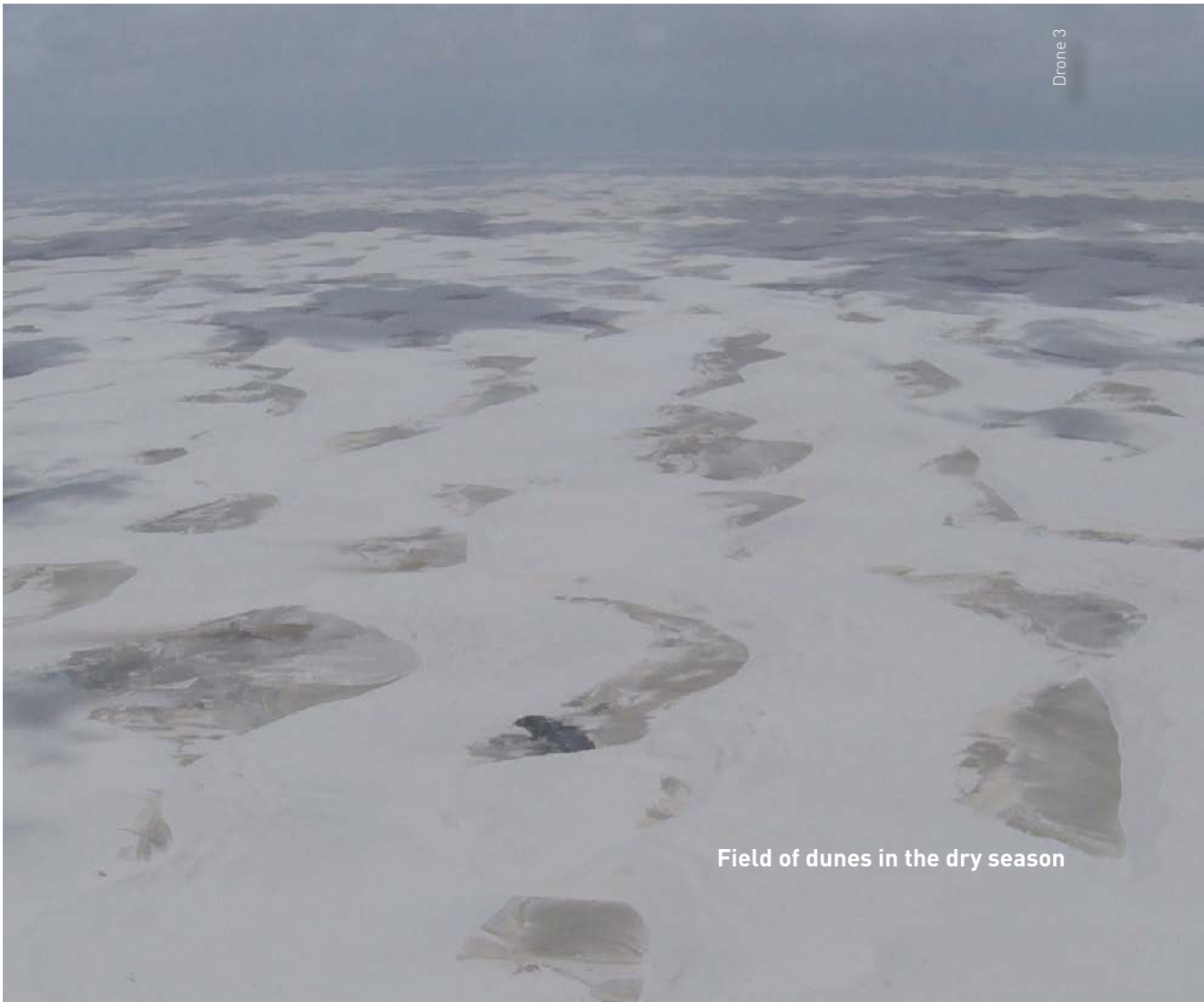
Lençóis Maranhenses May 26, 2008

Secretaria Estadual de Turismo - MA

Tourists dipping into a temporary lagoon with clear waters.

Jeff AVA

The unique and stunning landscape of Lençóis Maranhense seen from above.



Drone 3

Field of dunes in the dry season

Mario Barila

Wavy marks of mobile, wind-formed dunes near the banks of a temporary lagoon

Mario Barila

A specimen of freshwater turtle of the Trachemys adiutrix species (pininga), endemic to Lençóis Maranhenses.

Mario Barila

A capuchin monkey (Cebus calls), a primate present in the National Park area.

Priscila Steffen

Restinga tree species.

Priscila Steffen

Typical restinga flower.

Priscila Steffen

Humphylic communities between the dune strands.

Priscila Steffen

Restinga vegetation fixed on the sandy soil at the interior of the Primitive Area of the PNLM.

Priscila Steffen

Restinga vegetation fruit.

Priscila Steffen

A large and in excellent preservation condition mangrove, in the banks of the Periá River.

Sea turtle

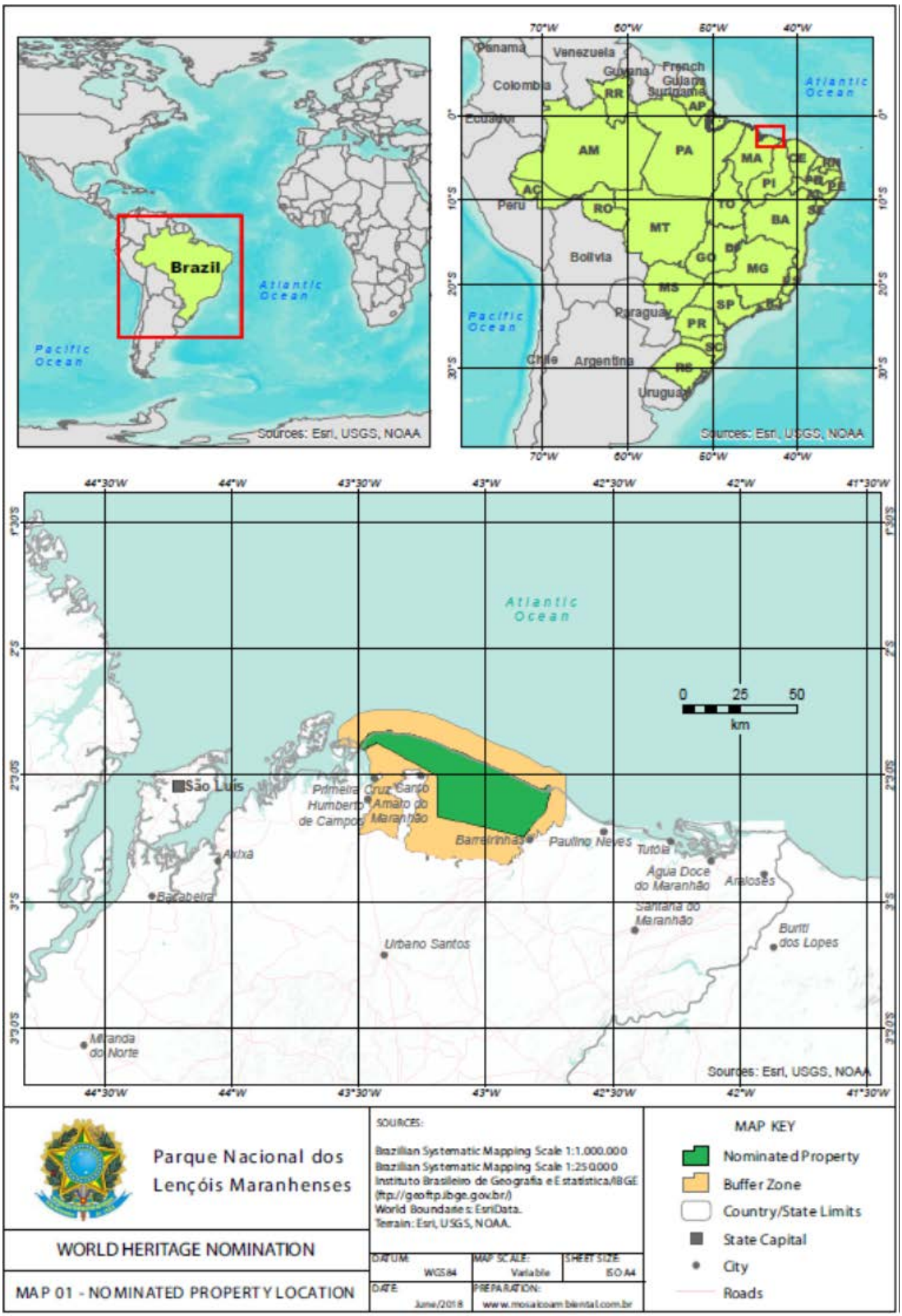
Adriano Souza

Baixa Grande locality.

Priscila Steffen

Pininga turtle (Trachemys adiutrix)

MAPS



Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

MAP 01 - NOMINATED PROPERTY LOCATION

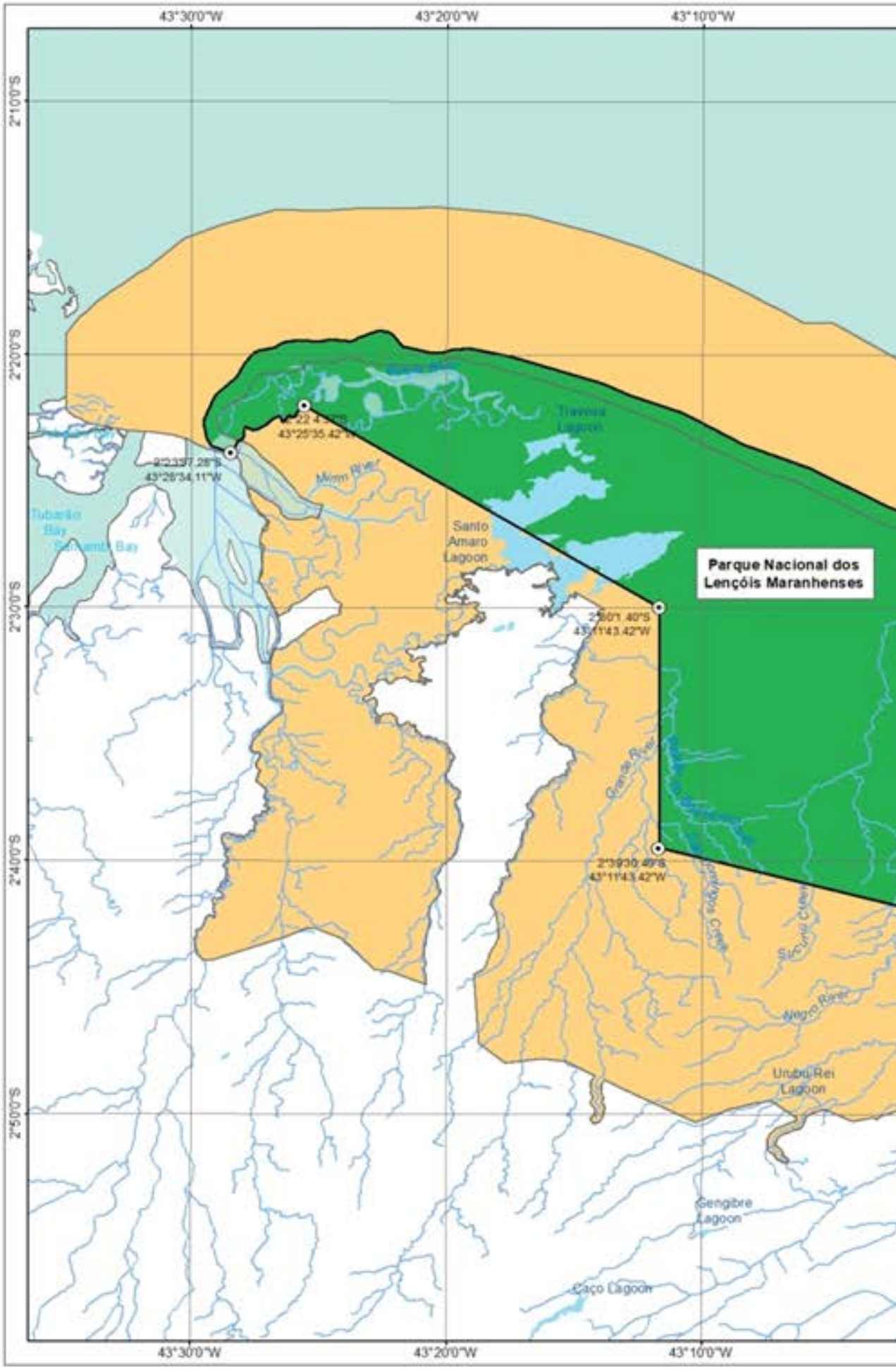
SOURCES:

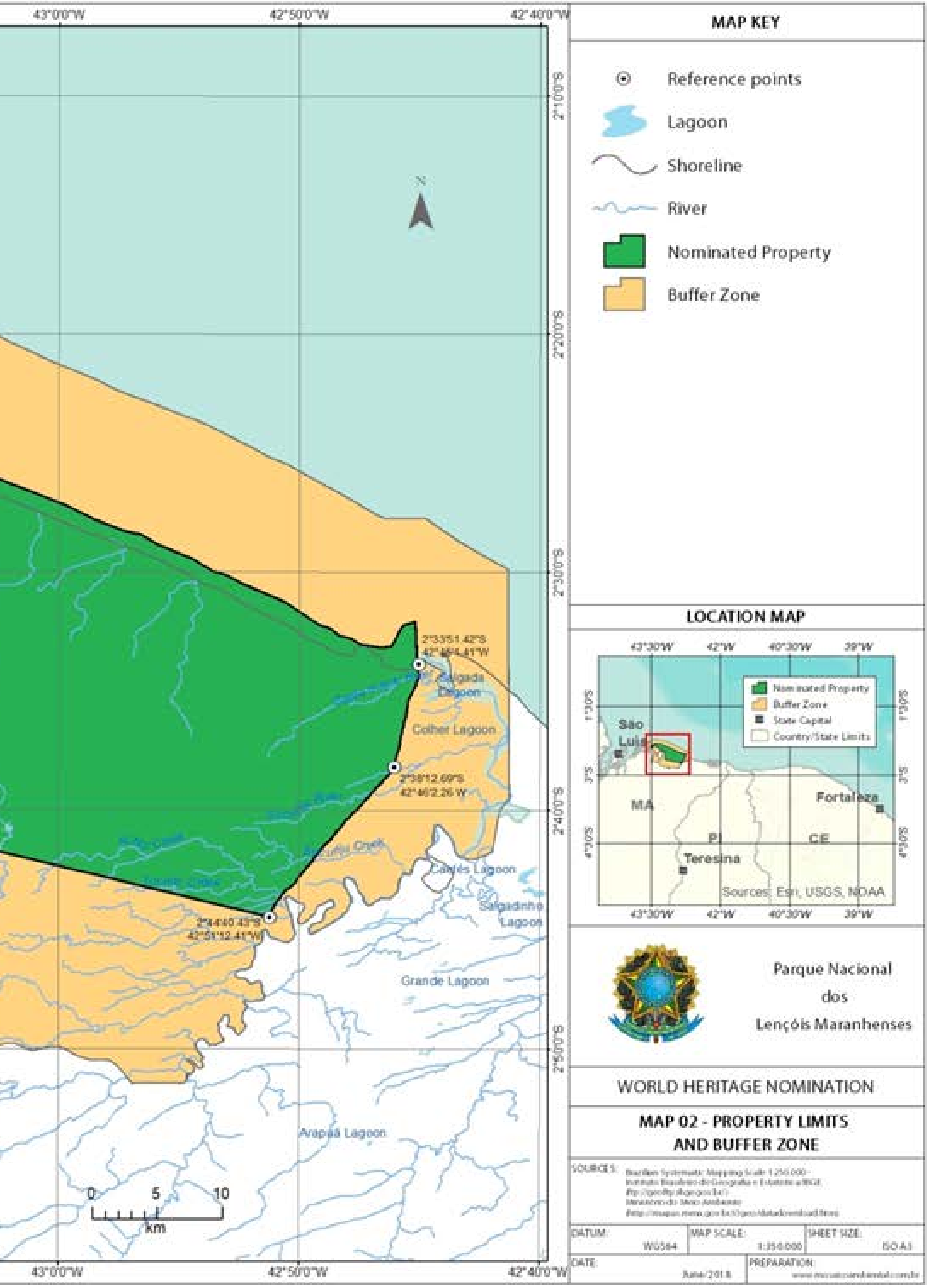
Brazilian Systematic Mapping Scale 1:1.000.000
Brazilian Systematic Mapping Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (ftp://geoftp.ibge.gov.br/)
World Boundaries: EsriData.
Terrain: Esri, USGS, NOAA.

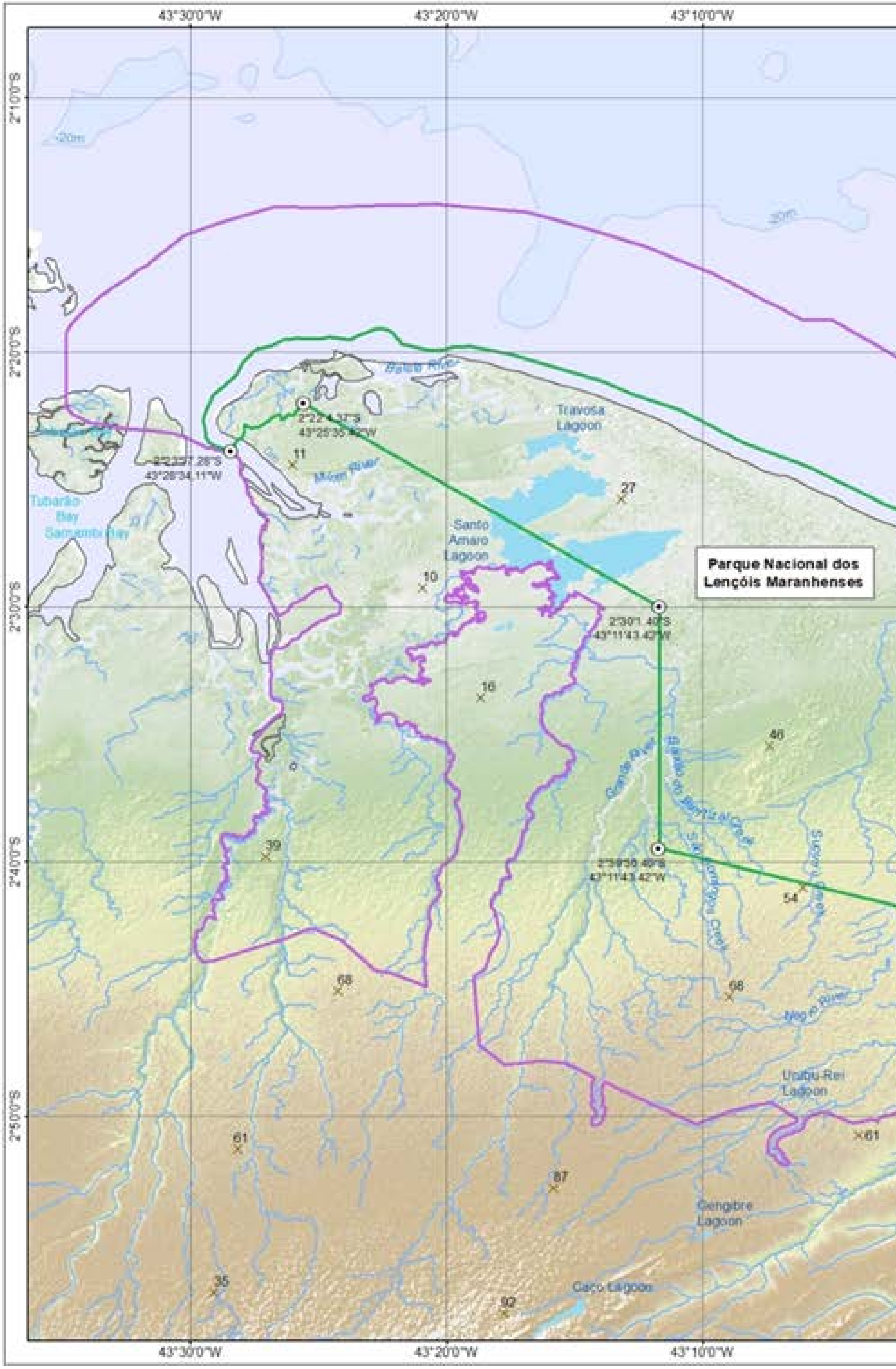
DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	Variable	ISO A4
DATE: June/2018	PREPARATION: www.mosaicoambiental.com.br	

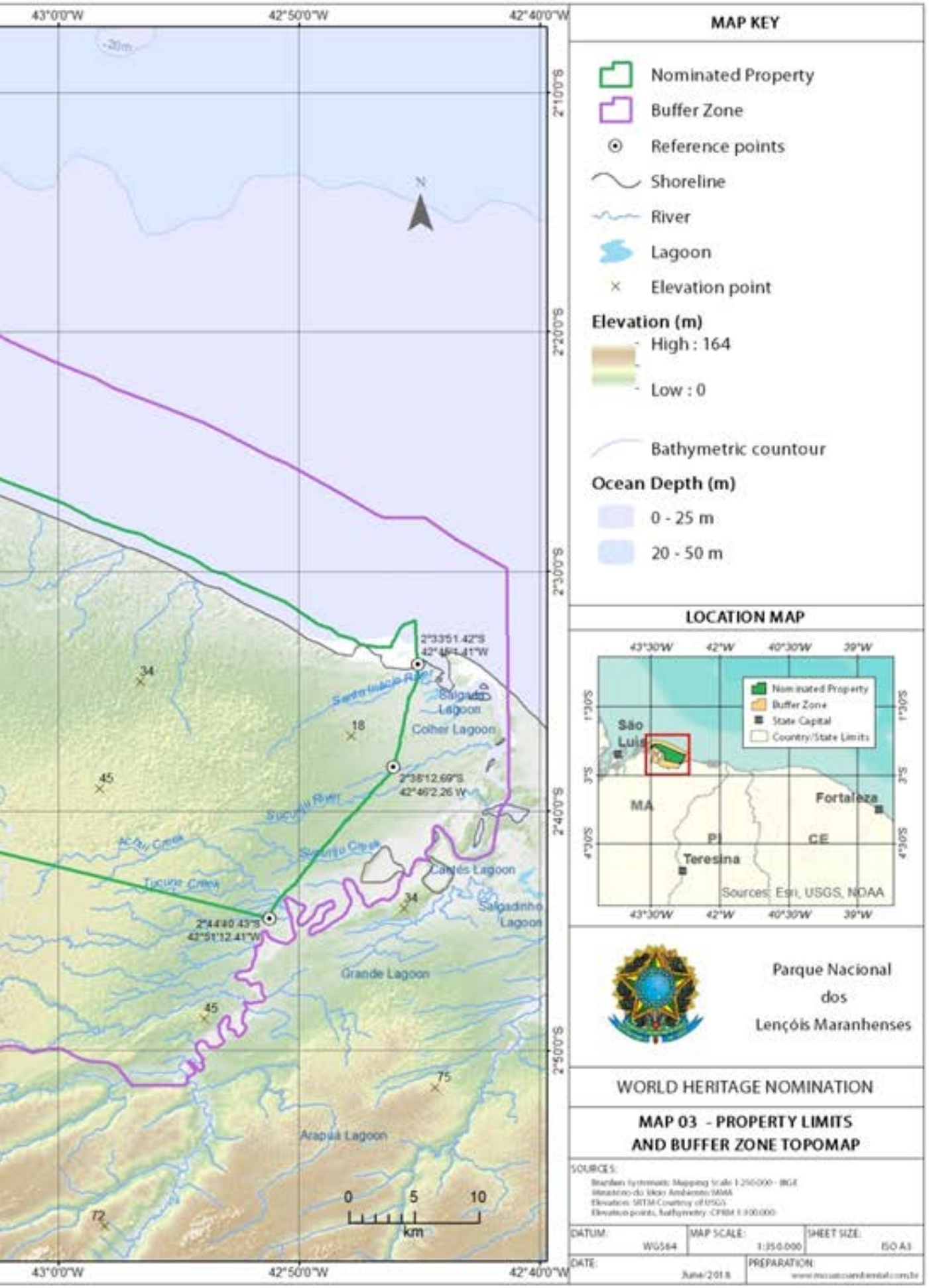
MAP KEY

- Nominated Property
- Buffer Zone
- Country/State Limits
- State Capital
- City
- Roads


43°30'0"W
43°20'0"W
43°10'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
Parque Nacional dos Lençóis Maranhenses
Santo Amaro Lagoon
Travosa Lagoon
Mirim River
Tubarão Bay
Grande River
Negro River
Urubu Rei Lagoon
Gengibre Lagoon
Caço Lagoon


MAP KEY
Reference points
Lagoon
Shoreline
River
Nominated Property
Buffer Zone
LOCATION MAP
Nominated Property
Buffer Zone
State Capital
Country/State Limits
São Luís
MA
PI
CE
Fortaleza
Teresina
Sources: Esri, USGS, NOAA
43°30'W
42°W
40°30'W
39°W
1°30'S
3°S
4°30'S
Parque Nacional dos Lençóis Maranhenses
WORLD HERITAGE NOMINATION
MAP 02 - PROPERTY LIMITS AND BUFFER ZONE
SOURCES:
DATUM: WGS84
MAP SCALE: 1:350.000
SHEET SIZE: ISO A3
DATE: June/2018
PREPARATION:
43°0'0"W
42°50'0"W
42°40'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
N
2°33'51.42"S
2°38'12.69"S
42°46'2.26"W
2°44'40.43"S
42°51'12.41"W
Salgada Lagoon
Colher Lagoon
Cantês Lagoon
Salgadinho Lagoon
Grande Lagoon
Arapuá Lagoon
0
5
10
km


43°30'0"W
43°20'0"W
43°10'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
-20m
Travosa Lagoon
Santo Amaro Lagoon
Parque Nacional dos Lençóis Maranhenses
2°22'4.37"S 43°25'35.82"W
2°23'27.28"S 43°28'34.11"W
2°30'1.40"S 43°11'43.42"W
2°39'30.49"S 43°11'43.42"W
Tubarão Bay
Urubu Rei Lagoon
Gengibre Lagoon
Grande River
Negro River
11
27
10
16
46
39
54
68
66
61
87
35
92



MAP KEY

- Nominated Property
- Buffer Zone
- Reference points
- Shoreline
- River
- Lagoon
- Elevation point

Elevation (m)

- High : 164
- Low : 0

- Bathymetric countour

Ocean Depth (m)

- 0 - 25 m
- 20 - 50 m

LOCATION MAP

Parque Nacional dos Lençóis Maranhenses

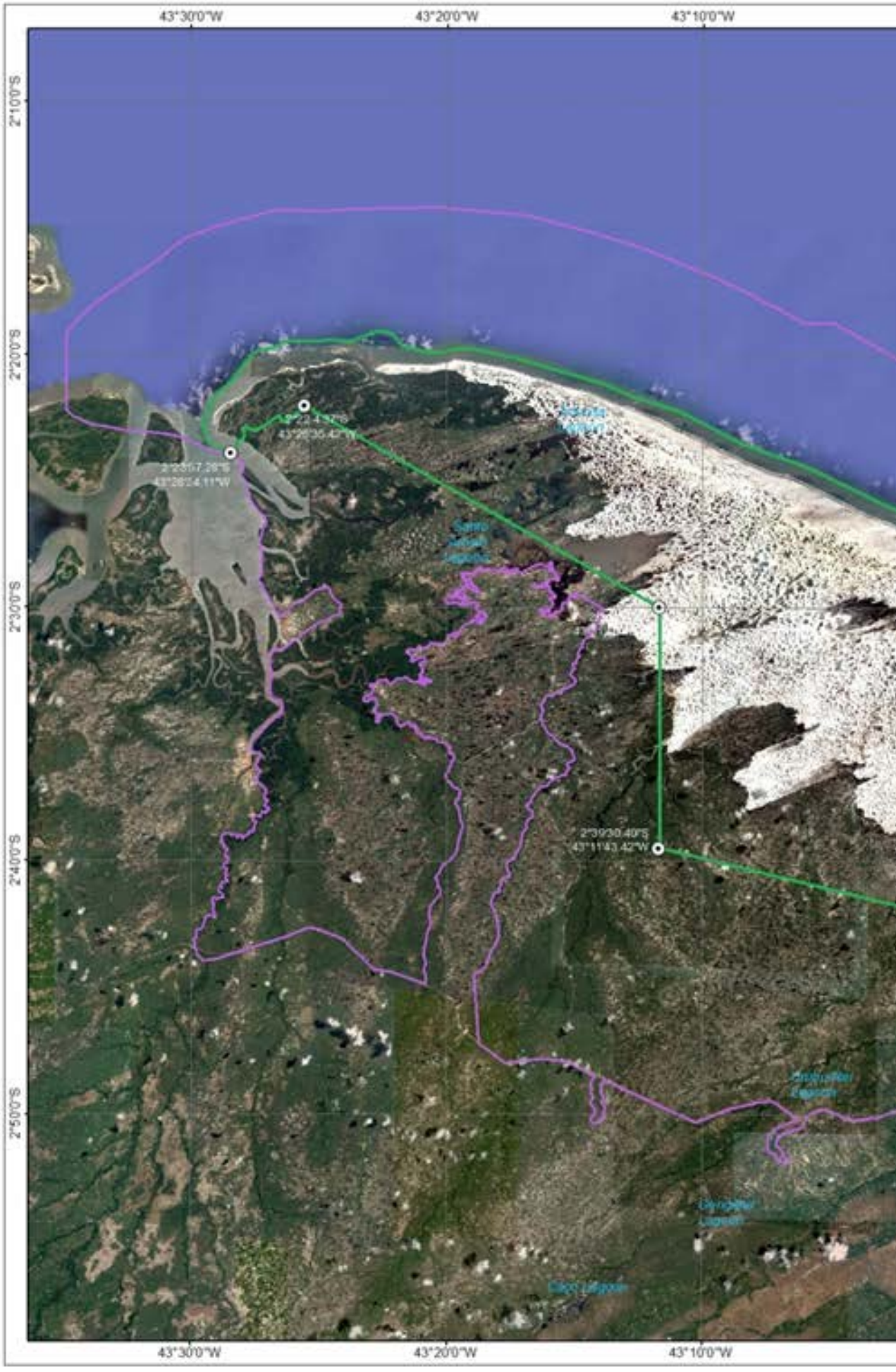
WORLD HERITAGE NOMINATION

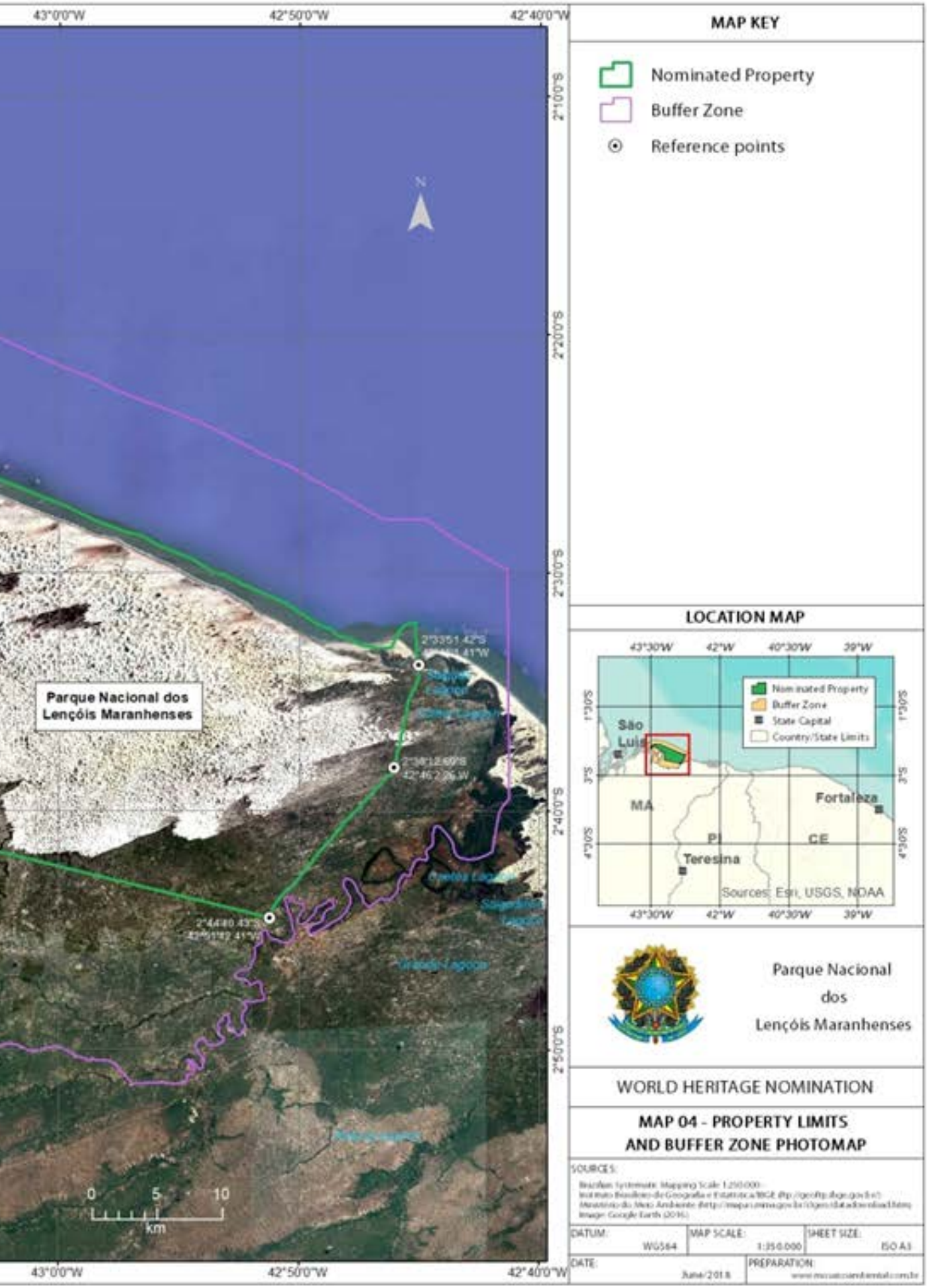
MAP 03 - PROPERTY LIMITS AND BUFFER ZONE TOPOMAP

SOURCES:
Brazilian Systematic Mapping Scale 1:250.000 - IBGE
Ministério do Meio Ambiente/MMA
Elevation: SRTM Courtesy of USGS
Elevation points, bathymetry: CPRM 1:100.000

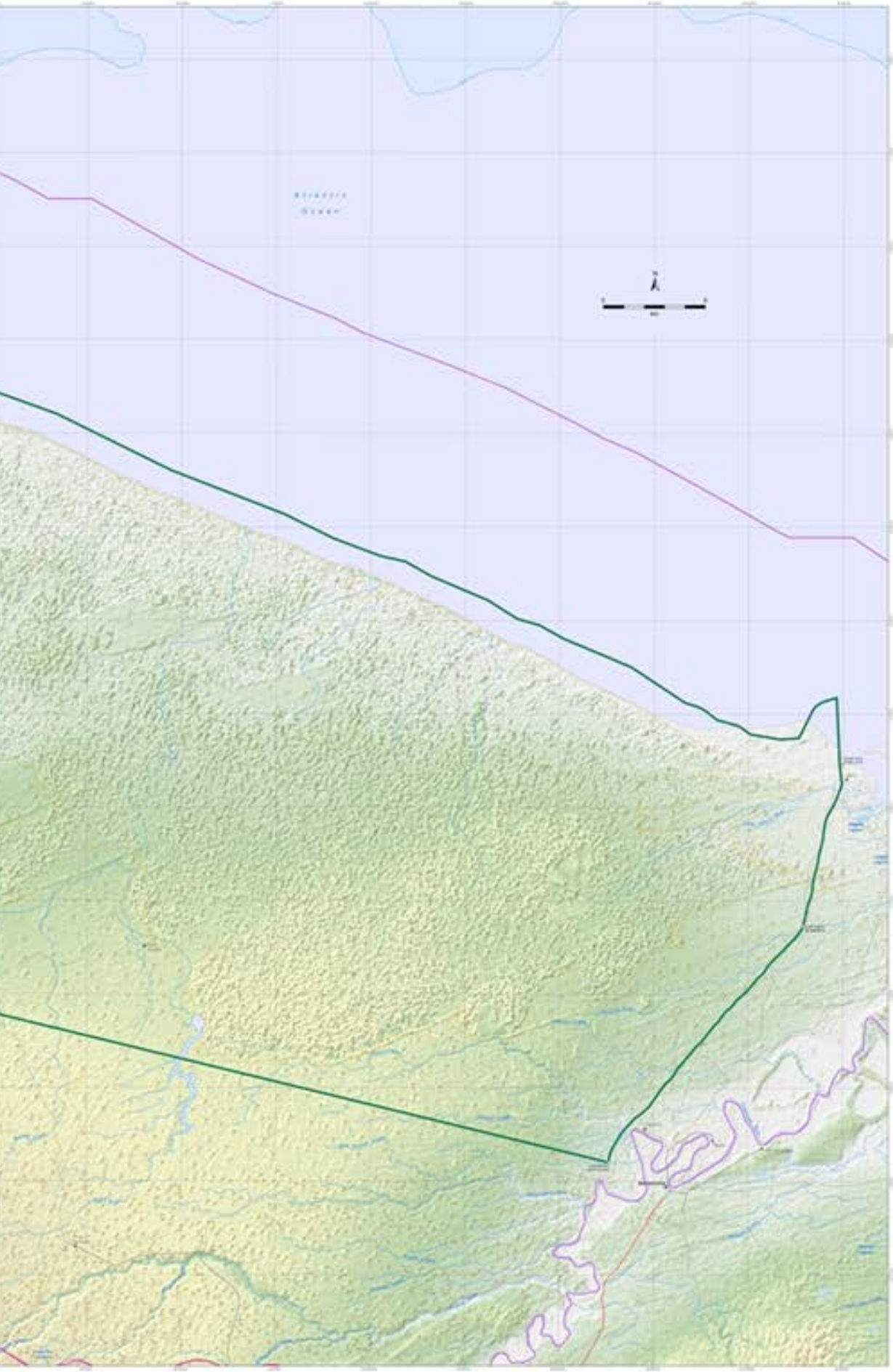
DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:350.000	ISO A3

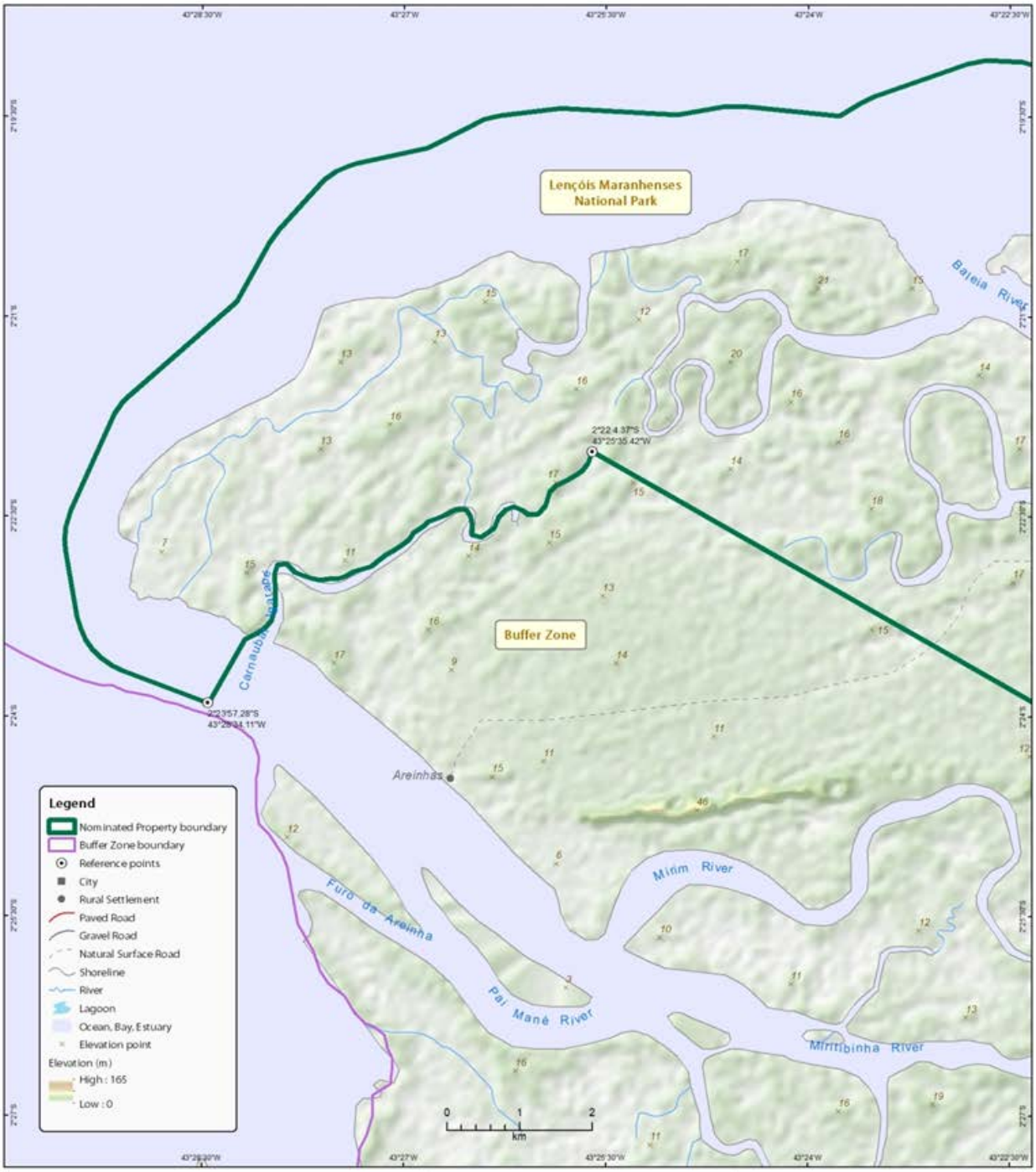
DATE:	PREPARATION:
June/2018	www.mscsustainabilitysolutions.com.br


43°30'0"W
43°20'0"W
43°10'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
2°39'30.40"S
43°11'43.42"W


43°0'0"W
42°50'0"W
42°40'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
N
Parque Nacional dos Lençóis Maranhenses
0
5
10
km
MAP KEY
Nominated Property
Buffer Zone
Reference points
LOCATION MAP
43°30'W
42°W
40°30'W
39°W
1°30'S
3°S
4°30'S
Nominated Property
Buffer Zone
State Capital
Country/State Limits
São Luís
MA
PI
CE
Fortaleza
Teresina
Sources: Esri, USGS, NOAA
Parque Nacional dos Lençóis Maranhenses
WORLD HERITAGE NOMINATION
MAP 04 - PROPERTY LIMITS AND BUFFER ZONE PHOTOMAP
SOURCES:
DATUM: WGS84
MAP SCALE: 1:350.000
SHEET SIZE: ISO A3
DATE: June/2018
PREPARATION


MAP KEY
LOCATION MAP
Parque Nacional dos Lençóis Maranhenses
WORLD HERITAGE NOMINATION
MAP 03 - NOMINATED PROPERTY TOPOMAP





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

MAP 05-A
1:50.000 GRID

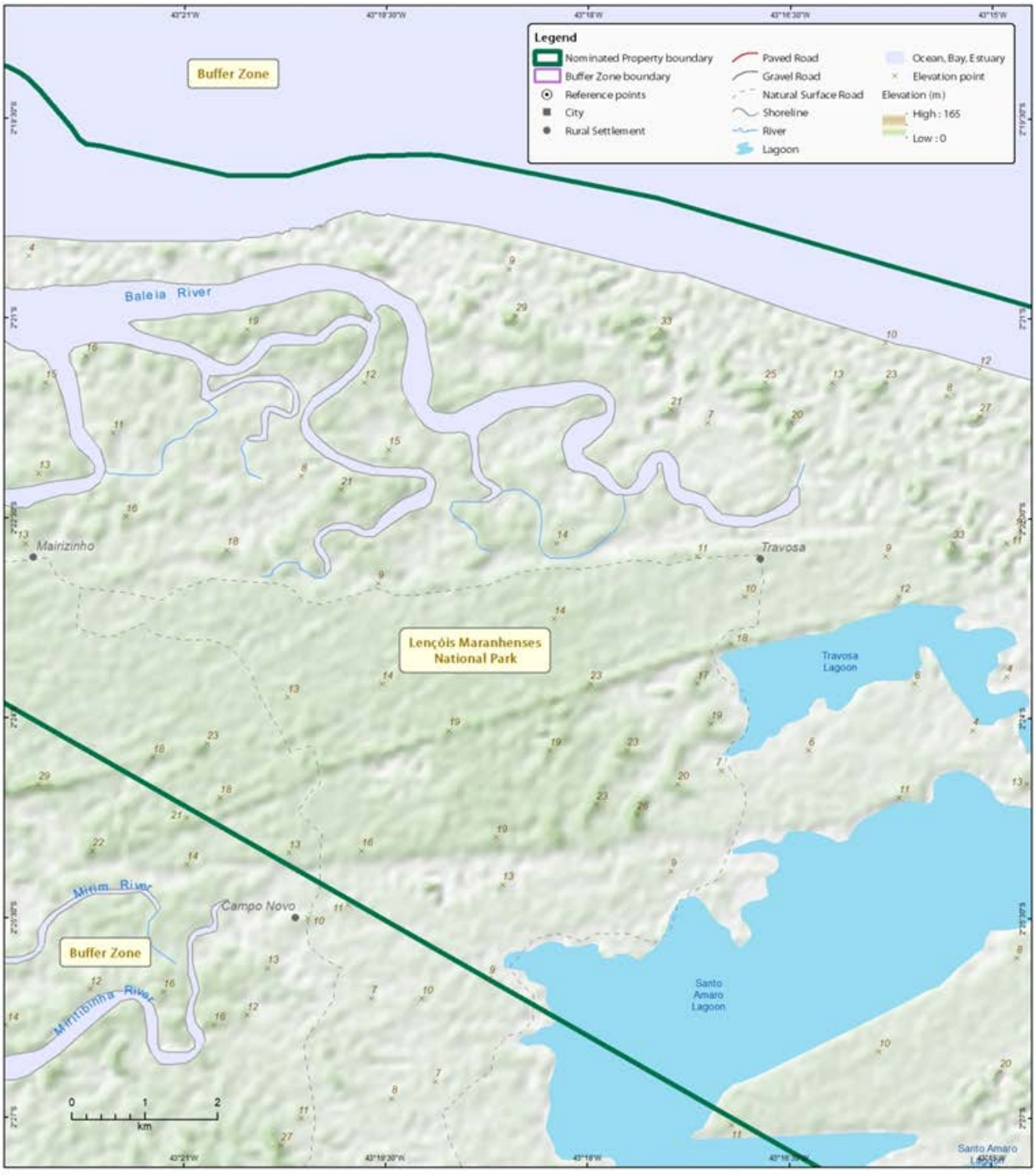
SOURCES:

Basemap: Brazilian Continuous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (http://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE

A	B	C	D	
E	F	G	H	I
	J	K	L	M



Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

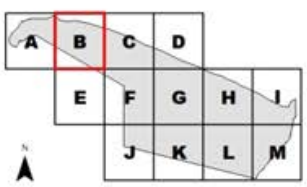
MAP 05-B
1:50.000 GRID

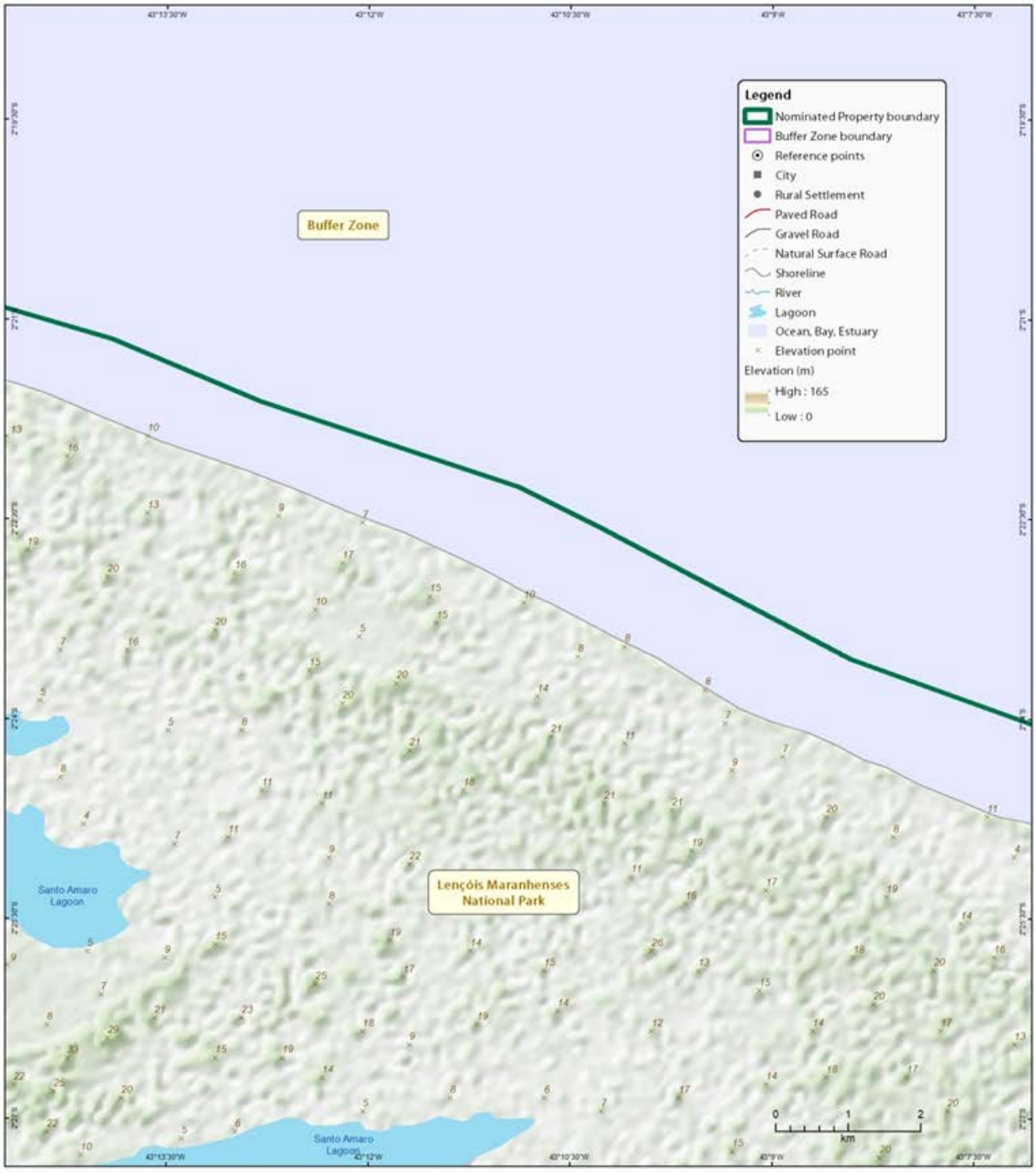
SOURCES:

Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministerio do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (https://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

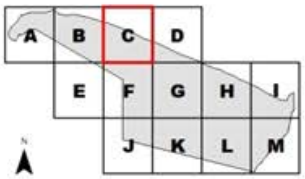
MAP 05-C
1:50.000 GRID

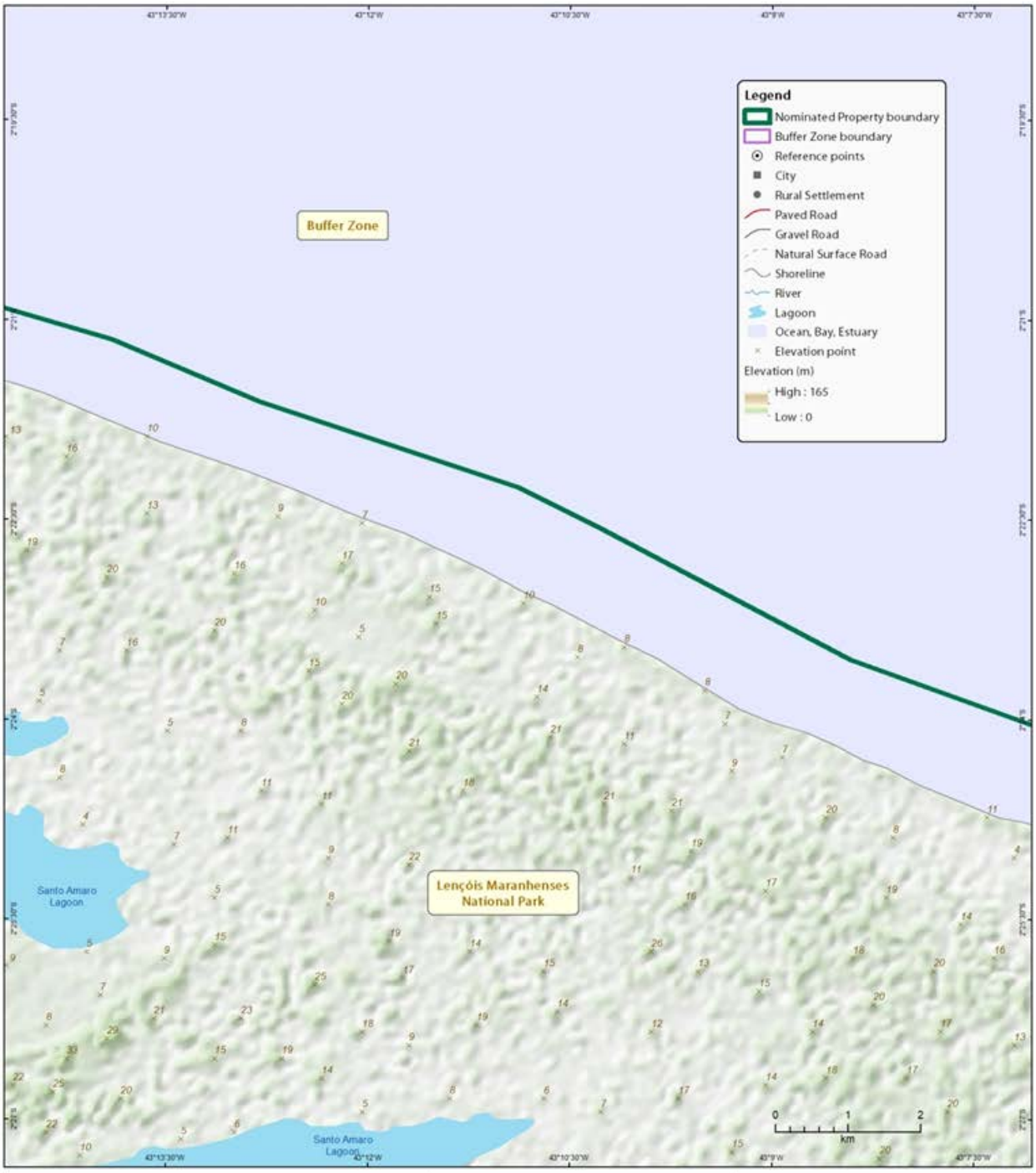
SOURCES:

Basemap: Brazilian Continuous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center
(http://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

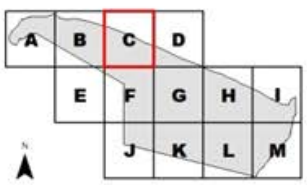
MAP 05-C
1:50.000 GRID

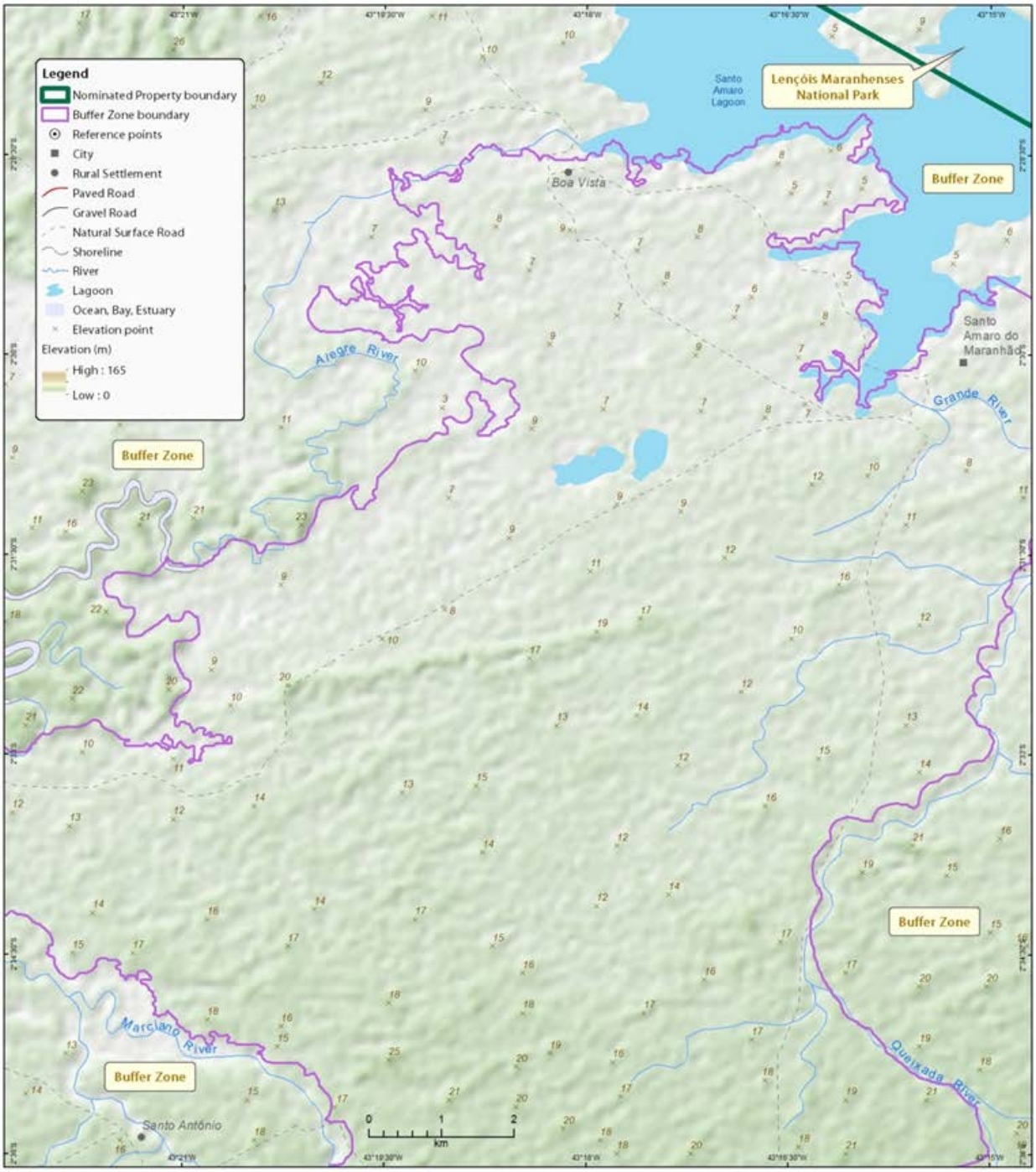
SOURCES:

Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministerio do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), US GS/Earth Resources Observation and Science (EROS) Center (https://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

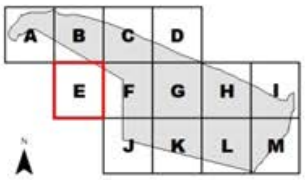
MAP 05-E
1:50.000 GRID

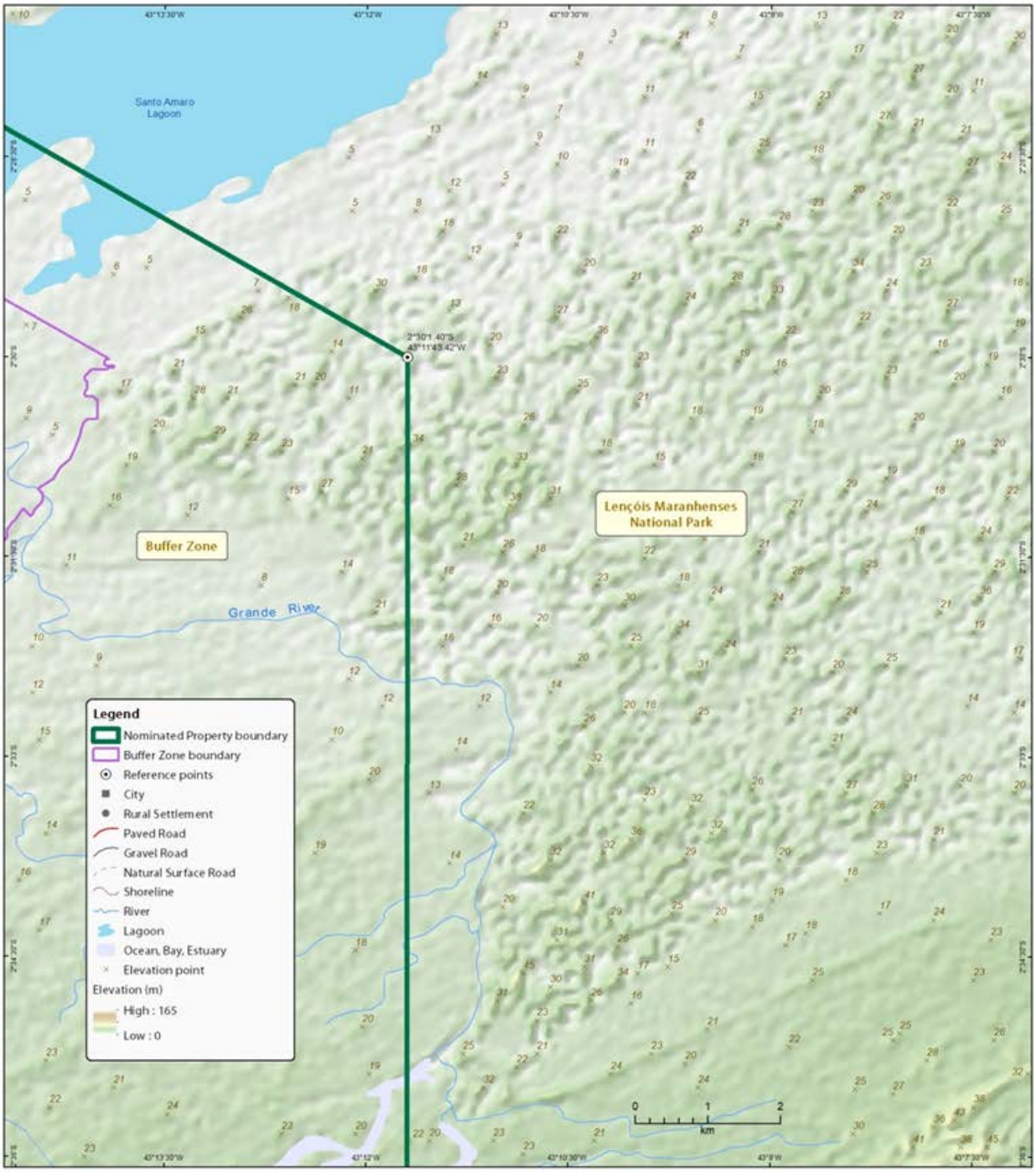
SOURCES:

Basemap: Brazilian Continuous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center
(https://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

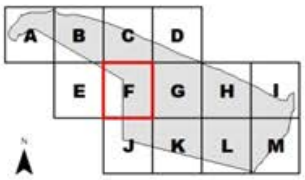
MAP 05-F
1:50.000 GRID

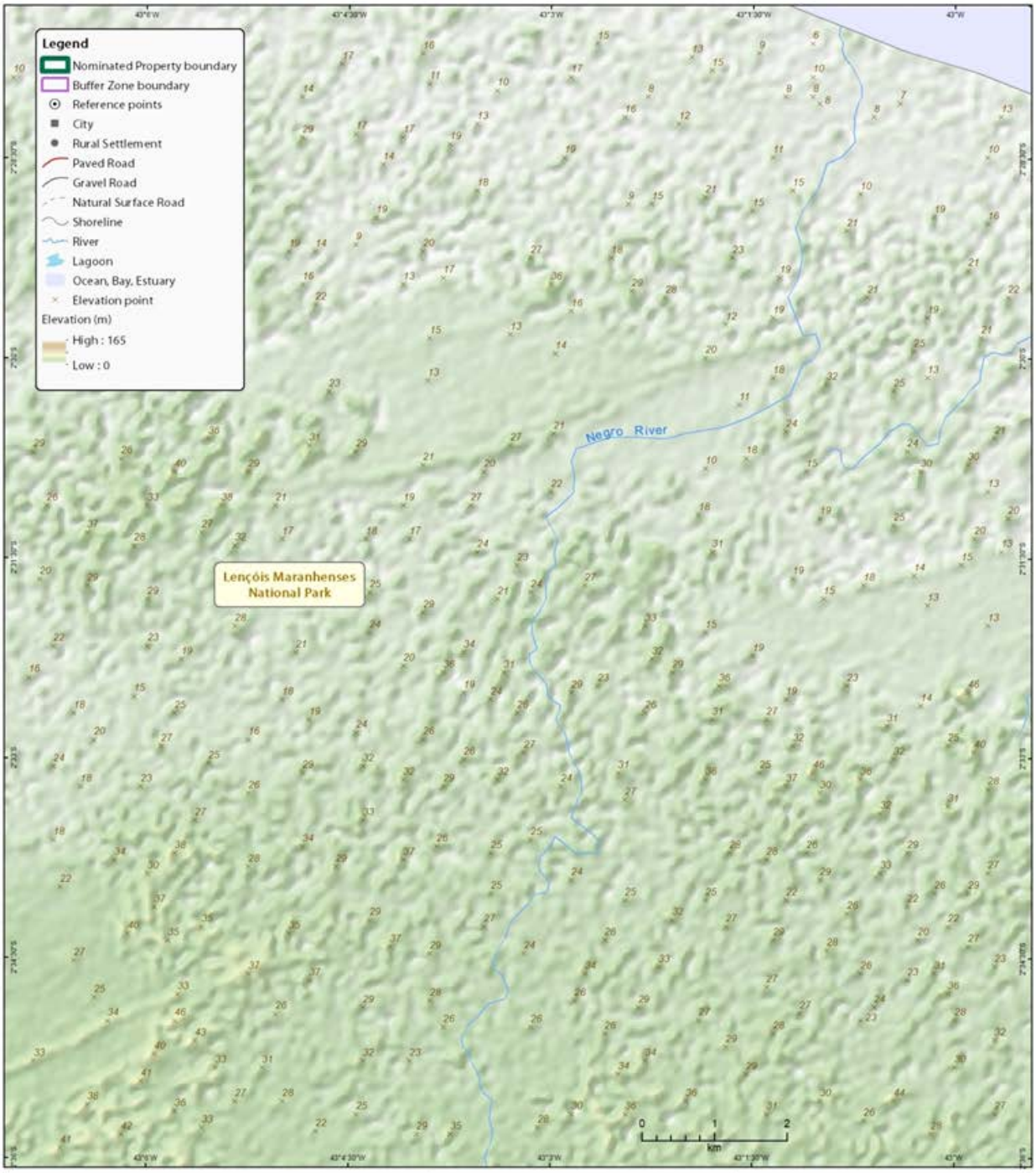
SOURCES:

Basemap: Brazilian Continuous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (http://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

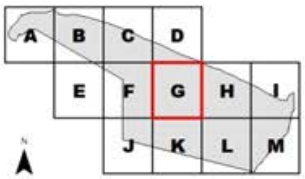
MAP 05-G
1:50.000 GRID

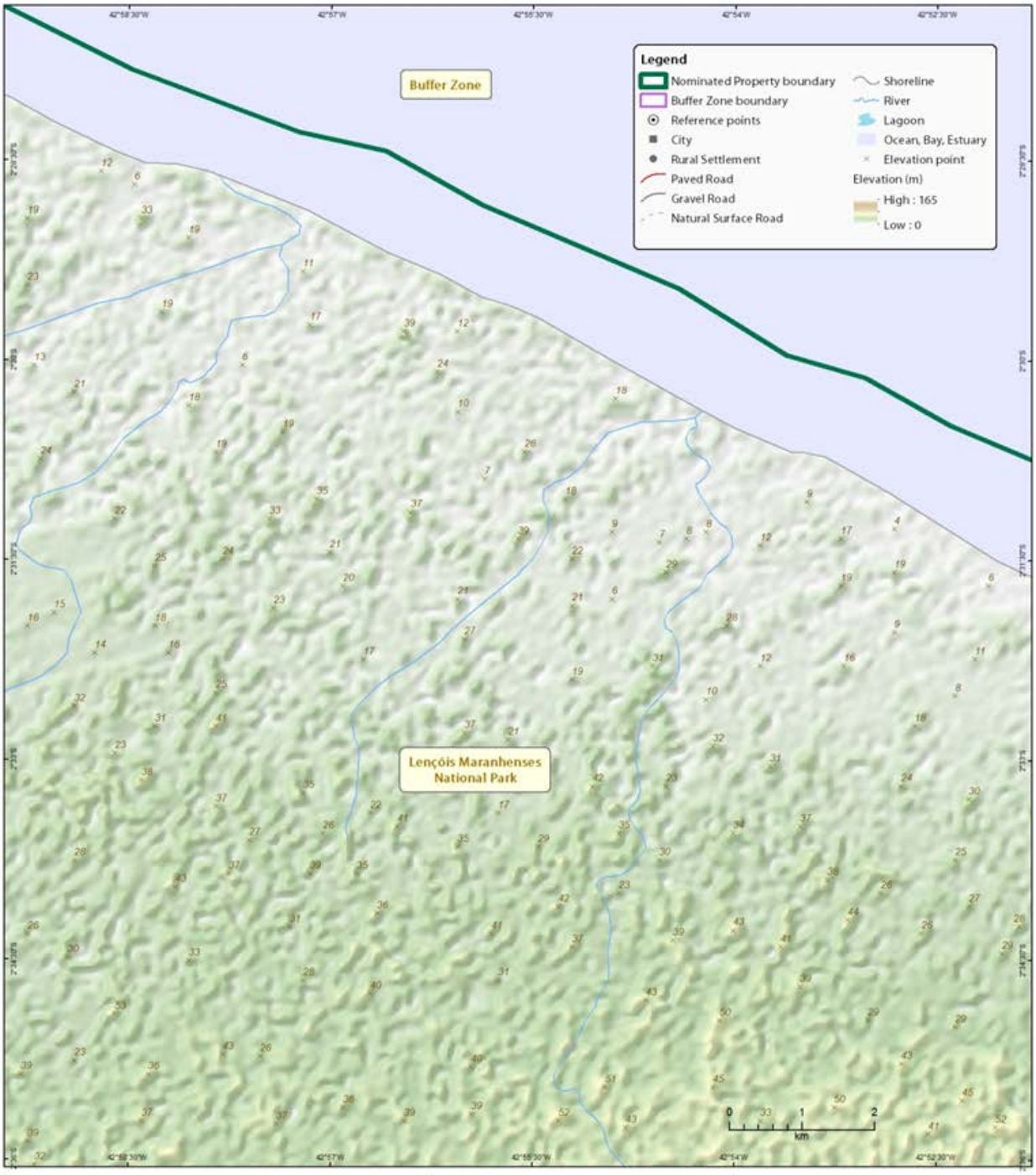
SOURCES:

Basemap: Brazilian Continuous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (https://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

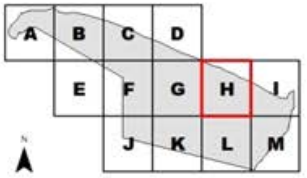
MAP 05-H
1:50.000 GRID

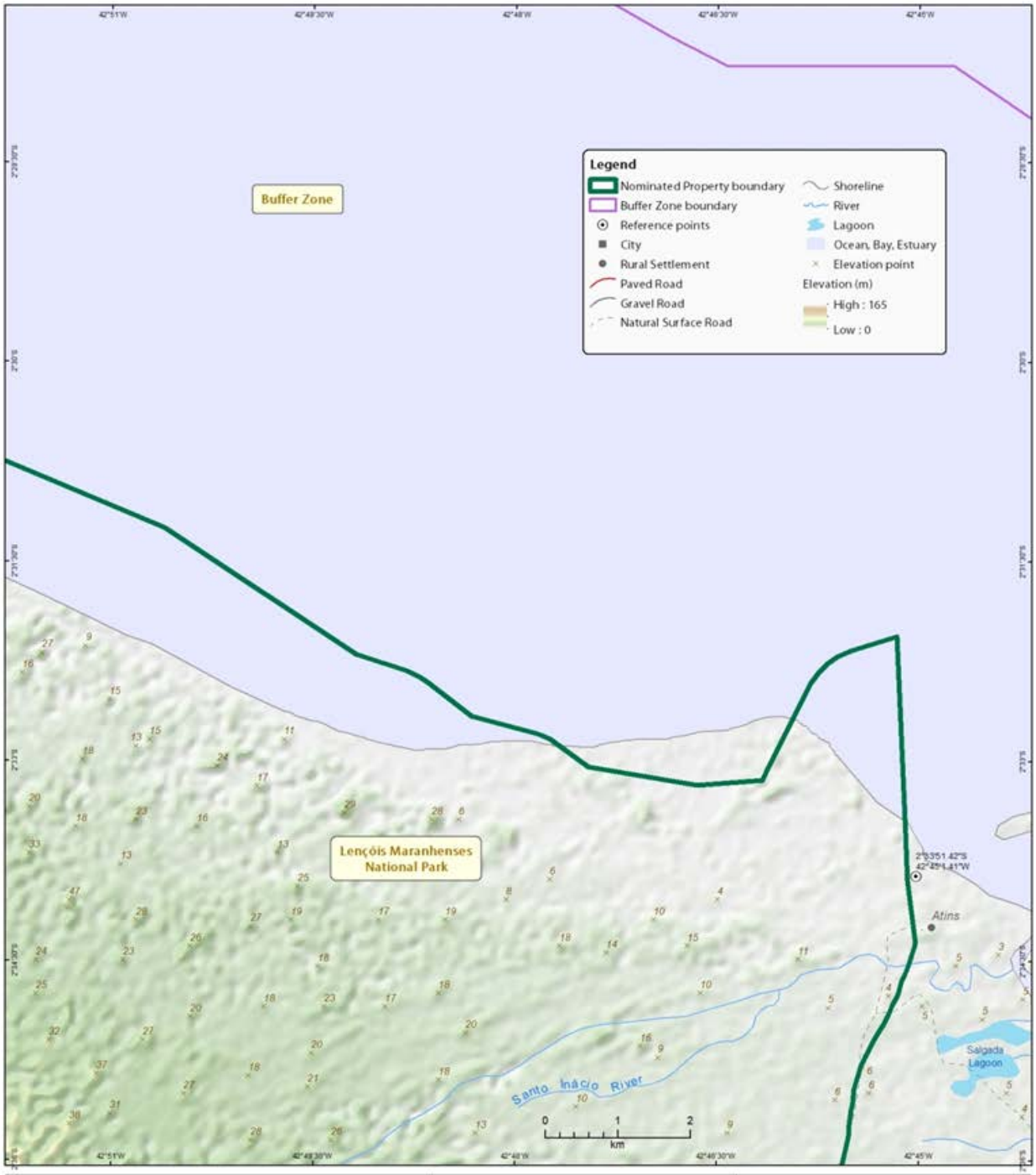
SOURCES:

Basemap: Brazilian Continuous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (http://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

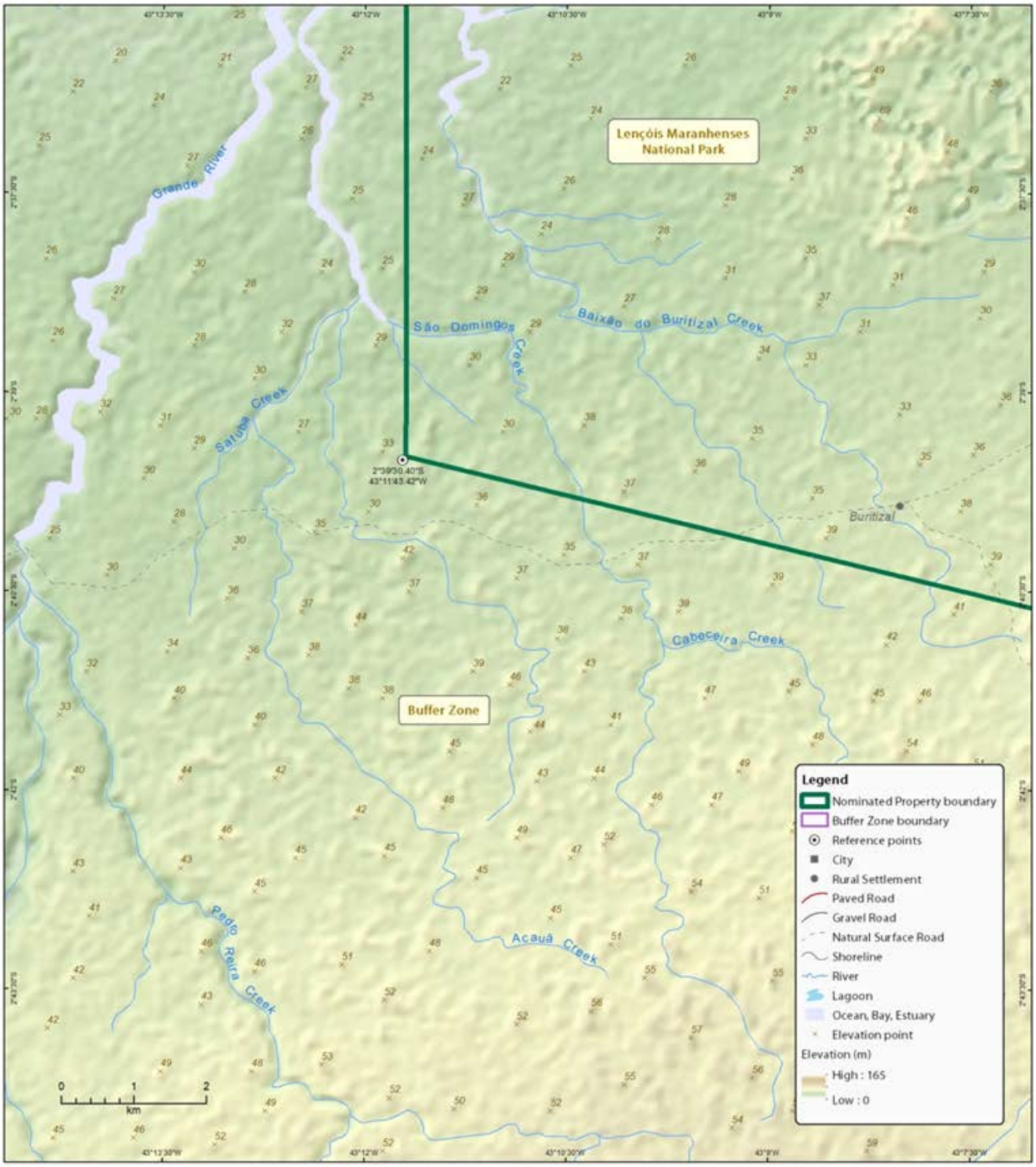
MAP 05-I
1:50.000 GRID

SOURCES:
Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (https://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE

A	B	C	D	
E	F	G	H	I
J	K	L	M	



Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

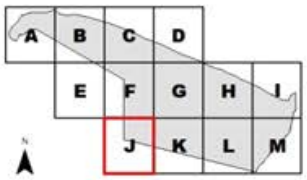
MAP 05-J
1:50.000 GRID

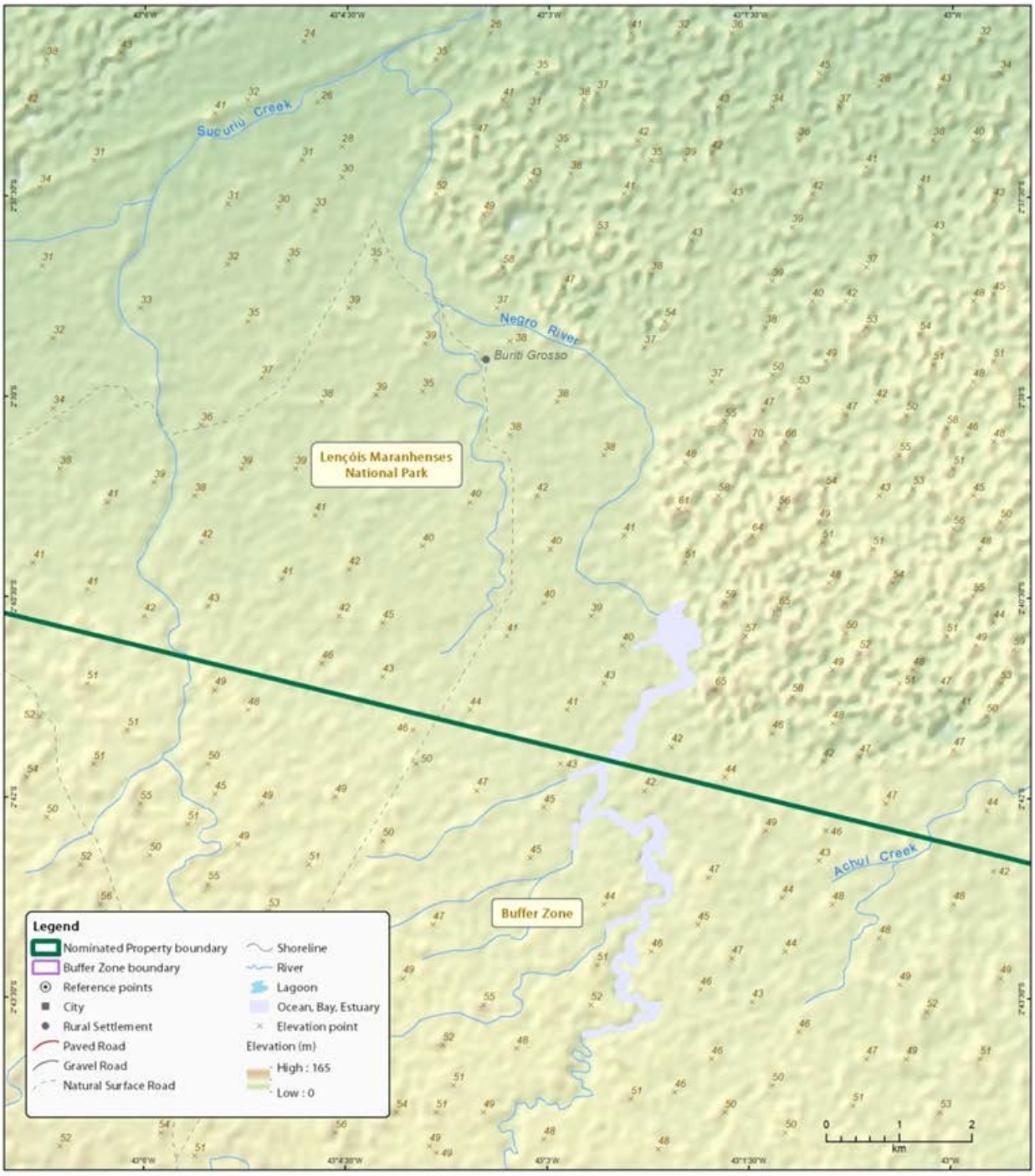
SOURCES:

Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (https://earthexplorer.usgs.gov)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

MAP 05-K
1:50.000 GRID

SOURCES:

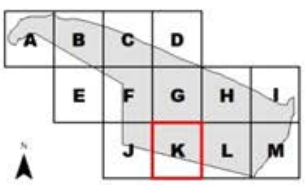
Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministerio do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (https://earthexplorer.usgs.gov)

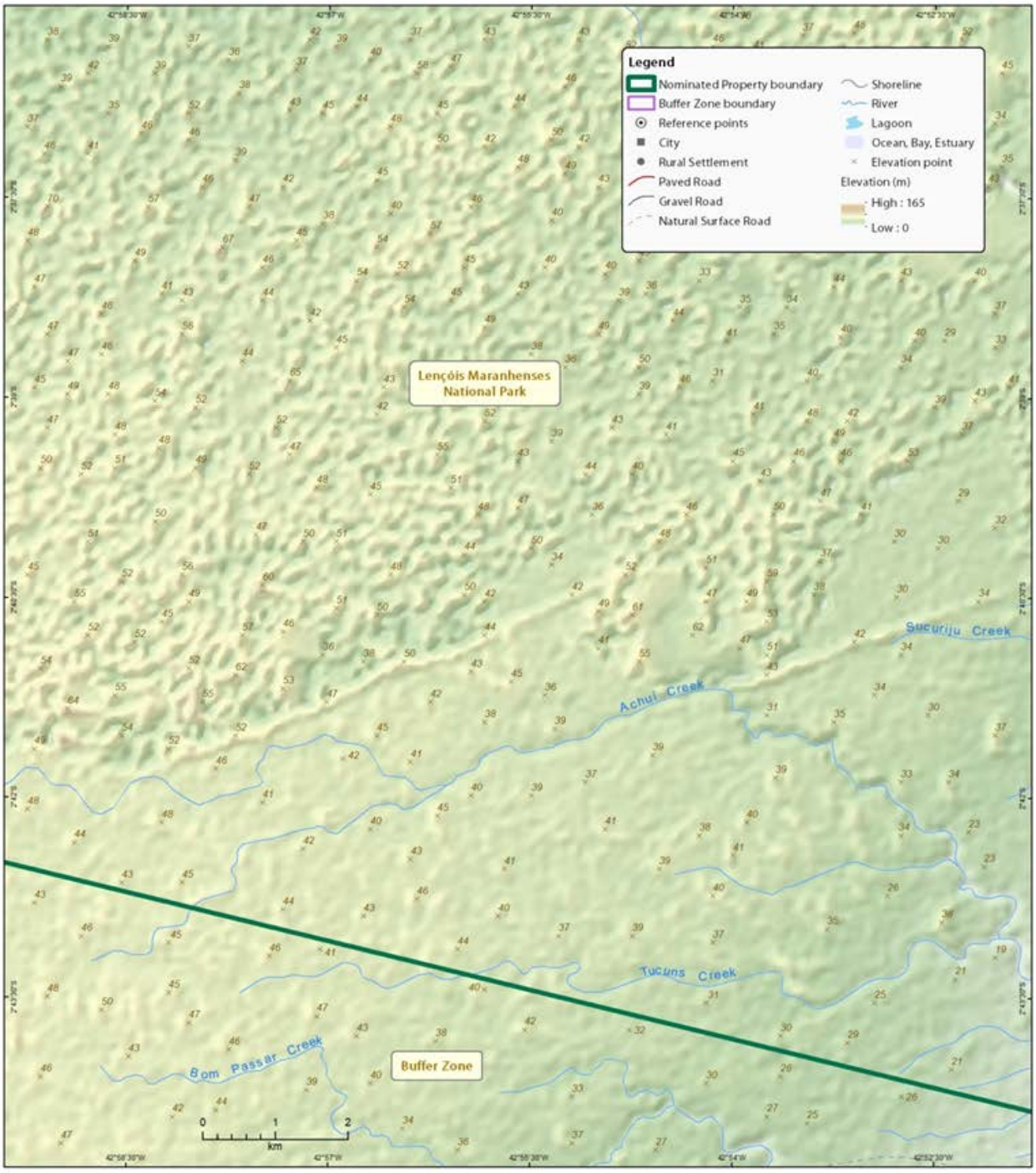
DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3

DATE: July/2018

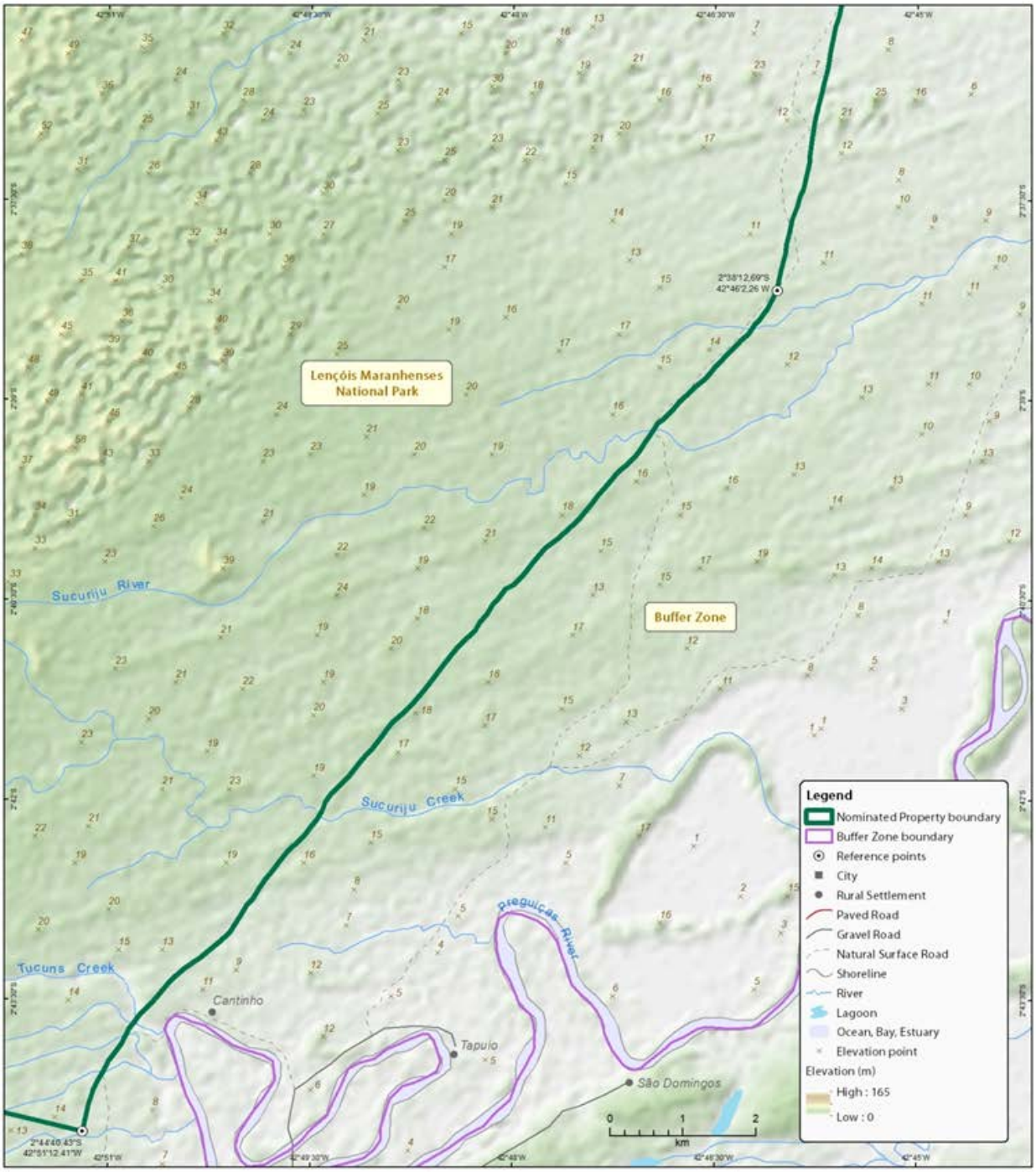
PREPARATION: www.mosaicoambiental.com.br

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses	MAP 05-L 1:50.000 GRID	MAP QUADRANGLE
WORLD HERITAGE NOMINATION	SOURCES: Basemap: Brazilian Continous Basemap Scale 1:250.000 Instituto Brasileiro de Geografia e Estatística/IBGE (2017) (ftp://geoftp.ibge.gov.br) Property and Buffer Zone Limits: Ministerio do Meio Ambiente/MMA (http://mapas.mma.gov.br/i3geo/datadownload.htm) Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (https://earthexplorer.usgs.gov)	A B C D E F G H I J K L M
NOMINATED PROPERTY TOPOMAP	DATUM: WGS84 / MAP SCALE: 1:50.000 / SHEET SIZE: ISO A3 DATE: July/2018 / PREPARATION: www.mosaicoambiental.com.br	



Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY TOPOMAP

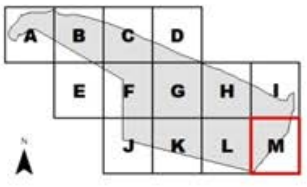
MAP 05-M
1:50.000 GRID

SOURCES:

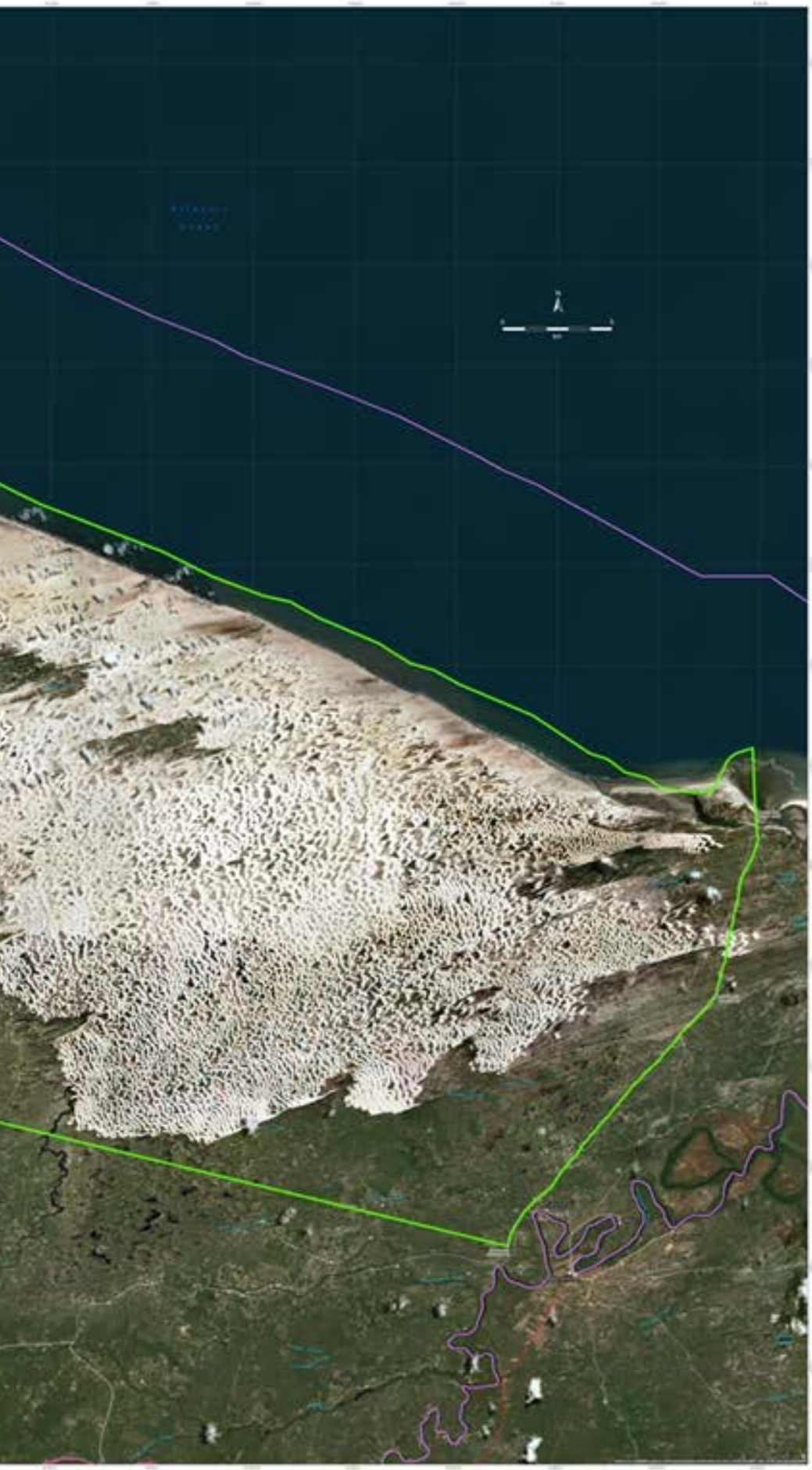
Basemap: Brazilian Continuous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM courtesy of NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center (http://earthexplorer.usgs.gov)

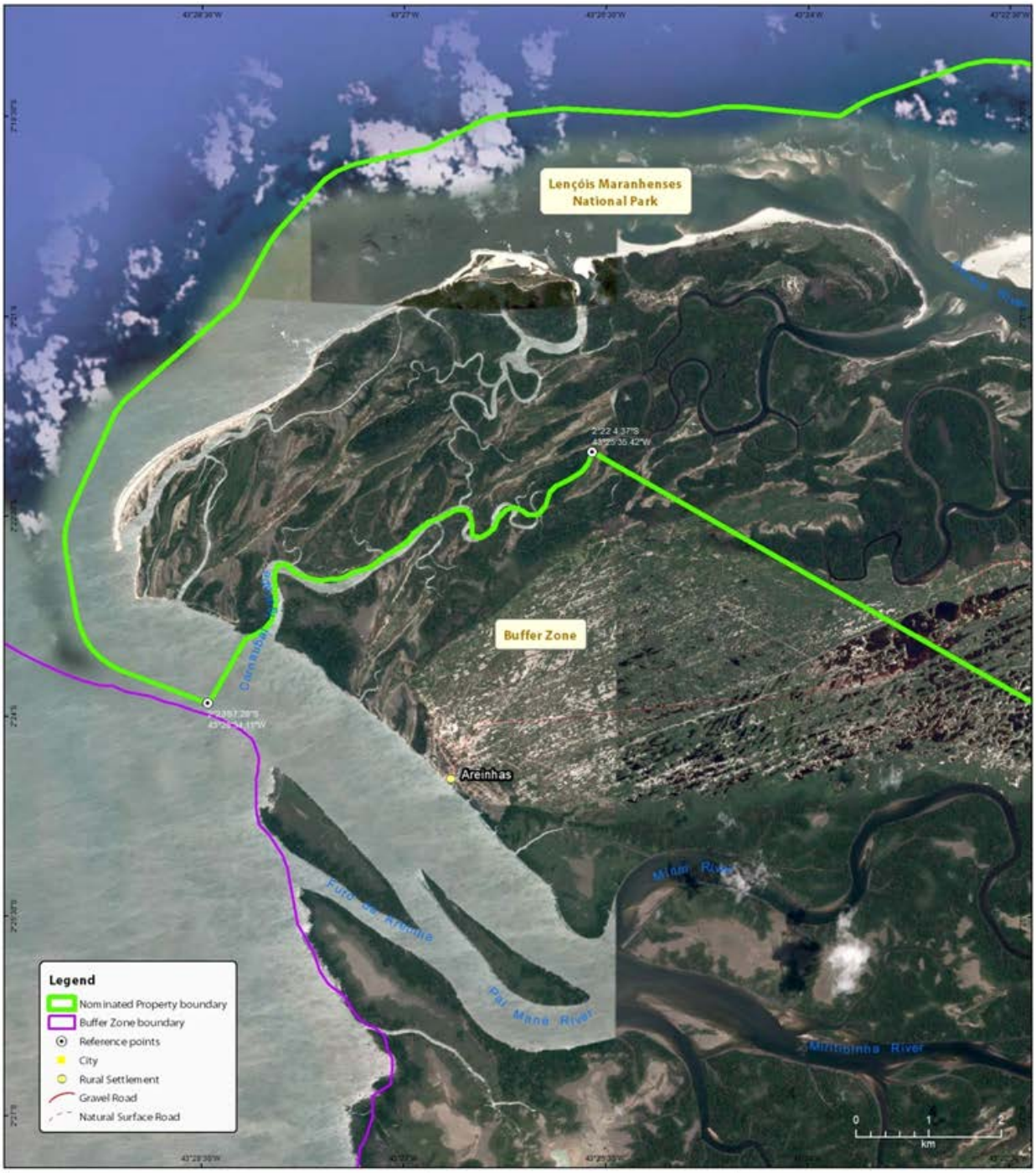
DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE




MAP KEY
LOCATION MAP
Parque Nacional dos Lençóis Maranhenses
WORLD HERITAGE NOMINATION
MAP 06 - NOMINATED PROPERTY PHOTOMAP





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY PHOTOMAP

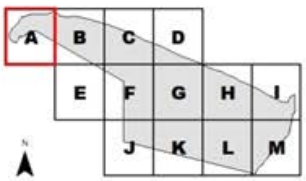
MAP 06-A
1:50.000 GRID

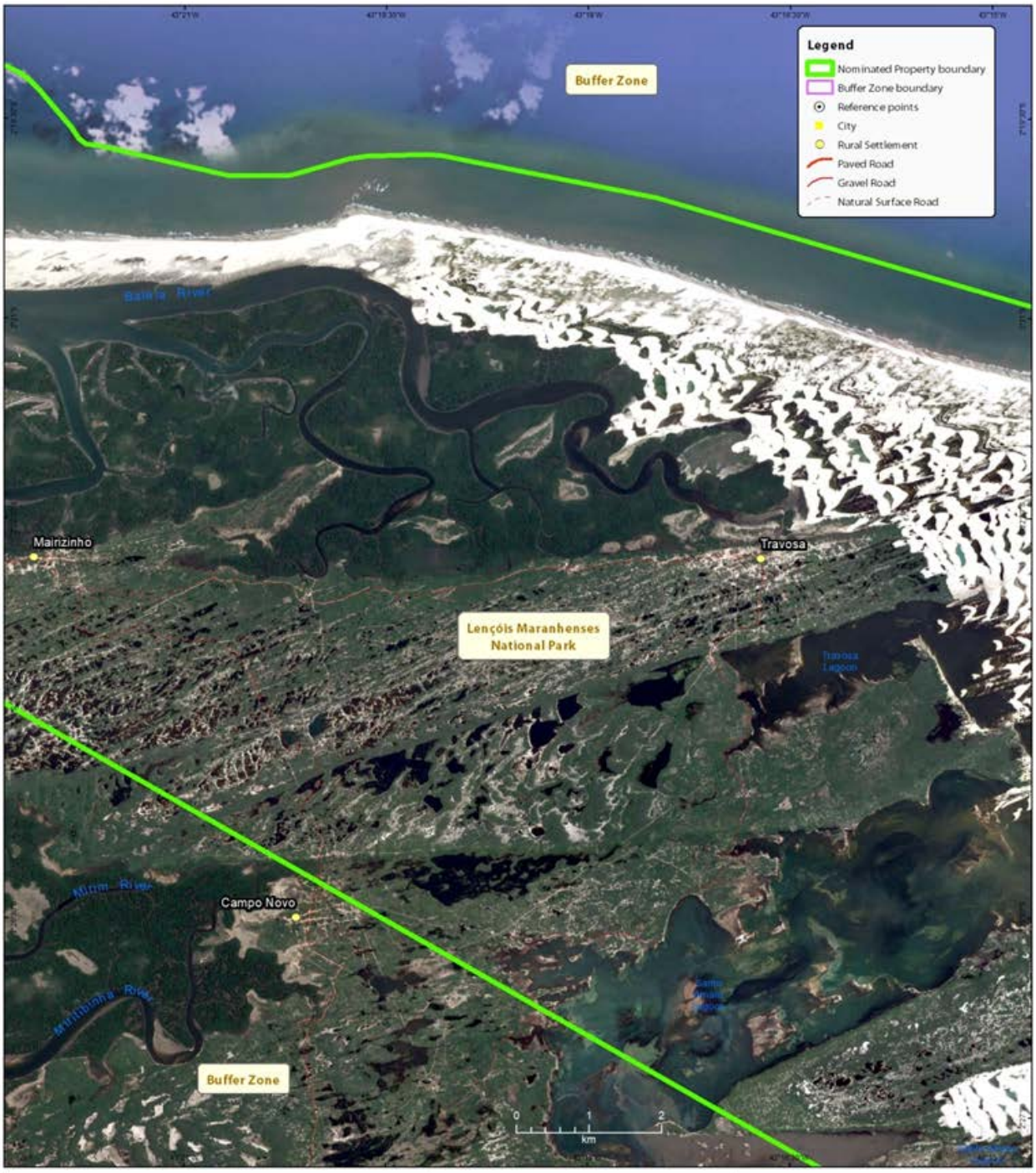
SOURCES:

Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Imagery: Google Earth, 2016.

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE

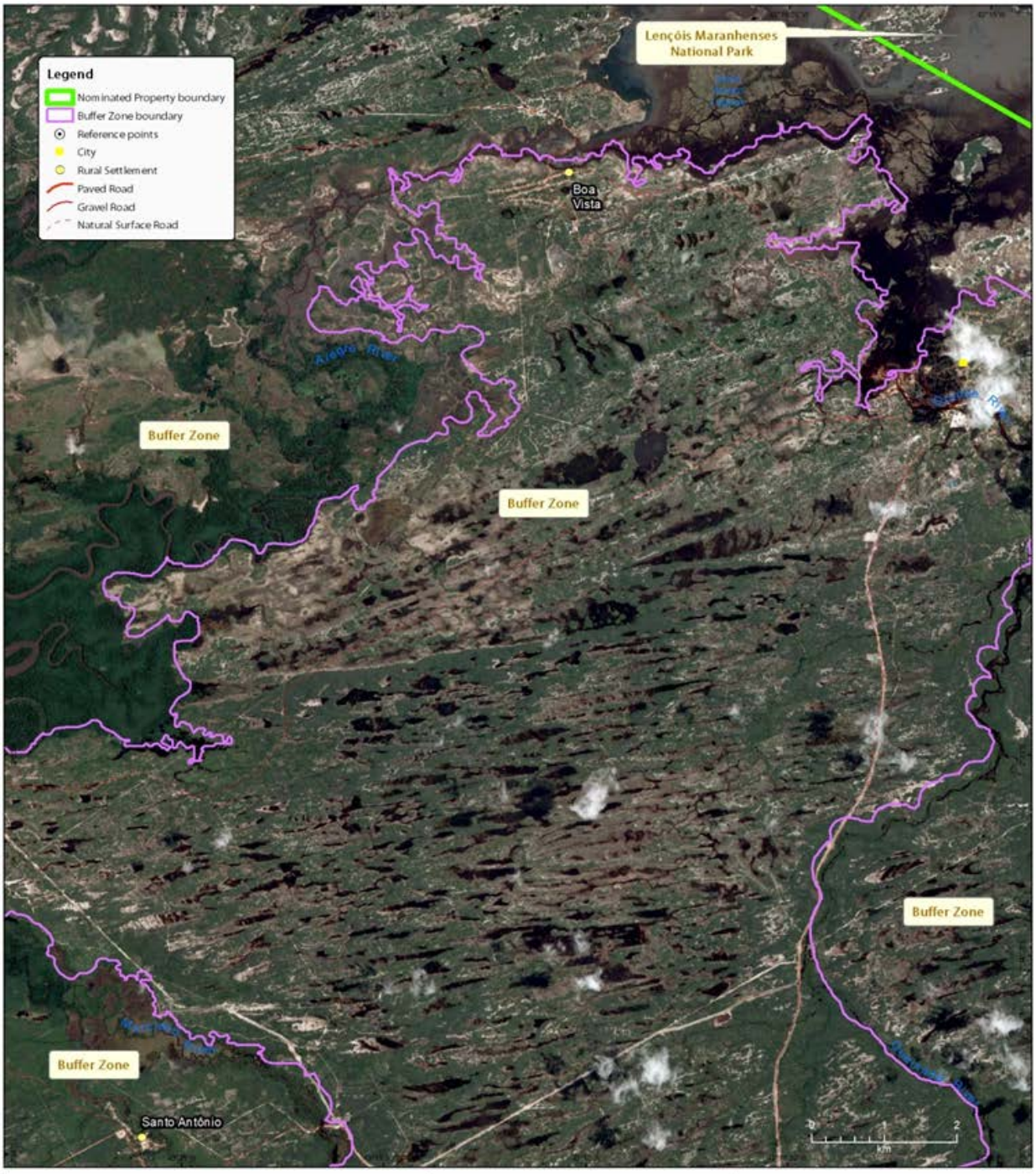




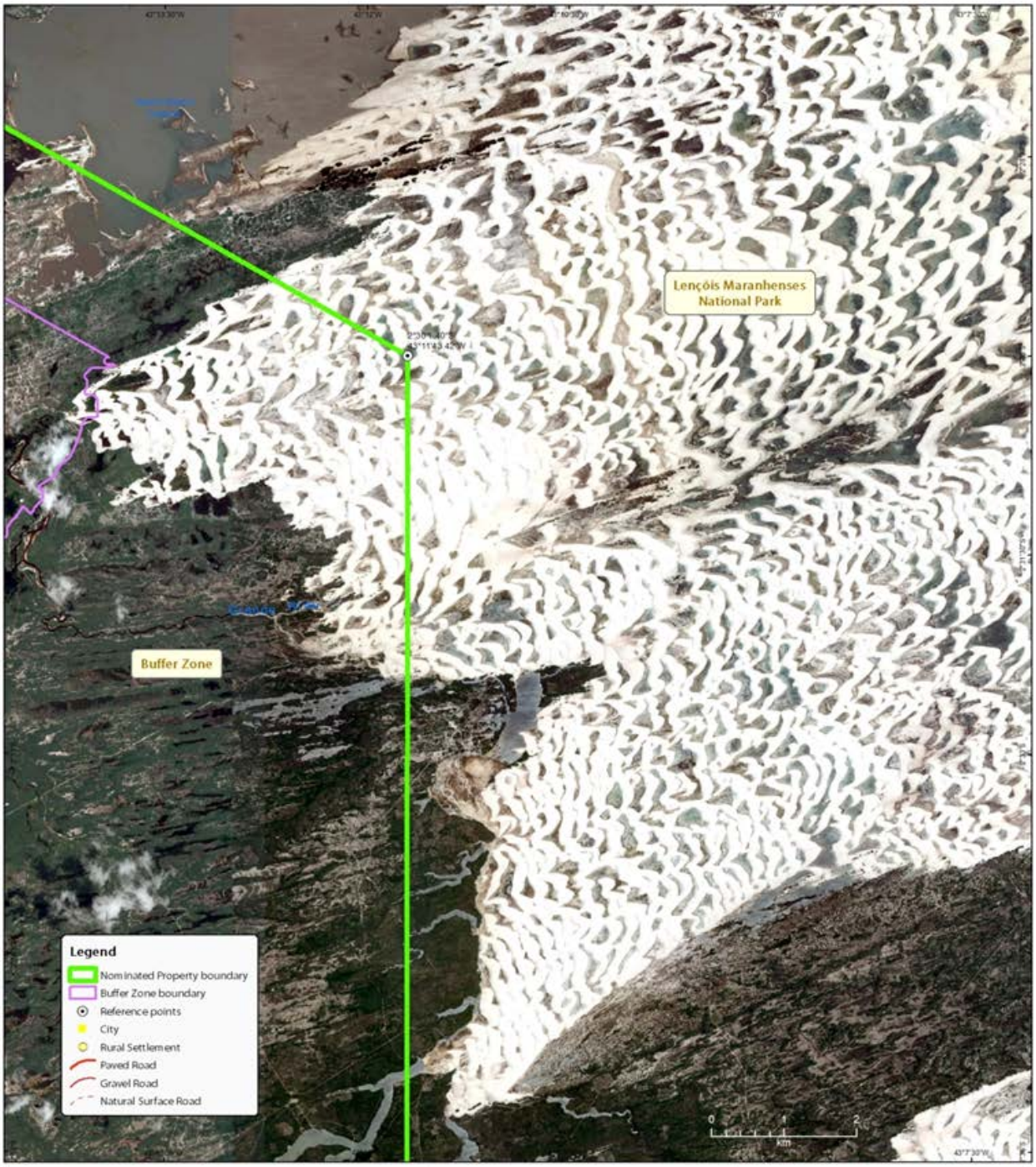
Parque Nacional dos Lençóis Maranhenses	**MAP 06-B** **1:50.000 GRID**	**MAP QUADRANGLE** A B C D E F G H I J K L M
WORLD HERITAGE NOMINATION	SOURCES: Basemap: Brazilian Continuous Basemap Scale 1:250.000 Instituto Brasileiro de Geografia e Estatística/IBGE (2017) (ftp://geoftp.ibge.gov.br) Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA (http://mapas.mma.gov.br/i3geo/datadownload.htm) Imagery: Google Earth, 2016.	
NOMINATED PROPERTY PHOTOMAP	DATUM: WGS84 / MAP SCALE: 1:50.000 / SHEET SIZE: ISO A3 DATE: July/2018 / PREPARATION: www.mosaicoambiental.com.br	

Parque Nacional dos Lençóis Maranhenses	MAP 06-C 1:50.000 GRID	MAP QUADRANGLE
WORLD HERITAGE NOMINATION	SOURCES: Basemap: Brazilian Continous Basemap Scale 1:250.000 Instituto Brasileiro de Geografia e Estatística/IBGE (2017) (ftp://geoftp.ibge.gov.br) Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA (http://mapas.mma.gov.br/i3geo/datadownload.htm) Imagery: Google Earth, 2016.	A B C D E F G H I J K L M
NOMINATED PROPERTY PHOTOMAP	DATUM: WGS84 / MAP SCALE: 1:50.000 / SHEET SIZE: ISO A3 DATE: July/2018 / PREPARATION: www.mosaicoambiental.com.br	

Parque Nacional dos Lençóis Maranhenses	**MAP 06-D** **1:50.000 GRID**	**MAP QUADRANGLE** A B C D E F G H I J K L M
WORLD HERITAGE NOMINATION	SOURCES: Basemap: Brazilian Continous Basemap Scale 1:250.000 Instituto Brasileiro de Geografia e Estatística/IBGE (2017) (ftp://geoftp.ibge.gov.br) Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA (http://mapas.mma.gov.br/i3geo/datadownload.htm) Imagery: Google Earth, 2016.	
NOMINATED PROPERTY PHOTOMAP	DATUM: WGS84 / MAP SCALE: 1:50.000 / SHEET SIZE: ISO A3 DATE: July/2018 / PREPARATION: www.mosaicoambiental.com.br	



Parque Nacional dos Lençóis Maranhenses	MAP 06-E 1:50.000 GRID	MAP QUADRANGLE
WORLD HERITAGE NOMINATION	SOURCES: Basemap: Brazilian Continous Basemap Scale 1:250.000 Instituto Brasileiro de Geografia e Estatística/IBGE (2017) (ftp://geoftp.ibge.gov.br) Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA (http://mapas.mma.gov.br/i3geo/datadownload.htm) Imagery: Google Earth, 2016.	
NOMINATED PROPERTY PHOTOMAP	DATUM: WGS84 / MAP SCALE: 1:50.000 / SHEET SIZE: ISO A3 DATE: July/2018 / PREPARATION: www.mosaicoambiental.com.br	



Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY PHOTOMAP

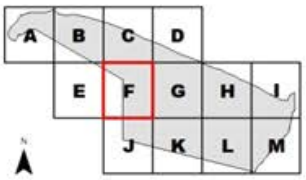
MAP 06-F
1:50.000 GRID

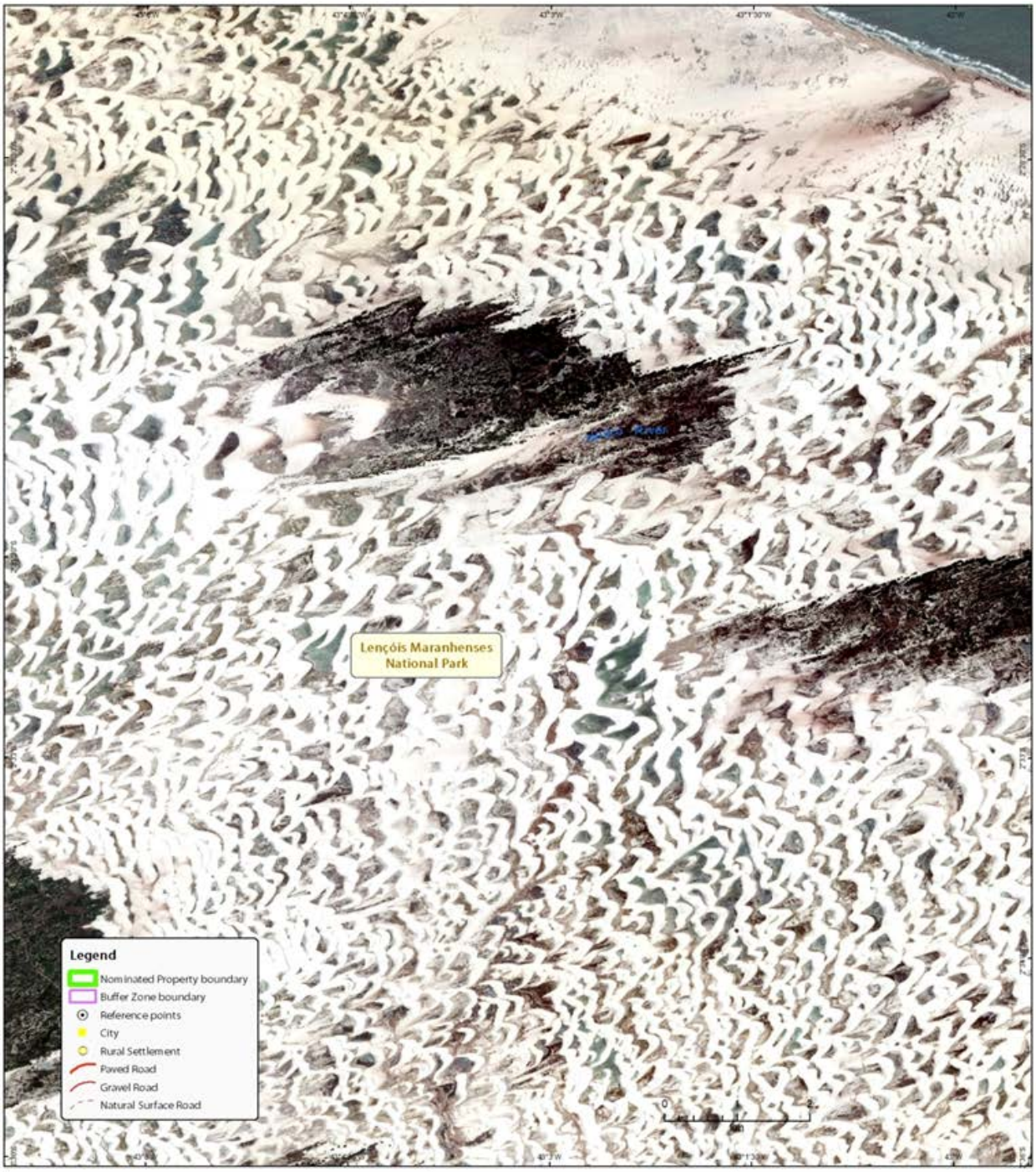
SOURCES:

Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Imagery: Google Earth, 2016.

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY PHOTOMAP

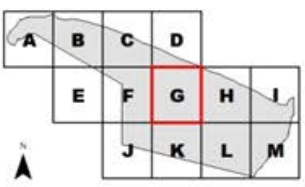
MAP 06-G
1:50.000 GRID

SOURCES:

Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Imagery: Google Earth, 2016.

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE



Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY PHOTOMAP

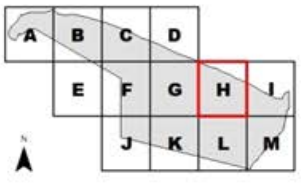
MAP 06-H
1:50.000 GRID

SOURCES:

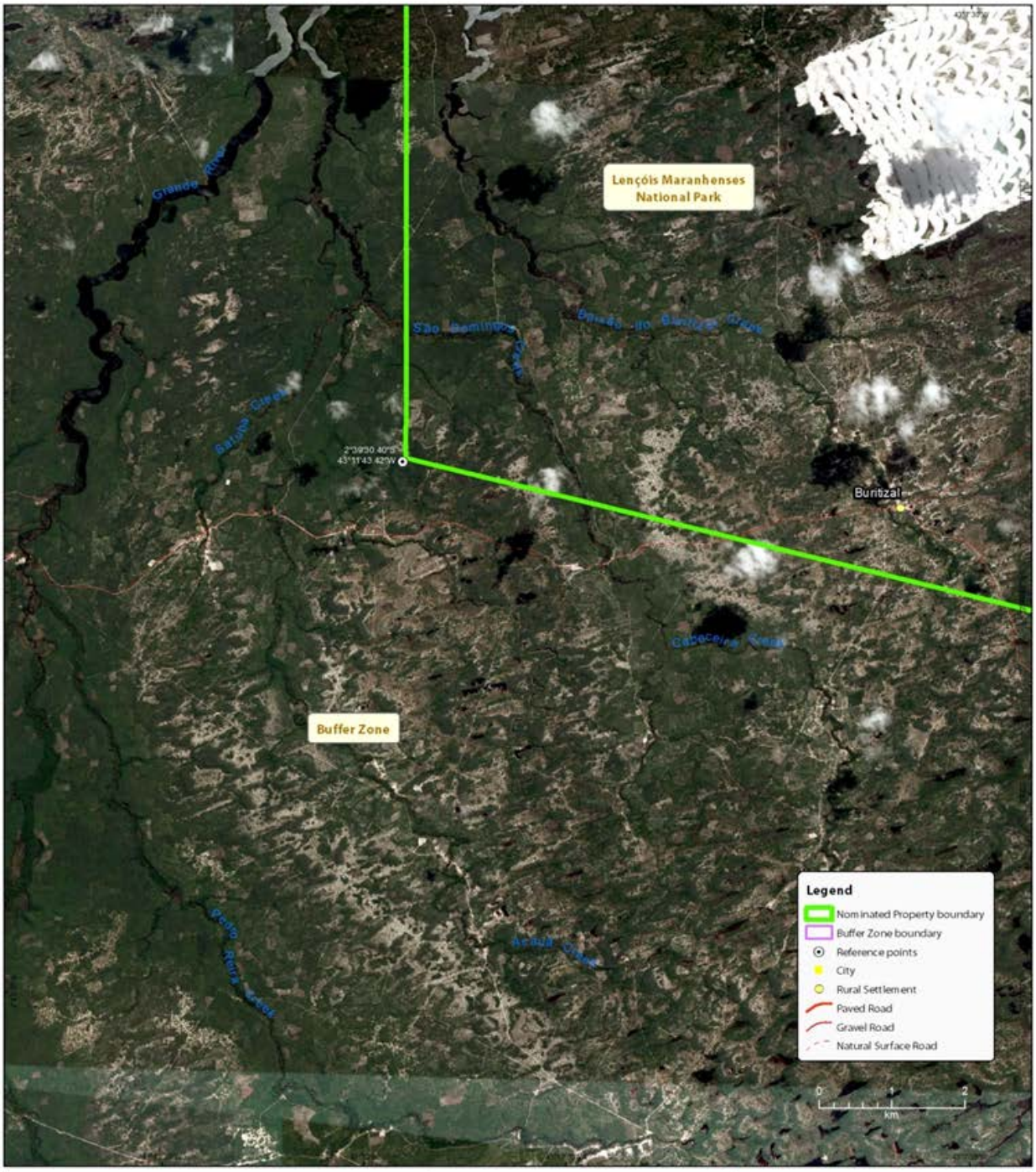
Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Imagery: Google Earth, 2016.

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

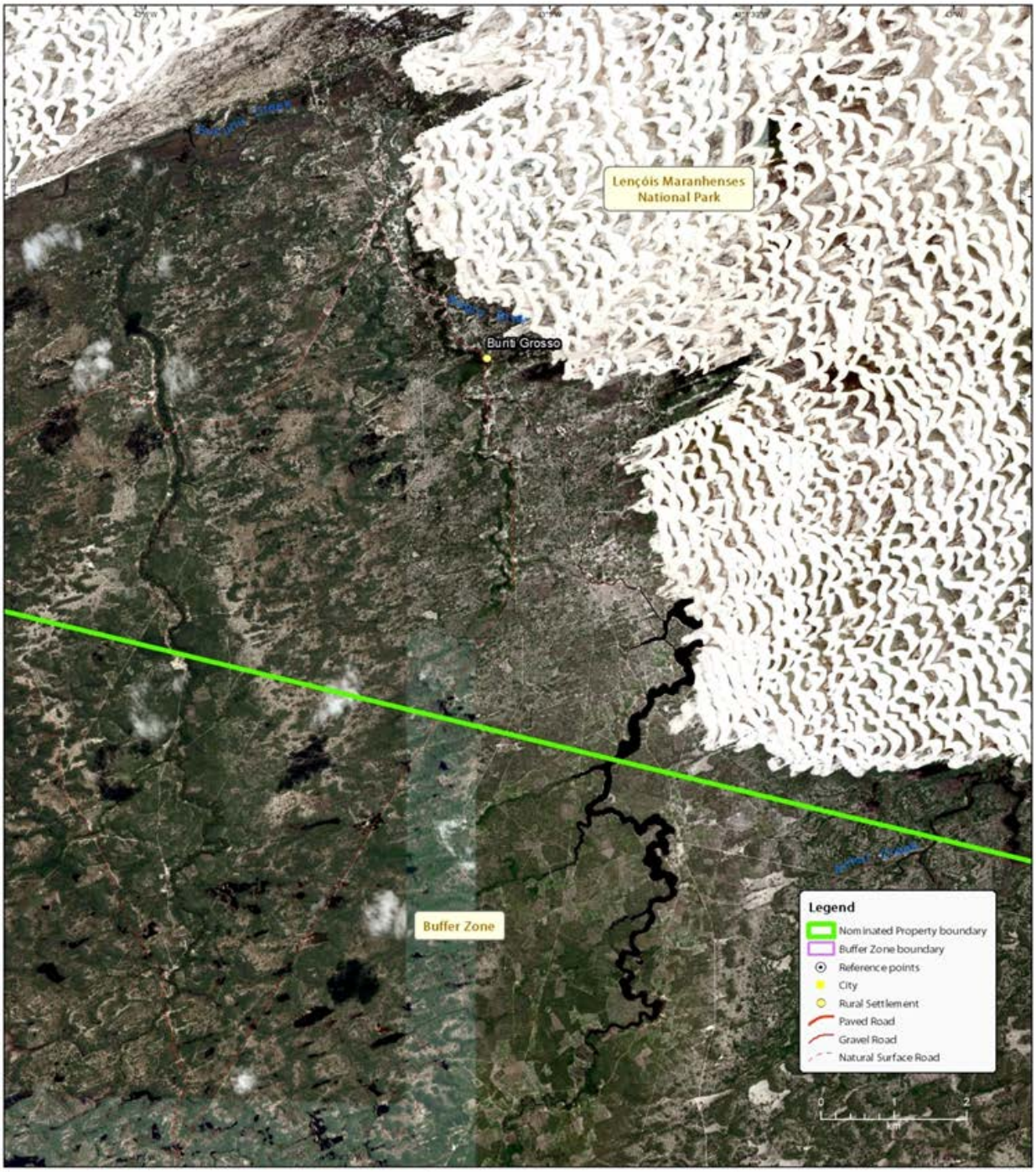
MAP QUADRANGLE



Parque Nacional dos Lençóis Maranhenses	MAP 06-I 1:50.000 GRID	MAP QUADRANGLE
WORLD HERITAGE NOMINATION	SOURCES: Basemap: Brazilian Continous Basemap Scale 1:250.000 Instituto Brasileiro de Geografia e Estatística/IBGE (2017) (ftp://geoftp.ibge.gov.br) Property and Buffer Zone Limits: Ministerio do Meio Ambiente/MMA (http://mapas.mma.gov.br/i3geo/datadownload.htm) Imagery: Google Earth, 2016.	
NOMINATED PROPERTY PHOTOMAP	DATUM: WGS84 / MAP SCALE: 1:50.000 / SHEET SIZE: ISO A3 DATE: July/2018 / PREPARATION: www.mosaicoambiental.com.br	



Parque Nacional dos Lençóis Maranhenses	**MAP 04-J** **1:50.000 GRID**	**MAP QUADRANGLE** A B C D E F G H I J K L M
WORLD HERITAGE NOMINATION	SOURCES: Basemap: Brazilian Continuous Basemap Scale 1:250.000 Instituto Brasileiro de Geografia e Estatística/IBGE (2017) (ftp://geoftp.ibge.gov.br) Property and Buffer Zone Limits: Ministerio do Meio Ambiente/MMA (http://mapas.mma.gov.br/i3geo/datadownload.htm) Imagery: Google Earth, 2016.	
NOMINATED PROPERTY PHOTOMAP	DATUM: WGS84 / MAP SCALE: 1:50.000 / SHEET SIZE: ISO A3 DATE: July/2018 / PREPARATION: www.mosaicoambiental.com.br	



Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY PHOTOMAP

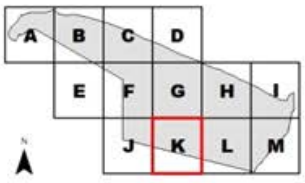
MAP 06-K
1:50.000 GRID

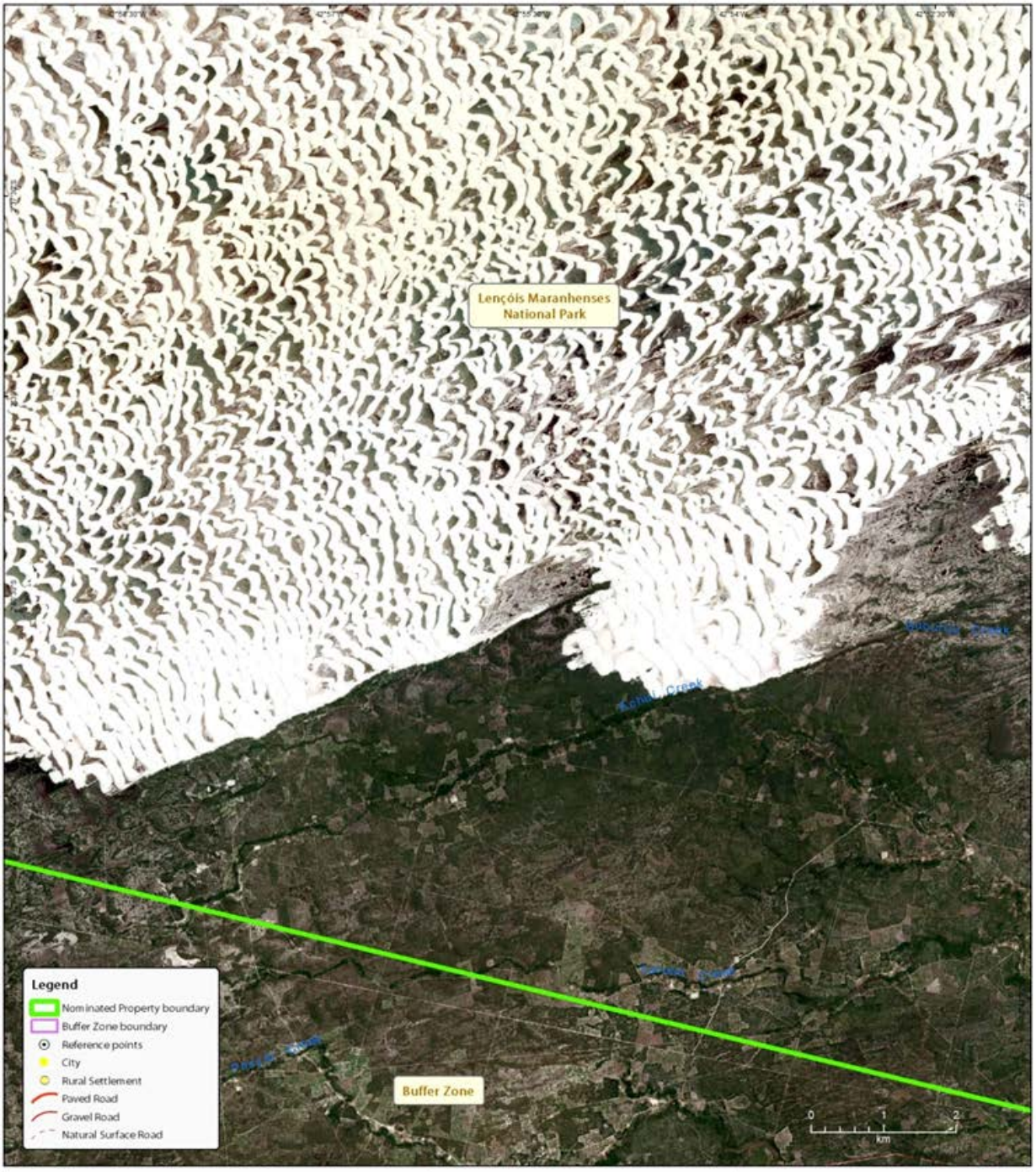
SOURCES:

Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Imagery: Google Earth, 2016.

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

NOMINATED PROPERTY PHOTOMAP

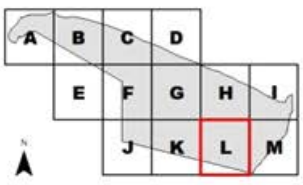
MAP 06-L
1:50.000 GRID

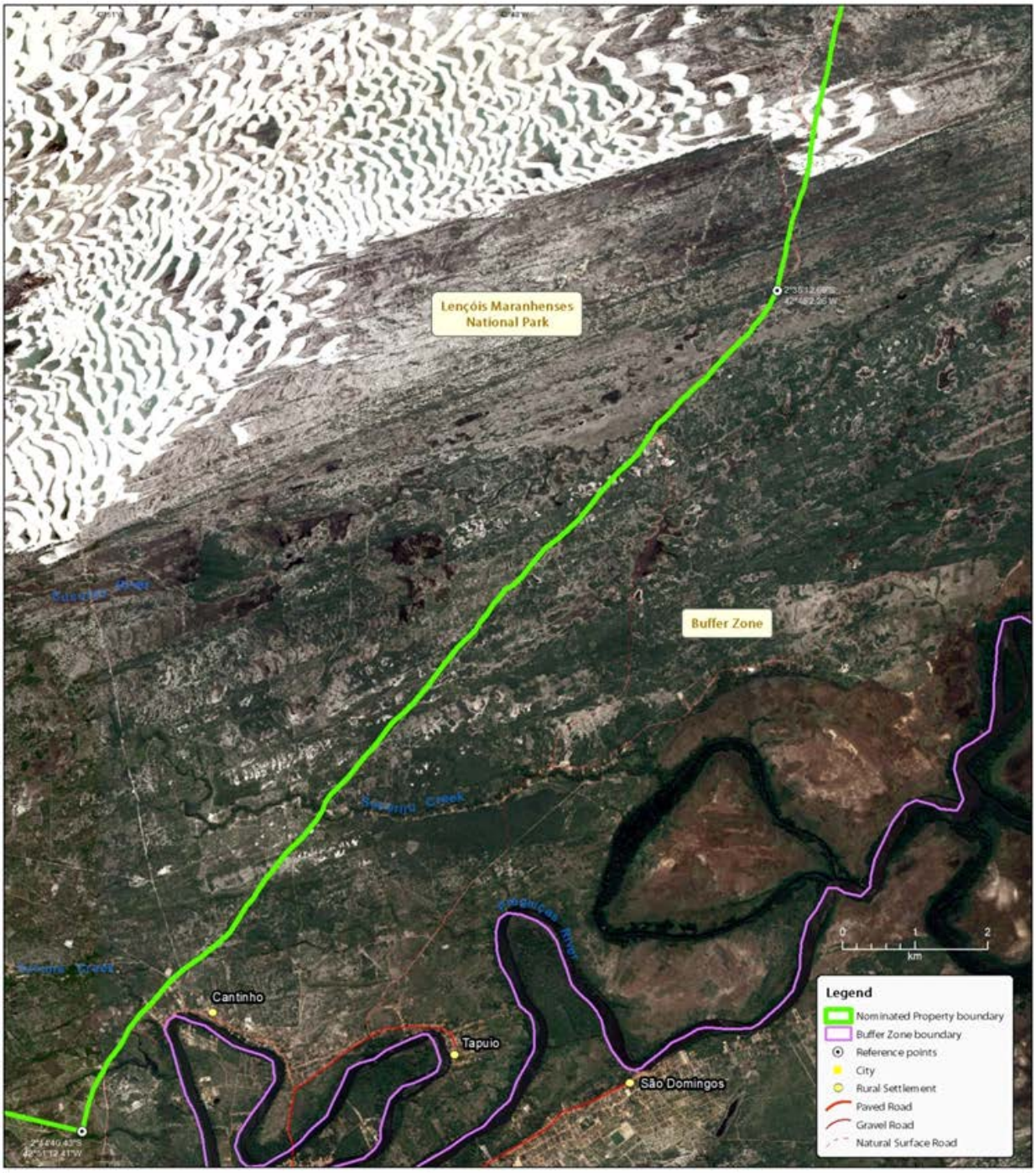
SOURCES:

Basemap: Brazilian Continous Basemap Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (2017)
(ftp://geoftp.ibge.gov.br)
Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA
(http://mapas.mma.gov.br/i3geo/datadownload.htm)
Imagery: Google Earth, 2016.

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:50.000	ISO A3
DATE: July/2018	PREPARATION: www.mosaicoambiental.com.br	

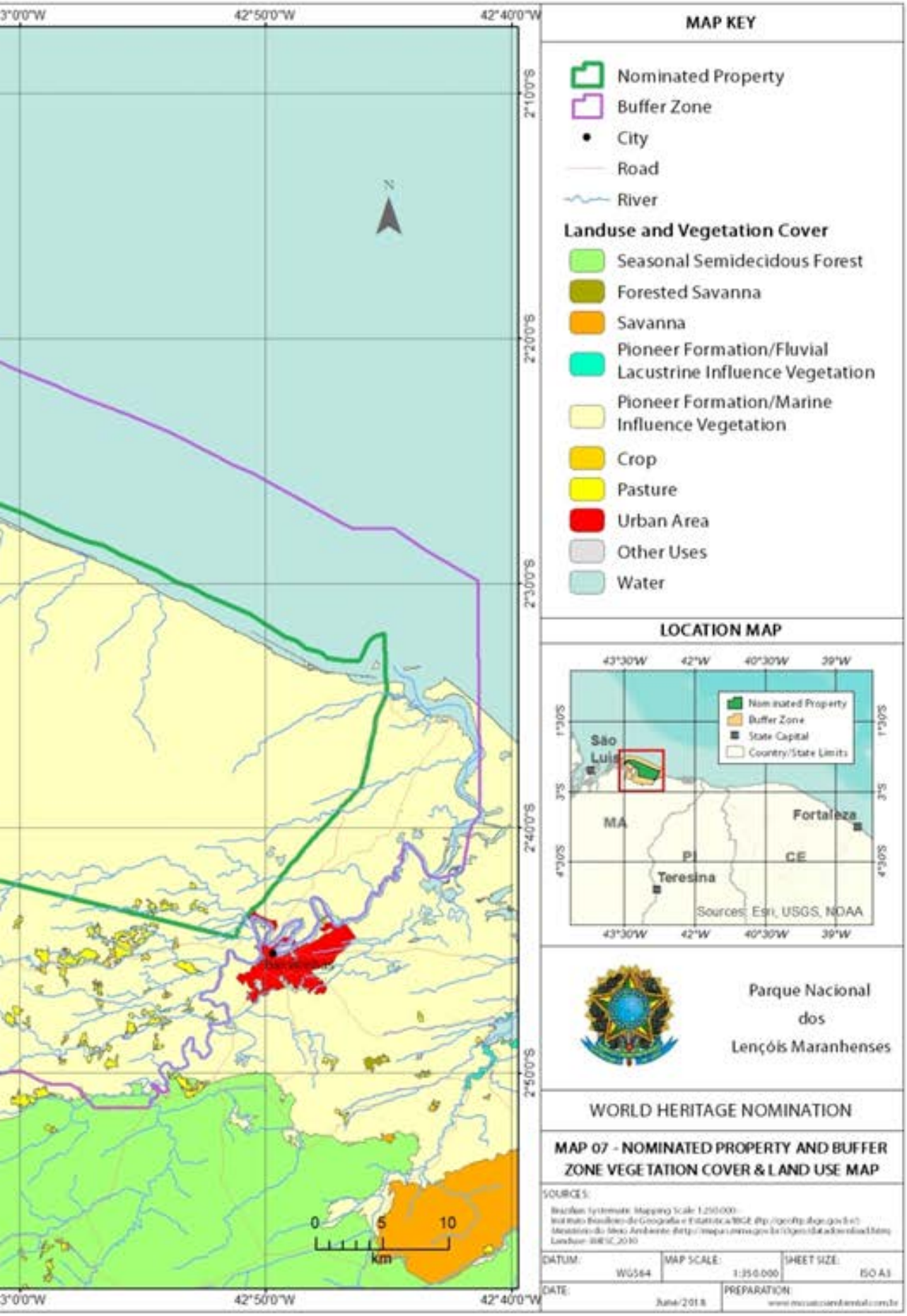
MAP QUADRANGLE





Parque Nacional dos Lençóis Maranhenses	MAP 06-M 1:50.000 GRID	MAP QUADRANGLE A B C D E F G H I J K L M
WORLD HERITAGE NOMINATION	SOURCES: Basemap: Brazilian Continous Basemap Scale 1:250.000 Instituto Brasileiro de Geografia e Estatística/IBGE (2017) (ftp://geoftp.ibge.gov.br) Property and Buffer Zone Limits: Ministério do Meio Ambiente/MMA (http://mapas.mma.gov.br/i3geo/datadownload.htm) Imagery: Google Earth, 2016.	
NOMINATED PROPERTY PHOTOMAP	DATUM: WGS84 / MAP SCALE: 1:50.000 / SHEET SIZE: ISO A3 DATE: July/2018 / PREPARATION: www.mosaicoambiental.com.br	


43°30'0"W
43°20'0"W
43°10'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
Primeira Cruz
Santo Amaro
Maranhão
Humberto
de Campos



MAP KEY

- Nominated Property
- Buffer Zone
- City
- Road
- River

Landuse and Vegetation Cover

- Seasonal Semidecidous Forest
- Forested Savanna
- Savanna
- Pioneer Formation/Fluvial Lacustrine Influence Vegetation
- Pioneer Formation/Marine Influence Vegetation
- Crop
- Pasture
- Urban Area
- Other Uses
- Water

LOCATION MAP

Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

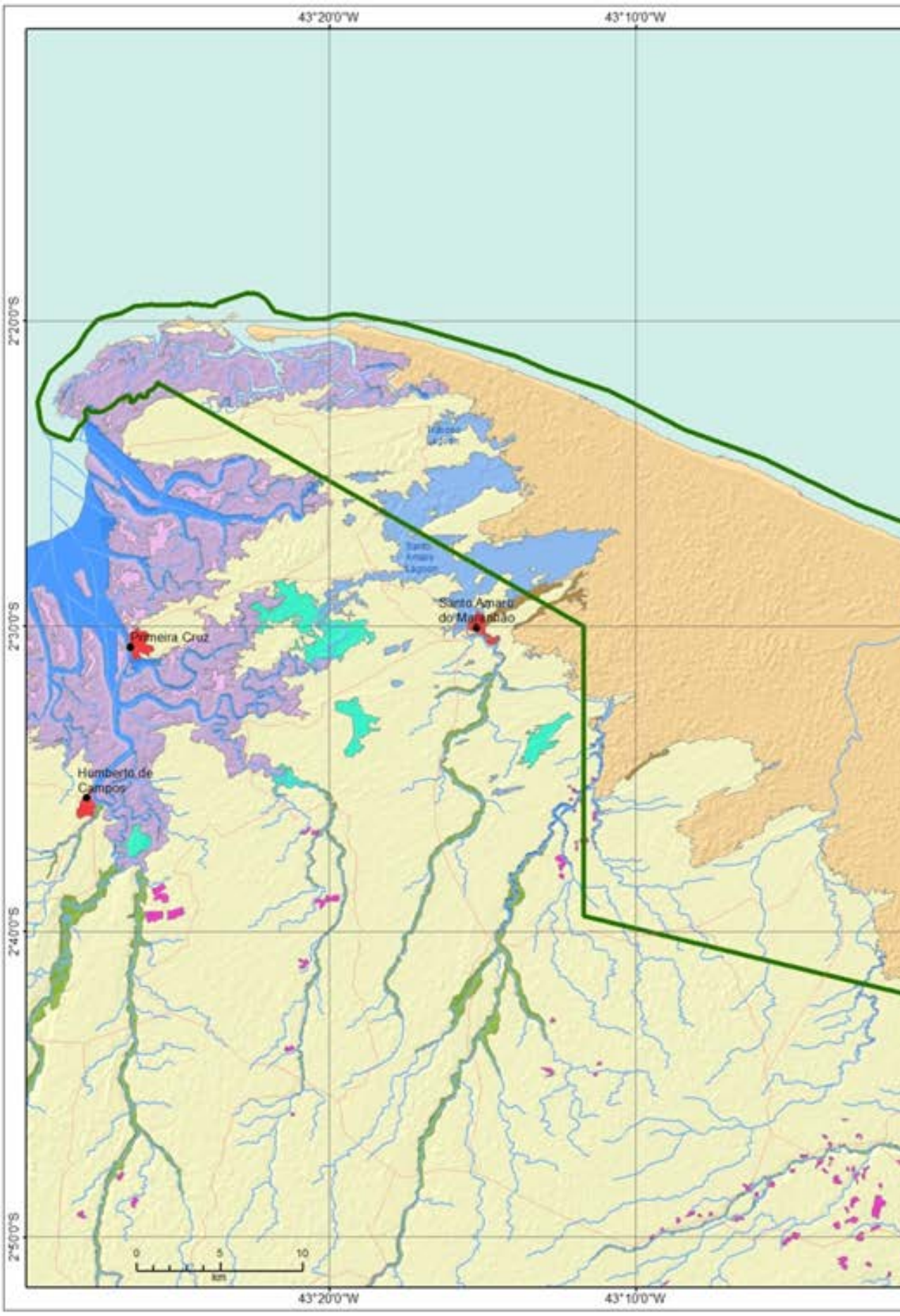
MAP 07 - NOMINATED PROPERTY AND BUFFER ZONE VEGETATION COVER & LAND USE MAP

SOURCES:

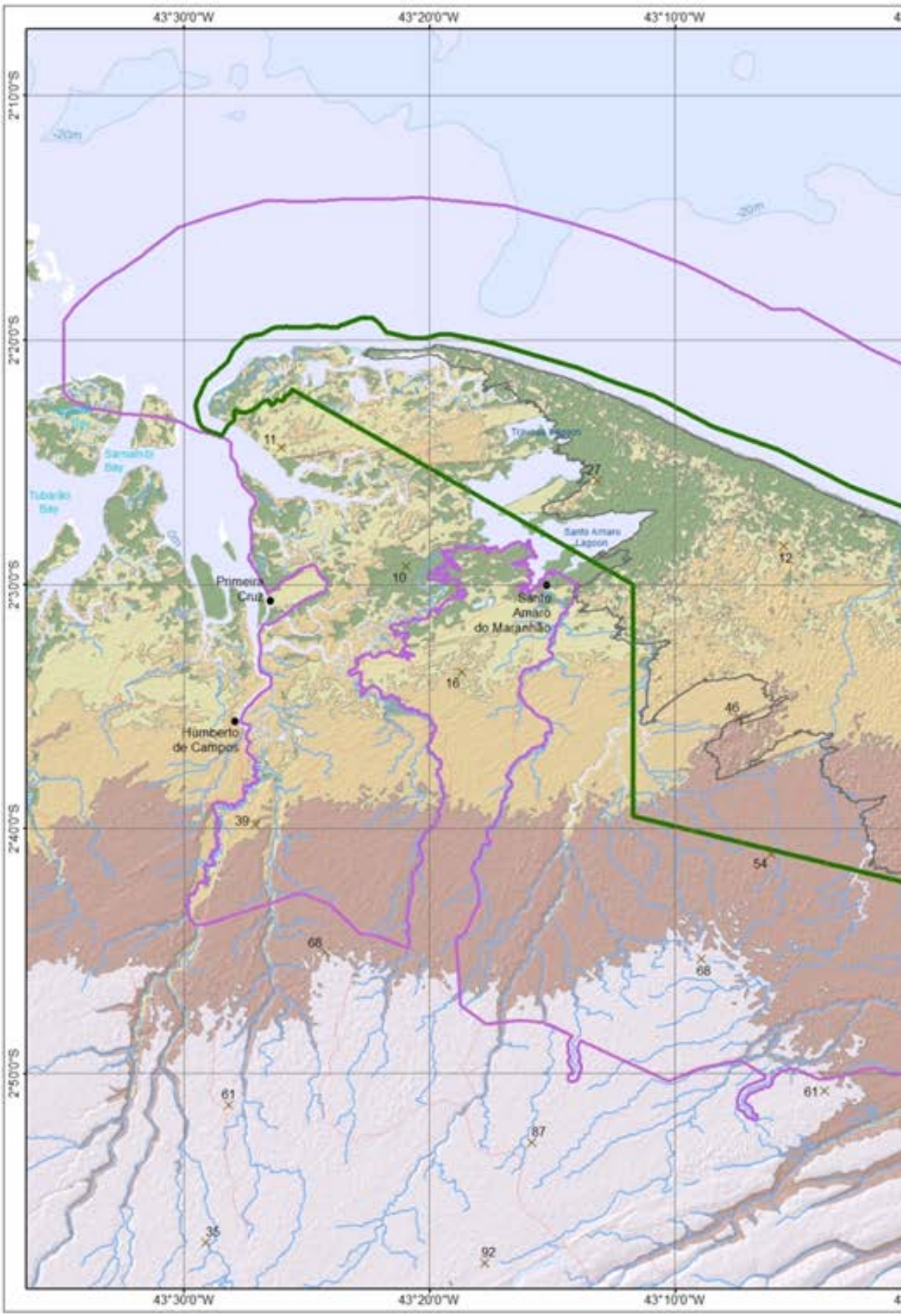
Brazilian Systematic Mapping Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (ftp://geoftp.ibge.gov.br)
Ministério do Meio Ambiente (http://mapas.mma.gov.br/i3geo/datadownload.htm)
Landsat - GEOCOVER 2010

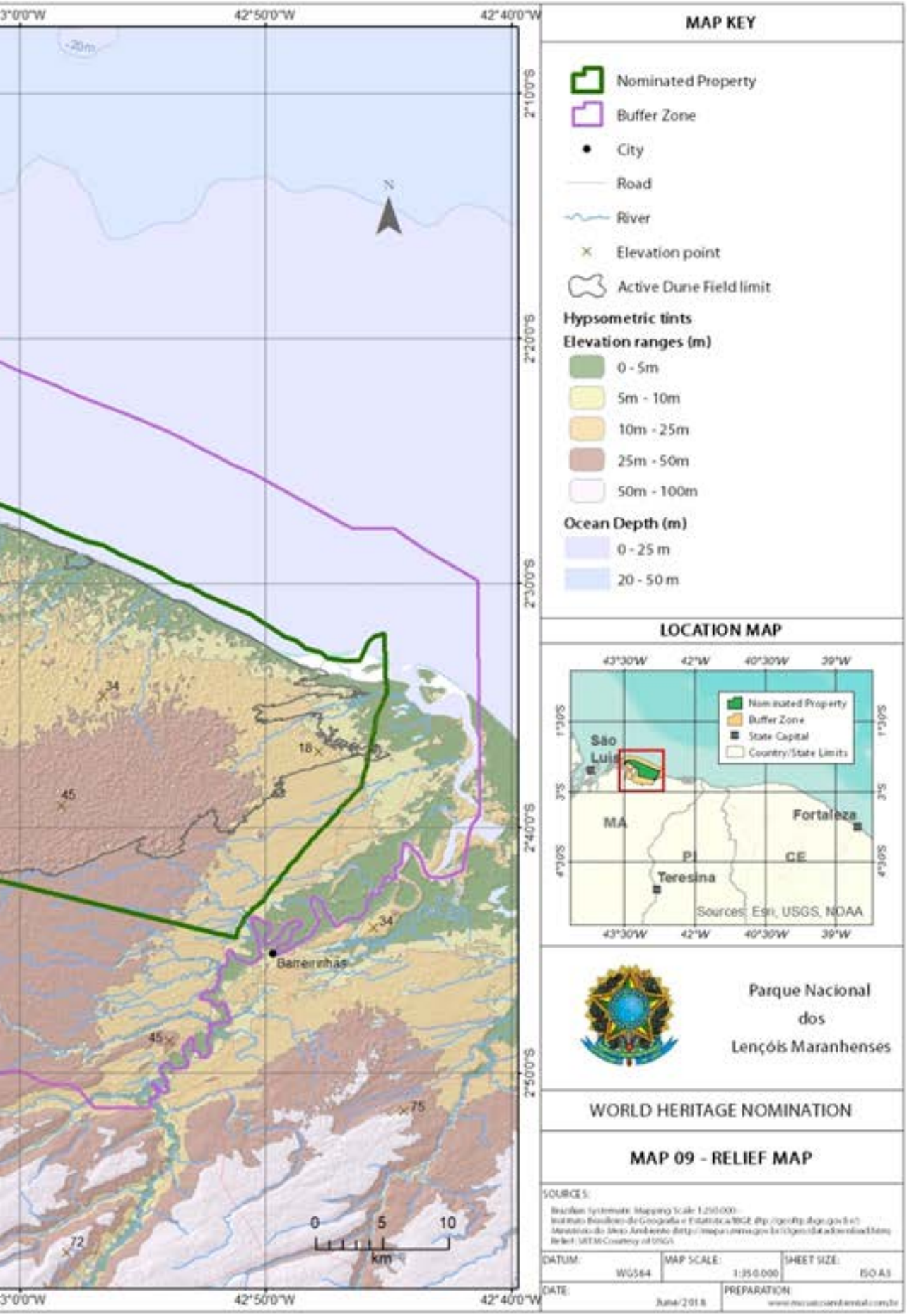
DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:350.000	ISO A3

DATE:	PREPARATION:
June/2018	


43°20'0"W
43°10'0"W
2°0'0"S
2°5'0"S
2°10'0"S
2°15'0"S
Primeira Cruz
Santo Amaro do Maranhão
Humberto de Campos
0
5
10
km


43°0'0"W
42°50'0"W
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
N
Barreirinhas
MAP KEY
City
Road
Nominated Property
River
Landuse and Vegetation Cover
Apicum (mangroove transition)
Mangroove
Marsh
Active Dune Field
Restinga (sandbank)
Restinga (sandbank)/field
Riparian Forest
Crop
Urban Area
Lagoon
River
Ocean
LOCATION MAP
43°30'W
42°W
40°30'W
39°W
1°30'S
3°S
4°30'S
Nominated Property
Buffer Zone
State Capital
Country/State Limits
São Luis
MA
PI
CE
Fortaleza
Teresina
Sources: Esri, USGS, NOAA
Parque Nacional dos Lençóis Maranhenses
WORLD HERITAGE NOMINATION
MAP 08 - NOMINATED PROPERTY
VEGETATION COVER & LAND USE MAP
SOURCES:
DATUM: WGS84
MAP SCALE: 1:280.000
SHEET SIZE: ISO A3
DATE: June/2018
PREPARATION


43°30'0"W
43°20'0"W
43°10'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
-20m
-30m
Tubarão Bay
Tubarão Lagoon
Santo Amaro Lagoon
Primeira Cruz
Santo Amaro do Maranhão
Humberto de Campos
11
27
10
12
16
46
39
54
68
68
61
61
87
35
92



MAP KEY

- Nominated Property
- Buffer Zone
- City
- Road
- River
- Elevation point
- Active Dune Field limit

Hypsometric tints

Elevation ranges (m)

- 0 - 5m
- 5m - 10m
- 10m - 25m
- 25m - 50m
- 50m - 100m

Ocean Depth (m)

- 0 - 25 m
- 20 - 50 m

LOCATION MAP

Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

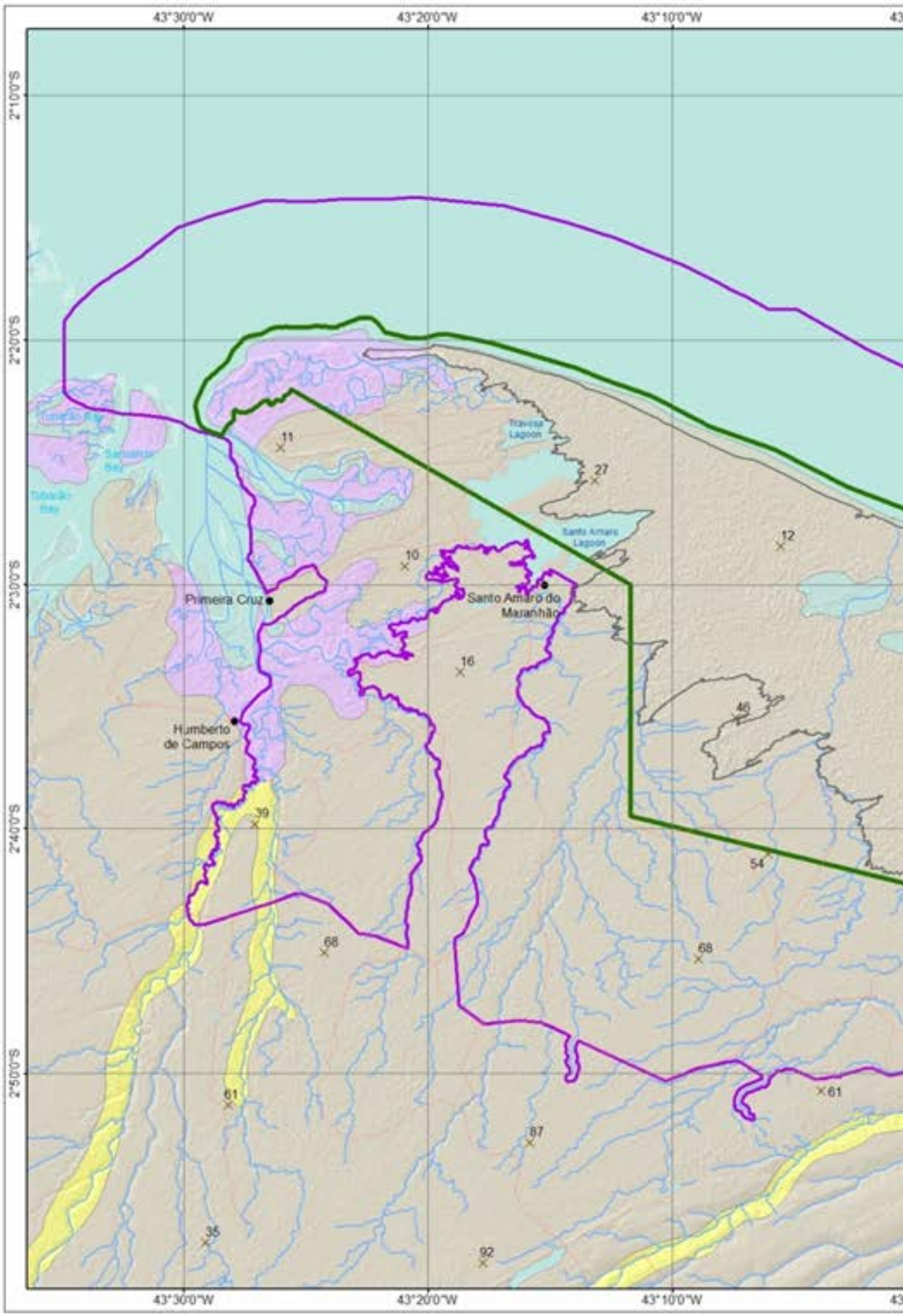
MAP 09 - RELIEF MAP

SOURCES:

Brazilian Systematic Mapping Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (ftp://geoftp.ibge.gov.br)
Ministério do Meio Ambiente (http://mapas.mma.gov.br/i3geo/datadownload.htm)
Relief: SRTM Courtesy of USGS

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:350.000	ISO A3

DATE:	PREPARATION:
June/2018	


43°30'0"W
43°20'0"W
43°10'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
Primeira Cruz
Santo Amaro do Maranhão
Humberto de Campos
Travosa Lagoon
Santo Amaro Lagoon
11
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87
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35
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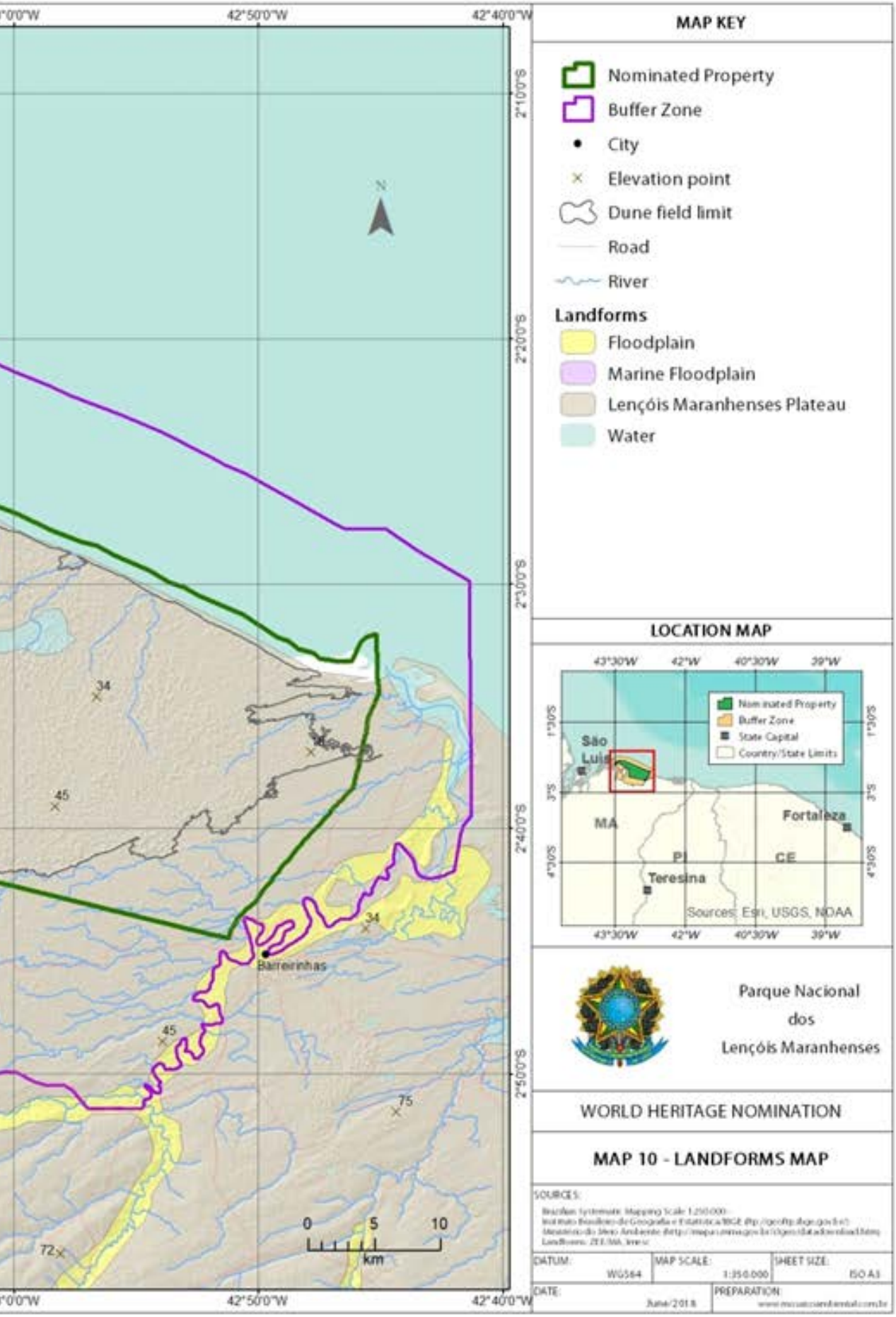


MAP KEY

- Nominated Property
- Buffer Zone
- City
- Elevation point
- Dune field limit
- Road
- River

Landforms

- Floodplain
- Marine Floodplain
- Lençóis Maranhenses Plateau
- Water

LOCATION MAP

Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

MAP 10 - LANDFORMS MAP

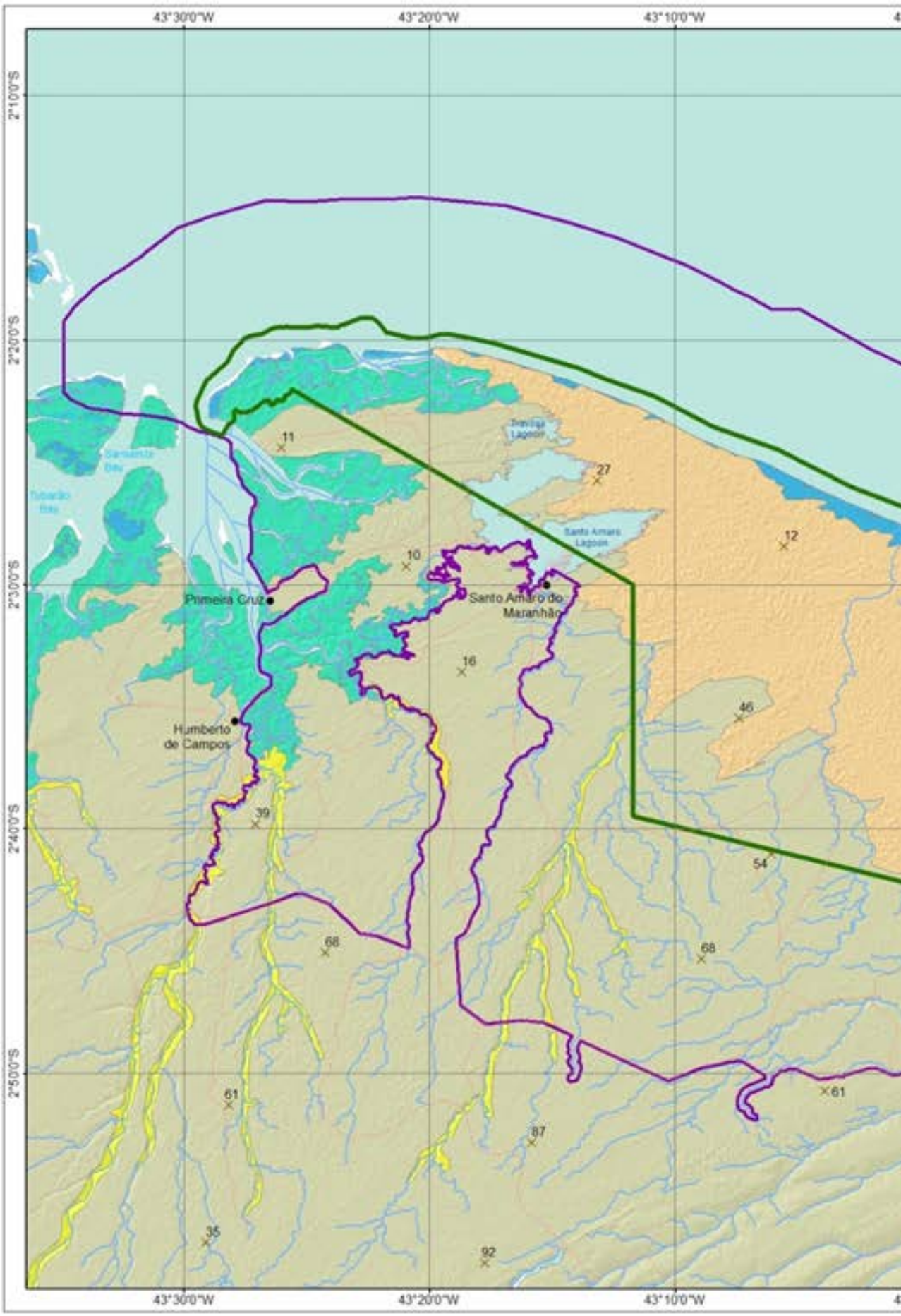
SOURCES:

Brazilian Systematic Mapping Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (ftp://geoftp.ibge.gov.br)
Ministério do Meio Ambiente (http://mapas.mma.gov.br/i3geo/datadownload.htm)
Landforms: ZEE/MA, Inema

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:350.000	ISO A3

DATE: June/2018

PREPARATION: www.mucuricoandoambiental.com.br


43°30'0"W
43°20'0"W
43°10'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
Primeira Cruz
Santo Amaro do Maranhão
Humberto de Campos
Tatuaçu Bay
Santo Amaro Lagoon
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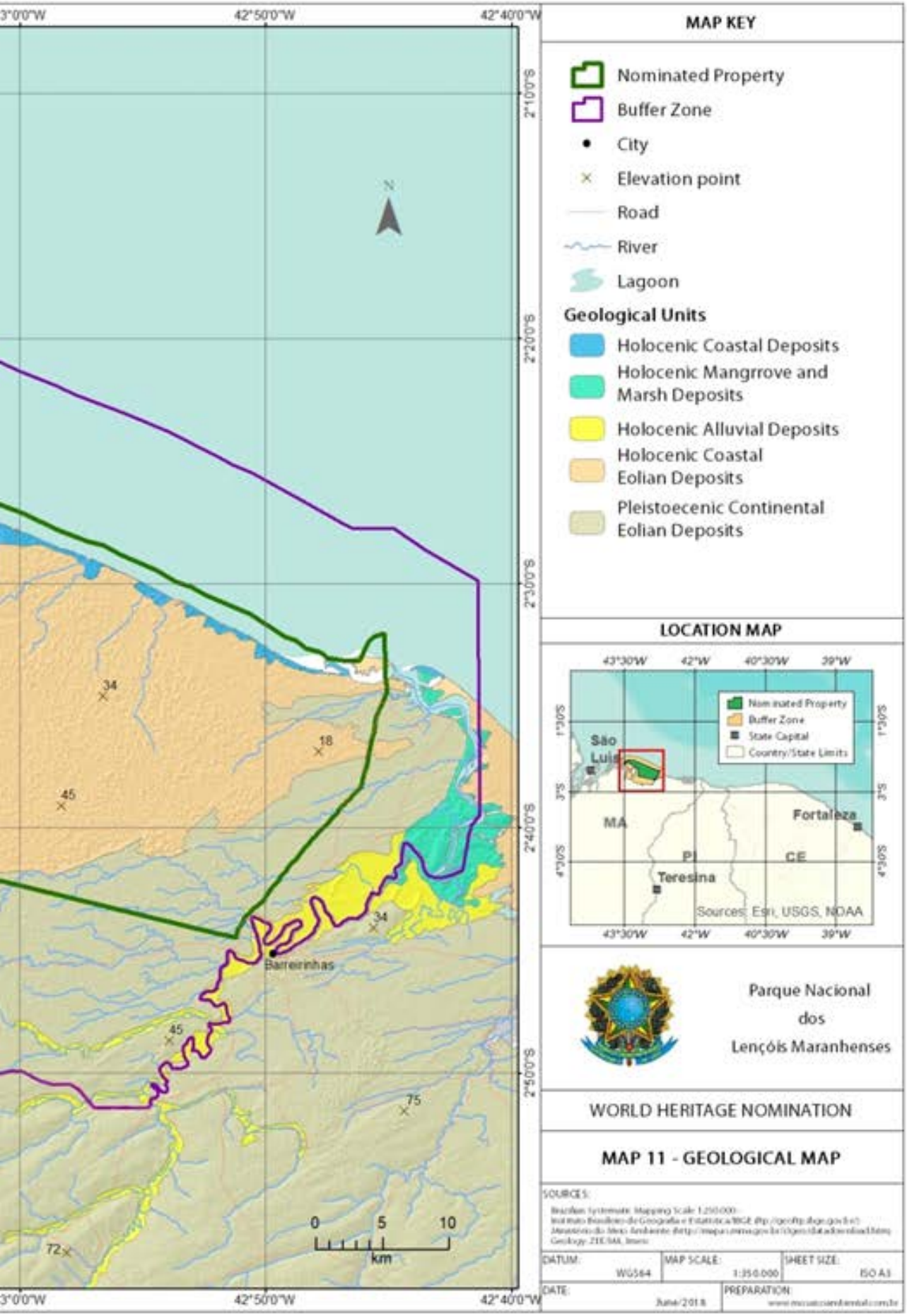
92



MAP KEY

- Nominated Property
- Buffer Zone
- City
- Elevation point
- Road
- River
- Lagoon

Geological Units

- Holocenic Coastal Deposits
- Holocenic Mangrrove and Marsh Deposits
- Holocenic Alluvial Deposits
- Holocenic Coastal Eolian Deposits
- Pleistoecenic Continental Eolian Deposits

LOCATION MAP

Parque Nacional dos Lençóis Maranhenses

WORLD HERITAGE NOMINATION

MAP 11 - GEOLOGICAL MAP

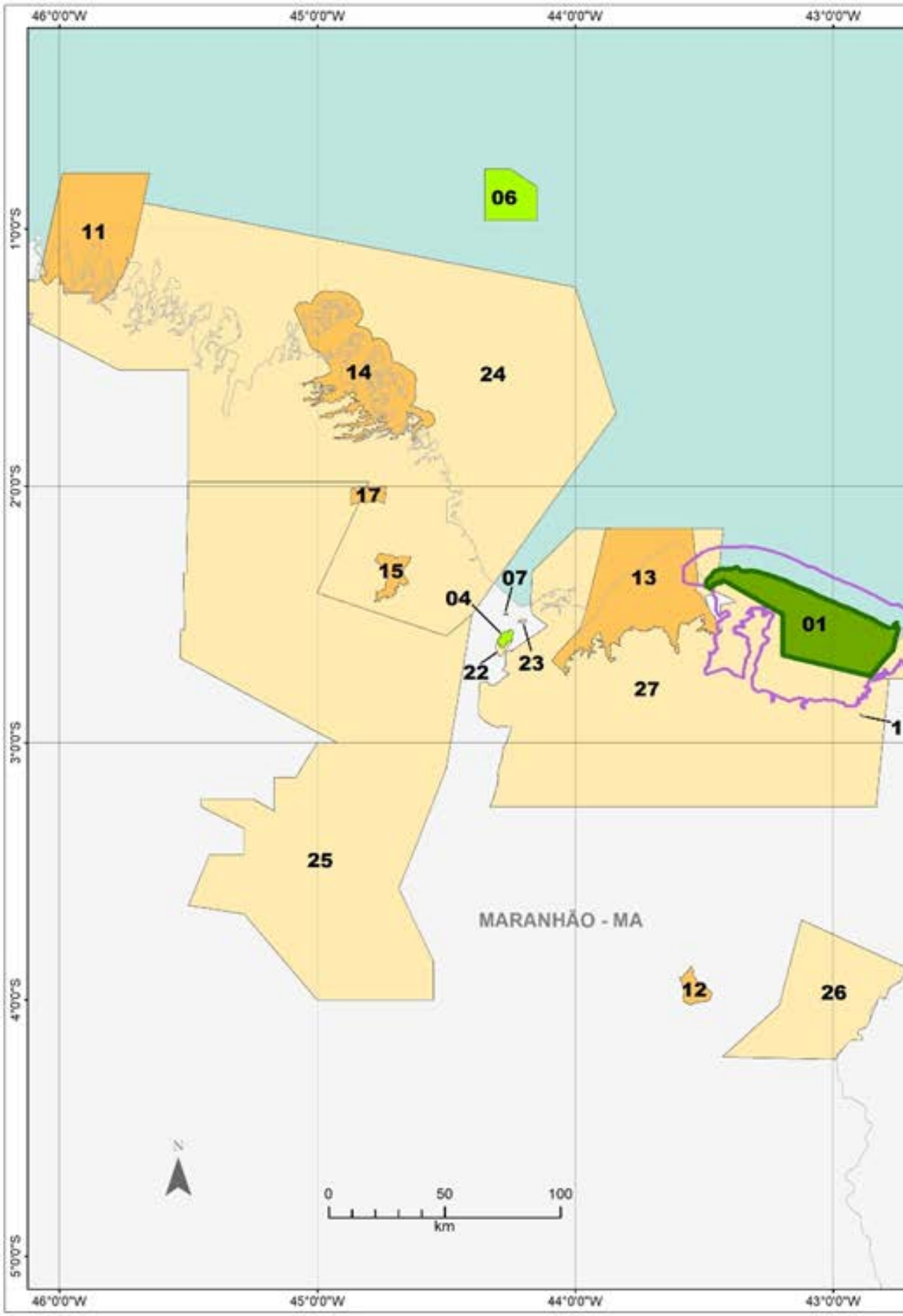
SOURCES:

Brazilian Systematic Mapping Scale 1:250.000
Instituto Brasileiro de Geografia e Estatística/IBGE (ftp://geoftp.ibge.gov.br)
Ministério do Meio Ambiente (http://mapas.mma.gov.br/i3geo/datadownload.htm)
Geology: ZEE/MA, Imesc

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:350.000	ISO A3

DATE: June/2018

PREPARATION:


46°0'0"W
45°0'0"W
44°0'0"W
43°0'0"W
1°0'0"S
2°0'0"S
3°0'0"S
4°0'0"S
5°0'0"S
06
11
14
24
17
15
07
04
13
01
22
23
27
25
MARANHÃO - MA
12
26
N
0
50
100
km

ID	NAME
1	Lençóis Maranhenses National Park
2	Ubajara National Park
3	Sete Cidades National Park
4	Bacanga State Park
5	Carnaúbas State Park
6	Parcel de Manuel Luis Marine State Park
7	Sítio Rangedor State Park
8	Delta do Parnaíba Environmental Protection Area
9	Serra da Ibiapa Environmental Protection Area
10	Palmares National Forest
11	Arapiranga-Troma Extractivist Reserve
12	Chapada Limpa Extractivist Reserve
13	Baía do Tubarão Extractivist Reserve
14	Cururupu Extractivist Reserve
15	Itapetininga Extractivist Reserve
16	Delta do Parnaíba Marine Extractivist Reserve
17	Quilombo do Frechal Extractivist Reserve
18	Prata Natural Heritage Private Reserve
19	Paulino Velôso Camêlo Natural Heritage Private Reserve
20	Recanto da Serra Negra Natural Heritage Private Reserve
21	Foz do Rio Preguiças Environmental Protection Area
22	Região do Maracanã Environmental Protection Area
23	Itapiracó Environmental Protection Area
24	Reentrâncias Maranhenses Environmental Protection Area
25	Baixada Maranhense Environmental Protection Area
26	Morros Garapenses Environmental Protection Area
27	Upaon-Açu/Miritiba/Alto Preguiças Environmental Protection Area

MAP KEY

- Nominated Property
- Buffer Zone
- State Limit

Conservation Units

Government Level, Group

- Federal, Full Protection Area
- State, Full Protection Area
- Federal, Sustainable Use Area
- State, Sustainable Use Area

LOCATION MAP

Parque Nacional dos Lençóis Maranhenses

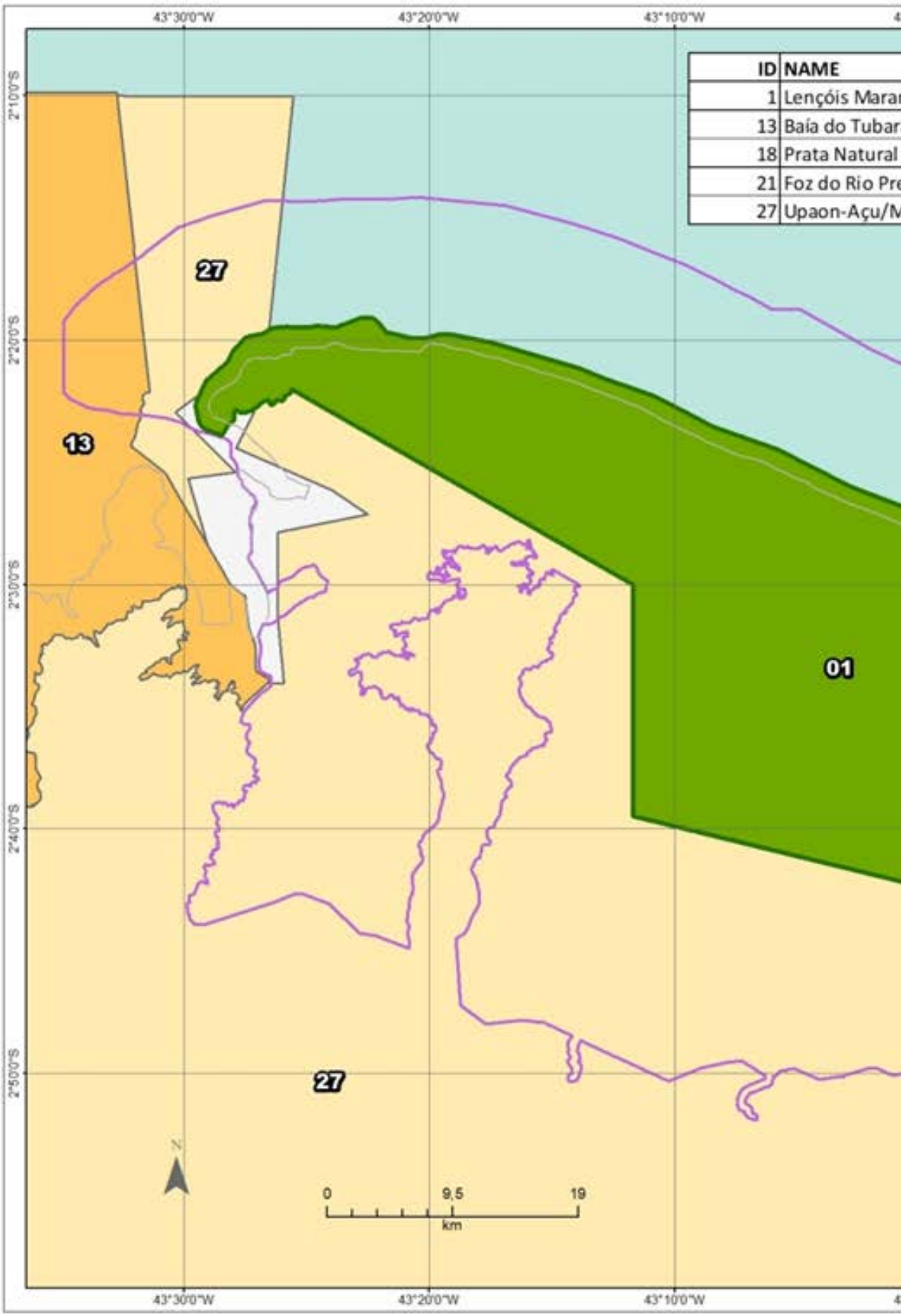
WORLD HERITAGE NOMINATION

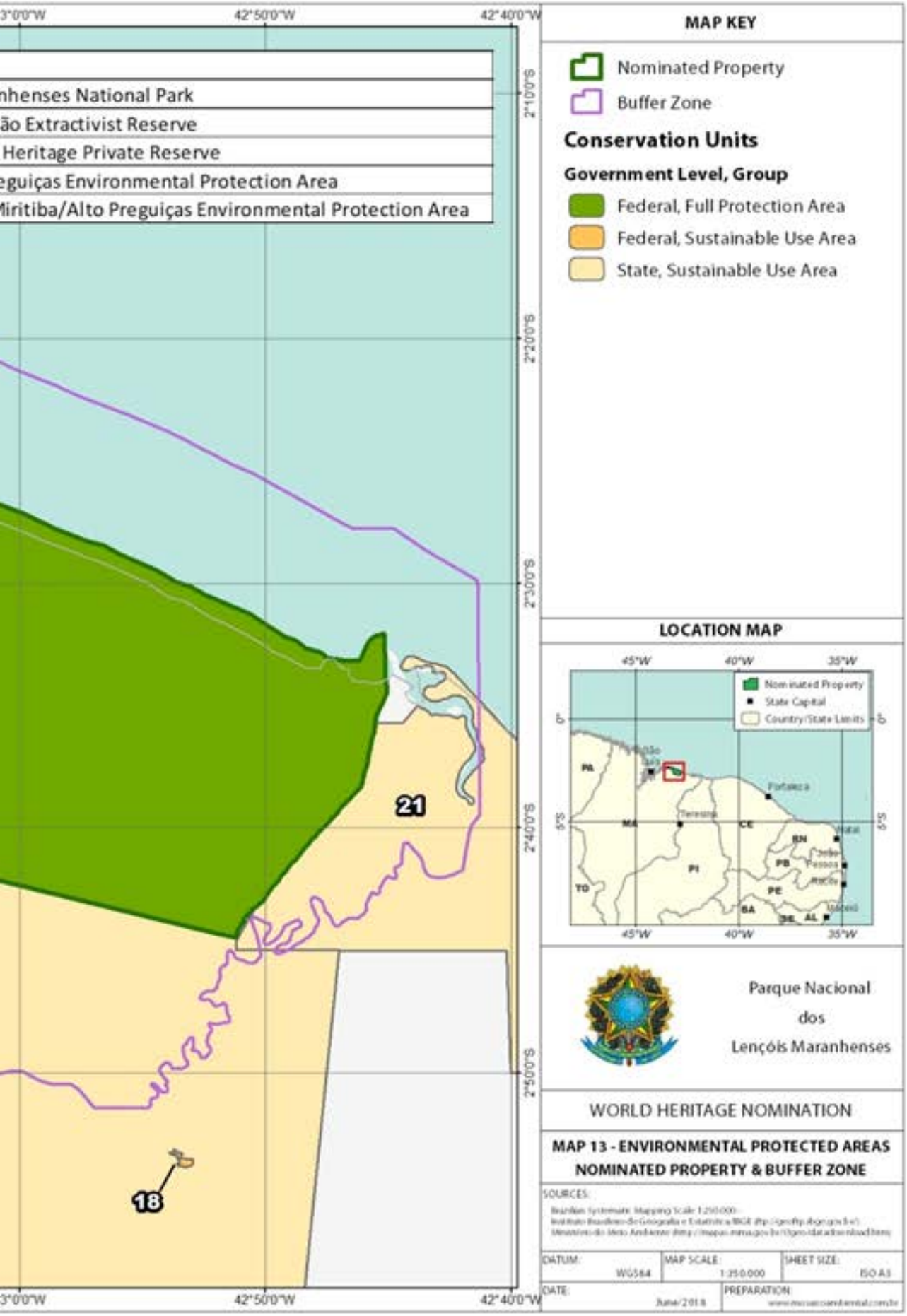
MAP 12 - ENVIRONMENTAL PROTECTED AREAS

SOURCES:

Brazilian Systematic Mapping Scale 1:250.000 -
Instituto Brasileiro de Geografia e Estatística/IBGE (ftp://geoftp.ibge.gov.br/)
Ministério do Meio Ambiente (http://mapas.mma.gov.br/i3geo/datadownload.htm)

DATUM:	MAP SCALE:	SHEET SIZE:
WGS84	1:2.000.000	ISO A3
DATE: June/2018	PREPARATION:	


43°30'0"W
43°20'0"W
43°10'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
ID
NAME
1
Lençóis Mara
13
Baía do Tubar
18
Prata Natural
21
Foz do Rio Pre
27
Upaon-Açu/M
27
13
01
27
N
0
9,5
19
km


3°0'0"W
42°50'0"W
42°40'0"W
2°10'0"S
2°20'0"S
2°30'0"S
2°40'0"S
2°50'0"S
nhenses National Park
ão Extractivist Reserve
Heritage Private Reserve
eguiças Environmental Protection Area
Miritiba/Alto Preguiças Environmental Protection Area
21
18
MAP KEY
Nominated Property
Buffer Zone
Conservation Units
Government Level, Group
Federal, Full Protection Area
Federal, Sustainable Use Area
State, Sustainable Use Area
LOCATION MAP
45°W
40°W
35°W
0°
5°S
Nominated Property
State Capital
Country/State Limits
PA
MA
CE
RN
PB
PE
PI
TO
BA
SE
AL
Parque Nacional
dos
Lençóis Maranhenses
WORLD HERITAGE NOMINATION
MAP 13 - ENVIRONMENTAL PROTECTED AREAS
NOMINATED PROPERTY & BUFFER ZONE
SOURCES:
DATUM:
WGS84
MAP SCALE:
1:250.000
SHEET SIZE:
ISO A3
DATE:
June/2018
PREPARATION:

Priscila Steffen

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8.a. Preparer

8.b. Official Local Institution/Agency

8.c. Other local Institutions

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Presentation

Lençóis Maranhenses. The name of the proposed site to be nominated as a World Heritage of Humanity is indicative of its beauty and uniqueness. Its beauty is related to the fact that this area presents a flat relief, consisting of marine quartz sands and strings of immense white dunes, which resemble "sheets thrown on the bed", as perceived and described by the first European navigators who explored this region (D'ANTONA, 2002 apud BELEZA & PEREIRA, 2016). Today, when looking at the landscape from satellite images, one notices that the navigators of yesteryear were right. The resemblance to a sheet thrown over the bed is crisp and beautiful.

History shows that since the beginnings of European colonization the landscape of the Lençóis Maranhenses National Park impresses for its beauty, immensity and uniqueness, for it is indeed an unique formation, not found anywhere else on planet Earth.

Even though it looks like a desert, it cannot be considered one, since it receives about 2000 mm of annual precipitation. It is, therefore, a humid area. However, as more than 90% of precipitation is contiguous between January and July, those who arrive at the National Park during the dry period are faced with a desert landscape. However, those arriving during the wet season are impressed by the thousands of lagoons formed in between the dunes, noting, quite obviously, that they are not in a desert. This feature is one of its singularities and its greatest landscape beauties.

The way the temporary lagoons are formed also confers a unique characteristic to Lençóis Maranhenses National Park. During the rainy season, rainfall is quickly absorbed by the sand, raising the water table above the ground and filling the temporary ponds between the dune chains. During this period the dunes barely move, due to the humidity and the lack of wind, which also makes the landscape of the humid season very different from the landscape of the dry season. This alternation of landscapes confers a singular beauty.

There are few coastal dune fields in the world that combine great length, conformation and rainfall volume that result in such beauty. In addition, the proposed site is located on a coastal plain that features one of the most significant records of dune fields developed throughout the quaternary. Its landscape is related to marine transgressions and regressions, which combined with the wind action allowed the formation of dune fields throughout the quaternary.

These characteristics are unique, making the proposed site completely different from any other dune field in the world and consequently unlike any other existing landscape.

Thus, the Lençóis Maranhenses National Park should be considered a World Heritage Site. It represents remarkable natural phenomena and is an area of exceptional natural beauty and aesthetic importance, besides being an exceptional example and identifier of stages in the history of the Earth, a record of significant ongoing geological processes in the development of landforms and significant geomorphic elements.

In addition, the National Park is home to species adapted to local conditions, such as 38 possibly endemic phytoplankton taxa, associated with lake isolation, an endemic species of restinga (Hybantus solccolaris) found in an area that shows signs of paleoclimatic insulation and the Pininga turtle (Trachemys adiutrix). There are also 31 species included in the red list of endangered species that inhabit the interior of the Park.

In addition, the site is inserted in the Cerrado Biome, in a transitional coastal region between the Amazon and the Caatinga biomes, which confers to this formation different characteristics from formations existing in these three biomes and even in other coastal regions. In addition, it shelters resting and mangrove vegetation, alluvial communities and pioneer vegetation of dunes, having, therefore, a huge biological diversity, comprising more than 850 species.

Therefore, the Lençóis Maranhenses National Park should be considered a World Heritage Site also because it contains relevant and significant natural habitats for the in situ conservation of biological diversity, including species of Exceptional Universal Value from the point of view of science and conservation.

In this sense, it is possible to affirm that the Lençóis Maranhenses presents a combination of climatic, geomorphic and biological characteristics, such as the delicate formations of dunes, lagoons and the presence of endemic and endangered species, not found in any other national or international sites. It is a unique environment, full of biodiversity and scenic landscapes of exceptional value.

Due to this set of characteristics, the Brazilian Government proposes the inclusion of Lençóis Maranhenses National Park in the World Heritage List, as a Natural Heritage Site.


Priscila Steffen

1. Identification of the Property

1.a Country

Brazil.

1.b State, Province or Region

Barreirinhas, Primeira Cruz and Santo Amaro do Maranhão, state of Maranhão.

1.c Name of Property

Lençóis Maranhenses National Park

1.d Geographical coordinates to the nearest second

2° 32' 12" S
43° 3' 49" W

1.e Maps and plans, showing the boundaries of the nominated property and buffer zone

Name of the Property - Lençóis Maranhenses National Park
Region(s) / District(s) - Barreirinhas, Santo Amaro do Maranhão, Primeira Cruz e Humberto de Campos, MA.
Coordinates of the Central Point – Lat: 2° 32' 12" S, Long: 43° 3' 49" W

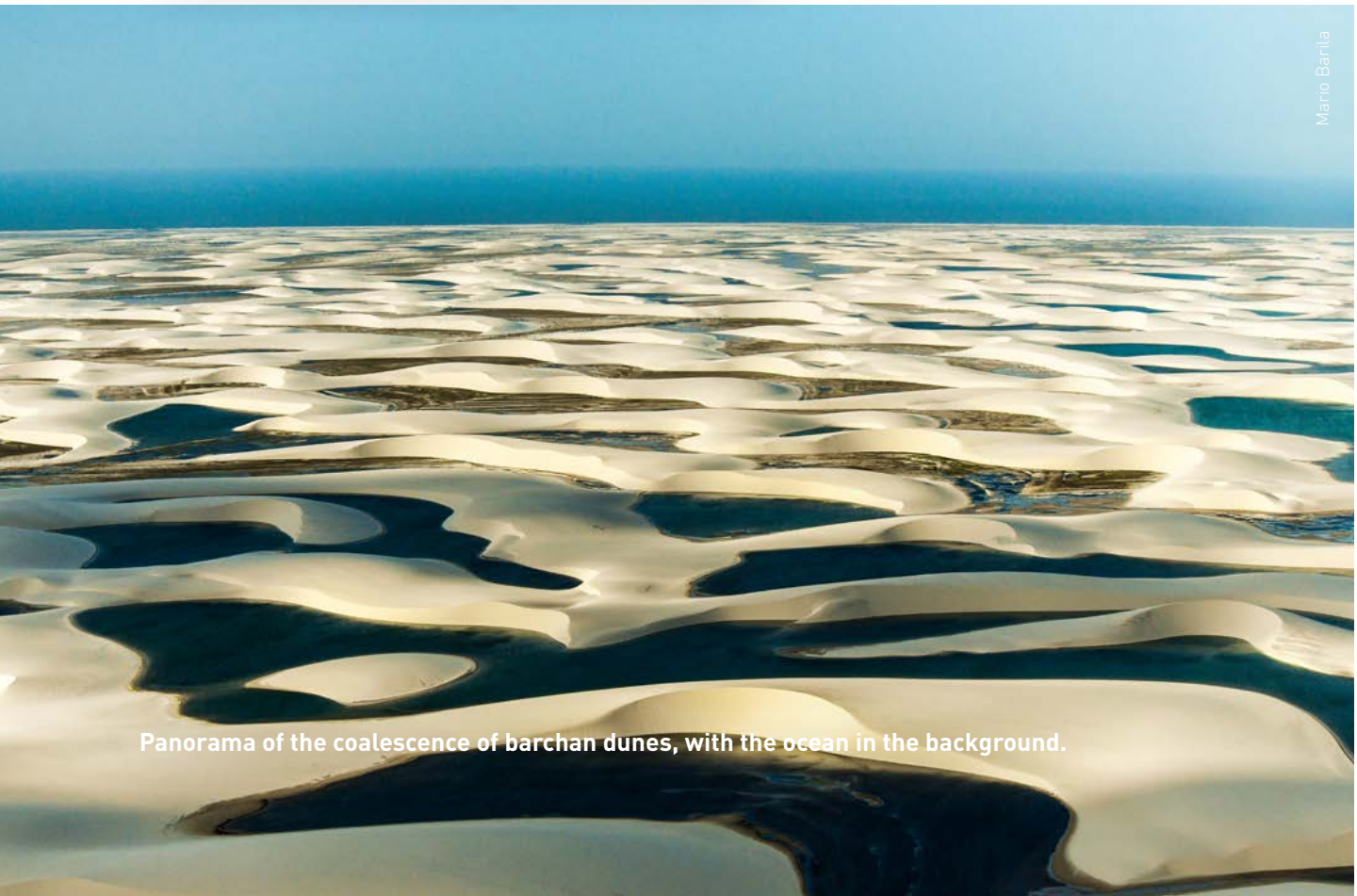
Table 1 – Map List

MAP NUMBER	IDENTIFICATION	FORMAT	SCALE
01	LOCATION OF NOMINATED PROPERTY AND BUFFER ZONE	A3	Variable
02	NOMINATED PROPERTY AND BUFFER ZONE	A3	1:350.000
03	NOMINATED PROPERTY AND BUFFER ZONE	A3	1:350.000
04	NOMINATED PROPERTY AND BUFFER ZONE TOPOMAP	A3	1:350.000
05	NOMINATED PROPERTY TOPOMAP	Large format	1:50.000
05a through 05m	NOMINATED PROPERTY TOPOMAP 1:50.000 GRID	A3	1:50.000
06	NOMINATED PROPERTY AND PHOTOMAP	A3	1:350.000
06a through 06m	NOMINATED PROPERTY PHOTOMAP 1:50.000 GRID	A3	1:50.000
07	VEGETATION COVER AND LAND USE MAP – NOMINATED PROPERTY	A3	1:350.000
08	VEGETATION COVER AND LAND USE MAP – NOMINATED PROPERTY AND BUFFER ZONE	A3	1:350.000
09	RELIEF MAP	A3	1:350.000
10	LANDFORMS MAP	A3	1:350.000
11	GEOLOGICAL MAP	A3	1:350.000
12	ENVIROMENTAL PROTECTION AREA	A3	1:2.000.000
13	ENVIRONMENTAL PROTECTED AREAS MAP	A3	1:350.000
14	ENVIRONMENTAL PROTECTED AREAS MAP NOMINATED PROPERTY AND BIFFER ZONE	A3	1:350.000

1.f Area of nominated property (ha.) and proposed buffer zone (ha.)

Area of Nominated Property (ha)- 155,000
Area of the Buffer Zone (ha)- 268.231
Total area (ha)- 423.231

The white sands produce a great contrast with the blue of the sky and the greenish tones of the lagoons, creating a landscape of rare natural beauty.



Panorama of the coalescence of barchan dunes, with the ocean in the background.

Pininga turtle (Trachemys adiutrix) on the margins of a freshwater lagoon

2. Description

The proposed site to World Natural Heritage presents a unique natural composition. This special condition stems mainly from the interaction of three extraordinary aspects related to this site: the exceptional natural beauty of its singular landscape; the presence of geomorphic features that represent notable examples of the major stages of the planet's natural history; and not least the presence of highly important natural habitats for the in situ conservation of biological diversity, which includes endangered species of outstanding universal value from the point of view of science and environmental conservation.

The site's beautiful landscape, similar to desert areas, with its chains of sinuous dunes that extend along the horizon is unique due to the high rainfall in the Park and due to the presence of the temporary and permanent lagoons of crystalline waters that appear in the rear of these elevations during the rainy periods of the region where the site is located. The landscape of the Lençóis Maranhenses National Park is still composed of other bodies of water, such as rivers and lakes, and exuberant elements of tropical flora, such as those associated with restinga vegetation and other pioneer formations such as riparian forests and mangroves.

The landscape of great scenic beauty that characterizes the National Park is related to the great contribution of sediments by the transgressions and marine regressions, that combined with the wind action allowed the formation of the fields of mobile dunes along the Quaternary, which consists of a unique geomorphic process in the world.

Concerning the relevance for biodiversity conservation, it should be pointed out that the area proposed as a World Heritage Site is part of the Cerrado, but presents a unique set of species, as the Park also shelters Caatinga and Amazon species, resulting in a diversity of more than 850 species, of which 31 species are included in the list of endangered species

2.a Description of Property

The proposed World Heritage site is located in the north coast of Brazil, in the State of Maranhão (Map 01 and Figure 01). It is comprised by a center area (nominated property), corresponding to Lençóis Maranhenses National Park, and by a protection zone of this center area (Buffer Zone), jointly totaling approximately 423,231 hectares, spread throughout the cities of Barreirinhas, Primeira Cruz, Santo Amaro do Maranhão e Humberto de Campos (Map 02).

Limits of the Nominated Property of the World Heritage Proposed Site

The boundaries of the nominated property starts at the following geographic coordinates: latitude 02o39'29 "S and longitude 43o11'42" WGr, located at the alignment of the network of telegraph lines connecting Humberto de Campos to Barreirinhas, be-

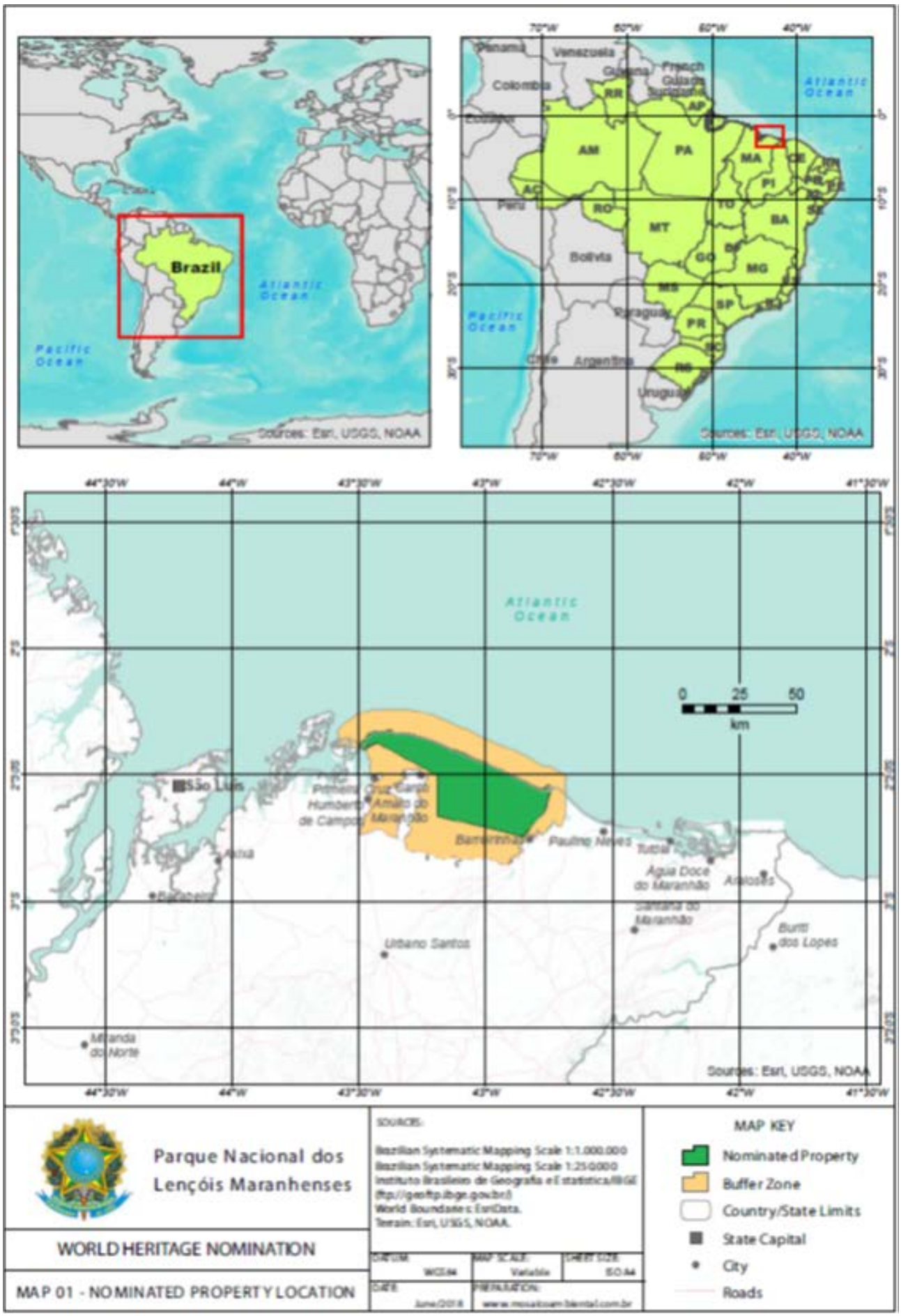


Figure 1. Nominated Property Location Map

ing that point 1; then it follows northbound, in a straight line, reaching point 2 at the geographical coordinates: latitude 2o30'00 "S and longitude 43o11'42" WGr; it then changes course into a north-west direction by means of another straight line, reaching point 3 at geographic coordinates: latitude 2o22'03 "S and longitude 43o25'34" WGr, located at the intersection of this line with Santaninha Island, in its northern part; it then follows the general southwest direction, reaching the point of geographic coordinates: latitude 2o33'11 "S and longitude 43o27'56" WGr, at point 4; it enters perpendicularly 1 kilometer into the Atlantic Ocean, rounding the coastline clockwise to the point of geographical coordinates: latitude 2o33'50 "S and longitude 42o45'00" WGr, at point 5; following then the road that connects Ponta do Mangue to Barreirinhas until the point at geographic coordinates: latitude 2o44'39 "S and longitude 42o51'11" WGr, located at the intersection of this road with the telegraph line, at point 6; it then follows this line, in the general northwest direction, reaching point 1 of this description, thus closing the perimeter.

Limits of the Buffer Zone

The buffer zone of the Lençóis Maranhenses National Park has an area of 423,231 ha. In its limits are included some of the municipalities of Humberto de Campos, Primeira Cruz, Santo Amaro do Maranhão and Barreirinhas, excluding the urban limits of these municipalities.

In the region of Primeira Cruz, the buffer zone covers areas with resting vegetation, fluvial-marine plains (mangrove, floodplain and apicum), fields of fixed dunes, recessed mesas, springs and mouths of the rivers Mirim, Miritibinha, Mananzaro, Velho and Alegre, which converge to the mouth of the river Periá, which, in turn, acts as a natural boundary between this municipality and that of Humberto de Campos. The latter has the same environment profile as Primeira Cruz, whereas in the southern sector the Ribeira River acts as natural border, holding an expressive riparian forest. In this area, therefore, the buffer zone is physically delimited by the rivers Periá to the west and Marciano to the east; to the north by limits of the Lençóis Maranhenses National Park; and to the south by the highway MA-402.

In the vicinity of Santo Amaro do Maranhão, the buffer zone is bordered by the Queixada River and the Santo Amaro Lake, while to the east is the Negro River, to the north the Lençóis Maranhenses National Park and to the south the MA-402 and the Bacabinha river. Predominant in this area are fields of mobile and (mainly) fixed dunes, recessed mesas, restinga and water courses that drain it towards the interior of the UC, like the Rio Grande and its 15 tributaries, in addition to six others that contribute to the Rio Negro. There is also the presence of sand fields in the vicinity of Santo Amaro do Maranhão, as well as riparian forest and subsistence crop areas.

In the region of Barreirinhas the buffer zone is delimited by the Negro river to the west; the Preguiças River to the east; the MA-402 highway and the source of the Mirinzal stream to the south; to the north, the boundary of the Park is the Atlantic Ocean. In this area, there is a sandy beach, a plain of wind deflation, a fixed dune field and a recessed beach in addition to restinga, followed by floodplains, riparian forest and areas for subsistence crops, as well as mangrove fringes near the village of Mandacaru. This area presents a significant drainage network represented by the Preguiças, Juçaral, Maçangano, Sucuriju and other watercourses.

In the Atlantic Ocean, the buffer zone is equivalent to 10km stretch starting from the boundary of the Park at sea, including the stretch from the mouth of the Periá/Barra dos Veados river in the west until its projection after Caburé,which includes part of the mouth of the Preguiças river, to the east,compriings the lower section of the municipalities of Primeira Cruz, Santo Amaro do Maranhão and Barreirinhas where artisanal fishing is practiced by the local population and trawling by large scale fishing companies.

2.a.I. Setting and Component Description

The Lençóis Maranhenses National Park is located on the northeastern coast of Brazil, in the macro-compartment called semi-arid north coast, whose limit goes from

Ponta dos Mangues Secos to Ponta do Itapagé. In area the Barreiras Group sedimentary deposits predominate, at the head of which numerous dune fields were developed, fed by the sediments originating from the internal continental shelf (MMA, 1996).

The Park consists of an extensive dune field, with temporary and perennial lagoons, restingas, mangroves, apicuns and forest areas around the rivers and perennial lagoons.

In its buffer zone are still semi-deciduous forests, savannas and sparse urban areas (Maps 7 and 8).

The succession of white sand dunes, when seen from above, resembles large sheets stretched by the wind, composing a landscape that cannot be found anywhere else on the planet. The appearance of crumpled sheets of these chains is the origin of the name of the proposed site.

Inserted in the east coast of the State of Maranhão, the site has an area of 155,000 ha which includes the municipalities of Santo Amaro, Primeira Cruz and Barreirinhas, and is composed by an extensive dune field comprising a total of 90,000 ha, with temporary and perennial lagoons, presenting distinct morphological dynamics from other sites of the Brazilian coast. Beaches ranging from 600 m to 2 km in length are found along the 80 km of the coast of the Park, as well as dunes up to 10 to 20 m in height, forming wide areas covered by sand. The abiotic and biotic attributes are presented below, in order to better describe the proposed site.

Adriano de Souza

Volta de Santo Amaro.jpg: Access road to the PNLM from Santo Amaro do Maranhão. Note the heavy clouds indicating the arrival of rain characteristic of the period between January and July.

Climate

The Park is located in a region of tropical climate of the equatorial zone, characterized by high temperature and rainfall. The predominance of a gently undulating relief, with depths of less than 100 m, where extensive dune fields and restinga vegetation are found, as well as features such as solar energy, albedo and sea level, interact with local and regional meteorological systems, thus creating a very complex climate at the area (IBAMA, 2003).

The northern and northeastern Brazilian coastal region is influenced by meteorological systems of several scales that interact with each other. The Intertropical Convergence Zone (ZCIT) and the semi-stationary high pressure of the South Atlantic are the main systems that influence the coastal region of Maranhão, giving rise to the north and east quadrant winds, respectively, and controlling the spatial and temporal distribution of precipitation. The ZCIT remains positioned over the region in the rainy season moving further north during the dry season (ARAUJO, 2015). Medium-scale and small-scale systems, such as cumulonimbus clusters associated with instability lines, typically occurring on the Atlantic coast, and sea breezes are also responsible for precipitation events in the region (El-Robrini et al., 2006; Meireles, et al., 2006).

Due to the proximity of the equator, the mean annual temperature is relatively high, reaching the 28°C mark. Minimum temperatures are observed during the rainy season, with average values of 22.6°C and maximum temperatures are observed in the dry period, especially between August and November, with average values of 31°C (INMET, 2018). The Lençóis Maranhenses National Park presents relative humidity levels around the 68% mark, mainly due to the trade winds and the cloud cover during most of the year, easing the temperature and provoking a relative thermal comfort (IBAMA, 2003).

Precipitation in the Maranhão coast varies from 1,400 mm to 2,600 mm from east to west. However, the predominant feature over the whole area is the presence of a dry season that lasts for at least three months. The intensity and duration of the dry period increases towards the east, reaching a period of six months in the areas near the Lençóis Maranhenses National Park to the low Parnaíba region (IBAMA, 2003). In the eastern part, therefore, the climate assumes a transitional character to drier areas, while the western part of the Maranhão coast presents a typical regime of the Amazonian forest. The presence of two marked seasons are, in the first instance, an effect of the ZCIT positioning, which in the rainy season is on the Maranhão coast while in the dry season moves to the northern hemisphere ceasing the rainfall on the region, starting a long period of drought. In addition, rainfall is also generated throughout the year by instability lines, which arise due to the sea breeze (EL-ROBRINI et al., 2006). In the vicinity of the Lençóis Maranhenses National Park, annual rainfall is around 1,800 mm, with a rainy season between March and May and a drier period between September, October and November (EL-ROBRINI et al., 2006).

As mentioned before, wind on the north and northeast Brazilian coast essentially follows the large-scale circulation, with predominance of east zonal flows, reaching an average velocity of 5 m/s. It is noteworthy that the wind speed increases near the coast due to the accentuated breeze effect. At the end of the dry period, the wind velocity increases as a function of the influence of the trade winds that blow more on the tropical region, being able to be identified by the near surface profile and being an omen of the precipitation increase (EL-ROBRINI et al. al., 2006).

Studies on the wind behavior in the region of São Luís, distant about 200 km from the proposed World Heritage site, showed that air mass displacement presents a predominant NE direction (43.3%) with a mean velocity of 3,1 m/s, decreasing from 23% to 30% in frequency during the rainy season, causing the increase of lull and action of SE and E winds in the region. In the dry period, the NE winds return to action, reaching in November 74.7% of predominance of the winds in this direction (IBAMA, 2003).

Winds reach an average of 8.3 m/s velocity In the Lençóis Maranhenses region during the dry period and 6.1 m/s in the rainy season, varying from regular to moderate wind. In the dry period the wind speed increases, reaching speeds equal to or superior to 14,1 m/s, attaining strong wind category. The winds move in successive bursts promoting significant changes in the coastal dynamics (IBAMA, 2003). This is a very important factor to understand the geomorphological dynamics of the proposed site, since moving dunes forms a large part of the area, whose displacement is associated with the wind dynamics. Therefore, the incidence of winds directly interferes with the unique characteristics of the proposed site.

Geology

The Lençóis Maranhenses National Park is part of the Barreirinhas Basin (Figure 2), whose origin and evolution is associated with the transforming separation of the South American and African continents. The Park occupies an area of approximately 46,000 km², of which 8,500 km² are immersed, with the maritime portion extending to the bathymetric quota of 3,000 meters. The basin has been considered as a classic example of a rhombic trans tensional basin, associated with dextral movement and continental crust projection of the Romanche Fracture Zone, which cuts it practically in half, extending westwards to the Island of São Luís (JUNIOR et al., 2007).

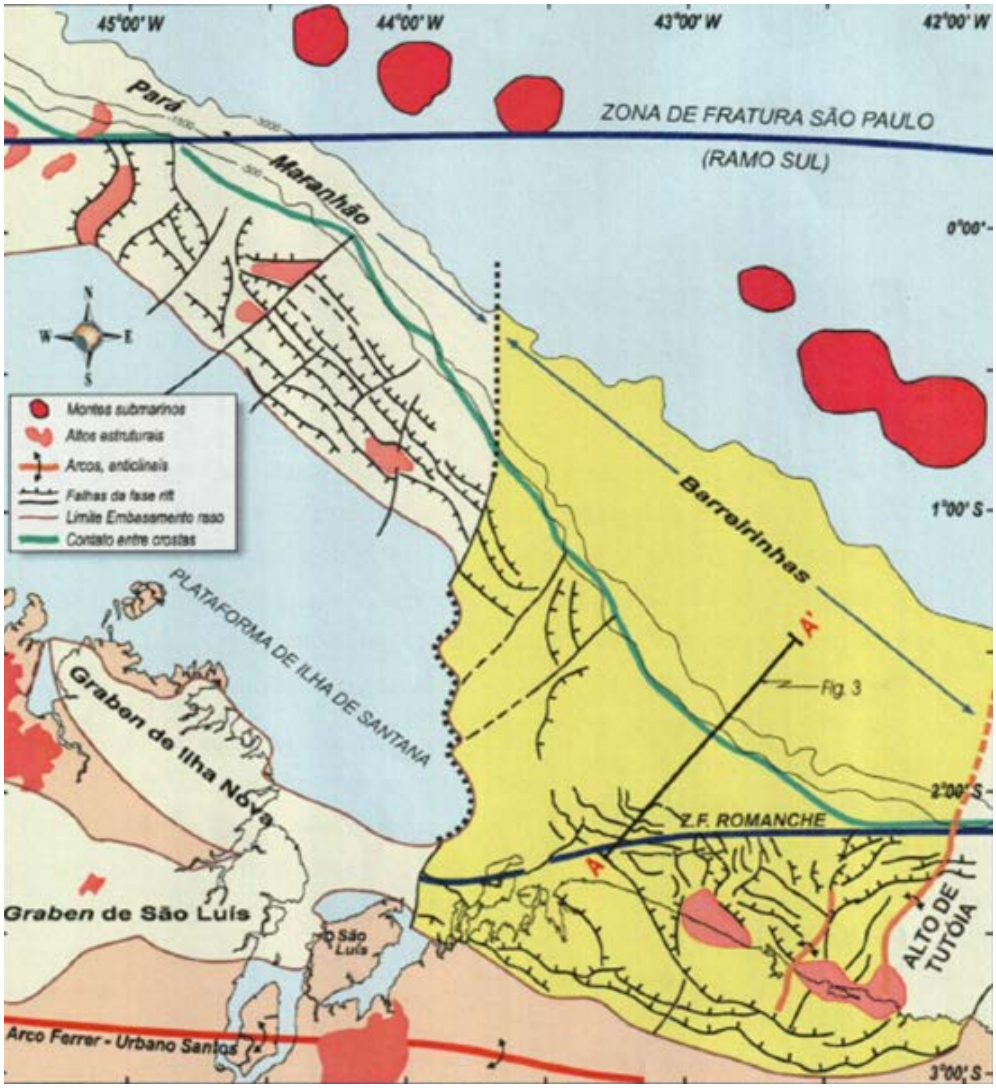


Figure 2. Location, limits and structural framework, at the rift section level, of the Barreirinhas Basin. Excerpted from Zalán (2004).

Barreirinhas Basin is bounded to the east by the Ceará Basin, represented by the Alto de Tutóia, and to the south with the shallow basement through the edge faults and to the west with the Santana Island Platform, from which the basin extends to deep waters.

The Barreirinhas Basin can be subdivided into two large sets of sequences: a pre-Aptian and a Meso-Cenozoic, covering the rocks of the rift phases and passive margin of the basin itself. The pre-aptian sequence set is related to a syneclization stage and is represented by the sedimentation of the underlying Paleozoic Basin of Parnaíba. The sequence of the rift phases corresponds to the retro gradient fluvial-deltaic complex of neoalbial age, belonging to the Canarias Group. The passive sequence is characterized by clasts and carbonates of high and low energy albo-cenomanians of the Caju Group, representative of the beginning of the marine sedimentation in the basin. These sequences are limited by divergences caused by sea level declines (IBAMA, 2003; ZALÁN, 2004).

The crystalline basement of the Barreirinhas Basin consists of gneiss, granite and quartz-mica schist of pre-Cambrian age. As mentioned, these rocks are overlain by the Cretaceous sedimentary package formed by the Canarias Group and the Caju Group. The Canarias Group comprises the Arpoador, Bom Gosto, Tutóia and Barro Duro Formations. The Arpoador Formation represents the basal unit of the sedimentary package, being constituted by shale and sandstones, settled discordantly on the pre-Cretaceous sediments and/or basement. The Bom Gosto Formation is predominantly sandy with alternating shale overlapping the Arpoador Formation, in lithological discordance. The Tutóia Formation is characterized by a transgressive sequence of dark shale, settling on the Bom Gosto and Arpoador Formation. The Barro Duro Formation consists of quartz sandstones ranging from white to light-gray and green in color, its granulometry varying from fine to coarse, partly conglomeratic, deposited in delta fans under marine conditions (IBAMA, 2003).

The Caju Group characterizes the cycle of carbonate deposition formed by the lithological components: limestone, shale, marls and subordinate sandstones. Regarding its stratigraphy, the sediments of the Caju Group overlap with the Barro Duro Formation of the Canarias Group and are pushed under the Pirabas Formation. This group is formed by bioclastic and oncolytic calcarenites (Bonfim Formation) and calcilutito (Preguiças Formation) sedimented in high and low energy neritic environments. The Neo-Albian Age is derived from the dating of palynomorphs and planonic foraminifera. The Periá Formation, consisting of clays, calcilutites and shale, represents the basal part of the Caju Group and was generated by deposition in a shallow marine environment (IBAMA, 2003).

The Humberto de Campos Group presents as its basal unit the Travosas Formation, constituted of dark shale and fine sandstones. Overlying these sediments are the carbonates of Santana Island and the coarse clastics of the Areinhas Formation. The Pirabas Formation develops throughout the basin capturing the Cretaceous sediments, being dated to the Lower Miocene, and is characterized by light-cream, soft, fossiliferous limestones, associated with shale of color that vary from red to greenish gray, sometimes lenticular in shape. Quartz sand of medium to coarse granulometry occurs frequently associated with limestones and shale. This formation appears on the coast of the State of Paraná and in restricted areas of Maranhão and Piauí. In the Lençóis Maranhenses National Park, near the Queimada dos Britos, sandstones, partially ferruginous sandstones with fine to medium granulometry and dark shale in the form of acicular blocks with frequent organic matter (IBAMA, 2003) appear on Lençóis Pequenos Beach (IBAMA, 2003).

The sediments of the Pirabas Formation, associated to the recent marine deposits of the internal platform, are probably the source area of quaternary sediments forming the extensive sand sheets of the region in question. According to Junior et al. (2007), the Pirabas Formation is associated to the last great transgression occurred in the equatorial margin, perpetuating itself in the geological record in the form of the carbonates of this formation. Subsequently, a phase of progression or regression was initiated, with a new retreat of the coastline during which the

sediments of the Barreiras Formation, dating from the Tertiary period, were deposited. Finally, sediments of the Barreirinhas Basin are also represented by the Quaternary Açuí Formation, which is characterized by quartz sands and small proportions of heavy minerals, graded fine to medium, moderately to well selected, rounded to sub-rounded in shape with occasional clay matrix as a function of wind, river or coastal deposition. These sediments completely cover the Barrerinhas Basin in the form of a field of mobile and fixed dunes (IBAMA, 2003).

Geology of Nominated Property is presented on the Map 9.

Geomorfology

The Lençóis Maranhenses National Park presents a gentle to moderately undulating relief, represented by the extensive field of mobile and fixed dunes, lakes, lagoons and beaches. As described by RADAMBRASIL (1973), this coastal region presents a smooth relief, with high dunes, restingas, mangroves and broad river mouths (Maps 10 and 11).

The coastal plain of Lençóis Maranhenses, west of the mouth of the Preguiças River, presents one of the largest field records of coastal dunes developed along the Quaternary. The origin of the field of mobile and fixed dunes is related to the selection of sediments due to the retrogradation of the sedimentary deposits of the Barreiras Formation and consequent expansion of the continental shelf, in line with the successive marine transgressions that have occurred since the Pleistocene, associated with the contribution of fluvial sediments of the main rivers, such as the Preguiças and Parnaíba (IBAMA, 2003).

The current coastal dynamics is closely related to the interaction of the following agents: climate, coastal drift, tidal regime and river currents. The coastal plain is characterized as the receiving area of the sediments brought by the coastal drift, originating from the internal platform, by the waves and sandy sediments reworked by the local drainage. In this way, a considerable part of the solid load is deposited on the beach, being exposed daily to the wind action during the cycles in between tides in intervals of 12 hours. This abundant sand stock forms, under the action of the trade winds, the extensive dune fields, which can be observed also along this macro region of the northeastern coast. Likewise, the sands that cover the internal platform adjacent to the Lençóis Maranhenses, which is narrow (70 to 80 km) and shallow (depths of approximately 80 m), form underwater dunes that move westwards, according to the direction of the coastal drift (IBAMA, 2003).

The supply of sediment from the beach towards the dune field is conditioned by the seasonal variations of rainfall, since during the rainy season sediment mobilization is reduced due to the higher moisture content and lower wind speeds. On the other hand there is a significant reduction in the moisture content of the sandy sediments during the dry period, due to the absence of rainfall and lowering of the water table, as well as the significant increase in the velocity of the winds, with a high displacement of the sands of the streak towards the deflation plain and consequently to the field of mobile and fixed dunes (IBAMA, 2003).

Several recent studies also detail the origin of the morphology of the Lençóis Maranhenses (eg.LUNA et al., 2012; LUNA et al., 2011). The dunes are formed thanks to the phenomenon known as saltação, when the winds uplift some grains of sand that collide with other grains of sand as they fall to the ground, splashing upwards, forming a cloud of sand close to the ground. The dunes are then formed when the deposition of sand overcomes erosion by the winds, forming mounds of sand that are constantly worked. When the winds blow in the same direction, these mounds of sand have two "arms" oriented towards the wind, originating the barchans or crescent dunes. The grains of sand are accumulated on their backs and transported towards the top before sliding on avalanches to the other side, causing the barchan dunes to move and grow. In the simulations carried out, the barchan dunes are formed on the beach and then join together forming long and narrow transverse dunes, perpendicular to the direction of the wind. As the transverse

dunes accumulate sand and advance inland, the instabilities in the avalanches cause them to break and fall, taking the form of larger barchans. In Lençóis Maranhenses, the abundance of sand allows the emergence of large numbers of crescent dunes, whose arms come together, forming corrugated chains, known as barchanoids.

Other elements such as vegetation and precipitation also influence the shapes of Lençóis Maranhenses. Regarding precipitation, it was observed that in the rainy season the temporary lagoons between the dune chains are responsible for softening and lengthening the curves of the barchanoids, besides limiting the growth of the crescents to a height of 20 meters. Dune chains can only intersect regularly with the lagoons when the annual water table fluctuation coincides with the delay time for the dunes to travel a distance equal to their width in the wind direction.

The vegetation influences the formation of the parabolic dunes, when the restingas grow fast enough to trap the arms of the barchans, allowing only the bodies to continue moving, giving rise to dunes with their internal curvature turned against the wind (ZOLNERKEVIC, 2013). As mentioned, in addition to these, several other morphological features are found in the Lençóis Maranhenses National Park, which will be better described below:

- Beaches

Sedimentary (commonly sandy) deposits, accumulated by the action of the waves that adjust to the conditions of waves and tides. In the Lençóis Maranhenses National Park, the sandy sediments that make up the beaches come from river discharges, coastal drift and the internal continental shelf (IBAMA, 2003). According to El-Robri et al. (2006), the beaches are formed by medium to thick sands, occasionally gravel (near the mouth of the largest rivers), moderately selected, with abundant remains of shells, organic matter and heavy minerals.

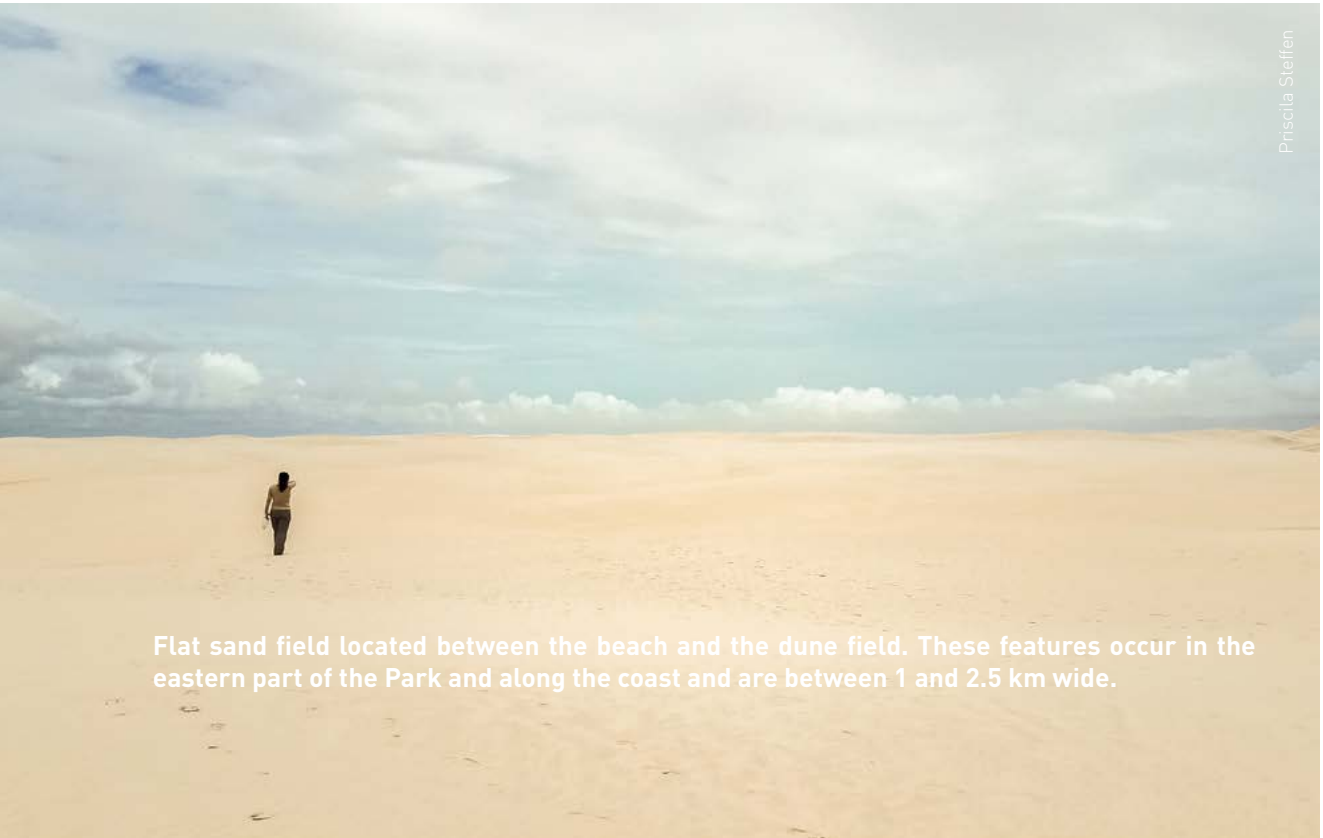
Along the beaches one can also find beach sandstones. These formations are discontinuously distributed, forming alignments parallel to the coastline, and usually appear in the stretch zone and in the surf zone. In general, they are conglomeratic sandstones with large amounts of bioclasts (mollusks and algae fragments), cemented by calcium carbonate (EL-ROBRINI et al., 2006). Above the beach, there is the post-beach zone, beyond the reach of ordinary waves and tides. Small elevations are observed at the site, however, formed above the limit of the average high tide flows reached during syzygy tides (IBAMA, 2003).

Canto dos Lençóis beach, located at the east end of the Park

- Sand sheets

This feature is defined as a characteristically planar, mantiforme wind surface, oriented according to the direction of the prevailing winds. The environmental dynamics of these features is related to the presence or not of herbaceous vegetation forming, at times, small mounds. These features are formed in the wind deflation plain, where isolated spots characterize as sand sheets. In the eastern portion of the UC, these geomorphic features are more common, occurring however throughout the area between the beaches and the dune fields, with a width varying from 1 km to 2.5 km (IBAMA, 2003). According to Gastão (2012), sediment removal by wind processes predominates in the deflation plain, usually through the erosion of frontal dunes, whose sediments are transported from the deflation plains to the continent, forming transgressive, tabular and wave dunes.

Figure 3. Beach and deflation plain in Lençóis Maranhenses National Park. Extracted from Google Earth (2018).



Priscila Steffen

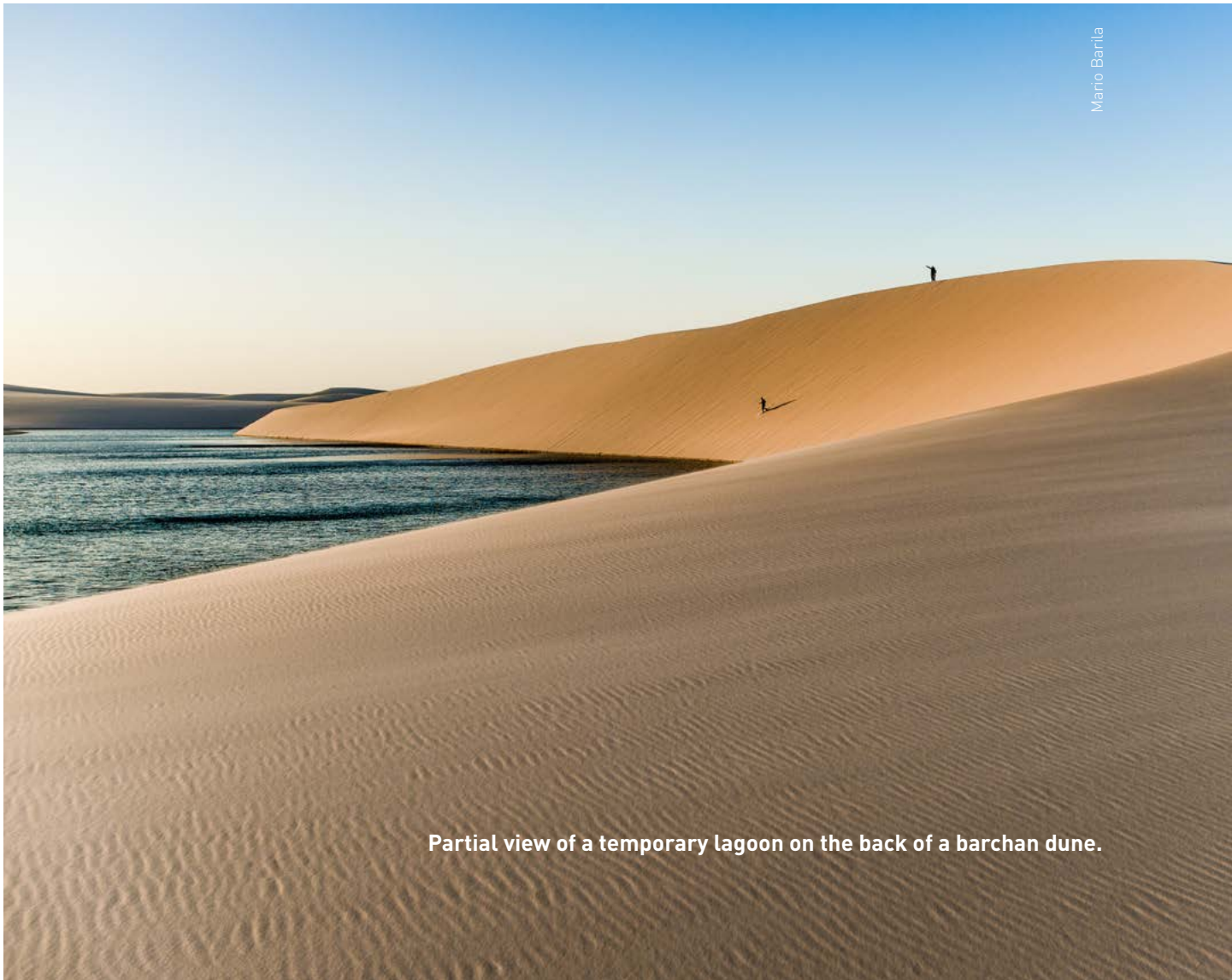
Flat sand field located between the beach and the dune field. These features occur in the eastern part of the Park and along the coast and are between 1 and 2.5 km wide.

- Dunes

The dunes are wind deposits, formed only when there is a large stock of sand available to be moved by the wind. The sedimentary wind system of Lençóis Maranhenses is composed of fixed and mobile dunes, generally in the form of barchan, transverse, parabolic, barchanoid and longitudinal dunes (IBAMA, 2003). The mobile dunes are characterized by the absence of vegetation and are formed near the beach, where the action of the winds is more intense. The fixed dunes occur at the rear or interspersed with the moving dunes, presenting incipient pedogenesis, resulting from the fixation by pioneering vegetation that prevents or attenuates the wind mobilization. There are still semi-fixed dunes, which are partially retained by grasses or shrubs (EL-ROBRINI et al., 2006). The main forms of dunes are presented below:

- Barchan Dunes

These dunes present a crescent shape, with the convex side facing the wind. In the Lençóis Maranhenses National Park, the orientation of these dunes obeys the direction of NE trade winds and present a softer slope on the convex (windward) side and a steeper slope, ranging from 10º to 50º on the concave (leeward) side. These have a width significantly greater than their height (IBAMA, 2003). According to Zolnerkevic (2013), the barchan dunes reach five meters high about one kilometer from the coastline and can reach up to 20 meters in height. Some can be 12 times wider, joining one another, and reaching up to 180 to 240 meters. Gonçalves et al. (2003) also affirm that the park's barchan dunes present approximately symmetrical "arms"at their place of origin (regular barchans) transforming into asymmetric arms as they migrate (irregular barchans). In addition to that, they tend to increase in quantity from July to November during the dry season, when there is a higher incidence of winds and sediment transport is intensified.



Partial view of a temporary lagoon on the back of a barchan dune.

- Barchan Chains

The chains of barchan or barchanoids (Figure 4) are characterized by the lateral union of barchan dunes that gradually grow as they move away from the sand sheets. As they grow in size, their migration speed decreases significantly. This is the most common form of dunes in the Lençóis Maranhenses area, arranged transversely to the direction of the wind. Gonçalves et al. (2003) classify these chains into transverse dunes of straight ridges and transverse dunes of sinuous ridges. Transversal straight ridged dunes are located on the sides and inner limits of the dune field, being of taller and having lower migration rate. The contact with the vegetation slows the advance of these dunes, reducing the distance between dunes and promoting certain retilinization of the ridges. The tranversal with sinuous ridged dunes, in turn, correspond to the dominant features in the Lençóis Maranhenses National Park, ranging from the post-beach to the inner limits of the dune field. They present an orientation perpendicular to the main direction of the winds (NE) with varied dimensions, with sinuosities proportional to the spacing between the dunes.

Figure 4. Barchan chain. Extracted from Google Earth (2018).

Barchan chains seen in the dry season.

- Parabolic

The parabolic dunes (Figure 5) are similar in shape to a parable, with the concave side facing the wind. As mentioned, this feature is originated by the entrapment of the "arms" of the barchan dune, by the vegetation or humidity, and the inversion of its convex side that becomes the concave side of the parabolic dune. These dunes are scattered in the south of the dune field, and their signs can be observed in areas where truncation occurs between the parabolic and barchan dunes (IBAMA, 2003). The parabolic dunes present varying dimensions. For example, the ones located near the center of Barreirinhas have widths of the order of 250 meters, reaching around 10 meters in height and length of approximately 90 meters (GONÇALVES et al., 2003).

Figure 5. Parabolic dunes indicated by the red arrows. Extracted from Google Earth (2018).

- Longitudinal Dunes

These are features developed in the lateral portions of the barchans and chains of barchans during their migrations (Figura 6). They are also, albeit rarely, observed along the parabolic dunes, when one of the arms of a barchan migrate faster than the other generating the transformation of a parabolic feature into a longitudinal cord. Therefore, the genesis of this longitudinal form is independent of the presence of bidirectional winds. Its occurrence, relatively restricted compared to other features, is mainly distributed over the large truncation surfaces of the wind deposits. These dune features are vary in size, with bodies ranging in width from 5 to 80 meters, heights of 1 to 5 meters and length of up to 2 km (GONÇALVES et al., 2003). According to IBAMA (2003), the longitudinal dunes are aligned according to NE winds and their presence is restricted to the boundary between the field of mobile and fixed dunes, mainly in the SE sector, where said limit is well defined, possibly due to the control of the vegetation and/or the existing waterways.

Figure 6. Longitudinal dunes indicated by the red arrows. Extracted from Google Earth (2018).

- Paleodunes

The paleodunes are Pleistocene coastal eolic deposits, characterized by an orange-yellow coloration. They are formed far from the beach, to the south, adjoining the field of mobile dunes, and are fixated by lush restinga vegetation. They are located on the plateaus, also known as low coastal sedimentary plateau, presenting approximately 50 to 60 meters in height (EL-ROBRINI et al., 2006).

- Flood plains

These are areas that are slightly above the average level of water, subject or not to floods during the wet season, and also known as terraces, floodplain or larger layer. During the dry season, when the water level is lower, there is a significant increase of the plain, as well as a certain advance of the free dunes on this morphological feature (IBAMA, 2003). According to Gastão (2012), in addition to the fluvial plains, there are also fluvial-marine plains, characterized as flat surfaces of an estuary, which lie between the mean low tide level and the mean high tide equinoctial level.

- Pedology

The types of soils found in Lençóis Maranhenses are characterized as marine quartzose sand and indiscriminate mangrove soils (IBAMA, 2003). According to Embrapa (2014), the classes of soil found are quartzose sands, indiscriminate mangrove soils and dunes. The marine quartzose sands are whitish gray, fine to medium in size with small proportions of clay, moderate and well selected. The A horizon prsents a thickness of less than 20 cm and contains partially decomposed organic matter. They are found mainly in the hydrophilic fields of restinga and fluvial-marine areas. The indiscriminate mangrove soil consists of gleaned materials with no differentiation of horizons, with a high content of sulfur coming from ocean waters. It is distributed in areas subject to the permanent influence of tides such as Travosa, Atins and Primeira Cruz (IBAMA, 2003).

The sands of Lençóis Maranhenses have a mean diameter of more frequent occurrence between 0,177 mm and 0,125 mm and between 0,354 and 0,250 mm, which refer to fine and medium sand, respectively. The fine sands are predominant (60%), but the medium grained sand is also significant and can be found on the beaches, sand sheets, lake banks, at the base of the dune chains, in the localities of Baixa Grande and Queimada dos Britos, where restinga vegetation occurs, as well as at the boundary between the mobile and fixed dune fields. The diameters of the sandy sediments diminish as they move away from the coastline, confirming the significant transport capacity of the NE trade winds, modeling the landscape of the Lençóis Maranhenses (IBAMA, 2003).

The indiscriminate mangrove soils are formed from the deposition of sand, silt and clay particles, as well as colloidal material brought in by the rivers. They are soft, muddy soils rich in decomposing organic matter, and therefore poor in oxygen (CPRM, 2011).

Mario Barila

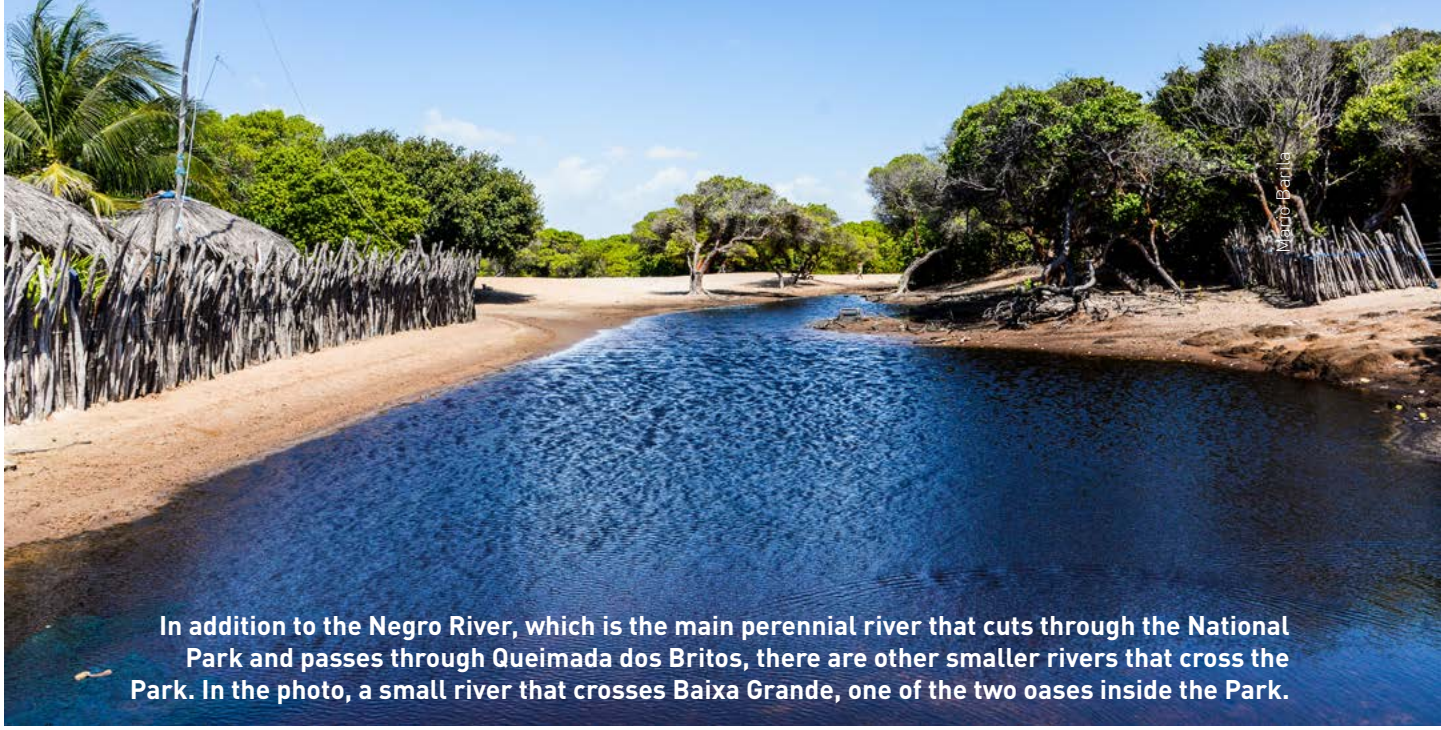
The population living inside the park and the surrounding area uses small boats to get around and fish in the region's rivers. Constant winds allow the use of sails.

Mario Barila

Detail of the Negro River, the main perennial river that cuts through the National Park, within the primitive zone in Queimada dos Britos

Mario Barila

Artisanal fishermen at the end of a day at the Preguiças River.



In addition to the Negro River, which is the main perennial river that cuts through the National Park and passes through Queimada dos Britos, there are other smaller rivers that cross the Park. In the photo, a small river that crosses Baixa Grande, one of the two oases inside the Park.

- Hidrografy

The Park's hydrography is composed of rivers, lakes, lagoons and lagunas that are important for the control of the migration of the dunes. The rivers of greater relevance are the Grande and Negro rivers, which allow in their routes the emergence of other water bodies like the Betânia and Esperança, respectively. The lagoons located in-between the dunes have different shapes, sizes and depths, being formed from the rainwater and the outcrop of the water table. Also included in the hydrography are the Santo Amaro and Travosa lakes that are the largest in the conservation unit and the lagunas, distributed in the wind deflation plain in depressions filled with salt water (IBAMA, 2003; ARAUJO, 2015). These water bodies are described below:

- Rio Grande: Its source is located near the locality known as Estiva, about 94 meters altitude, where it is called Alegre River, being called Rio Grande only after its confluence with the Rio das Pedras, flowing in an NE direction, covering a stretch of 72 km until lake Santo Amaro. Its drainage basin is of the endorheic type, with a dendritic drainage pattern, presenting predominantly meandering and/or anastomosed stretches. In the locality of Ponta do Espigão, the Grande river forms the Betânia lagoon. During the dry season (November), most of the lakes between the dunes disappear, as well as a significant reduction in the flow volume of the river, probably due to the lowering of the water table in the area due to the absence of rainfall.

- Rio Negro: It originates at approximately 70 meters of altitude near the town of Marreiro, following the NE direction with a length of 69 km from the source to the coastline. This river is the only one that managed to cross the extensive field of free dunes of the PNLM, characterizing the fluvial flow of the drainage basin as exorheic. Along its course it presents small streams responsible for the considerable flow, as well as for the dendritic type of drainage. Like the Rio Grande, the Negro River has sections of meandering and anastomosed channels. In the border between the field of mobile and fixed dunes, the Negro river gives origin to the Esperança lagoon.

- Betânia and Esperança lagoons: These are located at the boundary of the field of mobile dunes with the fixed dunes and are the result of the accumulation and/or enlargement of the Grande and Negro rivers, respectively, which gives them significant dimension and depth when compared to interdunal lagoons.

- Interdunal lagoons: These lagoons present different forms, sizes and depths and are formed from the waters of rainfall and outcropping from the water table. However, in the dry season, when the water table level drops, only the deepest ponds remain in place. Therefore, we can distinguish the temporary regime lagoons from the permanent ones by means of satellite images during the dry season in the Conservation Unit. In general, these lagoons differ from the lakes by their small size and depth.

- Lagoons: In areas of the wind deflation coastal plain, close to the coast, large depressions of small depths can be observed, filled with salty water in communication with the sea, showing flow and reflux during the tides of syzygy. Due to the significant coastal dynamics of the site, some of these morphological features are ephemeral, appearing and disappearing in a short space of time.

- Santo Amaro Lake: Located to the west of the park, it has a significant area, making it one of the largest lakes in the State of Maranhão, presenting sandy banks, islands, and a considerable lacustrine margin which in certain stretches, due to the small declivity, is subject to floods during the rainy period. At the end of the drought period, the water mirror is reduced by 25 to 35%, when small advances can be made, in certain stretches, from the chains of barchans on the lacustrine margin.

- Travosa Lake: It is the second lake in terms of size in the park and, like the previous one, it presents/displays diverse micro-features such as: sandy banks, islands, points and lacustrine banks subject to floods. In this lake the presence of the outcrop of the water table (nascent) at the base of the dunes towards the lake was observed, which suggests the presence of lithological control in the area. Studies on the genesis of the Santo Amaro and Travosa lakes suggest that deposits older than the current field of free dunes separate them. Thus, this feature suggests the evolutionary stage of a large estuarine lagoon that encompassed both lakes where the complete closure of the canal occurred, linking the lagoon to the ocean (sandstones), characterizing the depositional system of the barrier type (beach-dune)/estuarine lagoon.

In summary, the Nominated Property has a moderate amount of water resources in its interior and its surroundings, such as the rivers: Ribeira, Queixada, Alegre, Santo Inácio, Whale, Pequí, Marciano, Maçangano, Preguiças and Periá. The watersheds of the Preguiças and Periá rivers are the two largest in the Lençóis Maranhenses National Park. In addition, there is also a significant amount of streams and lakes due to the high rainfall rates, characteristic of the rainy season, and of the existing soil in the site (IBAMA, 2003).

- Limnology

  - In the Lençóis Maranhenses National Park Management Plan (IBAMA, 2003) is presented the classification of water bodies for the main landscape units (table 2), according to the National Council Resolution No. 20 of June 18, 1986 (CONAMA), which establishes the classification of fresh, brackish and salty waters, according to their prevailing uses. Sweet waters are waters with salinity equal to or less than 0.5 ‰, which can be classified into different classes. The waters of the special class are waters intended for domestic supply without prior or simple disinfection and preservation of the natural balance of aquatic communities, and there may not be total coliforms as well. Brackish waters are waters with salinity varying between 0.5 and 30.0 ‰, intended for recreation of primary contact, protection of aquatic communities, natural and/or intensive (aquaculture) breeding of species destined for human consumption.

Table 2. Physical-chemical parameters of the water bodies of the Lençóis Maranhenses National Park. Extracted from IBAMA (2003).

Body of Water	pH	OD (mg/L)	Salinity	Conduct. (µS/cm)	Temp. (ºC)	Class
Rio Grande1						**Special class**
Point1	4,6 – 6,1	5,5 – 7,1	0,0 – 0,0	50 – 20	29 – 26	
Point 2	4,4 – 6,3	6,4 – 6,8	0,0 – 0,0	50 – 25	30 – 26	
Mata Fome1	5,2 – 5,3	6,9 – 9,3	0,0 – 0,0	40 – 50	30 – 28	Special class
Atins1	6,2 – 7,0	10,6 – 6,1	0,0 – 2,9	60 – 1540	32 – 25	Class 7
Ponta do Mangue1	6,0 – 7,3	8,4 – 7,8	3,0 – 0,0	43 – 1030	32 – 31	Class 7
Baixa Grande1	5,5 – 5,2	8,2 – 6,9	0,0 – 0,0	30 – 770	26 – 29	Special class
Travosa1						**Class 7**
Point 1	7,0 – 7,1	7,1 – 7,1	5,0 – 0,0	700 – 1700	27 – 26	
Point 2	4,3 – 4,0	8,3 – 4,0	0,0 – 0,0	90 – 160	32 – 25	
Point 3	7,4 – 7,4	8,2 – 7,4	19,0 – 4,0	32000 – 17400	32 – 27	
Boa Vista1	5,2 – 5,7	X – 8,1	0,0 – 0,0	60 – 1050	30 – 28	Special class
Sto. Amaro1						Special class
Point 1	6,7 – 7,2	8,4 – 7,4	0,0 – 0,0	250 – 1710	27 – 24	
Point 2	7,8 – 7,8	8,3 – 7,8	0,0 – 0,0	300 – 760	32 – 27	
Queimada dos Britos1	4,8 – 4,8	8,4 – 7,1	0,0 – 0,0	60 – 170	32 – 28	Special class
Lagoa da Esperança1						
Point 1	4,4 – 4,4	6,3 – 7,1	0,0 – 0,0	50 – 40	29 – 27	Special class
Point 2	4,4 – 5,0	6,4 – 6,8	0,0 – 0,0	50 – 120	30 – 27	
L. Esperança2	4,90 – 7,74	7,48 – 8,04	0,0 – 0,0	38,0 – 39,0	28,8 – 29,6	
Varginha2	4,27 – 4,89	3,64 – 5,19	0,0 – 0,0	25,0 – 36,0	27,0 – 27,4	Special class
Lagoa Azul2						Special class
Point 1	4,48 – 8,27	8,05 – 8,71	0,0 – 0,0	30,0 – 30,0	26,4 – 26,7	
Point 2	4,72 – 4,74	8,81 – 9,07	0,0 – 0,0	36,0 – 37,0	26,6 – 26,8	
Alazão2						**Special class**
Point 1	8,23	9,33	0,02	60,3	30,7	
Point 2	8,05 – 8,09	8,50 – 9,02	0,03	733,0 – 743,0	30,8 – 31,2	
Point 3	7,8	8,04	—	1640	31	
Vassouras2						**Special class**
Point 1	8,07 – 8,14	8,66 – 10,9	0,01 – 0,02	281,0 – 510,0	26,8 – 27,5	
Point 2	8,60 – 8,78	11,8 – 11,9	0,01	271,0 – 360,0	28,6	
Point 3	8,33	13,6	0,02	491	31,4	
Point 4	8,98	14,6	0,02	594	30,1	
Buriti3	4,5 – 6,4	8,0 – 8,3	—	13 – 122	27 – 30	Special class
Rio Preguiças2	6,28 – 7,65	7,71 – 8,17	0,00 – 0,002	40,0 – 628,0	—	Special class

1 July-November 2000.

2 November-December 1996. GARAVELLO et al (1998).

3 November-December 1996. RIETZLER et al (1998).

2.a.II The biodiversity component

Brazil leads the list of the 17 megadiverse countries that, together, hold about 70% of the world's species of fauna and flora (MITTERMEIER et al., I997). Estimates indicate that the country is home of 10% to 20% of the earth's biological diversity, which is certainly related to its territorial extension and diversity, of more than 8,500,000 Km², associated to the enormous climatic, geomorphological diversity, and a wide mosaic of vegetation types.This puts Brazil in a leading position in world's discussions on biodiversity conservation, climate change and sustainability. For example, the country has the largest number of vascular plant species in the world, about 32,000 species, being 9% to 10% above the number of species indicated for China and Indonesia, the two closest in megadiversity (FORZZA et al., 20I0).This immense biodiversity is distributed into the seven biomes - Amazon, Cerrado, Caatinga, Atlantic Forest, Pantanal, Pampa and in the coastal and marine zone - which involves two hotspots,three wilderness areas,besides a seascape.

Yuri Teixeira

Well preserved restinga vegetation around the dune fields.

Yuri Teixeira

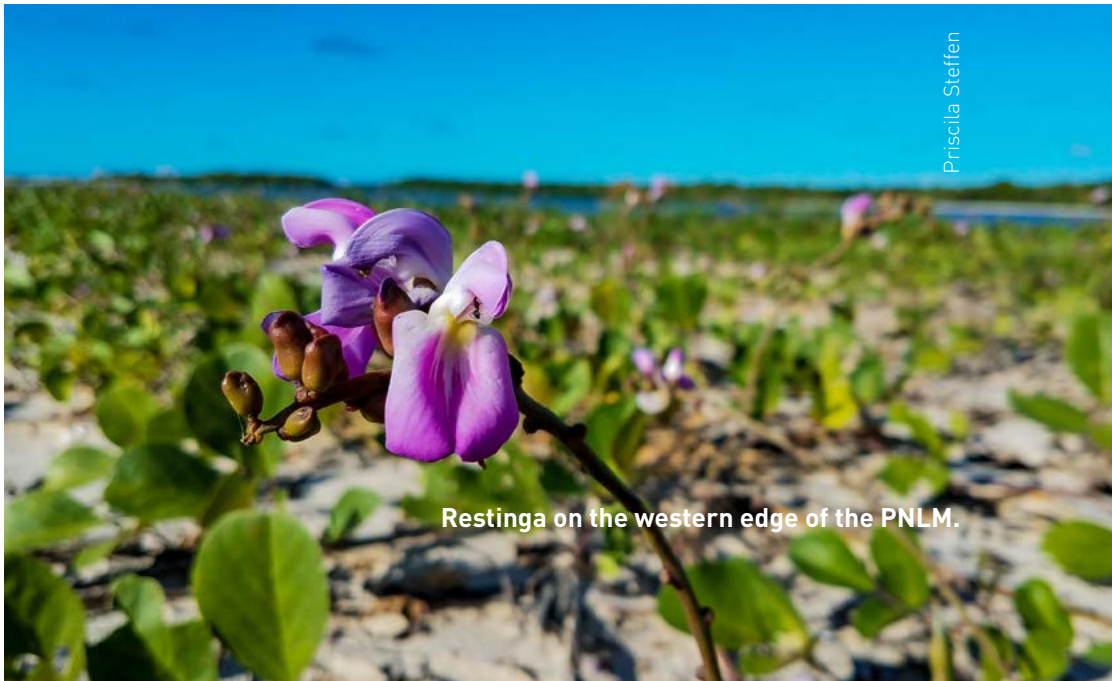
Next to rivers and perennial lagoons Restinga vegetation grows vigorous, populating the Park with herbaceous, shrub and tree formations, as well as swamps.

Yuri Teixeira

Marshes are formed in the interior of the perennial lagoons, which also harbors phytoplankton and zooplankton specimens.

Priscila Steffen

Mangrove area with ebb tide at the mouth of the Periá river



Priscila Steffen

Restinga on the western edge of the PNLM.

Priscila Steffen

Mangue in excellent state of conservation.

Priscila Steffen

Overview of a well-maintained mangrove area Restinga on the western edge of the PNLM.

- Vegetation

The vegetation of the state of Maranhão reflects the influence of the climatic transition conditions between the northeastern and Amazonian semi-arid climate (FILHO et al., 2011). The Lençóis Maranhenses National Park is located in the Cerrado biome, but has a strong influence of the Caatinga and Amazon ecosystems, so the species of these three biomes are found in the park and in the region. The National Park`s vegetation is composed of pioneer formations with marine influence (restingas), fluvial-marine influence (mangroves and apicuns) and fluvial influence (alluvial communities), which predominantly occupy the edges of its dunes with an area of 457.263 ha. The restinga is the predominant park vegetation (395.497 ha), covering 25,3% of the area, while mangroves represent 3.8% and alluvial communities or riparian forests represent only 0.4% of the park area (table 3). Bellow is presented the main botanical groups studied in Lençóis Maranhenses National Park. The Management Plan of the Park (IBAMA, 2003) was used as a reference document for listing the species, which was complemented by more recent works. The dunes orrespond to the more extensive formation of the Park, with more than 94 thousand hectares without vegetation cover or 60% of the total area.

Table 3. Area and percentage of vegetation

LAND USE AND VEGETATION COVER			
CLASS	AREA (KM2)	AREA (HA)	%
Active Dune Field	949,1	94.914,5	60,6
Apicum (mangroove transition)	1,1	110,1	0,1
Crop	3,4	335,8	0,2
Lagoon	44,1	4.412,1	2,8
Mangroove	59,3	5.929,8	3,8
Ocean	108,5	10.850,9	6,9
Restinga vegetation	385,8	38.579,0	24,6
Restinga vegetation field	9,6	964,8	0,6
Riparian Forest	1,4	142,7	0,1
River	3,3	331,1	0,2
TOTAL	1.565,7	156.570,5	100,0

As mentioned, the restinga presents the greater distribution troughout the conservation unit, being composed by herbaceous communities, shrubs and/or arboreal sclerophyllous and hygrophilae. The herbaceous communities colonize the slopes of the dunes and the sandy stretches composed of sclerophyllous vegetation, and are also observed surrounding the lakes. The sclerophyllous communities are more common in the slopes and at the top of the dunes, while the hygrophilous communities occur in the depressions between the dunes, where the interdunal lagoons form during the rainy season (IBAMA, 2003).

The mangrove ecosystem is composed of typical woody plants, adapted to the salinity conditions and the low oxygen contents of the muddy soils of these ecosystems. Besides the typical formation of mangrove, composed mainly by the genera Rizophora sp. (red mangrove), Laguncularia sp. (white mangrove) and Avicenia sp. (siriba) are found in this environment the apicuns, areas devoid of vascular vegetation due to hypersalinity and that usually develop between the average level of the quadrature high tide and the level of equinoxial high tide of syzygy, and the tropical marshes, which are formations between the mean sea level and the level of the high tide of equinoctial systolic tides (IBAMA, 2003).

Finally, alluvial communities are alluvial floodplain communities that reflect the effects of river flooding in the rainy season. In the Lençóis Maranhenses National Park alluvial communities have a complex structure and often count with the dominant presence of Mauritia flexuosa (buriti).

A total of 133 plant species were identified in 62 families in the Lençóis Maranhenses National Park area. The most representative families in number of species were Leguminosae, Myrtaceae, Rubiaceae, Apocinaceae, Arecaceae, Cyperaceae, Melastomataceae, Anacardiaceae, Chrysobalanaceae, Combretaceae, Euphorbiaceae and Malvaceae, being Leguminosae the family with the largest number of representatives (Annex 1). From the sites analyzed in the Management Plan (IBAMA, 2003), Queimada dos Britos was the one that presented the greatest botanical richness, with 86 species.

The flora of Lençóis Maranhenses National Park presents influence of other biomes as can be verified by the presence of Amazonian species such as Protium heptaphyllum, Humiria balsamifera, of wide occurrence in the Amazonian sandy prairies, Abarena carlata, Parinari campestres, Byrsonima amaenae, Hymenae parviflora, the last found on the salty region of the Amazon River estuary. The species Cereus pernambucensis, Cochlospermum sp., Jatropha gossypifolia, Copaifera sp., Hymenae parvifolia, Senna georgica, Pakira sp., Stryphnodendron barbatiman, and Passiflora sp. are listed for the Caatinga biome. In addition to these, Xyris sp. and Paepalanthus sp., herbaceous plants of great occurrence in Queimada dos Britos, corresponding to ancient genera of South America that have dispersed from the humid depressions of Central Brazil and that also occur in similar environments in the restingas. The presence of these species and others that occur frequently along the Brazilian coast corroborates that these restinga environments represent complex and heterogeneous vegetation complexes (IBAMA, 2003).

According to IBAMA (2003), there are two endemic species, Polygala adenophora and Hybantus solccolaris, which occur in Queimada dos Britos. However, according to Pastore & Silveira (2016), the first species has a larger distribution in Central and South America, and in Brazil it is also found in the States of Acre, Amazonas, Amapá, Tocantins, Pará, Roraima and Mato Grosso. The species Cereus jamacaru (mandacaru) was included in the IUCN Red List of Threatened Species (2018), in the least disturbing category.

The area of Queimada dos Britos presents peculiar aspects, such as the vegetation of a very old restinga, fact evidenced by the exuberance of the trees, by the layer of litter and deeper soil. In addition, it reveals a phytogeographic individuality, suggesting that this area has been isolated by paleoclimatic effects, configuring itself as a refuge zone (IBAMA, 2003).

Another peculiar aspect of the Lençóis Maranhenses region is the existence of paleo-mangroves, which were identified by the dark, muddy sediments, and presence of trunks and Pneumatophores, due to the burial of past mangroves. The burial of vegetation can be more recently evidenced as a result of the natural dynamics of the dunes, which form true vegetation cemeteries, as observed at the base of some moving dunes north of Queimada dos Britos (IBAMA, 2003).

- Phytoplankton

A hundred and sixty nine phytoplankton taxa were identified in the Lençóis Maranhenses National Park (Annex 2), distributed in eight classes: Bacillariophyceae, Zygnemaphyceae, Chlorophyceae, Cyanophyceae, Dinophyceae, Euglenophyceae, Chrysophyceae and Ooedogoniophyceae (Appendix 2). Of this total, 38 were cited for the first time in the state of Maranhão (ARAÚJO, 2000). The presence of these species, associated with the hypothesis that lakes can function as islands, is a factor that may be responsible for the development of endemic species in the Lençóis Maranhenses National Park area.

The greatest phytoplanktonic riches are found during the dry season, with the exception of the Mata-Fome stream where the number of species is higher during the rainy season. During the dry season, the Esperança lagoon and the Travosa lake are the areas with greater number of species. In spite of the great number of species in these environments only five of the eight classes registered for the con-

servation unit occur, being Queimada dos Britos the only place where all classes can be found (IBAMA, 2003).

The phytoplankton composition in the region between Primeira Cruz and Travosa is represented mainly by B acillariophyceae, constituting the highest percentage of microalgae present. This confirms the importance of this group in the area, and can be considered as one of the main primary producers, serving as food for many local filtering organisms (Miranda et al., 1988). There are 82 taxa in this area, with 62 species of Bacillariophyceae, followed by Cyanophyceae, Chlorophyceae and Zygnemaphyceae (five species each), Euglenophyceae (one species) and Dinophyceae (four species).

- Zooplankton

The set of planktonic animals that make up the lagoon-estuarine complex of Lençóis Maranhenses National Park is represented by free-living protists (non-photosynthesizers), tintinids, hydromedusae, chaetognatae, appendiculars, rotifers, microcrustaceans (copepods, cladocerans) and a wide variety of various benthic organism larvae (Annex 3). The largest variety of species in the protozoa, rotifers and cladocerans groups occurs during the rainy season. Copepods, on the other hand, present greater variety during the dry season, in estuarine environments. Larvae, for the most part, show their preference for estuarine waters. Brackish water and coastal marine organisms also live in these environments, represented mainly by copepods, chaetognatae, jellyfish, appendiculars and a remarkable diversity of meroplanktonic larvae.

The interaction of the lagoons with the rivers in the Lençóis Maranhenses National Park confers great biological complexity to it. The ponds are closely related to fish feed, maintaining the balance of algal and bacterial populations and the processes of stabilization of organic matter. In addition to harboring a considerable number of species, they are also very sensitive to external impacts, which can be verified through biotic, especially zooplankton, studies. Rotifers, under the hydrobiological aspects, are good indicators of the ecological-sanitary quality of ponds, lakes and reservoirs. There are no characteristic species of polluted waters found among the taxa living in the waters of the park (IBAMA, 2003).

- Spongiofauna

The survey of sponge species for the coastal segment of Lençóis Maranhenses National Park can be found in the work of Volkmer-Ribeiro et al. (1999). Several bodies of water were approached in this wide sandy belt, with Corvoheteromeyenia heterosclera occurring in the seasonal ponds nestled between the moving dunes closest to the contact line between the continent and the ocean. According to Volkmer-Ribeiro et al. (2007), this is the only species of sponge in the seasonal lagoons formed on the inner side of the dunes closest to the sea both in the Lençóis Maranhenses and in the other lagoons of the same type along the Brazilian northeastern coast, representing an indicator species for this coastal environment, made up by shallow lagoons formed between dunes in the tropical region

Mario Barila

Residents returning home with their catch of the day

Priscila Steffen

Artisanal fishing is also carried out in the marine portion of the Park. A fisherman displays an unidentified saltwater fish.

Priscila Steffen

Artisanal fisherman preparing his fishing gear.

Adriano de Sozua

Fish in the Verde Lagoon, in Barreirinhas.

Larissa Barreto

Sea turtle in the Lençóis Maranhenses National Park (Dermochelys coriacea) (leatherback turtle).

Larissa Barreto

Chelonia mydas (green turtle).

- Ichthyofauna

A total of 179 species of fish were cited for the Lençóis Maranhenses National Park (Annex 4). Of the species cited for the region, 20 are included in the Red List of Threatened Species (IUCN, 2008) in the Near Threatened (NT), Vulnerable (VU), Endangered (EN) and Critically Endangered (EN) categories. Of note are the Sphyrna lewini, Arius bonillai, Ageneiosus sp. Species, classified as Endangered and Epinephelus itajara, classified as Critically Endangered. The latter is a marine species that inhabits the tropical and subtropical waters of the Atlantic Ocean and is usually found in mangroves and rocky shores, close to shipwrecks, bridge piers and sandbanks. In a study about the ordination of grouper fishery, the coast of Maranhão State was identified as an area where significant reproductive aggregations of the species occur (MMA, 2007).

Recently, a new species of tetra, called Hyphessobrycon peorskii, was found inside the Lençóis Maranhenses National Park. The species is endemic, being described for the basins of the upper Munim and Preguiças rivers. This species lives in shallow, well-oxygenated and transparent waters, flowing on different types of substrates. The rivers where they were collected vary from 0.9 to 10 meters wide with a maximum depth of 1.60 meters and clear and sandy substrates with pebbles, mud, foliage and submerged logs. It appears that they live on aquatic vegetation, roots of fallen trees and trunks and feed on algae and small arthropods (Guimarães et al., 2018). The species Anablepsoides vieirai, Apistogramma piauiensis, Cichlasoma cf. zarskei, Copella arnoldi, Crenicichla brasiliensis, Megalechis thoracata, Nannostomus beckfordi, Synbranchus marmoratus were also found on the same locale

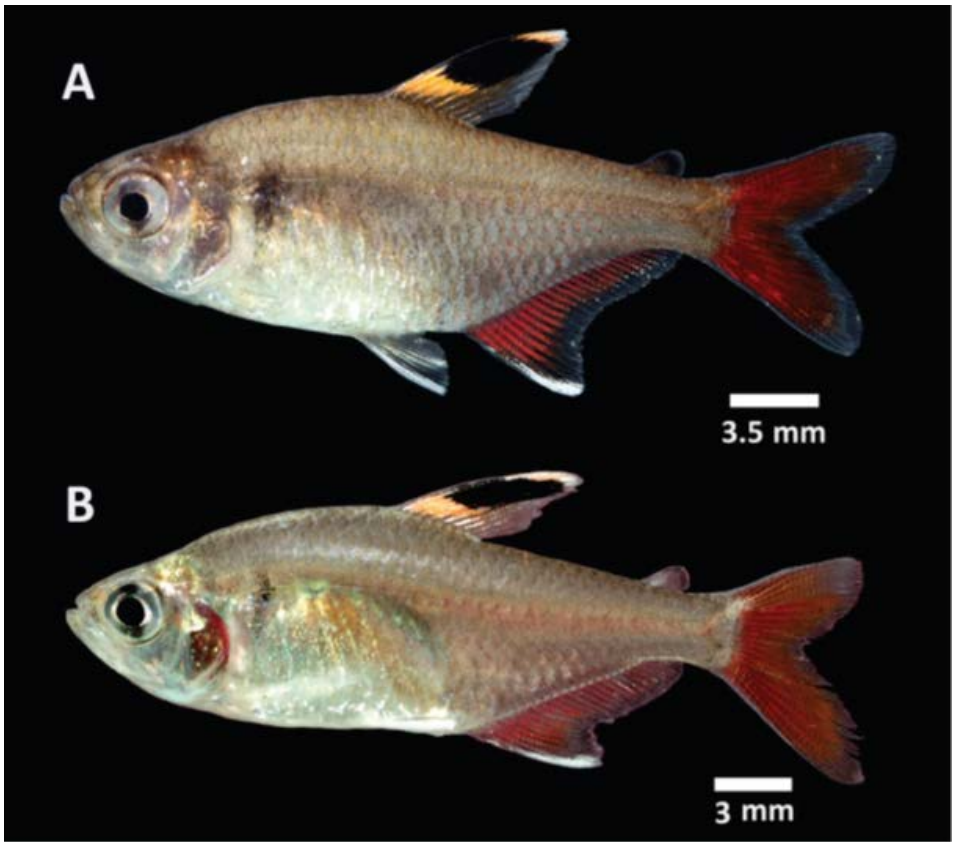
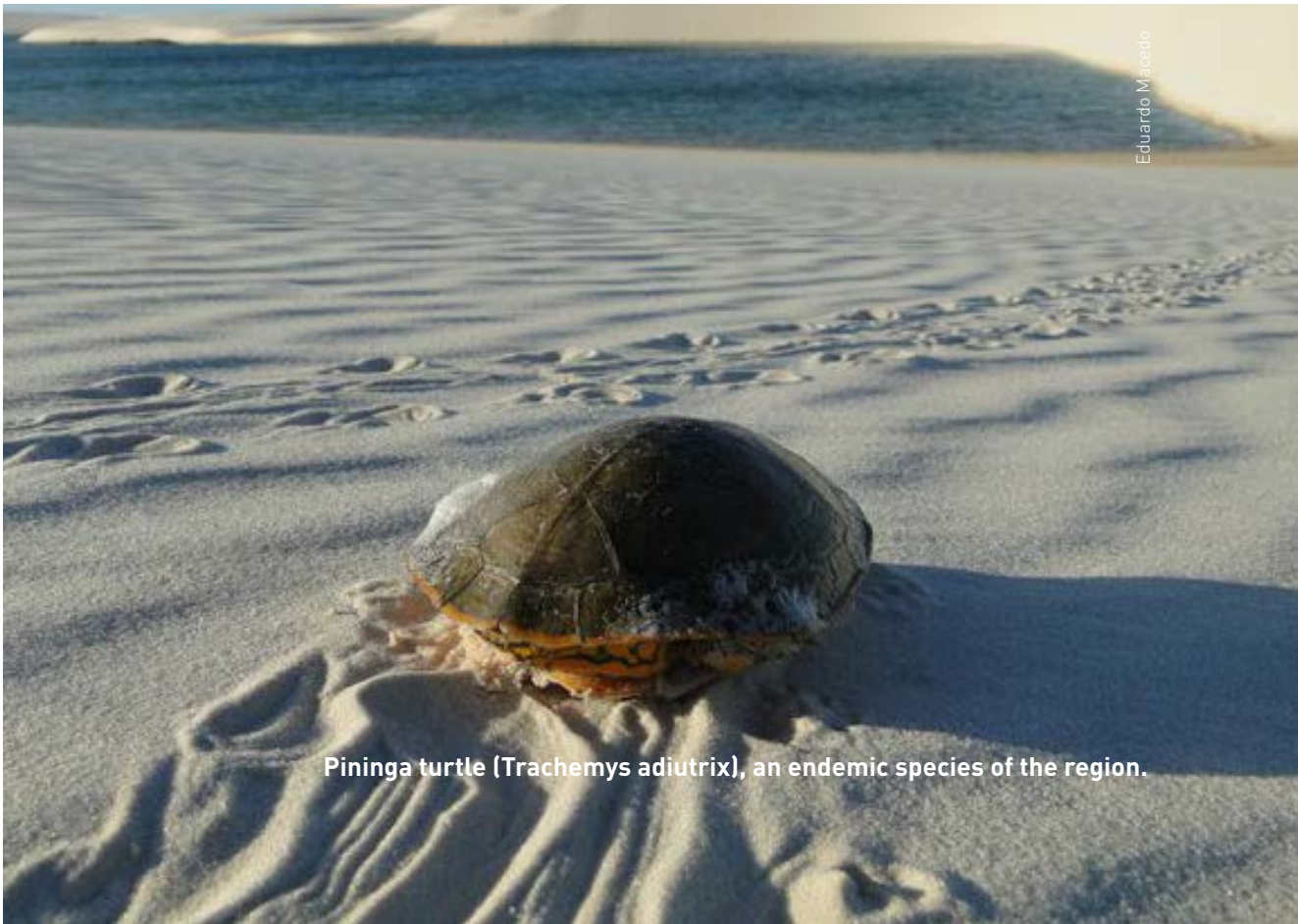


Figure 7. Hyphessobrycon peorskii. Live specimens photographed immediately after collection. Extracted from Guimarães et al. (2018).

Table 4. Species of fish included in the IUCN Threatened Species List (2018).

SCIENTIFIC NAME	COMMON NAME	IUCN (2018)
Carcharhinus limbatus	Sacuri de galha preta	NT
Carcharhinus leucas	Boca redonda	NT
Carcharhinus obscurus	Lombo preto	VU
Galeocerdo cuvier	Jaguara	NT
Sphyrna lewini	Rudela, Panã branco	EN
Sphyrna tudes	Panã amarelo	VU
Dasyatis geijskesi	Arraia morcego	NT
Aetobatus narinari	Arraia pintada	NT
Rhinoptera bonasus	Arraia jaburana	NT
Megalops atlanticus	Camurupim, Pirapema	VU
Arius bonillai	Uriacica	EN
Arius parkeri	Gurijuba	VU
Ageneiosus sp.	Mandubé	EN
Epinephelus itajara	Mero	CR
Epinephelus morio	Garoupa	NT
Mycteroper cabonaci	Sirigado	NT
Pomatomus saltator	Enchova	VU
Lutjanus analis	Cioba	NT
Lutjanus synagris	Carapitanga	NT
Balistes vetula	Cangulo	NT



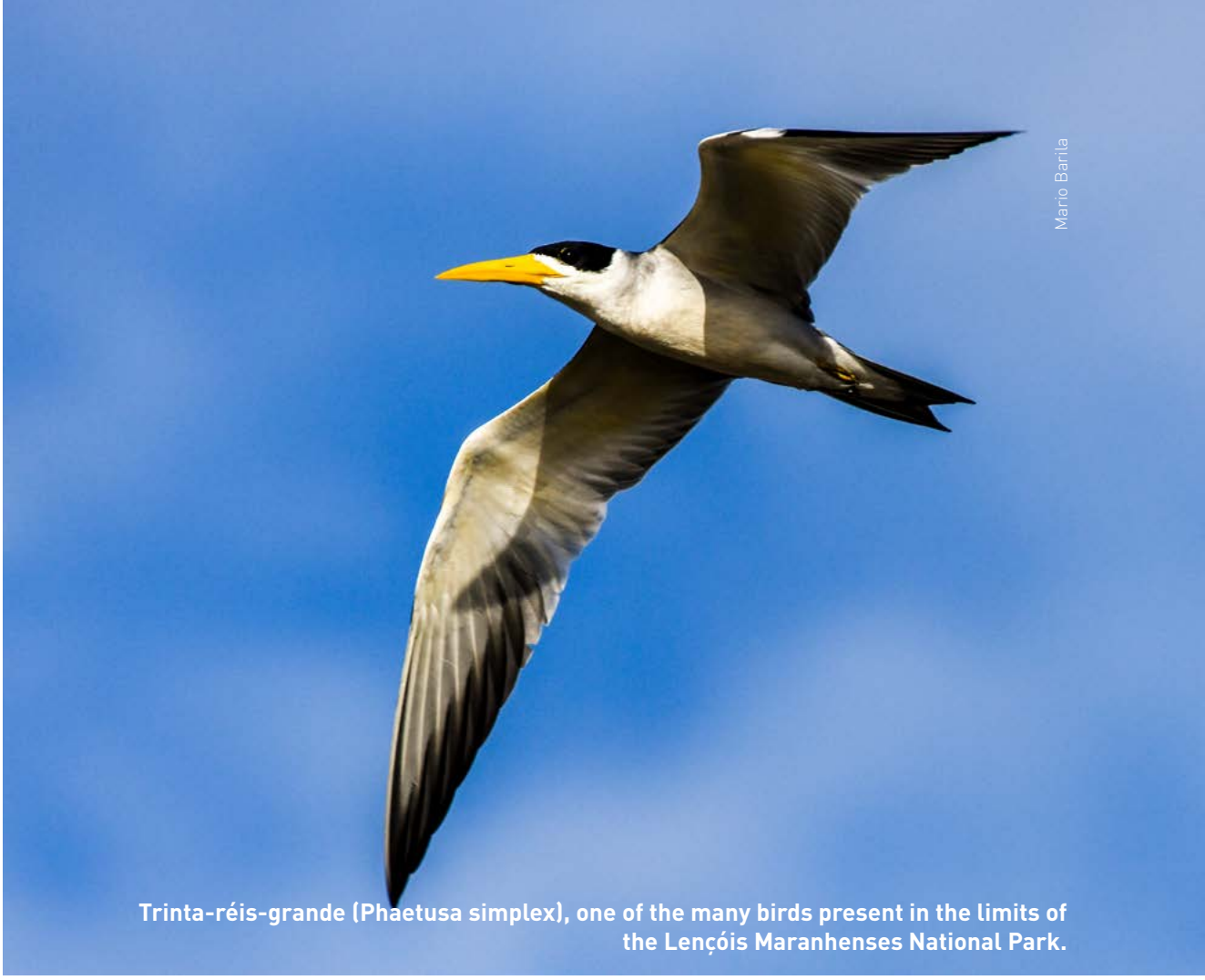
Pininga turtle (Trachemys adiutrix), an endemic species of the region.

Eduardo Macedo

Puppy of a sea turtle after spawning on beach in Lençóis Maranhenses National Park.

Eduardo Macedo

Pininga turtle (Trachemys adiutrix),



Mario Barila

Trinta-réis-grande (Phaetusa simplex), one of the many birds present in the limits of the Lençóis Maranhenses National Park.

- Herpetofauna

A list of herpetofauna species is not presented in the PNLM Management Plan (IBAMA, 2003), being cited only the occurrence of Trachemys adiutrix (pininga turtle), an endemic species of a small area of the coast of the States of Maranhão and Piauí, found in restinga vegetation, between dunes or open areas. A more recent study, however, registers 42 species of reptiles to the PNLM: 24 snakes belonging to 20 genera and 04 families (Boidae, Colubridae, Dipsadidae and Elapidae); 12 lizards, belonging to 11 genera and 08 families (Gekkonidae, Sphaerodactylidae, Mabuyidae, Gymnophthalmidae, Iguanidae, Polychrotidae, Teiidae and Tropiduridae); 02 blind snakes, belonging to the genus Amphisbaena, of the Amphisbaenidae family; 03 chelonians, belonging to 03 genera and 03 families (Cheloniidae, Dermochelyidae and Emydidae); and 01 Alligatoridae alligator (Miranda et al., 2012) (Annex 5).

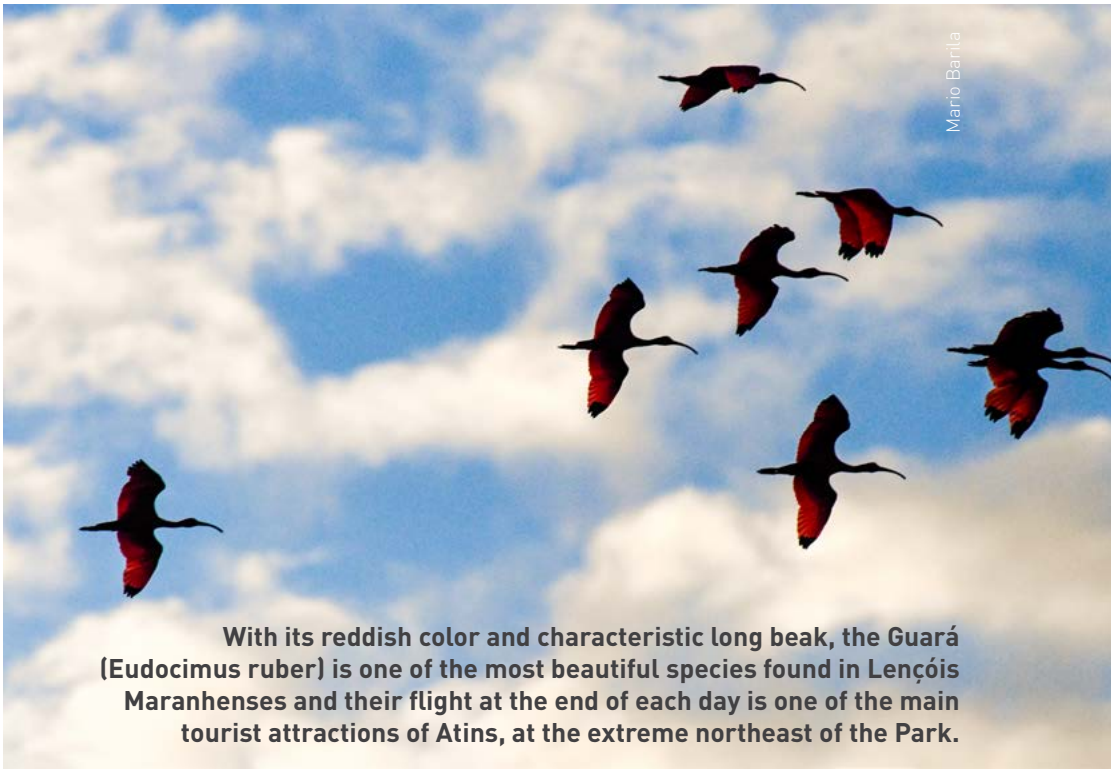
Despite the uniqueness of the environment and PNLM conditions, the recorded reptiles' taxocenosis includes species normally found in the surrounding biomes, such as Gonatodes humeralis and Varzea bistriata, associated with Amazonia, and Philodryas nattereri, Polychrus acutirostris and Brasiliscincus heathi, which are typical inhabitants of the Cerrado and the Caatinga. The exception is Trachemys adiutrix, which, as mentioned, is endemic to the region, but is on the IUCN Endangered Species List (2018). Other species also included in this list are: Dermochelys coriacea (vulnerable); and Chelonia mydas (endangered).

According to Miranda et al. (2012), the PNLM is an important site for the conservation of reptiles in Brazil, since it includes, in a small area (155,000 ha), a unique taxocenosis that combines several species of different biomes in a unique landscape. About 81% of the recorded species were observed only in the restinga, which further reinforces the need for their protection, especially of those living in the isolated sandbanks inside the park.

Figura 8. A Kentropyx calcarata. B Erythrolamprus poecilogyrus. C Oxyrhopus trigeminus. D Boa constrictor. E Drymarchon corais. F Thamnodynastes hypoconia. G Leptophis ahaetulla. H Trachemys adiutrix. Extracted from Miranda et al. (2012).

Mario Barila

A flock of Guará (Eudocimus Ruber) birds, with their characteristic reddish color.



Mario Barila

With its reddish color and characteristic long beak, the Guará (Eudocimus ruber) is one of the most beautiful species found in Lençóis Maranhenses and their flight at the end of each day is one of the main tourist attractions of Atins, at the extreme northeast of the Park.

Priscila Steffen

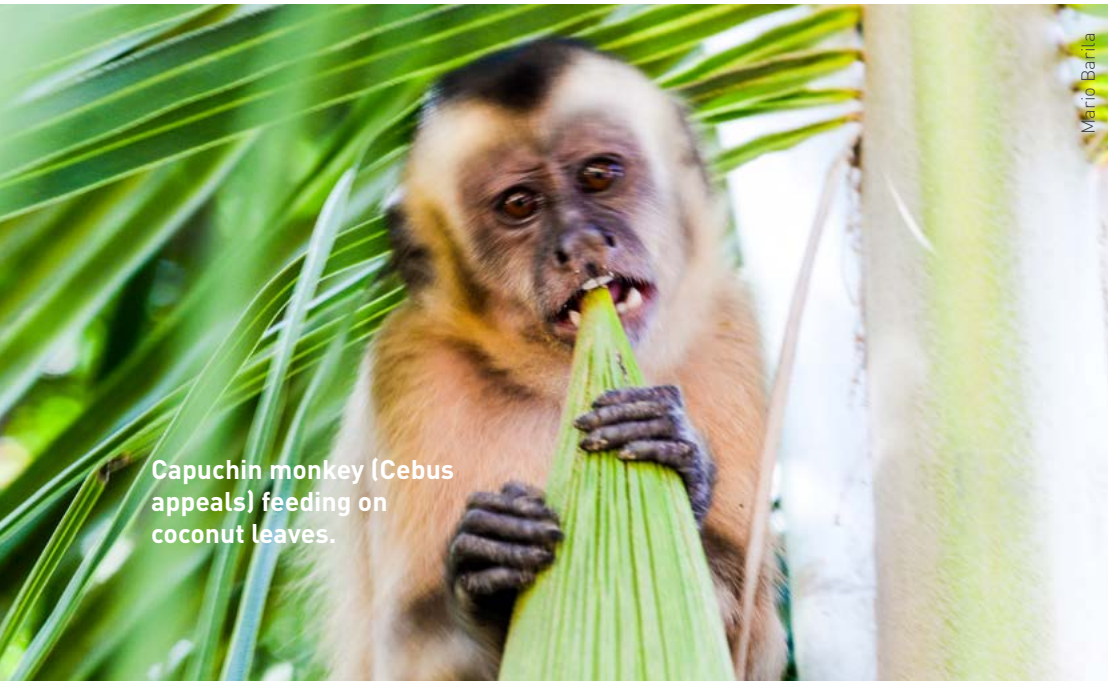
Avifauna in PNLM.

Priscila Steffen

Black-breasted Owl specimen (Speotyto cunicularia)

Priscila Steffen

Birds next to a mangrove.



Mario Barila

Capuchin monkey (Cebus appeals) feeding on coconut leaves.

- Avifauna

A total of 112 species were observed inside the PNLM region, belonging to 16 orders and 43 families. Of these species, only 33 belong to the Passeriform order, distributed among 04 families of the Suboscines suborder and 08 families of the Oscines suborder (Annex 6). Many of the commonly found species are abundant in altered and widely distributed areas throughout Brazil. Among these are the Crotophaga ani (anum preto), Pitangus sulphuratus (bem-te-vi), Piaya cayana (alma-de-gato) and, mainly, Tyrannus melancholicus (suiriri-tropical). In addition to these, the Mimus gilvus, Fluvicola mengeta, Glaucidium brasilianum (caburé), not to mention the most characteristic birds of the area, the maçaricos, batuíras, seagulls and other coastal birds (IBAMA, 2003). The most representative families in the park are Northern migrants and waterfowl. The Park's region is of some importance to the migratory species of North America, from whence they arrive in the initial period of the year. These would comprise about 15% of the local diversity. On the other hand, this relevance appears to be small, especially when compared to the central-north coast of Brazil, which includes the western coast of Maranhão (IBAMA, 2003). Most of the recorded species are found in coastal environments (mangrove, restinga, beach), although several of these also occur in cerrado areas. Some of the observed species, such as Cariama cristata (seriema) and Penelope superciliaris (jacu), are not usually associated to coastal environments, but to Cerrado areas. In addition, in spite of the absence of quantitative data, a preponderance of species characteristic of altered environments is oberved, such as Crotophaga ani (anu preto), Pitangus sulphuratus (bem-te-vi) and, mainly, Tyrannus melancholicus (suiriri-tropical) (IBAMA, 2003). Five species are included in the Threatened Species List (IUCN, 2018): Calidris canutus; Calidris pusilla; Aratinga solstitialis; Pyrrhura perlata; and Pteroglossus bitorquatus.

- Mastofauna

A low diversity of mammalians was described in the Management Plan (IBAMA, 2003), counting only 17 species (Annex 7); but small mammals and bats were not catallogued. Even so, the area presents some peculiarities, such as reports of the occurrence of the white (albino) fox Cerdocyon thous, which could be the result of genetic isolation and/or an adaptive process for life in the dune areas. This event is not known to any other population of this species, but still requiring further scientific investigation for its verification. The species Lontra longicaudis, Leopardus tigrinus and Trichechus manatus are listed in the Threatened Species List (IUCN, 2018) as Endangered Species.

- Entomofauna

The restinga vegetation, common in the PNLM, corresponds to a very attractive ecosystem for the entomofauna. Most of the floral species found in the region's dunes are entomophilic, but specifically mellitophilous. A total of 46 species of bees were identified (IBAMA, 2003; Ribeiro et al., 2008; Silva et al., 2009). The studies on public health and disease-transmitting vectors have also identified 13 species of Maruins (Culicoides) (Costa et al., 2013), 09 species of mosquitoes of the Lutzomyia genus (Filho et al., 2015) and 10 species of vampire bugs (Triatominae) (Rebelo et al., 1998). According to the Management Plan (IBAMA, 2003) other insects such as mutilidae (Mutilidae), dragonflies (Odonatas), wasps (Pompilidae), are abundant, mainly in dune areas and near rivers and lagoons. Dermaptera were observed at night on the sand. Lepidoptera (Ninphalidae, Pieridae and Morpho species) and Orthoptera (Blatidae, Grilidae, Acrididae) were also observed in the restinga area. Vespidae nests of different species were also recorded. Few Coleoptera were visualized, with only one individual of the Cerambicidae collected. Formicidae were found in decaying material and inside cacti (Annex 8).

- Threatened Species

If we consider all groups, the Lençois Maranhenses National Park presents 31 species included in the red list of threatened species and 3 endemic species (Table 5)

CI-Brasil

Lontra longicaudis, an endangered species that inhabits the National Park.

Table 5 – Endemic and threatened species present Lençóis Maranhenses National Park

ESPÉCIES ENDÊMICAS		
NOME CIENTÍFICO		NOME POPULAR
Hybantus solccolaris		
Hyphessobrycon piorskii		Tetra
Trachemys adiutrix		Tartaruga-pininga
ESPÉCIES AMEAÇADAS		
NOME CIENTÍFICO	NOME POPULAR	IUCN (2018)
Carcharhinus limbatus	Sacuri de galha preta	NT
Carcharhinus leucas	Boca redonda	NT
Carcharhinus obscurus	Lombo preto	VU
Galeocerdo cuvier	Jaguara	NT
Sphyrna lewini	Rudela, Panã branco	EN
Sphyrna tudes	Panã amarelo	VU
Dasyatis geijskesi	Arraia morcego	NT
Aetobatus narinari	Arraia pintada	NT
Rhinoptera bonasus	Arraia jaburana	NT
Megalops atlanticus	Camurupim, Pirapema	VU
Arius bonillai	Uriacica	EN
Arius parkeri	Gurijuba	VU
Ageneiosus sp.	Mandubé	EN
Epinephelus itajara	Mero	CR
Epinephelus morio	Garoupa	NT
Mycteroper cabonaci	Sirigado	NT
Pomatomus saltator	Enchova	VU
Lutjanus analis	Cioba	NT
Lutjanus synagris	Carapitanga	NT
Balistes vetula	Cangulo	NT
Trachemys adiutrix	Tartaruga-pininga	EN
Dermochelys coriacea	Tartaruga-de-couro	VU
Chelonia mydas	Tartaruga-verde	EN
Calidris canutus	Ruiva	NT
Calidris pusilla	Maçarico-miúdo	NT
Aratinga solstitialis	Jandaia-verdadeira	EM
Pyrrhura perlata	Tiriba-pérola	VU
Pteroglossus bitorquatus	Araçari-de-nuca-vermelha	EM
Lontra longicaudis	Lontra	NT
Leopardus tigrinus	Pintadinho, gato-do-mato	VU
Trichechus manatus	Peixe-boi	VU

2.b. History and Development

Even though documentary references are scarce, it is well established that the Maranhão region was first settled by indigenous peoples in the pre-colonial period. By the 17th century Maranhão was inhabited by approximately 250,000 indigenous people, belonging to 30 different ethnic groups, the majority of whom no longer exist today. Peoples such as the Tupinambá, Barbado, Amanajó, Tremembé, Araioses and Kapiekrã were exterminated by the colonizers or saw their ethnicitymingle and disappear through miscegenation, slowly dissolving both socially and culturally. Other ethnicities such as the Krikati, Kanela, Guajajara and Gavião still mark their presence in the area until today (CARNEIRO, 2014).

Regarding the island of São Luís, however (also known as Ilha Grande, Ilha de UpaonAçue and Ilha do Maranhão), important documents on indigenous history were produced, dating from the first moments of colonization, as demonstrated in Bandeira (2015). There are reports that the Tupinambá arrived very late on the Island of São Luís due to the migrations caused groups fleeing mistreatments by the Portuguese in the region of Pernambuco:

> *"It is seven years now that a certain character, whose name and quality will be kept quiet by circumstances, seeing that the Tupinambás Indians who formerly lived in the Tropic of Capricorn had taken refuge in the Island of Maranhão and its surroundings, avoiding the domination of the Portuguese, left Pernambuco with a companion, bringing some Portuguese men, and eight to ten thousand Indians, among men, women, and boys, all of the same nation existing there" (D'ABBEVILLE, 2002, p. 93).*

Claude d'Abbeville was a French Capuchin priest who, with other priests, registered and visited 27 indigenous villages on the Island of Maranhão, describing them as consisting of "four houses, made of thick sticks, or stakes, covered by leaves of the palm tree called pindó (pindoba) which is found in great abundance in the woods, and that being well arranged in the house, resist the rain" (D'ABBEVILLE, 2002, p.185). In addition to fishing and gathering, the Indians planted cassava and potatoes as subsistence.

There were other human groups, however, living in the area before the arrival of the Tupinambá at the time of European colonization, as evidenced by archaeological research in the city of São Luís, which unearthed different ceramic pieces in the archaeological sites studied. Many occupations linked to the Tupinambá peoples are located over these archaeological sites, such as sambaquis (shell mounds and middens) and other lito-ceramics sites, evidencing that the Tupinambá reoccupied these places, like others of the region. For a better understanding of the history of occupation by the pre-colonial peoples older and earlier than the Tupi presence, other archaeological studies are needed (BANDEIRA, 2015).

Figure 9. Morphology of Tupinambás villages in Brazil, demonstrating areas of fields, houses and harbor. Source: Hans Staden (1999). Extracted from Bandeira (2015).

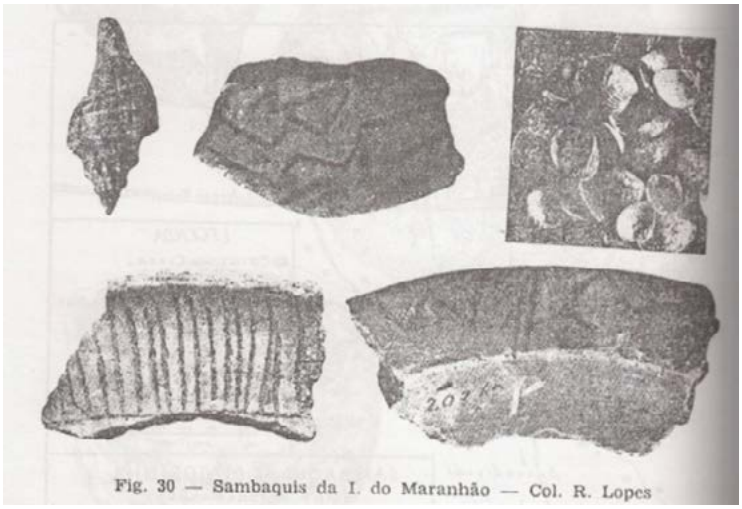


Figure 10. Archeological matrrial colected at the sambaquis of Maranhão Island, Raimundo Lopes Collectionatthe Museu Nacional, Rio de Janeiro, (LOPES, 1937). Extracted from Bandeira (2015).

The first attempt by European colonial groups to occupy the territory took place within the framework of the Portuguese expansion project, when D. João III divided Brazil into Hereditary Captaincies. The region was then divided into two captaincies, under the administration of Aires da Cunha and Fernando Álvares de Andrade, in the year 1535. Expeditions were carried to occupy and populate the captaincies in the 17th century, but, having failed, Maranhão continued as a region virtually unknown until the time of Felipe III, when the kingdoms of Portugal and Spain were united under the same crown. The largest portion of Maranhão was located west of the meridian of Tordesillas, a limit that was beginning to be frankly ignored. At times, it was represented in the South American charts as a region completely integrated within the Vice-reign of Peru, separated from the State of Brazil, being also designated as "Amazon river land", "Tupinamba land" or "land of the Caribbean" (CARDOSO, 2011; TROVÃO, 2008). Europeans of various nationalities, mainly English, Dutch and French, constantly visited Maranhão's coast, and it was only in 1612 that the latter made official their presence on the island of Maranhão, baptizing it São Luís Island in honor of the French king (TROVÃO, 2008). The project of French occupation was the one that left a more lasting mark in the local historiographical memory. First, they occupied one of the smaller islands (Santa Anna) and then the Ilha Grande, where they erected a cross and established a fortification.

Figure 11. Erection of the Cross by the Capuchin Fathers in the seventeenth century, as a mark of the French colonization on the Island of São Luís. Source: John Carter Library, Brown University. Extractedfrom Bandeira, 2015.

In the following year, the Portuguese undertook an expedition to conquer the territory and drive out the French, focusing on São Luís, where they were based. Commanded by Captain Jerônimo de Albuquerque and Sergeant Diogo de Campos, the Portuguese fleet sped through the sandbanks of Parnaíba and Tutóia, surprising their opponents. The historians' reports are unanimous about the permanence of the Portuguese and Spaniards from October 14 to 22, 1614 in the territory that today belongs to the municipality of Primeira Cruz, which was considered a strategic site for the conquest. There they erected a cross, the first by the Portuguese and Spanish in Maranhão, thus giving the locality its current name (IBAMA, 2003). It is important to emphasize that the conquest of this territory was not limited to a military operation to drive away "pirates", "traffickers" or "invaders" from the northern coast of the State of Brazil. It was also part of a Hispano-Portuguese project of protection and commercial integration on the frontier between Portuguese America and the Castilian Indies, following the continuity of the Iberian Union in the New World (CARDOSO, 2011).

The process of occupation and colonization of the territory took place through two fronts of expansion, one by the plains, having as a starting point the Golfão Maranhense, and the other by the plateau, having as a route of penetration the valley of the river Parnaíba. This last frontier of expansion was driven by the creation of pasture land and the cultivation of sugar cane, the main activities responsible for the occupation of the northeastern backlands and, consequently, of Maranhão itself. The coastal front advanced through the waterway system, timidly spreading first east and west and then along the riverbanks, giving rise, therefore, to a linear occupation, with areas isolated from each other, until the construction of the first highways.

Another occupation front at the region of the proposed site was created at the beginning of the 20th century, by the migration and penetration of the Northeastern people who fled from the droughts and the lack of a labor market in their places of origin. These migrants initially advanced by the sea, landing at the port of Tutóia, and, later, by the Valley of the Parnaíba, through the cities of Floriano and Teresina. Finding available lands, constant rains and soil proper for agriculture, Northeastern migrants promoted a series of changes in Maranhão territory, among them the establishment of new penetration routes, such as towards the virgin Amazonian forests of Maranhão, the revitalization and creation of new municipalities and the confirmation of the economic profile of the State effectively as an agricultural region, focusing on the cultivation of cotton, rice and other grains (TROVÃO, 2008).

From the 1950s on, the expansion of a federal paved road system began to integrate Maranhão into the Northeast and Center-South of the country, which was aided by state and local roads that contributed to the growth of the central region of the State. The opening of the Belém-Brasilia route favored the occupational explosion of the west of the state, in particular in the city of Imperatriz. Since the 1960s, public development policies in the Maranhão region have been accentuated, altering the set of relations between land and labor, also shifting the process of spontaneous occupation of the lands of Maranhão.

In the 1970s, Maranhão experienced a process of implementation of several capital-intensive enterprises, linked to the logging activities in the region of Tocantins, allowing the expansion of the municipality of Açailândia. Also, in this decade the occupation of Alto Turi was consolidated, through the Superintendence of Development of the Northeast (SUDENE), standing out among the expanding locales the municipality of ZéDoca and the project of colonization of Buriticupu. Starting in the 1980s, with the implementation of the Greater Carajás Program, the new front of economic expansion was installed in the region of the Pre-Amazônia Maranhense, along the Carajás-Ponta da Madeira railroad corridor axis, thus boosting the region of Santa Luzia / Açailândia and Imperatriz / João Lisboa.

The implementation of different industrial projects, especially the mining-metallurgists and loggers, have caused serious damage to the environment, with the devastation of the forests, pollution of water resources and the air, besides the

disarticulation of the way of life of the native populations. The consequences of these impacts marginalized these populations, since the number of jobs they generated was insufficient to absorb the large number of unemployed and unoccupied people theses projects generated in the displaced native communities, due to low level of education and lack of skilled labor.

A process of shift in the existing traditional moorings in the productive systems of Maranhão can be seen starting in the 1980's. There was no innovation or new technologies in the agricultural sector. Thus, agriculture lost importance in favor of extensive cattle ranching, which occupies more land and produces relatively less, employing fewer workers. The consequences, as seems natural, arose in the larger participation of the primary sector in the formation of GDP, leading to lower family income per worker and, consequently, a worse quality of life.

History of the occupation of Maranhão's municipalities

The proposed site covers the municipalities of Primeira Cruz, Santo Amaro and Barreirinhas, whose histories are aligned with the process of occupation and development of the territory of Maranhão. As mentioned, the municipality of Primeira Cruz was strategically occupied by the Portuguese and Spaniards for the conquest of São Luís, and was founded on October 14, 1614. However, there is no official record of the permanent population in Primeira Cruz, leading us to presume that in the first centuries after its foundation the population fluctuated in-between fishing seasons, as is characterized by the remains of houses that were mainly fishing stations.

Barreirinhas, so named due to the existence of dunes that border the entire extension of the municipality, was created in 1858, when it was dismembered from the municipality of Tutóia by the force of Provincial Law n. 841. There is no precise date for the occupation of the territory by settlers man in territory, however it is well established that it must have been through the Rio Preguiças, that crosses the central portion of the municipality, and by its tributaries that allow the navigation of small boats. According to oral tradition, there are indications that in the late eighteenth and early nineteenth century in the neighboring Rio Preguiças a small community of Caeté natives thrived, in the general locality of present day city of Caetés, and these can be considered the first inhabitants of Barreirinhas. Despite the absence of supporting documents, there exists material indications of the presence of Caetés and Tapuias natives, mainly the straw huts found on the banks of the rivers and the indigenous artifacts found when the dunes change their position by the action of the winds (Beleza& Pereira, 2016). Man's settlement on the region was then determined by the fertility of the banks of the river and its tributaries, by the pastures and fields suitable for cattle breeding, by the abundance of fish in the rivers and lakes, and by the amenity of the climate.

Among the factors that contributed to the occupation of the land was the road linking Campo Maior in Piauí to Brejo in Maranhão stands out, crossing the Mocambo River, thanks to a bridge built by the imperial government in 1849, eventually reaching Icatu. This road favored the migration of people to the area, motivated mainly by the natural pastures existing on the banks of the river and the availability of fertile land for farming, which led to the emergence of several settlements. Another road, connecting the present cities of São Bernardo and Humberto de Campos, also favored the occupation. This allowed the formation of some riverside settlements, such as Santo Antônio, an important center for the production of sugar and brandy, and also known for the cattle ranch of owned by the Jesuits of the Companhia de Jesus, as well as some rural settlements along the roadside, such as Vertente, BuritiAmarelo and Santo Amaro. The latter is currently an autonomous municipality, and is a centar for production of wool, cattle, sheep and horses, while the others have dedicated themselves to agriculture.

The occupation of Santo Amaro took place through the Jesuits who had been expelled from Tutóia because of land poaching. Traveling through the interior of Lençóis Maranhenses, the Jesuits decided to settle on the site and built a ranch. They then sought out the landowner and asked for the land to be donated, which

was granted to them. However, having expanded their land irregularly, the Jesuits were again expelled. Pursued by soldiers, they penetrated the dunes and camped near a small mountain range, later called Morro do Espia, as they kept a spy there. With the approach of the soldiers, the Jesuits fled, finally camping in a spit near the dunes, where a Jesuit named Amaro died. Thus, the others gave the place the name of Santo Amaro in his honor.

After burying the deceased Jesuit, the others left, leaving Mr. Alfredo in place, a Portuguese who accompanied them and who liked the place very much. Some time later, Mr. Alfredo hosted Mr. Joaquim, who was on his way to Tutóia. However, also enjoying the place, he returned later with his wife to live there. His wife took with him, as inheritance, 50 heifers, 50 sheep and 50 goats, thus appearing the first three farms of Santo Amaro. It is considered, therefore, that Mr. Joaquim was the founder of the city, for there he built a church, the initial landmark of the village, which later received an image of Santo Amaro (IBAMA, 2003).

Conservation record

As we have seen in the processes of occupation and development described in this section, together with the difficulties put forth by the apparently uninhabitable dunes, the sand spits which are not very productive for extractivism and by less fertile sedimentary soils, the results of the occupation of the western portion of the Maranhão coast were constituted by sparse occupational nuclei of low density islands of settlements. Thus, the landscape found by the RADAMBRASIL project presented a low population density and a large area of ecological interest due to the presence of dunes and sand spits (CASTRO, 2012), resulting in the recommendation of the creation of a national park:

> *"It is then proposed the creation of a National Park, in the area of Lençóis Maranhenses, of recognized natural beauty by the presence of extensive dune fields.*
>
> *The natural conditions existing therein fall under Article 3 of Law 4771/65 and its implementation aims not only to preserve the regional landscape context, but also to meet educational, recreational and research objectives. As such, it should be emphasized that the region presents a great ecological diversity. In addition to research related to the vegetation of beaches, dunes and san spits - considering that, there, this vegetation comes into contact with that of the Cerrado and the Caatinga - other research can be carried out, aiming at the knowledge of the phytogeographic evolution of large areas of the Northeast and North of Brazil" (BRASIL, 1973).*

The proposal to create the Lençóis Maranhenses National Park was therefore presented in the 1970s to fill gaps in the National System of Protected Areas and to meet the demands of the scientific community and institutions working in the environmental area of the State of Maranhão.

The LençóisMaranhenses National Park was created by Decree No. 86,060, dated June 2, 1981, with an area of 150,000 ha which remains unchanged until today (IBAMA, 2003). The denomination of "LençóisMaranhenes" ("lençóis" being the portuguese word for "sheets") has its origins related to the first navigators that arrived with their boats, near the coast of the region, due to the fact that this area presents a flat relief, consisting of marine quartz sands and strings of immense white dunes, which resembled "sheets thrown on the bed" (D'ANTONA, 2002 apud BELEZA & PEREIRA, 2016).

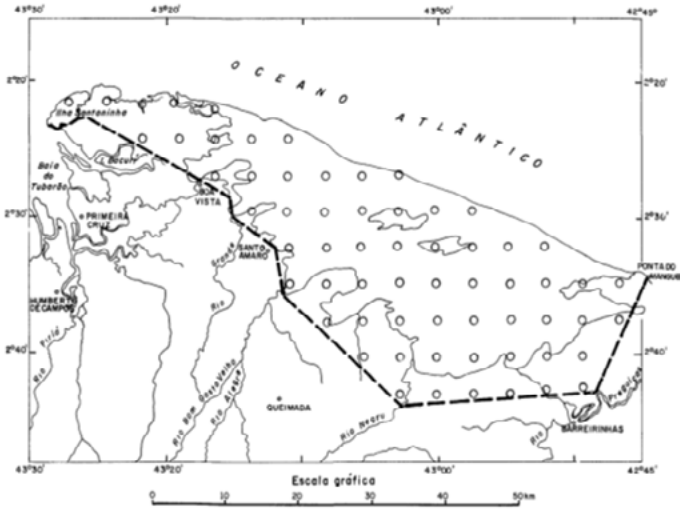


Figure 12. Proposed limits for the Lençóis Maranhenses National Park. Extracted from BRASIL (1973).

Figure 13. Aerial photo of the Lençóis Maranhenses presented at the RADAMBRASIL project showing its general aspects, highlighting its amplitude and scenic beauty and tourist potential. Extractedfrom BRASIL (1973).

3. Justification for Inscription

3.1.a) Brief synthesis

The Lençóis Maranhenses National Park is located in the northeastern region of Brazil, on the east coast of Maranhão. The Park has an area of 155,000 ha, of which 90,000 ha is composed of an extensive dune field with temporary and perennial lagoons. Beaches are found along the 80 km of the coast of the PNLM, ranging from 600 m to 2 km wide, adjacent to the dune field with different formats and heights. The rest of the PNLM area is composed of other bodies of water, such as rivers and lakes, and covered by lush restinga vegetation and other pioneer formations such as riparian forests, mangroves and apicuns (a saline and unweaned formation occurring in small sections of the National Park). The succession of dunes, seen from above, resemble large sheets ruffled by the wind, composing a landscape that can not be found anywhere else in the world.

This landscape of great scenic beauty represents the result of continuous climatological, geological and geomorphological processes, and is related to the great contribution of sediments by the transgressions and marine regressions which, combined with the wind action, allowed the formation of the fields of mobile dunes along the Quaternary. Under constant action of the trade winds, blowing in a single direction, the dunes assume shape of long barchan chains, which are then also modeled by hydrography of the park. The temporary lagoons formed by the increase of the water table in the rainy season soften and lengthen these chains which, associated with the increase of humidity and reduction of the speed of the winds, limit the advance and growth of the dunes in that period. Inter-dunal lagoons assume different shapes, sizes, depths and colors, enchanting all visitors. In the wind deflation plain there are small, flooded depressions during the tides of syzygy, forming the lagoon environments present along the coast of the park.

The site also stands out because it presents significant habitats for the conservation of biodiversity. Inserted in the Cerrado, the Park is home species of the Caatinga and the Amazon, resulting in a diversity of more than 850 species. The vegetation of the Park is composed of pioneer formations of restinga, mangroves and alluvial communities, which together with the marine and freshwater environment are fundamental for the conservation of species of fish, reptiles, birds and mammals. The importance of the site as an ecological refuge can be evidenced by the greater plant life richness observed in Queimada dos Britos, a central region of the Park, which also presents itself as an "island" of vegetation. Thirty-one of the Park's species are included in the list of endangered species.

3.2.b) Justification for Criteria

Critério vii: contain superlative natural phenomena and areas of exceptional natural beauty and aesthetic importance.

The Lençóis Maranhenses National Park, made up of large white dunes, looks like a typical desert at first sight. However, it differs from a desert due to the relatively high volume of precipitating water, forming temporary lagoons between the dune chains.

Much of the National Park's territory is dominated by this landscape that cannot be found anywhere else in the world. The interaction of climatic, geological, and geomorphological factors over time has given rise to an extensive field of dunes, most of which present barchan forms oriented in one direction by the winds and filled in their depressions with fresh water. The dunes can reach up to 20 m in height, forming sinuous chains with 75 km in length. The combination of these features such as the extension, the conformation of the dunes and the volume of rain is unique, and there is no other field of coastal dunes with similar beauty.

Almost all precipitation falls between January and July, when it is quickly absorbed by the sand, raising the water table above the ground and filling the temporary ponds. Therefore, it is soon after the rainy season that the Lençóis Maranhenses National Park presents its best scenery, when the blue, green and black lagoons of different sizes, shapes and depths reach their maximum volume, attracting thousands of tourists. Around the proposed site there are also typical permanent lakes, such as Santo Amaro and Travosa Lakes, but the temporary ponds is the feature that differentiate this site from any other dune field.

Besides the temporary lagoons, the National Park has many other natural attractions and paradisiacal landscapes such as beaches along its 80 km coastline, rivers and dunes, which allow the visitors to experience activities such as trekking, bathing and contemplative tourism. Another major attraction is the Baixa Grande, located inside the dunes field, being considered a typical oasis. This region presents the greatest diversity of vegetation and its lagoons are deep for most of the year. The proposed site was also recently one of the scenarios of the Hollywood film "Avengers: Infinite War", which was chosen by its special "out of the ordinary" landscape, to portray another planet, attesting to its exceptional natural beauty.

Critério viii: be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms or significant geomorphic or physiographic features.

The Lençóis Maranhenses National Park overlaps with sedimentary packages that were formed successively over geological time, presenting materials of varied origins due to marine transgressions and regressions. The Pirabas Formation develops throughout the Barreirinhas Basin capturing the cretaceous sediments, being one of the sources of the materials forming the extensive sand sheets of the region. The Pirabas Formation is associated with the last great transgression of the equatorial margin, after which a regression phase was initiated, with a new retreat of the coast line during which the sediments of the Barreiras Formation were deposited. These sediments, which are also associated with Açuí Quaternary Formation sediments, make up the sediments that cover the entire region and form the mobile and fixed dune fields.

The dune fields are related, therefore, to the selection of materials by the oscillations of the sea level, and the ensuing sediment deposition and enlargement of the continental shelf in consonance with the contribution of fluvial sediments coming from the main rivers, like the Preguiças and the Parnaíba. This coastal plain, located west of the Preguiças River, is therefore one of the largest records of coastal dune fields developed along the Quaternary, being the most important of the Brazilian coast and one of the most significant in the world.

This abundant sand stock is constantly worked by the wind, which ends up giving the Park's characteristic shape. The region is heavily influenced by the trade winds, which blow in the NE direction, transporting the sands of the beach towards the interior. When the winds blow in the same direction, the mounds of sand begin to present "two arms" oriented towards the wind, originating the barchan dunes. These are thus born on the beach, giving rise to transverse dunes perpendicular to the wind and later to larger barchan dunes. The abundance of sand in the Lençóis Maranhenses National Park allows the emergence of many barchan dunes, whose arms end up forming chains of, also known as barchanoids, which can reach up to 75 km in length.

The form of these dunes also presents a great contribution to seasonality of the precipitations, since in the dry period the winds are stronger, favoring the movement and increase of the dunes, whereas in the rainy season the speed of the winds decreases, which, associated to the increase of the humidity and elevation of the water table, forms the temporary ponds, reduces sediment mobilization, limiting the growth of the dunes to a height of 20m. In addition, the presence of temporary ponds is responsible for smoothing and lengthening the barchanoids' curves, giving the dunes their characteristic shape. The process of formation of barchan, transversal and barchanoid dunes is common in other dune fields, as for

example in the Namibian Sand Sea, however none presents chains of dunes intercalated with lagoons, due to the water table setting during the rainy season, which makes the Lençóis Maranhenses National Park remarkable from a geomorphic point of view.

Critério x: contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

The Lençóis Maranhenses National Park is located in the Cerrado biome but also counts with a strong presence of the Caatinga and the Amazon biomes, so that the species of these three biomes are found in the park. The vegetation is characterized by Pioneering formations with marine influences (restingas), fluvio-marine (mangroves) and fluvial (riparian forests), which predominantly occupy the edges of the moving dunes and shelter a diversity of species of plants, invertebrates and vertebrates. In total, 857 species were catalogued at the proposed site, a number that can still increase with the continuity of the researche, given the limited research that has been carried in the Park.

The vegetation of restinga predominates in the park, being mainly found on paleo-dunes, to the south of the field of movable dunes. The floristic heterogeneity of this vegetation, with representatives of different plant formations, such as Cerrado, Caatinga, tropical forest and restinga, adequately characterizes this region as a transition zone. A total of 134 plant species distributed in 62 families were identified, one of them endemic to Queimada dos Britos (Hybantus solccolaris). Queimada dos Britos area possesses the highest botanical diversity, with 86 species. The floristic analysis revealed a phytogeographic individuality for this central area of the Lençóis Maranhenses National Park, suggesting that this area experienced a possible isolation resulting from paleoclimatic effects.

Restinga vegetation is also important for reptile species, since 81% of 42 species living inside the Park are found only in this environment. Lençóis Maranhenses has significant importance for the conservation of this animal group in Brazil, since it includes in a relatively small area a single taxocenosis, which combines several species of different biomes. Three species of turtle are included in the list of endangered species, Trachemys adiutrix (tartaruga-pininga), which is endemic to a small coastal region of Maranhão and Piauí, Dermochelys coriacea (tartaruga-de-couro) and Chelonia mydas (tartaruga-verde).

Regarding other animal groups, 179 species of fish were recorded, of which 20 are included in the list of species threatened with extinction. Recently, a new endemic species (Hyphessobrycon peorskii), described for the upper Munim and Preguiças river basins, was found. The area is also of great importance for migratory bird species in North America, such as maçaricos (Calidris canutus), the trinta-réis-boreal (Sterna hirundo) and the blue-winged Duck (Anas discors). A total of 112 bird species have been recorded, of which five are included in the list of endangered species. Among the mammals, three are also considered threatened: Lontra longicaudis, Leopardus tigrinus and Trichechus manatus. The possible occurrence of albino weed dogs (Cerdocyon thous) (mentioned in the Management Plan, but still requiring further scientific investigation for its verification) may be the result of a genetic and/or an adaptive process for life in the dunes, an event that is not known by any other population of this species and may represent another particularity of the proposed site.

3.3.c) Statement of Integrity

The Lençóis Maranhenses National Park has an area of 155,000 ha which encompasses all the elements that express its exceptional universal value. The dune fields are found widely on the Brazilian coast and in other coastal regions of the world, but none of them have forms with the same extension of this site. There are

90,000 ha of field of mobile dunes, which form long chains of barchan dunes, all oriented in the same direction and interspersed by lagoons. In addition to these morphological features, parabolic and longitudinal dunes, paleo-dunes, deflation plains and long beaches are well represented in the park area. All these elements are interconnected and express the processes involved in the formation of the Lençóis Maranhenses landscape throughout geological time.

The restinga vegetation is the most representative in the park, covering an area of approximately 395,497 ha, representing 25.3% of the total area, mostly around the dunes field and in good condition. It is also exuberant inside the dunes field, including the localities of Queimada dos Britos and Baixa Grande, which present the greatest botanical diversity of the whole site. This region comprises the primitive zone of the National Park, characterized by the low human intervention and great biological and scientific importance, being destined for the preservation of the natural environments and for primitive activities of recreation. It is important to mention that in the southeastern part of the park is still verified the practice of clearing for agriculture, but without representing a great threat to the integrity of the park. Mangrove vegetation, despite being in a more restricted area in the northwest part of the park, is of great importance for the maintenance of the productivity of the nearby coastal waters. It is also in good state of conservation, being the only portion of mangrove protected by an unit of integral conservation on the coast of Maranhão. The Lençóis Maranhenses National Park is part of the National System of Conservation Units (Law 9.985/2000 and Decree 4.340/2002), which regulates and establishes criteria and standards for the creation, implementation and management of these protected areas. The Park belongs to the integral protection group of conservation units, whose main objective is the conservation of nature, allowing only the indirect use of their natural resources. The Lençóis Maranhenses National Park also counts with a 423,231 ha buffer zone (which corresponds to the proposed Site's Buffer Zone), where according to the legislation, human activities are subject to specific norms and restrictions with the purpose of reducing the negative impacts of the environment on the conservation unit. In addition, 65% of this Buffer Zone, equivalent to more than 178 thousand hectares, are inserted in conservation units of sustainable use, ensuring its integrity even more. In addition to the Buffer Zone, other areas around the site are also protected by areas of integral protection and sustainable development, which further strengthens the integrity of the site proposed for inclusion in the World Heritage list.

3.1.d Protection and Management Requirements

The Brazilian government has an elaborate institutional and legal arrangement focused on environmental protection. The National Environmental System (SISNAMA) and the National System of Water Resources Management (SINGREH) are the two essential institutional structures that comply with the constitutionally foreseen principles of environmental protection.The first was created by the National Environmental Policy, Law 6.938/81, being made up by the entities and institutions of federal, state and city and the Federal District environmental authorities. Its objective is to establish an articulated and decentralized set of actions for environmental management in the country, integrating and harmonizing specific rules and practices that complement each other at the three levels of Government. It is structured by the governing council, with the function of formulating guidelines for the environment and natural resources, by the National Council of the Environment (CONAMA), a consultative and deliberative body that advises the government and establishes federal norms and standards that must be observed by the states and municipalities, by the Ministry of Environment (MMA), the central body that plans the actions related to the National Environment Policy, congregating all the bodies that SISNAMA and by the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA), Chico Mendes Biodiversity Preservation Institute (ICMBio) and the Botanical Garden Research Institute of Rio de Janeiro, in charge of implementing environmental policies. In addition to these

bodies, SISNAMA also includes state and municipal bodies and entities that establish complementary norms, as well as control and supervise the environment in their respective jurisdictions.

SINGREH was created by Law No. 9433/97, known as the Water Law, which also instituted the Water Resources National Policy (PNRH). In addition to implementing the Water Resources National Policy, this system aims to promote integrated water management, to arbitrate administratively on conflicts related to water resources, to promote the protection and recovery of water resources, and to control the use of water through Collection. SINGREH has different decision-making bodies, with space for participation of several sectors of society. The National Water Agency (ANA), an authority linked to the MMA for the implementation of the Water Resources National Policy, the Water Resources Councils of the States, the National Council of Water Resources (CNRH), the highest deliberative and normative body of the Federal Level, the River Basin Committees and their agencies, responsible for implementing the national water policy at river basin level, and the public authorities of the three spheres, whose competencies are related to the management of water resources. In this system, the hydrographic basins are the territorial unit for the management of water resources through the committees that come to represent an organization of the State with administrative political function.

The Ecological Economic Coastal Zoning is an instrument of coastal management, which must be elaborated in a participatory manner and establish environmental goals and directives capable of ordering space, also functioning as a mechanism to support the actions of monitoring, licensing, inspection and environmental management. This instrument is supported by Federal Law No. 6938/1981, which establishes the National Environmental Policy (PNMA), Federal Law 7661/1988, which establishes the National Coastal Management Plan (PNGC) and Decree No. 5,300/2004 Which regulates the ZEEC. Among the instruments of territorial management that aim at environmental protection and conservation of biodiversity, however, the National System of Protected Areas (SNUC) can be considered the most important. The SNUC was created by Law 9.985/2000 and Decree No. 4,340/2002, which regulates it, establishing criteria and standards for the creation, implementation and management of protected areas. The Protected Areas of the SNUC are divided into two groups with specific characteristics: the Strict protection protected areas, whose basic objective is nature conservation, with only the indirect use of their natural resources; and the Sustainable Use, whose aim is the compatibility and conservation of nature with the sustainable use of its natural resources.

Pursuant to Article 8, the group of Strict Protection is composed of the following categories:

A) Ecological Station;

B) Biological Reserve;

C) National Park;

D) Natural Monument;

E) Wildlife Refuge.

Pursuant to Article 14, the Sustainable Use group is composed of:

A) Environmental Protection Area;

B) Area of Relevant Ecological Interest (ARIE);

C) National Forest (FLONA);

D) Extractive Reserve (RESEX);

E) Wildlife Reserve (REFAU);

F) Sustainable Development Reserve (RDS);

G) Private Natural Heritage Reserve (RPPN).

In addition to the protected areas officially recognized by different governmental spheres, Brazil has in the Law of Protection of Native Vegetation (Law no. 12,651, of May 25, 2012) a legal instrument that deals with the protection, conservation, possible removal and use of natural areas. This Act defines as rural properties that need to be maintained and protected in the territory. They are of two natures:

(a) Permanent Preservation Area (APP), which must be protected due to physical and ecological fragility, determining its location by the geography of properties, such as the marginal ranges of any watercourse and slopes;

(b) Legal Reserve, which constitutes a proportion of the area of property that must maintain native vegetation to, together with the PPAs, contribute to the conservation of biodiversity.

The network of protected areas in the proposed area also interacts with other levels of environmental management and government development plans.

The proposed preliminary management plan for the site includes a framework and mechanisms to ensure the effective integrated action of these bodies. It also proposes a management chart, which includes and organizes the participation of stakeholders, through two management committees: the executive committee, composed of institutions directly and closely related to the proposed World Heritage Site; and the advisory council, larger and composed of a set of entities that interface with the management of the site (see Annex 11: Management plan). The advisory council will strengthen and integrate the action of those who are involved in the integrated management practice in the region, and it aims to increase the integration of local management entities in the protection and monitoring of the site, based on the protection of outstanding universal values of the site.

A logical framework was developed, establishing plans and conservation projects, communication, and site management, with short, medium and long- term commitments.

3.2 Comparative Analysis

The present comparative analysis was carried out between similar sites distributed around the world, whether or not included in the World Heritage List. Thus, the Lençóis Maranhenses National Park was compared to other dune fields based on the criteria selected for its nomination: represent outstanding natural phenomena or an area of exceptional natural beauty and aesthetic importance (criterion vii); to be an exceptional example and identifier of specific stages in the history of the Earth, including life records, significant ongoing geological processes in the development of terrestrial forms, or significant geomorphic elements (criterion viii); and contain the most relevant and significant natural habitats for the in situ conservation of biological diversity, including those containing threatened species, of Exceptional Universal Value from the point of view of science and conservation (criterion x).

The Lençóis Maranhenses National Park resembles a desert, but differs from one particularly in terms of its relatively high volume of water: up to 2,000 mm of annual precipitation. Over 90% of this precipitation, however, falls between January and July, when it is rapidly absorbed by the sand, raising the water table above the ground and filling the temporary ponds between the dune chains, which hardly move at this time of year due to the humidity and the lack of wind, forming temporary ponds up to three meters deep. These features are unique, making Lençóis Maranhenses National Park completely different from any other dune field in the world.

Dune fields are widely found in coastal regions and desert regions in the world. The coastal zone corresponds to the transition zone between the continental domain and the marine domain, being subject to the processes of sea level oscillation, erosion and deposition by the action of waves, tides and currents and wind

processes. Therefore, they are highly unstable environments with great temporal and spatial variability (BAPTISTA NETO et al., 2004). However, there are few coastal dune fields that combine characteristics such as extent, conformation and volume of rainfall that result in such beauty as can be seen at Lençóis Maranhenses. In addition, the proposed site is located on a coastal plain that presents one of the most significant records of dune fields developed along the quaternary.

If the comparison is made with other desert areas, the Lençóis Maranhenses National Park remains very unique and unlike any other area. According to the IUCN Desert Landscapes (2011), the world's deserts cover about a third of the Earth's surface and occur on all continents, including Antarctica. The hot desert regions are located mostly in latitudes of 30o where atmospheric high pressure belts are formed, resulting in moisture withdrawal and low annual rainfall, often less than 200 mm. These areas contain the majority of large dune systems, also known as sand seas, which are constantly reworked by the winds (PONT, 2015).

In relation to the landscape attribute of extraordinary beauty, the proposed site can be compared with other dune fields in the world. By comparison, the Ounianga Lakes Natural World Heritage Site consists of large permanent lakes, separated by dune fields, with sweeping colors and shapes in the heart of the Sahara desert; however, it differs from the proposed site in relation to the geomorphic elements and their processes involved (attributes of criterion viii).

The formation of these lakes is related to the filling by sediments of a larger flooded area during the last humid phase of the lower Holocene, which are currently fed exclusevely by underground fossil water, a complex and unique hydrological system, while the proposed site landscape at Lençóis Maranhenses is related with marine transgressions and regressions which, combined with the wind action, enabled the formation of dune fields along the quaternary, which are now temporarily flooded by rainwater.

Figure 14. Boukou Lake of into the World Heritage Site of the Ounianga Lakes. Source: http://whc.unesco.org/en/documents/117147

Figure 15. Lake Teli of in the site of the World Heritage of Lakes of Ounianga (Republic of Chad). Source: http://whc.unesco.org/en/documents/117142

Namibia's Natural Sand Sea World Heritage is the only coastal desert in the world that includes extensive dune fields where condensation from haze is the main source of local water. Fogs are usually recorded for 60 to 120 days a year, sometimes condensing and forming drizzle, but most of the time being intercepted by the dunes, where the deposited moisture allows the sustainment of the spectacular biodiversity of the site. In this area, more than 300 species of plants, invertebrates and vertebrates are present, of which more than 50% are endemic, adapting to a variety of microhabitats in constant change and ecological niches. In this regard, the Lençóis Maranhenses National Park also houses species adapted to local conditions, such as 38 possibly endemic phytoplankton taxa associated with lake isolation; 01 endemic plant species of the resting (Hybantussolccolaris) found in an area that shows signs of paleoclimatic isolation; and the pininga turtle (Trachemysadiutrix); which may be the result from both a genetic process and an adaptive process for dune life. It is important to emphasize, however, that the site is inserted in the Cerrado Biome, in a transition region between the Amazon and the Caatinga, besides sheltering vegetation of restinga, mangrove, alluvial communities and also pioneer vegetation of dunes, having as such, a greater biological diversity, comprising more than 850 species.

Figure 16. Namibian Sand Sea World Heritage. Source: http://whc.unesco.org/en/documents/123192

Figure 17. Mist over the Namibian Sand Sea. Source: http://whc.unesco.org/en/documents/123191

Regarding the dune fields that are not included in the World Heritage list, the Badain Jaran desert in the People's Republic of China is home to the largest stationary dunes in the world with permanent lakes that gives the desert the name of "Mysterious Lakes". Although annual precipitation varies from 118 mm in the southeast to 37 mm in the northwest part of the desert, the lakes are fed by underground springs whose waters originate from precipitation and melting snow from mountains that surround the desert miles away, flowing under gravel deposits that become thinner and block the flow of water, thus forming the lakes (YANG et al., 2003). Like the Ounianga Lakes, this area also presents great scenic beauty, but differs from the proposed site in relation to the processes involved in landscape formation.

The Lençóis Maranhenses National Park has typical permanent lakes as well, which are fed by the outcrop of the water table, such as Lake Santo Amaro and Lake Travosa, but it differs from any other dune field because it has interdunar lagoons with different shapes, sizes and depths that are formed by rainwater in a given period.

Figure 18. Badain Jaran desert. Source: http://www.china-tour.net/288-Trekking-to-Lakes-in-Desert-Badain-Jaran.html#

There are many active coastal dune fields in Brazil, which are found in four main ranges: between the east-central coast of Maranhão (Lençóis Maranhenses Region) and the south of Rio Grande do Norte; between Sergipe and Alagoas, in the vicinity of the mouth of the São Francisco river; in the region of Cabo Frio in Rio de Janeiro; and between the island of Santa Catarina and the southern end of Rio Grande do Sul (GIANNINI, 2007). However, none presents the same characteristics of the Lençóis Maranhenses National Park, being the most important dune field on the Brazilian coast and one of the most significant in the world that records the development of coastal dune fields throughout the quaternary.

In the stretch between the east-central coast of Maranhão and the south of Rio Grande do Norte, the Environmental Protection Area of the Parnaíba Delta (PI) and the National Park of Jericoacoara (CE) are also important, which also have paradisiac landscapes and natural attractions that integrate with Lençóis Maranhenses National Park in a tourist route known as Route of Emotions. As mentioned, similarities are found mainly in the presence of dune fields, which can take considerable widths (5 km to 10 km), for example in the APA of the Parnaíba Delta, with lagoons formed in the depressions. However, unlike the proposed site, the large lagoons in the APA of the Parnaíba Delta are formed mainly at the expense of the riverbeds by the dunes (IBAMA, 1998). In spite of the common formation of lagoons in these areas during rainy seasons, the phenomenon in the Lençóis Maranhenses National Park is more expressive due to the relatively higher rainfall of 2000 mm against only 1200 mm in the APA of the Delta of Parnaíba and 1034 mm in the PARNA of Jericoacoara, but also more remarkable due to the conformation of its dune fields, characterized by the presence of long chains of barchans dunes. Rainfall waters then flood the areas between the dunes, forming lakes that cover about 41% of the Lençóis Maranhenses area, a phenomenon that is not observed in the two other areas mentioned (LUNA et al., 2012).

Figure 19. Mangrove in the APA of the Parnaíba Delta. Source: http://www.icmbio.gov.br/portal/visitacao1/unidades-abertas-a-visitacao/9411-area-de-protecao-ambiental-delta-do-parnaiba

Figure 20. Poldros Island in the APA of the Parnaíba Delta. Source: http://www.icmbio.gov.br/portal/visitacao1/unidades-abertas-a-visitacao/9411-area-de-protecao-ambiental-delta-do-parnaiba

Figure 21. Dunes in the Jericoacoara National Park. Source: http://www.viajecomigo.com/2015/05/27/parque-nacional-jericoacoara-ceara-brasil/

It is possible to affirm in this sense that the Lençóis Maranhenses National Park presents a combination of climatic, geomorphic and biological characteristics, such as the delicate formations of dunes, lagoons and the presence of endemic and endangered species, not found in any other similar national or international site. Comparative analysis of both unlisted comparable assets or present on the World Heritage List demonstrate that this proposed site is a unique environment, full of biodiversity and scenic landscapes of exceptional value, passive for inclusion in the World Heritage List. Table 6 presents comparative analysis synthesis.

Table 6. Comparative analysis synthesis between the proposed and other comparable sites.

Site \ Atributes	EXTENSIVE DUNE FIELDS OF GREAT BEAUTY	DUNE FIELDS WITH LAKES FORMED BY RAINWATER	IMPORTANT RECORD OF THE DEVELOPMENT OF DUNE FIELDS THROUGHOUT THE QUATERNARY	IMPORTANT FOR IN SITU CONSERVATION OF BIOLOGICAL DIVERSITY	GOODLEVEL OFINTEGRITY
Lençóis Maranhenses National Park		Goodlevelofintegrity	YES	YES	YES
Ounianga Lakes World Heritage Site	YES	NO	NO	YES	YES
Namibian Sand Sea World Heritage Site	YES	NO	NO	YES	YES
BadainJaranDesert	YES	NO	NO	YES	YES
Parnaíba Delta APA	YES	YES	NO	YES	YES
Jericoacoara PN	YES	YES	NO	YES	YES

Figure 22. Distribution of Sites Map.

Mario Barila

Temporary ponds assume the most diverse colorations, due to the presence or not of vegetation and rock outcrops in the background. The pond pictured above features a beautiful greenish tone.

Mario Barila

At the height of the flood season, there is an increase in temporary lagoons and many of them interconnect, forming large stretches of submerged areas.

Mario Barila

Contrast between blue lagoons and the sand dunes.

3.3 Proposed Statement of Outstanding Universal Value

a) Brief synthesis

Consisting of large, sweeping dunes, Lençóis Maranhenses National Park looks like an archetypal desert at first glance, but in fact it is not, as a relatively large volume of water precipitates in the wet period (between January and July) raising the water table above the soil and forming temporary lagoons between the dunes.

Located in the northeastern region of Brazil, on the eastern coast of Maranhão, Lençóis Maranhenses National Park has an area of 155,000 ha, of which about 90,000 ha are composed of an extensive dune field with temporary and perennial lagoons. Along the 80 km of its coast, are beautiful beaches followed by the deflation plains, where the removal of the sediments by the wind action, forming barchan dunes predominates. With the inward movement by the prevailing winds, these dunes take the form of long winding chains of barchans, filled in the rainy season by ponds of different colors, shapes, sizes and depths. At the end of this period, the site presents its best scenario, when the inter-dunal lagoons reach their maximum volume, attracting thousands of visitors to bathe in their crystalline waters.

The origin of the dune field is related to the great contribution of sediments by the marine transgressions and regressions, which combined with the wind action allowed the formation of the dune fields along the Quaternary. The site also stands out because it sits on a transition region between three Brazilian biomes, the Cerrado, the Caatinga and the Amazon, so that species of these three biomes can be found there, forming a unique combination. The vegetation of the park is composed of pioneer formations of restinga, mangroves and alluvial communities which, together with marine and freshwater environments, are fundamental for the conservation of a great diversity of species.

b) Justification for Criteria

Critério vii: The Lençóis Maranhenses National Park is dominated by an incomparable landscape. It is formed by successive chains of dunes interspersed by temporary and perennial lagoons that dazzle tourists from all over the world. Along the 80 km of coastline of the park, there is a flat beach with width between 600 m and 2 km that find dunes with heights between 10 and 20 m. Connected to each other, the barchan dunes form long winding chains with up to 75 km of extension that penetrate more than 20 km towards the interior. The appearance of crumpled sheets of these chains of dunes, seen from above, gave rise to the name of the site. When they receive rains during the first half of the year, these dune chains are filled by waters that rise from the water table, resulting in temporary ponds with different shapes, sizes and depths. Bathing in these freshwater lagoons is the main attraction of the site, as well as the contemplation of the majestic white dunes interspersed by green and blue lagoons, composing a landscape of unique beauty that cannot be found anywhere else in the world.

Mario Barila

Ripple marks on the bottom of a temporary pond.

Adrianode Souza

Betânia Lagoon, one of the most sought after by tourists.

Adrianode Souza

Reflexo Lagoon, in Santo Amaro do Maranhão.

Priscila Steffen

Crystalline water imparts unsurpassed beauty to the thousands of temporary lagoons formed during the wet season.

Mario Barrila

Detail of the junction of temporary ponds during the floods high season.

DRONE

Lençóis Maranhenses resemble a desert during the dry season, forming a landscape that contrasts a lot with that of the wet season.

Mario Barrila

One of the Park's inter-dunal temporary lagoons during the rainy season.

Priscila Steffen

During the dry period the lagoons are drained and the connection between them is lost.

Priscila Steffen

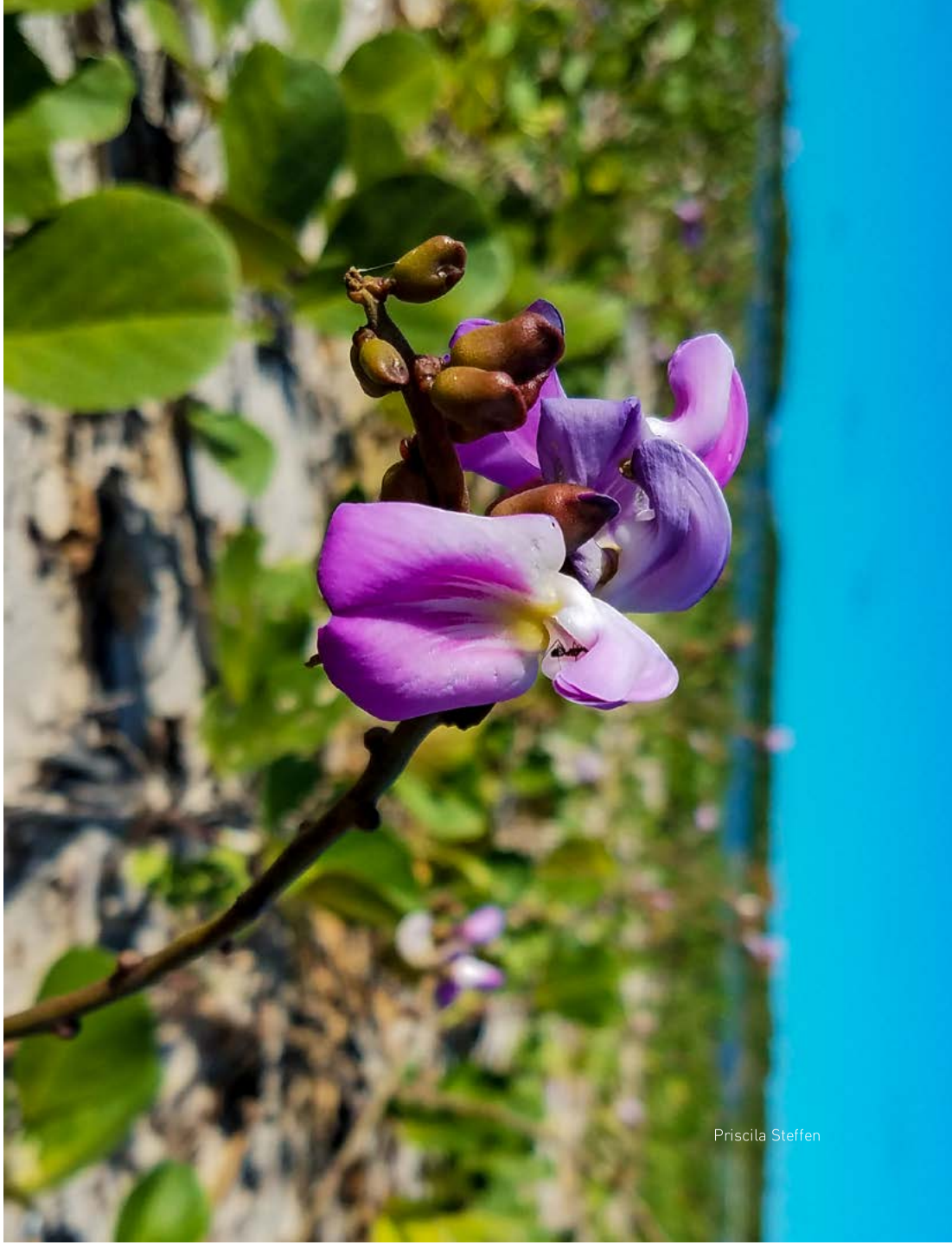
The rocks below the dunes keep the water table close to the surface, so that during the rainy season it rises, forming temporary lagoons.

Critério viii: Lençóis Maranhenses National Park sits at the Barreirinhas Basin superimposed on sedimentary packages, whose erosive and depositional processes gave rise to the sediments that cover the region. Under wind action these sediments formed a field of mobile and fixed dunes, considered the largest in South America and one of the most significant that records the development of coastal dunes along the Quaternary. This great contribution of sediments constantly worked by the trade winds, blowing from the northeast, take the form of long chains of barchans arranged in the same direction, that increase of size as they advance inland. In the rainy season, however, the temporary ponds formed by raising the water table soften and lengthen the curves of the barchanoids, limiting also their movement and growth. It is therefore this perfect alternation between winds and rains that guarantees the extraordinary beauty of the proposed site.


Priscila Steffen


Priscila Steffen


Priscila Steffen


Priscila Steffen

Adriano Souza

Mario Barila

A specimen of freshwater turtle of the Trachemys adiutrix species, endemic to Lençóis Maranhenses.

Mario Barila

Tatu peba (Euphractus sexcinctus) walking through Lençóis Maranhenses.

Mario Barila

Bird eggs in the Park.

Priscila Steffen

Preserved mangroves occur in several parts of the Park.

Priscila Steffen

The existing restinga within the Park has a high degree of conservation.

Critério x: It is characterized by pioneering formations with marine influence (restingas), fluvio-marine (mangroves) and fluvial (alluvial communities) presenting species of the Cerrado, Caatinga and Amazon. The restinga vegetation predominates in the site, located mainly in the surroundings of the field of mobile dunes, but also in the interior. This "island" of vegetation has the greatest botanical diversity of the site, as well as a phytogeographic individuality, suggesting isolation by paleoclimatic effects. The Lençóis Maranhenses National Park has a richness of 857 species and is very important for the conservation of migratory birds in North America, such as the tortoise (Calidris canutus), the trinta-réis-boreal (Sterna hirundo) and the Marreca-de-asa-azul (Anas discors) and reptiles, as it includes a single taxocenosis, which combines several species of different biomes. There were 857 species, of which two were endemic to the site (Hybantus solccolaris and Hyphessobrycon peorskii) and one endemic to a small coastal area between Maranhão and Piauí (Trachemys adiutrix). Thirty-one species are endangered, among them Epinephelus itajara, Dermochelys coriacea, Chelonia mydas, Trachemys adiutrix, Lontra longicaudis, Leopardus tigrinus and Trichechus manatus.

c) Statement of Integrity

Lençóis Maranhenses National Park has an area of 155,000 ha, of which 90,000 ha is formed by fields of mobile dunes with beautiful chains of barchans intercalated by temporary and perennial lagoons. More than 40,000 ha is covered by lush restinga vegetation, which along with mangroves, lagoons, rivers, marine areas and other ecosystems support a high diversity of species. The site is therefore large enough to guarantee the representativeness of elements and processes that confer its exceptional universal value. In addition, it integrates the National System of Conservation Units, belonging to the integral protection group, where natural resources can only be used indirectly. It presents a buffer zone, with specific norms and restrictions of human activities, to minimize the negative impacts of the environment on the site. All these factors contribute to ensure the integrity of the proposed site.

d) Protection and management requirements

The Brazilian government has an elaborate institutional and legal arrangement focused on environmental protection. The National Environmental System (SISNAMA) and the National System of Water Resources Management (SINGREH) are the two essential institutional structures that comply with the constitutionally foreseen principles of environmental protection. The first being made up by the entities and institutions of federal, state and city and the Federal District environmental authorities. Its objective is to establish an articulated and decentralized set of actions for environmental management in the country, integrating and harmonizing specific rules and practices that complement each other at the three levels of Government. SINGREH aims to promote integrated water management, to arbitrate administratively on conflicts related to water resources, to promote the protection and recovery of water resources, and to control the use of water through Collection. SINGREH has different decision-making bodies, with space for participation of several sectors of society. In this system, the hydrographic basins are the territorial unit for the management of water resources through the committees that come to represent an organization of the State with administrative political function.

The Ecological Economic Coastal Zoning is an instrument of coastal management, which must be elaborated in a participatory manner and establish environmental goals and directives capable of ordering space, also functioning as a mechanism to support the actions of monitoring, licensing, inspection and environmental management

Among the instruments of territorial management that aim at environmental protection and conservation of biodiversity, however, the National System of Protected

Areas (SNUC) can be considered the most important. The SNUC was created by Law 9.985/2000 and Decree No. 4,340/2002, which regulates it, establishing criteria and standards for the creation, implementation and management of protected areas. The Protected Areas of the SNUC are divided into two groups with specific characteristics: the Strict protection protected areas, whose basic objective is nature conservation, with only the indirect use of their natural resources; and the Sustainable Use, whose aim is the compatibility and conservation of nature with the sustainable use of its natural resources. The group of Strict Protection is composed of the five categories, Protection and Management Requirements.

In addition to the protected areas officially recognized by different governmental spheres, Brazil has in the Law of Protection of Native Vegetation (Law no. 12,651, of May 25, 2012) a legal instrument that deals with the protection, conservation, possible removal and use of natural areas. This Act defines as rural properties that need to be maintained and protected in the territory. They are of two natures: (a) Permanent Preservation Area (APP), which must be protected due to physical and ecological fragility, determining its location by the geography of properties, such as the marginal ranges of any watercourse and slopes;

(b) Legal Reserve, which constitutes a proportion of the area of property that must maintain native vegetation to, together with the PPAs, contribute to the conservation of biodiversity.

The network of protected areas in the proposed area also interacts with other levels of environmental management and government development plans.

The proposed preliminary management plan for the site includes a framework and mechanisms to ensure the effective integrated action of these bodies. It also proposes a management chart, which includes and organizes the participation of stakeholders, through two management committees: the executive committee, composed of institutions directly and closely related to the proposed World Heritage Site; and the advisory council, larger and composed of a set of entities that interface with the management of the site (see Annex 11: Management plan). The advisory council will strengthen and integrate the action of those who are involved in the integrated management practice in the region, and it aims to increase the integration of local management entities in the protection and monitoring of the site, based on the protection of outstanding universal values of the site.

A logical framework was developed, establishing plans and conservation projects, communication, and site management, with short, medium and long- term commitments.

Priscila Steffen

The restinga in good state of conservation is the dominant vegetation in the proposed site.

Priscila Steffen

The dunes interspersed with temporary ponds are the dominant landscape. It is an environment with a high degree of conservation, mostly without human presence.

4. State of Conservation and factors affecting the Property

4.a Present state of conservation

The area of the proposed World Heritage Site was decreed as National Park by the Brazilian government in 1981 (Federal Decree No. 86,060, June 2, 1981), and as such, the official protection of this area has been ongoing for more than 35 years.

This Strict Protection Category Protected Area has as its general objective the protection of the representative samples of the terrestrial and marine ecosystems, which give the Lençóis Maranhenses National Park a prominent position among other Units of the National System of Protected Areas (SNUC), since it comprises one of the largest dune fields and coastal paleo-dunes formed along the quaternary in transitional areas between three biomes: Amazonian forest, cerrado and caatinga.

In this sense, the proposed property area was included in the monitoring program carried out by the Brazilian government and WWF-Brazil, which have been using the Rappam method (Rapid Assessment and Prioritization of Protected Area Management) to monitor the management effectiveness of the Conservation (ICMBio, 2011). This method allows the rapid assessment and prioritization of the management of Protected Areas, providing decision makers and policy makers related to Protected Areas a simple tool to identify the main trends and aspects that need to be considered in order to achieve better effectiveness in a given system or group of protected areas (ICMBio, 2011).

The process used in the Rappam method comprises three distinct areas of analysis: (a) context, which includes the analysis of pressures, threats, vulnerabilities and the scenario of the unit's biological and socioeconomic importance; (b) management effectiveness, which involves the integration of planning elements, inputs, processes and results; and (c) analysis of the system of Protected Areas, considering the design and planning of the area and the public policies related to the conservation of natural resources, which verifies whether the biodiversity and socio-cultural aspects objectives of the conservation of are being met. Each Protected Area evaluates and incorporates the results into the planning and actions of the management plan. Two Rappam evaluation cycles have already been carried out in the country: 2005-06 (first cycle) and 2010 (second cycle).

Considering the differences between the general effectiveness estimates in the two Rappam cycles, the Lençóis Maranhenses National Park was considered one of the positive highlights (increase of more than 25 percentage points), reaching the fourth position in the ranking of the highest increases in management effectiveness among the Units in the period between the two evaluation cycles (ICMBio, 2011). In 2010 Lençóis Maranhenses National Park had a 45-point increase, from 27% in the first cycle, to 72% in management effectiveness in the second cycle, setting the Park among those with a high management effectiveness (over 60%).

When the monitoring considered the aggregation of selected specific issues in order to formulate an indicator of management effectiveness from the perspective of public use for visitation and environmental education in Federal National Parks, the Lençóis Maranhenses National Park was ranked in the 23rd position among the 64 parks evaluated, reaching 57.1% of effectiveness in this regard.

This evolution in the state of conservation of the site between the years 2005 and 2010 can best be observed in the Management Effectiveness Synthesis Table for the Rappam cycles 2005-06 and 2010 (Table 7).

Priscila Steffen

The restingas and lagoons form a unique environment.

Priscila Steffen

The restinga vegetation is exuberant around the lagoons and perennial rivers.

Table 7: Síntese da efetividade de gestão no Lençóis Maranhenses National Park nos ciclos Rappam 2005-06 e 2010.

Evaluation Cycle	General Indicator	Biological Importance	Socio-economic Importance	Vulnerability	Objectives	Legal Protection	Area Design and PLanning	Human Resources
2005-06	27%	80%	76%	51%	64%	32%	50%	4%
2010	72%	96%	87%	42%	83%	56%	89%	64%

Evaluation Cycle	Communication and Information	Infrastructure	Financial Resources	Management planning	Decision Making	Research, evaluation and monitoring	Results
2005-06	33%	8%	23%	20%	30%	17%	18%
2010	80%	56%	77%	76%	71%	77%	66%

Fonte: ICMBio, 2011.

The Park achieved significant improvements in all aspects, even those that were already considered to be highly effective, such as the biological importance of the unit, which increased from 80% to 96% of effectiveness. It is important to emphasize that this item incorporates data on the presence of endangered and threatened species, support for key species, ability to ensure the landscape's critical function, as well as the presence of the site's high biodiversity and high endemism, among others, which are all factors relevant to the conservation of the attributes that give the LençóisMaranhenses National Park its unique universal value.

Another biodiversity monitoring relevant to the assessment of the integrity of the site refers to the Brazilian Biomas Environmental Monitoring Program (PMABB), established in 2007 by the Brazilian government, which focuses on deforestation rate, monitoring and mapping; the assessment of plant cover and land use; fire monitoring; and restoration of vegetation and selective extraction.

For the monitoring of the Brazilian cerrado biome, the program incorporates the TerraClass Cerrado Project, which carries out mapping, characterization and analysis of the dynamics of land use and cover of this biome through systematic and periodic monitoring using remote sensing and geographical information systems (range of cartographic scales of analyzes between 1: 25,000 and 1: 50,000) (IBAMA, 2015).

At the same time as it analyzes the evolution of remnants of the native vegetation of the whole biome, the monitoring can adopt a more specific role regarding the limits of the Lençóis Maranhenses National Park. According to this assessment for the period of 2010 and 2011, a total of 724,667 hectares of deforested areas were identified in the Brazilian cerrado, of which 131,062 ha were located in the State of Maranhão, only 2 ha being inside the Lençóis Maranhenses National Park (IBAMA, 2015).

It is still possible to monitor the state of conservation of the site using as basis the studies developed in 2002 for the environmental diagnosis within the scope of the Management Plan of Lençóis Maranhenses National Park, which followed the methodology of Rapid Ecological Assessment (REA) implemented in two seasonal cycles, defined by climatic conditions in the Maranhão region: dry period and rainy season (IBAMA, 2003).

According to the Management Plan of the Lençóis Maranhenses National Park, the REA is a flexible methodological procedure used to obtain and apply, in an emergency, biological and ecological information in biologically diverse but little known areas. It is a technique designed to respond to specific conservation objectives, at often limited time periods, being efficient in identifying priority areas for management, protection and management plans (IBAMA, 2003).

The data obtained serve as a basis for evaluating the evolution of the conservation of the site, since the methodology can be replicated to the same sites chosen for the diagnosis of the Lençóis Maranhenses National Park Management Plan.

In this study, multiple levels of information were employed, including analysis of topographical survey maps, satellite images and aerial reconnaissance. Seven sampling sites were defined based on the differentiated characteristics of the landscapes, with emphasis on vegetation pattern, geomorphological factors and habitat integrity (Figure 23) (IBAMA, 2003). Field activities allowed the collection of information, resulting in ecological maps and description of flora, fauna, anthropic activities and land use, indicating sites that demand a greater degree of protection and need of further analysis (IBAMA, 2003).

In addition, some Protected Areas located in the Amazon, Cerrado and Mata Atlântica biomes, such as the Lençóis Maranhenses National Park, are part of the climate-relevant biodiversity-monitoring program, taking into account adaptation and mitigation measures. The program, with standardized protocols, is a partnership between the Ministry of the Environment, ICMBio and the German Technical Cooperation Deutsche GesellschaftfürInternationaleZusammenarbeit-GTZ. Although this program ended in 2014 for the area of the proposed site, it still has potential to be replicated in the future and its data can be linked to those previously raised for the Lençóis Maranhenses National Park area.

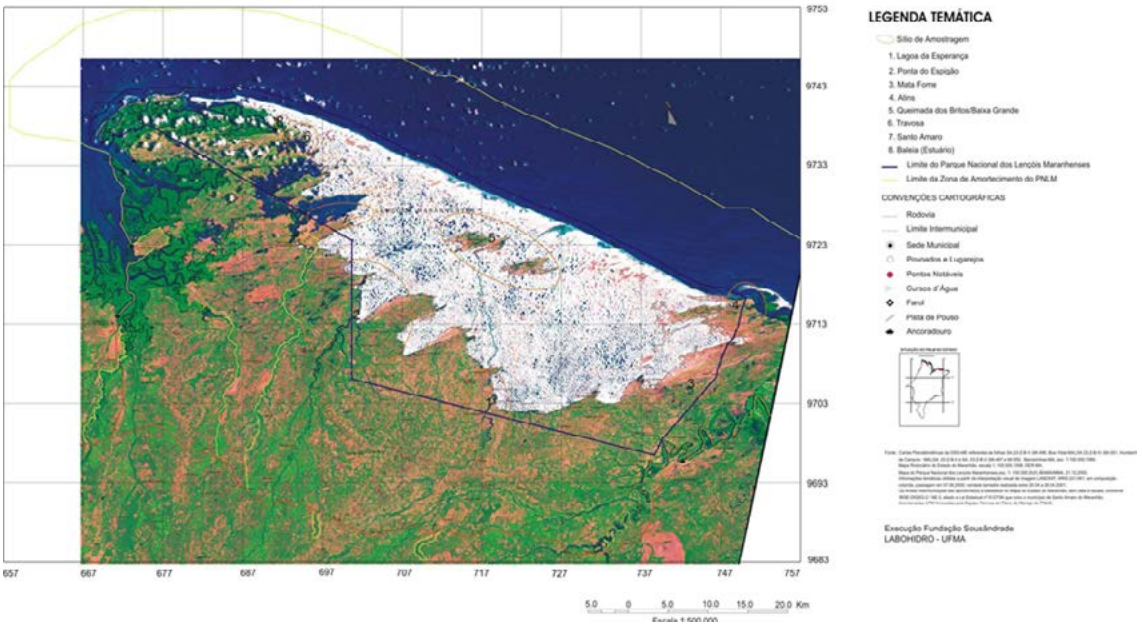


Figura 23: Map for the management plans of Lençóis Lençóis Maranhenses National Park (Source: IBAMA, 2003)

4.b Factors affecting the property

(i) Development pressures

Despite the environmental integrity and the high level of official protection that the category of Stricted ProtectionProtected Area offers to the proposed property, the area of the site presents risks associated with ongoing development projects and regional development programs, especially those regarding large-scale ventures that may affect the socio-economic and environmental dynamics of the territory.

The most recent threat to the integrity of the proposed unit is posed by an electric power generation project, located in the municipalities of Barreirinhas and Paulino Neves on the right bank of the Preguiças River - the eastern boundary of the buffer zone of the proposed unit. According to data from the National Electric Energy Agency (ANEEL), the Delta 3 Wind Farm Complex (Figures 24 and 25), as it is known, comprises a group of eight wind farms adding 96 wind turbines, which is the largest complex of this energy modality in the state. This large project, which started operations in 2017, has an installed capacity of 220.8 megawatts, but

should be expanded with the addition of another 100 new wind turbines installed in new wind farms planned for the coming years (Delta 4, 5 and 7). It should be noted that these projects are associated with the implementation of energy transmission networks, which according to information from the PNLM manager were prevented by the environmental agency from crossing the territory of the unit and its buffer zone.

An Environmental Impact Study was required in order to prevent environmental impacts of these projects, which also determined the counterparts that must be carried out by the company both to protect the environment and the population inside the area of influence of the enterprise. Among the counterpart actions of the project are infrastructure works to improve road access, projects linked to education and income generation for local communities.

Figures 24 and 25: Installations of the Delta 3 Complex (Source: Omega Energy Company - http://www.omegaenergia.com.br/projetos/complexo-delta-3/).

At the regional level, the pressures caused by the enterprise can generate combined effects of urban expansion, concentration and population growth, in addition to exerting pressure on the tourism industry through changes made to the coastal landscape, possibly interfering with the tourist flow.

Even though it is not included in the territory of the Park or in its buffer zone of the proposed site, this type of enterprise can generate impacts on the fauna of the region, especially to the avifauna; as an insurmountable barrier in the path of migratory routes, collision with wind generators, electrocution caused by the collision with associated transmission lines and habitat destruction. Besides these, the occupation of the coast can generate impacts on the spawning process of sea turtles, caused both by the facilities of the wind turbines and the opening of construction sites and access roads to the project.

In this sense, according to Brazilian environmental legislation, the contractor is responsible for carrying out mitigation and the monitoring of identified impacts on local and surrounding ecosystems.

The exploration of oil and natural gas also constitute a possible development pressure for the proposed site, since a new cycle of exploratory research has occurred in the region of the Barreirinhas Sedimentary, even if this industry does not show the same dynamism of the wind farms in the region surrounding the unit.

However, with the opening of pre-salt oil and gas reservoirs on the coast of southeastern Brazil, associated with the low economic viability measured in the explorations carried out in the Barreirinhas Basin, suggest a scenario of little concern as a region of the good. In addition, the pressure of environmental agencies to demand the rigor of the precautionary principle with the possible impacts on the marine, coastal and terrestrial ecosystems of the Basin prevented the auctioning of some of the exploration blocks in the region at the beginning of 2018.

However, currently, at least one of the blocks auctioned in the last 5 years in the Barreirinhas Basin is in exploratory offshore drilling activity, and some associated research activities such as seismic studies have been carried out in this region.

Although unlikely, the scenario of hydrocarbon production in the basin could generate environmental impacts such as oil spills, beach pollution, intensification of maritime traffic, introduction of exotic invading organisms, and others related to the activities of Long Term Tests and Production Pilots, which test the capacity of the reservoirs and evaluate the behavior of the area's production, in addition to the development of production, with the extraction of oil contained in the reservoirs on a commercial scale.

Another pressure originating from regional development that affects the site is related to new spatial dynamics established with the pavement of roads and openings of new routes of interconnection between the States of Maranhão and Paraíba. The process of socioeconomic development of the Lençóis Maranhenses Region intensified starting with the construction of the MA-402 highway in 2002, linking the capital of Maranhão to Barreirinhas. This 260 km route, which was previously traversed only by animal traction in a 12 hour journey, can today be covered in about 3.5 hours and by any type of vehicle, allowing the most effective insertion in the national and international tourism circuit (MMA, 2008).

This project not only greatly increased the tourist flow in the region of the site, but also made it possible to access different visitor profiles. In this way, the accelerated growth of tourism in the region was observed, requiring a greater rigor in the planning of the infrastructure of the municipalities and of the national park itself (MMA, 2008).

In addition to the construction of the MA-402, the implementation of the Lençóis Maranhenses Ecotourism Center at the beginning of this century also intensified real estate speculation in the PNLM region and its buffer zone, increasing trends in tourism expansion and construction of summer houses and complexes in areas of environmental criticality constituted by dunes, beaches and restingas, with the associated expropriation of the native population (IBAMA, 2002).

Another activity that exerts pressure on the PNLM refers to industrial fishing carried out by vessels from the fleet of companies based in Belém (PA), Luís Correia (PI) and Camocim (CE), considering that most of these boats fish using the trawling method from the mouth of the Preguiças River to the mouth of the Baleia River, which constitutes an inadequate, conflicting and predatory practice, considering that it occurs in the area of the Protected Area, in the area of the coastal strip, destroying the marine substrate along the coast and capturing juvenile fish species, thus interfering with the renewal of fish stocks (MMA, 2003).

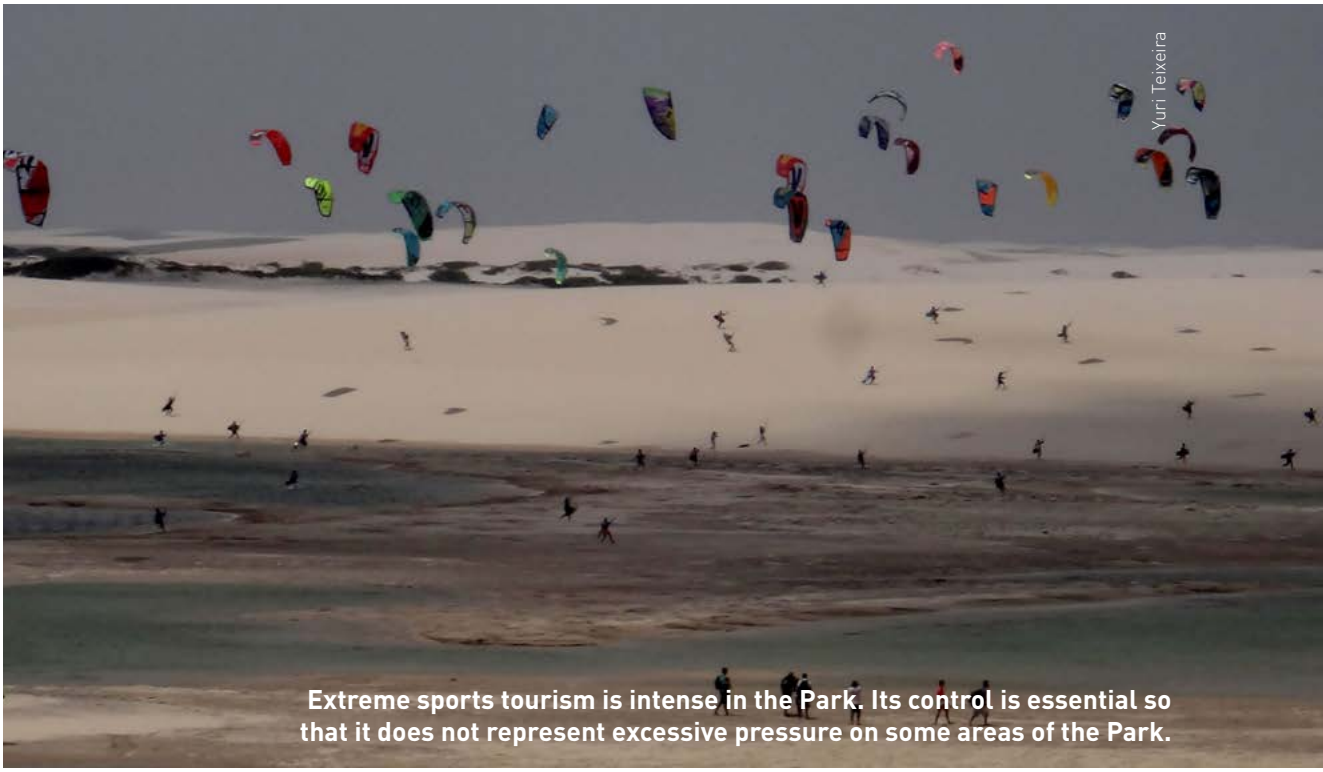
(ii) Environmental pressures

With the improvement of access to the proposed property starting in the year 2000, such as the construction of the MA-402 road (São Luiz-Barreirinhas) and an airport at Barreirinhas, together with the increase of investments for the implementation of programs and strategies to encourage and support tourism in the region of Lençóis Maranhenses, the population centers around the National Park, especially the city of Barreirinhas, began to live a new stage of development with greater population density, real estate expansion and urban infrastructure growth.

The implementation of the Lençóis Maranhenses Ecotourism Hub has generated real estate speculation in the region of Lençóis Maranhenses National Park, with tendencies of tourist expansion and the construction of summer houses and tourist complexes in areas of environmental vulnerability and the expropriation of land from the native population (IBAMA, 2003).

Priscila Steffen

Access to the interior of the Park is only possible on four-wheel drive vehicles.



Yuri Teixeira

Extreme sports tourism is intense in the Park. Its control is essential so that it does not represent excessive pressure on some areas of the Park.

Autor desconhecido

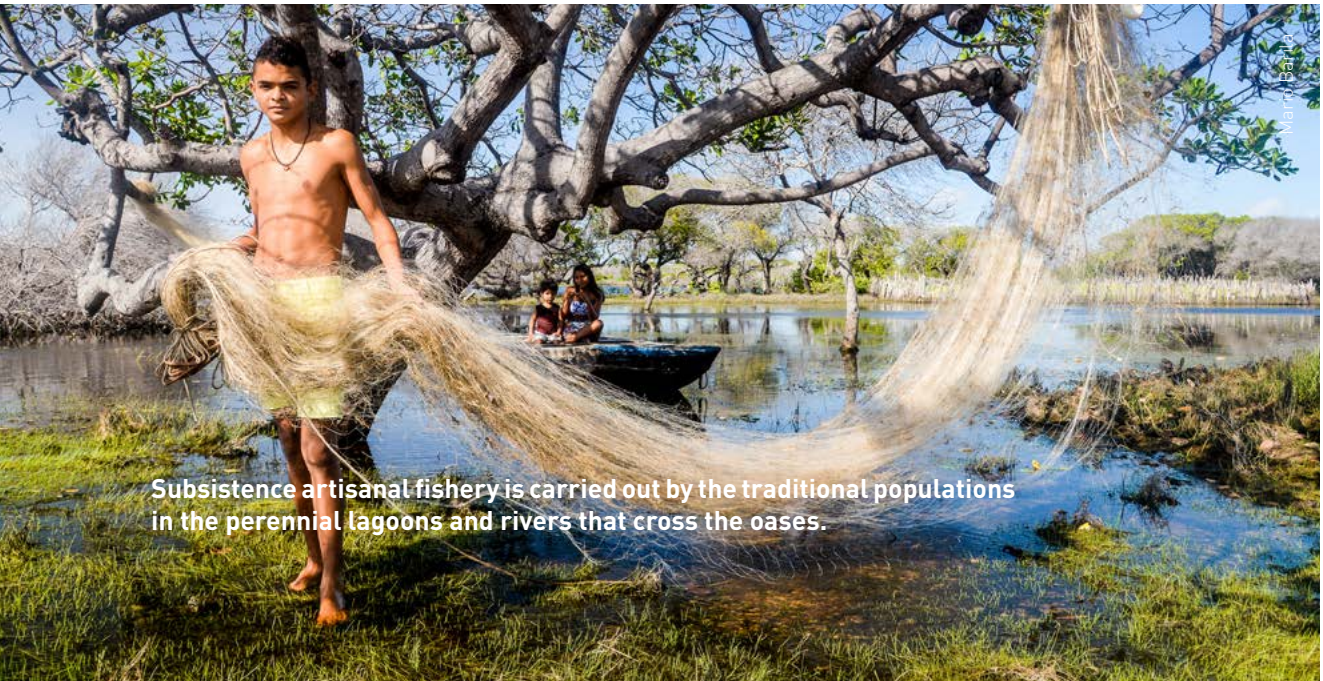
There are various forms of extreme sports that are practiced within the Park, such as cycling.

Mario Barila

In the perennial and temporary lagoons most of the leisure activities are carried out. In this photo a group of young people take advantage of a shallow lagoon to play football.

Mario Barila

Fishing boat used for fishing in rivers and in the Sea in the Park's Buffer Zone.



Mario Barila

Subsistence artisanal fishery is carried out by the traditional populations in the perennial lagoons and rivers that cross the oases.

Mario Barila

Sarney Filho Elementary School, in the Betânia community, inside the Park.

Mario Barila

Grazing animals in the interior of the National Park. The farm animals are raised loose in the park, but all have owners, are marked and very well controlled.

Mario Barila

Sailing boats and paddleboats are very common in the rivers of the region.

Priscila Steffen

In the urban centers of Barreirinhas and Santo Amaro, around the Park, local commerce is highly dependent on the flow of tourists who visit the Park.

Priscila Steffen

The traditional population that inhabits the Park uses raw materials available in nature to build their dwellings.

Priscila Steffen

Typical village of residents inside the National Park.

Secretaria Estadual de Turismo - MA

Tourist structure by the sea.

Secretaria Estadual de Turismo - MA

There is an important tourist structure in the vicinity of the Preguiças River, at the edge of the Park and within the Buffer Zone.

This new panorama added to the pressure on natural areas in the region, such as increasing the use of natural resources around the proposed property. The direct use of these resources and the occupation process themselves constitute foci of conflicts within a National Park.

This is compounded by the difficulties of understanding the rules and procedures used by the environmental agencies by the people living inside the Park, which can sometimes threaten some traditional ways of life and accentuate environmental degradation, thus demanding requiring more resources from managers and new strategies to mitigate these impacts.

The following table outlines the main threats identified by the 2010 survey using the Rappam method with the focus on monitoring the management effectiveness of the LençóisMaranhenses National Park (Table 8).

Table 8: Lençóis Maranhenses National Park pressures and threats analysis table.

PRESSURE	TENDENCY	REACH	IMPACT
Tourism and recreation	Drastic increase	Total (>50%)	Severe
Fishing	Slight increase	Generalized (15-50%)	Severe
Hunting	Stable	Dispersed (5-15%)	High
Pastures	Slight increase	Dispersed (5-15%)	High
Agriculture	Slight increase	Generalized (15-50%)	High
External influences	Drastic increase	Total (>50%)	High
Human occupation	Slight increase	Generalized (15-50%)	High
Use of resources by local population	Slight increase	Generalized (15-50%)	High
Residue disposal (pollution)	Drastic increase	Total (>50%)	Severe
Logging	Stable	Dispersed (5-15%)	Severe

Source: ICMBio, 2011

In order to describe the pressures, data was collected about pressure tendencies in the last five years (graded drastic increase, slight increase, stable, slight decrease, drastic decrease), coverage (total = over 50% of Lençóis Maranhenses National Park area; generalized = 15 to 50% of the area, and dispersed = 5-15%) and, finally, the intensity of the impact (severe, high and moderate) of each threat listed (ICMBIO, 2011).

Pressures related to tourism and recreation activities refer to the adverse effects caused by visits to trails, motorized tours and other types of recreation, whether authorized or not. Disposal of waste (pollution) includes any inadequate disposal of waste and effluent, solid or liquid, such as household waste and effluents (ICMBIO, 2011).

The item "pastures" refers to the presence of livestock activity in the interior of the National Park, which represents a compromising activity and conflicting with the intended uses for this category of Protected Area. In this sense, goats, pigs and cattle can be observed in almost all the extension of the Park, while buffaloes and horses are more restricted to the area of Travosa and Santo Amaro (MMA, 2003).

Grazing of these animals reduces the availability of wildlife resources (adversely affecting them by competition) and can negatively alter the floristic composition of the Park, besides being a potential source of disease transmission (MMA, 2003). The presence of domestic animals is verified throughout the entirety of the Park.

Another activity causing negative impact refers to industrial fishing and trawling from the mouth of the Preguiças River to the mouth of the Baleia River, which

constitutes an inappropriate, conflicting and predatory practice, considering that it occurs in the area of the proposed unit, in the zone of the coastal substrate, destroying the marine substrate near the coast and capturing juvenile fish species, thus interfering with the renewal of fish stocks (MMA, 2003).

Despite generating much smaller impact than industrial fishing, artisanal fishing also constitutes an activity in conflict with the regulations of Lençóis MaranhensesNational Park. Subsistence fishery is carried out by residents of the interior and near the Park, and are characterized for the use of small-mesh waiting nets and vessels in Esperança lagoon, Travosa and Santo Amaro lakes, Negro and Grande rivers (IBAMA, 2003).

Although sporadic in frequency, hunting is still occurring inside the Protected Area, representing an impact factor on the populations of birds and mammals of the region. Hunting pressure may be responsible for the probable absence (or near disappearance) of species such as Mazama gouazoubira(veado-catingueiro), Tayassu tajacu (caititu), Agouti paca (paca), Dasyprocta prymnolopha (cutia), among others, inside and outside of the limits of the National Park (IBAMA, 2003).

Extractive activities are carried out within the Park area with the exploitation of buriti, babassu, tucum and carnauba palms, from which straw, wax, nuts and coconut are extracted, as well as cashew nutsextractivism and logging for the production of charcoal and firewood.

Another source of pressure lies in the practice of primitive agriculture with typical subsistence characteristics, represented mainly by cassava, rice and bean plantations. This agricultural practice causes changes in the environment, such as deforestation, occasional slash-and-burn and soil impoverishment. The monoculture of the cashew tree that de-characterizes the landscape diversity is also a big factor impacting the landscape diversity of the Park. In the areas where cashew trees are planted, the natural landscape is quite disturbed due to the frequent practice of slash agriculture, carried out with the objective of ensuring the development of cashew trees (IBAMA, 2003).

The pressures related to external influences refer to the adverse effects, within the Unit, arising from activities carried out in its immediate or close surroundings, such as pollution, waste, loss of connectivity and climate change (ICMBIO, 2011).

Coastal ecosystem protection strategies should also consider growing climatic instability, such as sea level rise, as that would mean the loss of dune areas and permanent drowning of part of the coastal ecosystems.

The Brazilian Panel on Climate Change (PBMC in Portuguese initials), established by the Interministerial Ordinance MCT/MMA No. 356 of September 25, 2009, is a forum within the framework of the Intergovernmental Panel on Climate Change (IPPCin Portuguese initials). As with the IPPC, the PBMC relies on the collaboration of dozens of experts and technical staff and produces special reports to support Brazil in the discussions of the SUBSTA (Subsidiary Body for Scientific and Technological Advice) of the United Nations Framework Convention on Climate Change Climate, as well as environmental policies and climate change in the country.

According to the first report issued by the BPCC in 2014 (Scientific basis of climate change), the scenarios indicate a decrease in rainfall in the winter months throughout the country, as well as during summer in the Maranhão region. Therefore, the frequency of rainfall in the Lençóis Maranhenses National Park region should decrease and the frequency of consecutive dry days should increase (PBMC, 2014).

As for the Cerrado, thebiome in which the Lençóis Maranhenses National Park is inserted, this report points to a 1ºC increase in surface temperature with a percentage decrease between 10% and 20% of rainfall during the next three decades (until 2040). By the middle of the century (2041-2070), the same report estimates atemperature increase between 3º to 3,5ºC and reduction between 20% and 35% of rainfall. At the end of the century (2071-2100) the temperature increase should reach values between 5º and 5,5ºC and the decrease in rainfall should be more critical, between 35% and 45%, accentuating seasonal variations (PBMC, 2014).

The Center for Management and Strategic Studies (CGEE), a social organization supervised by the Brazilian Ministry of Science, Technology and Innovation (MCTI), undertook the elaboration of studies on the state of the art on desertification, land degradation and drought in the Brazilian semiarid region and its environment. As a result, the Brazilian government prepared in 2007 the Atlas of Areas Susceptible to Desertification in Brazil (MMA, 2007).

According to this publication, as it is located in an area surrounding the Brazilian semi-arid region, the Lençóis Maranhenses National Park is considered one of the Units in an area susceptible to the desertification process. It should be emphasized that the area of the proposed site, as well as its buffer zone and the municipal territories in which the Lençóis Maranhenses National Park is inserted, were not classified as areas affected by the desertification process, and were classified as not subject to criticality assessments in regard to this process (MMA, 2007).

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

The Atlas of Natural Disasters in Brazil shows that the state of Maranhão, where the proposed site site is located, is an area of very low occurrence of natural disasters (CEPED-UFCS, 2013). The three municipalities where the proposed area is inserted presented only 4 occurrences of disasters in the 1991-2012 period (CEPED-UFCS, 2013).

In this small number of occurrences, there are events of floods, flash-floods and droughts. The latter with only one occurrence in the early 1990s and restricted to the municipality of Barreirinhas, while for the whole state 167 were identified for the period between 1991 and 2012 (CEPED-UFCS, 2013).

Despite the occurrence of floods and flash-floods being reported as the two major disasters in the State of Maranhão, with 180 and 154 records, respectively, between 1991 and 2012, for the region of the proposed site only two flood events were recorded - both in the 90's, one in the municipalities of Primeira Cruz and another in Santo Amaro do Maranhão (CEPED-UFCS, 2013).

Still according to the Atlas of Natural Disasters Brazil, the occurrence of floods in the Lençóis Maranhenses National Park region was recorded only once, in 1996, in the village of Primeira Cruz (CEPED-UFCS, 2013).

However, events of lower severity related to droughts and intense rains have a seasonal occurrence in the region ofthe National Park. Heavy rains result in the flooding of the main trails of access to the Park, particularly in March and April, during which are recorded the highest rainfall (MMA, 2003) in the region. However, these events are of small magnitude and cannot be classified as disasters

The seasonal variations in precipitation influence the mobility of sediment, which, in the rainy season, is reduced due to the higher moisture content and lower wind speed (MMA 2003).

During the dry season, however, there is a lowering of the water table, which along with the increase of wind speeds promote the migration of the dunes, which occur with greater intensity in the boundary areas between the free and fixed dune fields (MMA 2003). Thus, during the dry season, the dynamics of the dunes causes the burial of vegetation close to the base of the free dunes, forming true botanical cemeteries where indications of the local vegetation, once covered by sand,can be observed (MMA, 2003).

It should be noted that both the dynamics of the dry season and the rainy season are characteristic of the natural processes that occur in Lençóis Maranhenses National Park and cannot be characterized as disasters.

(iv) Responsible visitation at Word Heritage site

The main characteristic of the visitation status of the candidate site for World Heritage is its markedly seasonal character, focused on the contemplation of its nat-

ural areas, but also supported in the cultural aspects of the population residing in the park (IBAMA, 2003).

The period of greatest influx of visitors occurs during school holidays (summer and winter), with a higher concentration in the months of January and July. The months of May, June and July are considered the best season of visitation, when the temporary lagoons of the dune fields are already formed by the rains, which usually start in March.

According to the Park Management Plan, the vast majority of Brazilian visitors come from the states of São Paulo, Brasilia, Salvador and Rio de Janeiro. Foreign visitors include France, Germany, the United States, Italy and Argentina. In general, visitors come on excursions, group of friends or with the family (IBAMA, 2003).

The displacement of tourists occurs more frequently by car, followed by the use of buses and to a lesser extent by air and sea transport.

Regarding the frequency of visitation, most of the visitors are first time visitors, although there is a significant presence of people attending the Conservation Unit two or more times during the year (IBAMA, 2003).

The main access of the visitors to the proposed site is done by land through the municipality of Barreirinhas, where several travel agencies operate, using, taxi, bus lines and vans, with several daily departures from the capital São Luís (ICMBIO 2010)

Despite responding to a considerably smaller number of tourists, the municipality of Santo Amaro do Maranhão also offers access to the Lençóis Maranhenses National Park, by a route which is traversed by land via highways leading to the Sangue location, where 4x4 vehicles adapted to the transport of passengers take them to the seat of the municipality (ICMBIO, 2010).

Mario Barila

The local population uses the Park for their leisure.

Priscila Steffen

Small groups of tourists walking in the park.

Priscila Steffen

Many boaters offer tours on the Preguiças River in wooden boats.
The impact of this activity is very low, being adequate for the Park.

Priscila Steffen

The access roads to the National Park where cars circulate are all in natural conditions, such as the one pictured above.

Priscila Steffen

The Periá River, at the western boundary of the PNLM. The crossing of vehicles is done by rafts exclusively.

Priscila Steffen

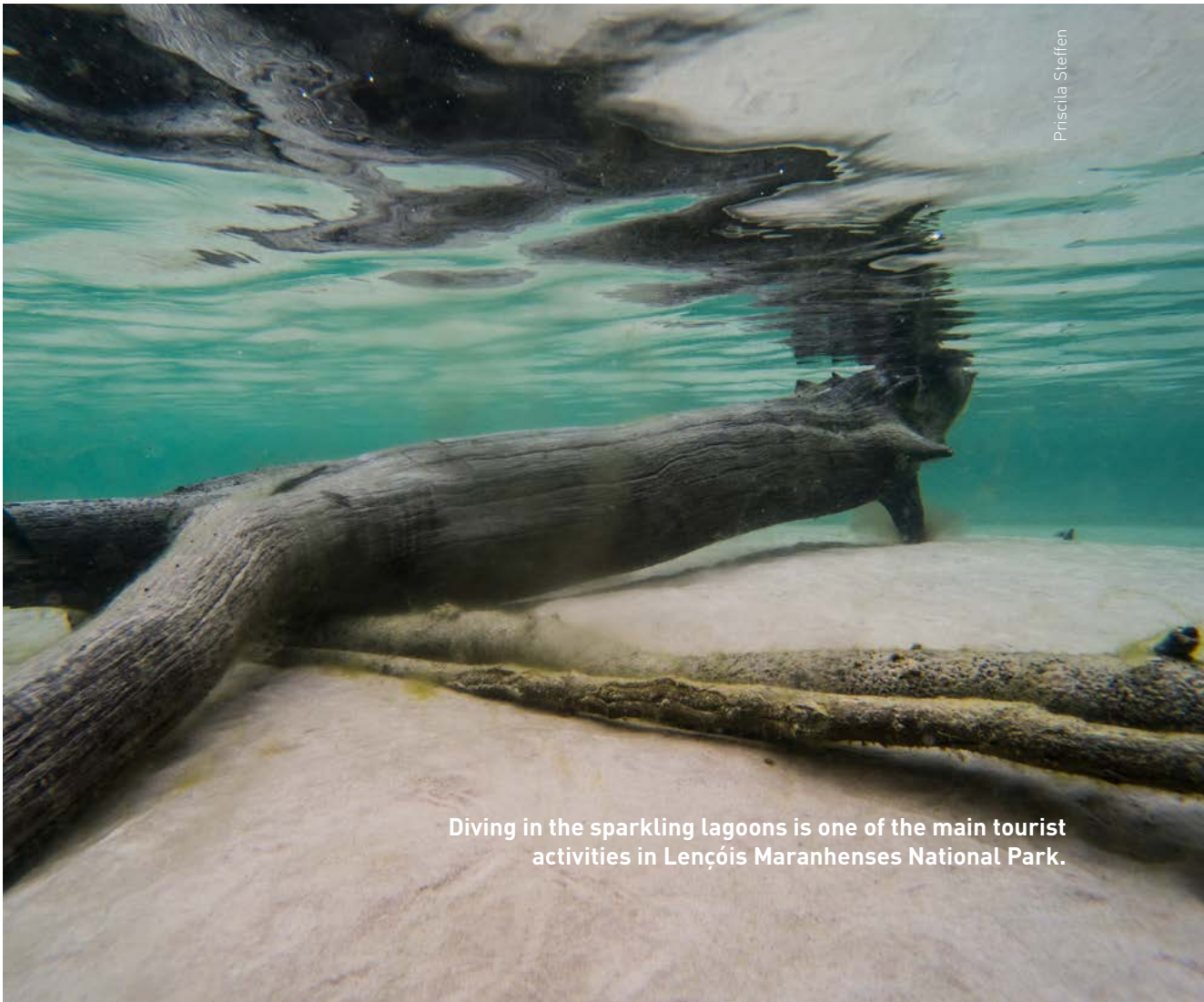
Tourists bathing in one of the inter-dunal temporary lagoons near Santo Amaro do Maranhão.

Priscila Steffen

Crafts are one of the main sources of income for the local population, and tourists visiting the region are their main consumers.

Mario Barila

The Mandacaru lighthouse, near the mouth of the Preguiças River, is one of the best spots for a panoramic view of Lençóis Maranhenses.



Priscila Steffen

Diving in the sparkling lagoons is one of the main tourist activities in Lençóis Maranhenses National Park.

The entrance to Lençóis Maranhenses National Park, be it from Barreirinhas or Santo Amaro, is done by vehicles with 4x4 traction, usually with adaptations in their frame for transport of up to 10 passengers. Access to the Park in both cities is done by sand tracks in the restinga, crossing several streams and creeks. If entering the park through Barreirinhas, it is still necessary to cross the river Preguiça by ferry. Three companies make the crossing in different points of the city (ICMBIO, 2010).

In 2006, when the headquarters of the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) still operated near the main entrance of the Lençóis Maranhenses National Park, giving access to the tourist circuits of the Azul and Bonita lagoons, 52,819 visitors were registered in the Park, with a higher flow of visitors on weekends and holidays (ICMBio, 2010).

Although the most recent data on the annual number of tourists visiting the Lençóis Maranhenses National Park have not been collected, the Barreirinhas City Hall, which concentrates the main accesses to the proposed site, started in May 2018 the implementation of a control system of visitors to the attractions called "Digital Voucher", in partnership with ICMBio.

This system aims to support the management of tourist activity through the collection of information about visitors and control of access to tourist attractions of the National Park. With this new digital system, visitors are required to use an electronic bracelet containing information from the "Digital Voucher" and present it at the checkpoints located throughout the Park.

According to the latest data collected by this visitor control system in Barreirinhas, between 09/05/2018 and 06/06/2018 the attractions of the National Park received almost 9.000 tourists. The most visited tourist circuits during that same period were those of Lagoa Azul and Lagoa Bonita, which received about 3,500 visits, followed by the Esperança and Canto do Atins lagoons circuits.

Considering that several investments in access infrastructure to the proposed site have already been carried out, including the most current ones, such as the construction of the Barreirinhas airport and the connecting roads of this municipality to the coastal circuit of the state of Piauí, it is expected that the visitor volume continues to grow and is supported by public policies for the management of regional and local tourist activity.

As an example of these policies, it is worth highlighting the "Emotions Route and Its New Challenges" project, carried out between the years of 2012 and 2015, whose objective was to develop and qualify the companies of the region to increase, in a sustainable way, the national and international tourist flow in the region of the proposed site.

The Lençóis Maranhenses National Park has been widely disseminated in national and international itineraries, being identified as a tourist hub by Federal, State and Municipal Governments, which see in this activity a viable economic alternative for the Lençóis Maranhenses region (MMA, 2008). Magazine and television reports constitute the main means of dissemination, and are mainly responsible for the influx of tourists into the Park, as well as recommendation by friends and past visitors and the growing participation of tourism agencies in the promotion of the Conservation Unit (IBAMA, 2003).

The region of the Lençóis Maranhenses National Park is served by PRODETUR/NE[1], and belongs to the Natural Cluster classified as a priority by the government (MMA, 2010). The cities of Barreirinhas, Santo Amaro, Humberto de Campos, Primeira Cruz and Morros make up the Lençóis Hub created by the Tourism Development Plan of the State of Maranhão (Plano Maior) implemented by the State Government and PRODETUR (MMA, 2010).

The municipality of Barreirinhas, key to the touristic management of the Lençóis Maranhenses National Park, is part of the National Regionalization Program of the Ministry of Tourism, being part of the 65 destinations inducing regional tour-

ism determined by the Ministry of Tourism to obtain an international quality standard. Together with the regions of Jericoacoara and the Parnaíba Delta, the region forms the Lençóis-Delta-Jeri Integrated Route, through a partnership between the Ministry of Tourism, SEBRAE and the Spanish Agency (MMA, 2010).

The tourist structure of the city of Barreirinhas counts on almost 60 hostels and hotels and offers the best options of lodging in the region (data collected at the Ministry of Tourism). Other lodging options can be found in Praia do Caburé and Atins, which add up to a total of approximately 60 lodging businesses in the municipality, representing almost 800 units and about 2,000 beds (MMA, 2010).

Also according to data from the Brazilian Ministry of Tourism, the municipality of Barreirinhas offers 24 food establishments of small and medium size, 85 tourism agencies and 10 tourist transport companies, counting also with a Tourist Information Office located in Casa do Turista, where the Municipal Secretariat of Tourism works.

Although not the main destination of visitors to the Park, the municipality of Santo Amaro do Maranhão is also included in the infrastructure to support touristic activity, and the main attraction offered is the Santo Amaro Circuit. According to data from the Ministry of Tourism, this municipality has 46 tourism agencies, 13 lodging facilities and 5 small and medium-sized food establishments to support visitors to Lençóis Maranhenses National Park.

According to indicators of tourism potential, there are items considered as "great" inside the World Heritage proposed site, including the superstructure of tourism and tourist attractions, as well as its attractiveness to ecotourism. The destination as a whole is also classified as "great" (MMA, 2010).

The regulation and control of the tourist activity within the proposed site directly follows the National System of Brazilian Conservation Units (SNUC), requiring that the public visitation be subject to the norms and restrictions established in the Park Management Plan, to the norms established by the agencies responsible for its administration and those foreseen in regulation (Law nº. 9.985 / 2000, article 11, § 2º), in addition to the basic restrictions and conditions for public use provided for in the Brazilian National Parks Regulations (Federal Decree 84.017 / 79).

Among the specific legal instruments of the proposed property that directly interfere with its public use, it is worth mentioning Ordinance nº. 63 of 2010, that defines criteria for accreditation and authorization of the services of driving of visitors and transport in vehicle traction, with touristic ends, inside the Lençóis Maranhenses National Park.

(v) Number of inhabitants within the property and the buffer zone

The estimate of people living inside the proposed site and its buffer zone was made based on the 2010 demographic census, this being the last official population count produced in Brazil.

For this estimate, the number of dwellers in private and collective households in the census tracts inserted in the PNLM and its buffer zone were surveyed. Thus, an estimated 5,570 people were living in the interior of the property and around 17,810 inhabitants in its buffer zone.

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[1] The Program for the Development of Tourism in the Northeast is a program implemented by the Federal Government in 1992 through the Ministry of Sports and Tourism and prepared in partnership with the National Bank for Economic and Social Development (BNDES), the Banco do Nordeste do Brasil (BNB), the Inter-American Development Bank (IDB) and the Northeastern state governments, focusing on expanding the infrastructure of the Northeast region to expand and attract the superstructure of the tourism sector.

(Source: https://pt.wikipedia.org/wiki/Programa_de_Desenvolvimento_do_Turismo_no_Nordeste).

Priscila Steffen

Entrance of the administrative headquarters of the Lençóis Maranhenses National Park in Barreirinhas.

Priscila Steffen

Headquarters of the Lençóis Maranhenses National Park in the city of Barreirinhas, Maranhão.

5. Protection and Management of the Property

5.a Ownership

The lands and attractions that make up the proposed heritage are owned by different actors, including the federal government, the municipalities of Barreirinhas, Primeira Cruz, Santo Amaro do Maranhão and Humberto de Campos and private individuals or companies.

Surveys carried out in 1977, prior to the creation of the Lençóis Maranhenses National Park, at registry offices archives and from data gathered fro the application of questionnaires to the residents of the municipalities of Barreirinhas, Humberto de Campos and Primeira Cruz, showed that there were properties inside the Park that had a definitive registry ownership. These properties comprised a total of 44.846,94 ha at that time, which corresponds to approximately 29% of the Park's total area (IBAMA, 2003).

But the lands belonging to the federal protected areas of Strict preservation must be owned by the Federal Government, per Law 9985/2000, which established the National System of Protected Areas. Therefore, the lands within Lençóis Maranhenses National Park are, in part, owned by the Federal Government. Gradually, these areas will be incorporated into the possession of the Federal Government, as the land regularization of these protected areas is performed.

The areas of Lençóis Maranhenses National Park included in seawater (10.665 ha), according to Article 20 of the Federal Constitution and Decree-Law 9,760 of September 5, 1946, are property of the Federal Government and are, therefore, public areas.

The areas covered by inland waters, including rivers and lagoons, belong to the States of the Federation, according to article 25 of the Federal Constitution. Regarding the proposed site, these waters, which cover 5,450 ha, belong to the state of Maranhão, being therefore public areas.

Within the Lençóis Maranhenses National Park there are still 1023 ha formed by fluvial or sea-river islands. According to Article 20 of the Federal Constitution and Decree-Law 9.760 of September 5, 1946, the islands are property of the Federal Government, being, therefore, public areas.

Thus, we can consider that the total area of 155.000 ha of the Property is formed by areas that belong to or should belong to the public power (Table 9).

Regarding the Buffer Zone, its marine portion, which has 103,364 ha, is owned by the Federal Government and therefore, according to Decree-Law 9.760 of September 5, 1946, is also a public area. In addition to the 7,076 ha of continuous waters (rivers and lagoons) and the 2,887 ha of marine, fluvial and fluvial islands in the Buffer Zone, there is a total of 133,327 ha of this area formed by public lands, belonging to the Federal Government or to the Government of the State of Maranhão.

The remainder of the Buffer Zone, which includes its entire continental area, consists of private or of indefinite ownership areas.

In assessing land ownership throughout the proposed World Heritage Natural Site, it is noted that 288.237 ha are public areas or should belong to the public power and 134.904 ha are private or undefined areas.

Table 9 - Public and private areas of Lençóis Maranhenses National Park Natural Heritage Site

	STATUS OF THE PROPERTY	AREA (HA)	%
NOMINATED PROPERTY	Public áreas or should belong to the public power	155.000	100
	Private áreas or of undefinided ownership	0	0
	Total Area	155.000	100
BUFFER ZONE	Public areas	133.327	
	Private áreas or of undefinided ownership	134.904	49,7
	Total Area	268.231	50,3
PROPOSED HERITAGE SITE	Public áreas or should belong to the public power	288.237	68,1
	Private áreas or of undefinided ownership	134.904	31,9
	Total Area	423.231	100

5.b Protective designation

The proposed Natural World Heritage Site area is protected by several laws regarding the protection of the environment and at different levels of management, especially at the federal level. The following are the main legal instruments protecting the proposed site.

The first Law that should be highlighted is the Federal Constitution, which in its article 225 affirms the importance of conserving the environment, including the Coastal Zone, precisely where the site natural of Lençóis Maranhenses National Park is proposed:

> *"(...) the Coastal Zone are a national patrimony and their use will be made in the form of the law, under conditions that ensure the preservation of the environment, including the use of natural resources."*

It is worth noting the Federal Law 7.661 of May 16, 1988, which establishes the National Plan of Coastal Management. This Law, whose main objective is to regulate the use of existing resources in the Brazilian coast, has as one of its principles the protection of Nature, being an integral part of the National Environmental Policy. Thus, in its article 2, presenting its objectives, this Law affirms that:

> *"(...) will specifically aim at guiding the national use of resources in the coastal Zone in order to contribute to raise the quality of life of its population, and the protection of its natural, historical, ethnic and cultural heritage".*

It is clear that it intends to regulate the use of coastal zone resources in a way associated with environmental protection.

Specifying conservation priorities, Law 7.661, in its third article, states that the National Coastal Management Plan should:

> *"(...) give priority to the conservation and protection, inter alia, of the following assets:*

I - natural, renewable and non-renewable resources; reefs, parcels and algae banks; Coastal and oceanic islands; river systems, estuarine and lagoon systems, bays and coves; Beaches; Promontories, cliffs and marine caves; sandbanks and dunes; Coastal forests, mangroves and submerged prairies";

Federal Decree No. 5,300 of December 7, 2014, which regulated Federal Law No. 7,661/1988, establishes in its Article 3 that the Brazilian coastal zone corresponds to the geographical interaction space of air, sea and land, including its renewable or non-renewable resources, covering a sea band and a terrestrial band.

In this way, the entire extension of the proposed World Heritage site should be considered as a priority area for nature conservation.

The Law of Protection of Native Vegetation (Federal Law No. I2,651, of May 25, 2012) is also important for the protection of the nominated proposal, especially regarding the Areas of Permanent Preservation (APPs). This Law defines that existing vegetation in this area cannot be removed or be impacted. It also states that the mangroves and sandbanks that fix the dunes as APPs, as well as the 30-meter bands along the banks of the rivers and 50 meters near the springs (the latter two assists in protecting the region's water resources).

Mangroves are also protected by resolutions of the National Council for the Environment (CONAMA), the highest body of SISNAMA. CONAMA Resolution No. 303, dated March 20, 2002, which provides for parameters, definitions and limits of Permanent Preservation Areas, states in its article 3, section X that mangroves constitute APP in all its extension.

The local state laws also contribute with protective legal instruments for the candidate site, such as Law 5.405, dated 8/4/1992, which instituted the Environment Protection and disposed on the appropriate use of the natural resources of the State of Maranhão. This Law, in its article 57, also considers permanent preservation the vegetation and areas intended for:

> "a) mitigation land erosion;
>
> b) fixing the dunes;
>
> c) forming a protection strip along highways, railways and ducts;
>
> d) protecting sites of exceptional beauty or of scientific, historical and cultural value;
>
> e) asylum fauna and flora species threatened with extinction;
>
> f) to ensure conditions of public welfare;
>
> g) protect sites of ecological importance. "

In addition to having protective measures supported by federal and state laws, the proposed Natural World Heritage site is protected under municipal legislation as well. In 1990 an influx of investments on the tourism industry made the municipality of Barreirinhas the gateway to Lençóis Maranhenses National Park, resulting in a massive development of the services sector, such as hotels, inns, sightseeing, restaurants, and others (MARQUES, 2012). Barreirinhas offers thus a more comprehensive and diversified set of legal provisions among the other municipalities inside the Park. Bellow are briefly presented then some of Barreirinhas municipal laws, which the proposed site is under tutelage.

The Organic Laws of Barreirinhas, established on April 5, 1990, according to its article n.1, is the Magna Carta of the municipality and meets the precepts of the Federal Constitution and State of Maranhão Constitution. Article 3 of this law establishes the Municipality's foundations: autonomy; the dignity of the person; and the social values of work and free enterprise. In its article 13, which deals with urban organization, this law establishes that the appropriate land-use planning will be done through planning and control of use, subdivision and occupation of urban land; among other deliberations (MARQUES, 2012).

Another important instrument of municipal planning is the Code of Works of the Municipality, instituted by Municipal Law No. 494/02, whose purpose is to regulate any and all construction, renovation and extension of buildings carried out by private individuals or public entities inside municipal territory, to ensure basic

conditions of safety, hygiene and comfort of buildings of interest to the community (MARQUES, 2012).

Regarding the municipal environment, Barreirinhas' Municipal Code of the Environment, established by Municipal Law No. 540/2005, directs the action of the Municipal Public Power and its relationship with citizens and public and private institutions for environmental sustainability based on actions of preservation, conservation, defense, improvement, recovery and control of the environment, according to Article n.1 of this Law (MARQUES, 2012).

The Municipal Master Plan is one of the most important municipal planning instruments established by the Statute of Cities (Federal Law No. 10,257 of July 10, 2001). Municipal Law no. 524/2005 instituted Barreirinhas' municipality Master Plan. According to this law, the Municipal Master Plan is a basic and regulatory instrument for the municipal planning process and an important development policy, which acts not only on public, but also on private entities, taking into account the Budget Guidelines Laws of the Multiannual Investment Budget and the Municipality's Annual Budget.

Originally, the Zoning and Occupancy of Municipal Soil Law was the instrumentation that composed Barreirinhas' Master Plan, and was approved on the same year of the Plan, which can be understood as a complementary urban planning instrument.

The Zoning and Occupancy of Municipal Soil Law Barreirinhas was instituted by Municipal Law No. 531, of July 5, 2005, which provides for the division of the city of Barreirinhas into zones and on matters related to municipal institutional organization, with the objective of defining norms and indices of parceling, use and occupation of the municipal soil, besides presenting guidelines for social, economic and urban development. The Article 4 of this Law established the creation of forty-five zones, including a Central Zone, two River Side Zones, six Residential zones, twenty Environmental Protection zones, one Zone of Institutional Interest, two of Social Interest, one of Sanitary Interest, as well as three Special Agricultural zones, two Industrial zones, one Airport, two Urban Expansion Zones and four zones of Tourism Interest (MARQUES, 2012).

The determinations regarding Environmental Preservation Zones and Green Areas are specified in Chapter IX of this of municipal zoning Law that, according to its Article 41, refer to the areas located on the mainland (river banks and interiors of hydrographic basins, lakes, lagoons, streams, rivers, mangroves, apicunas, dunes, natural fields and other flood areas).

Article 42 and 43 of the Municipal Zoning Law determine, respectively, the areas of interest and of environmental protection, and the areas and zones of permanent preservation, considering them unfit for human use and occupation (river beds and waterways, river basins, lakes, lagoons, streams, rivers, floodplains, dunes and mangroves and environmental reserves) (MARQUES, 2012).

Finally, and more recently, the municipality of Barreirinhas, through law nº 762 of October 2, 2017, instituted an instrument to control visitors to the PNLM and its areas of visitation. This instrument was titled DIGITAL VOUCHER and, according to the first article of the law 726/2017, is a system of control of the flows of tourism to the attractions, ensuring the preservation of the ecosystem, control over the information about the technology used, the load of circulation in attractions, security used in the operation, agreed values on tourist products and visitor safety, as well as regulating the relationship between Tourism Agencies, Tourist Attractions, Tourist Guides, Local Visitors Conductors, Tourist Carriers, Means of Lodging, and Food Services, with the Municipality of Barreirinhas.

Notwithstanding diminishing the scope of the aforementioned legal provisions, the greatest legal protection to which the proposed World Heritage Site is subject is provided by the Brazilian federal legislation on Protected Areas, regulated by Federal Law 9.985, of July 18, 2000, which created the National System of Protected Areas (SNUC). This law established the categories of Brazilian protected areas and their management objectives, based on the categories defined by the IUCN.

Although the proposed site has been legally protected since before the enactment of the SNUC Law, the implementation of this federal law has proven to be an important instrument to further strengthen the management of Brazilian protected areas.

In this sense, it should be noted that the entire area of the proposed property is subject to specific legal protection of the Brazilian National Parks, which are understood by the SNUC Law as Conservation Units (CUs) of the category of Integral Protection - admitting only the indirect use of its natural resources.

The proposed site was awarded status of National Park (category II of the IUCN) by Federal Decree No. 86,060 of June 2, 1981, which further established that its primary purpose would be to protect the flora, fauna and natural beauties locations.

As well as the core-area of the site, its Buffer Zone is also covered by the federal SNUC law, having been established by article 2, item XVIII of Law 9.985/2002, which defines it as the "surroundings of a Protected Area, where human activities are subject to specific norms and restrictions, with the purpose of minimizing negative impacts on the site". The same law, in its Article 35 (§ 1), further establishes that the body responsible for administering the Protected Area may establish specific regulations regarding the occupation and use of the resources in the Buffer Zone.

According to CONAMA Resolution No. 428, of December 17, 2010, activities that may affect the Buffer Zone of a Protected Area will only have its environmental permit granted after authorization of the Conservation Unit's managing body, and only after the due and relevant environmental studies.

In order to maintain the proposed site's Buffer Zone legal protection status its limits were defined, in full, as the same assigned to Lençóis Maranhenses National's Park Buffer Zone, whose delimitation was established by the Management Plan of the Park itself, homologated in 2003 by IBAMA Ordinance No. 48/03-N-2003.

According SNUC, the Management Plan for a Protected Area is understood as a technical document whereby, based on the general objectives of a conservation unit, its zoning is established and the norms that should govern the use of the protected area and the management of its natural resources, including the implementation of the physical structures necessary for its management.

Thus, this technical document not only defined the Buffer Zone of the Protected Area, but also assigned norms for the management of both this zone and the area of the National Park itself. And, therefore, it can be considered Lençóis Maranhenses National Park's most specific planning instrument, which, together with the Park Advisory Council (instituted by Administrative Rule no. 16 of February 21, 2014), allow a more efficient and participatory management of the proposed good to world heritage.

Although the Lençóis Maranhenses National Park Management Plan establishes general norms for visitation activities, the Protected Area does not yet have a Public Use Plan. In this sense, in order to ensure greater legal protection for the management of public use within the Park, ICMBio established, through Decree No. 199, dated May 18, 2017, rules and procedures for the registration and authorization of onerous use for the provision of the tourist transportation service for visitors and essential transportation of passengers in vehicles in the Lençóis Maranhenses National Park area.

In addition to policies that directly affect the proposed area for the heritage site, other national sectorial policies are important in guiding actions at the different political-administrative levels. In 1994, Brazil ratified its participation as a member in the three conventions created after the World Conference on Environment and Development of 1992, that is, The Convention on Biological Diversity, the United Nations Framework Convention on Climate Change and the United Nations Convention to Combat Desertification. Guidelines, goals and actions were established and implemented in states and municipalities, through the National Biodiversity Program (Pronabio), the Climate Change National Policy (NPCC) and

the National Action Program to Combat Desertification and Mitigating the Effects of Drought (PAN Brazil).

The National Congress and the Presidency of Brazil recently ratified the Paris Climate Agreement, approved in December 2015 during the World Conference on Climate (COP 21) held in France. Thus, Brazil will officially appear in the global pact of the countries that will work, through voluntary targets, to try to reduce and minimize greenhouse gases, according to the United Nations Framework Convention on Climate Change. Brazil's goal in the agreement is to cut greenhouse gas emissions by 37% by 2025, with a 43% reduction by 2030, compared to 2005 levels.

5.c Means of implementing protective measures

Since Brazil's ratification of the Convention on Biological Diversity (CBD) in 1994, Brazil has been perfecting the planning and structure for the management and protection of biodiversity in its territory through the National Biodiversity Program (Pronabio). Federal Decree no. 4,339 of 2002 defines the principles and guidelines for the implementation of the National Biodiversity Policy. Federal Decree no. 4,703 of 2003 established the new objectives and a coordinating forum of the Pronabio, denominated National Commission of Biodiversity (Conabio). Conabio is an organ composed of government agencies representatives and of civil society organizations and plays an important role in the discussion and implementation of Brazil's commitments to the Convention on Biological Diversity, as well as in identifying and proposing priority areas and actions for research, conservation and uses of the biodiversity in the Coastal and Marine zones, in the Cerrado (which comprehend the Lençóis Maranhenses National Park) and in other Brazilian biomes.

In the same year, the country also ratified the participation in the United Nations Framework Convention on Climate Change. The Brazilian commitment to the Convention is implemented through the National Policy on Climate Change (PNMC), instituted in 2009 by Federal Law no. 12,187, and regulated by Federal Decree no. 7,390 in 2010, when the baseline of greenhouse gas emissions was established for the country. The instruments for the implementation of the PNMC are the National Plan on Climate Change, the National Plan for Adaptation to Climate Change, the National Fund on Climate Change and the Communication from Brazil to the United Nations Framework Convention on Climate Change.

The National Environment Council (CONAMA), which brings together different sectors of society, is an advisory body with the purpose of advising, studying and proposing to Government, guidelines of governmental environmental policies, and has the normative character of the instruments of the environmental politics. (http://www.mma.gov.br/port/conama) The Ministry of the Environment and its autarchies - National Water Agency (ANA); Brazilian Institute of Environment and Renewable Natural Resources (IBAMA); the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio); and the Rio de Janeiro Botanical Garden Research Institute (JBRJ) - are responsible for the implementation of government policies and guidelines defined for the environment. The states, the Federal District and the municipalities, within the scope of their competencies and in the areas of their jurisdictions, establish supplementary and complementary norms, as well as actions and policies that are associated with environmental protection, providing discipline on the use of environmental resources, and control and monitoring. Regarding the proposed site, it is important to highlight Maranhão's Environment and Natural Resources Secretariat (SEMA) of Maranhão, which is responsible for planning and coordinating the implementation of policies related to the promotion, organization, regulation, oversight and control of actions related to the exploration and preservation of the environment and natural resources in the State of Maranhão.

The SNUC, established by Federal Law no. 9.985 of 2000, is one of the Key elements of SISNAMA and for the protected spaces policy in the country (MMA, 2004).

The SNUC is managed with the participation and collaboration of federal, state and municipal public bodies, falling to the Environment Ministry (MMA), through the Department of Protected Areas (DAP/MMA) the mandate to articulate and coordinate actions to consolidate the System, playing the role of a central management body. The advisory and deliberative body is represented by CONAMA, the executing agencies represented at the federal level, by ICMBio and IBAMA (on a supplementary basis) and, at the state and municipal levels, by the state and municipal environmental agencies. The executing agencies of SNUC have the function of implementing it, subsidizing proposals for the creation and management of federal, state and municipal conservation units in their respective spheres of activity.

The SNUC consists of 12 categories of protected areas according to the international system of International Union for Conservation of Nature - IUCN and other categories adapted to the Brazilian context. The SNUC is considered an achievement in environmental legislation, mainly for establishing clear criteria and standards for the creation, implementation and management of conservation units, representing the main instrument to guarantee the protection of the proposed site to world natural heritage.

The status of National Park also allowed the proposed World Heritage site to have an Advisory Board as an integral part of its institutional relationship strategy, allowing the participation of various sectors of the local society in the Park's decisions and policies. This implies that the main local actors, directly or indirectly affected by the Lençóis Maranhenses National Park, have a seat and can maintain an open dialogue in a formal forum of the CU, seeking solutions to conflicts and building partnerships in environmental and socioeconomic actions at the municipal level.

The Consultative Council of Lençóis Maranhenses National Park, created by ICMBio Ordinance nº 16 of 2014, counts on the participation of representatives of the federal, state and municipal public administration, such as the state and municipal environment and tourism secretariats and the Federal Institute of Education, Science and Technology of Maranhão (IFMA/MA) and the managers of the National Park, among other public institutions. This council also counts on several representatives of the civil society of the municipalities that comprise the Lençóis Maranhenses National Park, such as the population living in the interior of the Park, fishermen communities and rural workers representatives, tour operators and conductors of visitors, among others.

Together with the Advisory Council, the proposed site also relies on the CU's Management Plan, homologated by the IBAMA Ordinance No. 48/03/2003, which contributes to broadening the protection integration in the area of the proposed site.

The management of public use within the proposed World Heritage site still counts with the protection of ICMBio Ordinance No. 199, dated May 18, 2017, which established rules and procedures for the registration and authorization of onerous use for the provision of the tourist conducing service and essential transportation of passengers in vehicles in the Lençóis Maranhenses National Park area. This is supervised both by the managers of the CU and by the municipal and state inspection bodies in the Park's region.

In this sense, the city of Barreirinhas still offers support in tourist flow control inside the proposed site through means of sentry boxes installed for the Digital Voucher system, and in the access of Santo Amaro, the city hall is a similar voucher, and the entrance control will be realized by means of a form to be filled in the city's tourism centre.

In Brazil, municipalities have a constitutional responsibility to exercise control over land use and occupation and create conditions for the protection of biodiversity and development in their territory. To this end, a guideline was created for the urban policy and its main instrument, the Municipal Master Plan, defined by the Federal Constitution and regulated by the City Statute - Federal Law no. 10,257 of 2001. The Municipal Directives Plan is an instrument for the implementation

of development policies and mandatory urban expansion for municipalities with a population of more than 20 thousand inhabitants, as well as municipalities that are part of metropolitan areas and urban agglomerations, with areas of special tourist interest, and those located in Areas of influence of ventures or activities with significant environmental impact.

The Municipality of Barreirinhas had its Guidelines Plan drawn up in 2005. The directives of the Master Plan were transformed into a municipal law that regulates zoning, land use and occupation, protected spaces and other definitions not only in the urban area, but throughout the territory of the city. In this sense, the Municipal Master Plan is an important mechanism for effective environmental protection in the municipality, if articulated and integrated with other institutional mechanisms, such as Municipal Environmental Systems and similar structures at the state and federal levels.

The country has strict legislation for the establishment of economic enterprises and activities that use natural resources that are potentially polluting or that can cause environmental degradation. There are legally established rules and stages such as the Environmental Impact Study (EIA) and the Environmental Impact Report (RIMA), which are required and coordinated by the environmental agencies responsible for licensing the activity. They are important tools for applying the principles of prevention and sustainable development. The EIA is a preliminary assessment, necessary for the accomplishment of any work or activity that may cause harm to the environment, and that aims to diagnose the feasibility of its accomplishment, with the purpose of avoiding damages or at least compensating the environmental problems that may arise from the enterprise or activity, or even intensify the positive impacts. It is composed of scientific, technical, social, economic and other studies that allow us to gauge possible negative impacts. The RIMA is the description, analysis, reflection and presentation of possible solutions of the environmental impacts according to the information gathered in the EIA.

In the interface between the environmental licensing process and protected areas, Law No. 9,985, which establishes the National System of Nature Protected Areas and established criteria and standards for the creation, implementation and management of protected areas, provides for the Application of compensatory measures pertinent to the impacts caused by the implantation of large enterprises that cannot be mitigated.

Brazil also has a National Plan for the Prevention, preparation and Rapid Response to Environmental Emergencies with Hazardous Chemicals - P2R2. P2R2 is aimed at improving the process of prevention, preparation and rapid response to environmental emergencies with hazardous chemicals in the country, and seeks to cover any potentially environmental-related ventures/activities that may potentially cause environmental emergency with these products throughout the country. It is an important instrument for the area of the proposed site due to the risk presented by the gas and oil operations in the region. According to the Decree creating the Plan - Decree no. 5,098, dated June 3, 2004 - P2R2 consists of actions, activities and projects to be developed and implemented in a participatory manner and integrated by federal, district, state and municipal governments and by civil society. Mechanisms established in the Law on the Protection of Native Vegetation (Federal Law No. 12.651 of 2012), such as the Rural Environmental Registry (CAR) and the Environmental Regularization Program (PRA), are also an important landmark for the better understanding of the reality of the rural landscape and greater capillarization of biodiversity conservation actions. The CAR is a mandatory electronic register for all rural properties in the country, with the objective of gathering environmental information from rural properties and possessions. With this information, it is possible to know the location and size of the native vegetation in the rural properties, and the areas that must be restored or compensated, through the adhesion to the PRA, of those owners who have environmental liabilities.

The state sphere still offers important means to guarantee the protection of the proposed, with emphasis on Maranhão's Ecological-Economic Macrozoning (MacroZEE-MA).

MacroZEE is an instrument for territory planning and ordering, harmonizing economic, social and environmental relations. It demands an effective effort of institutional sharing, aimed at the integration of the actions and territorial public policies, as well as the articulation with the civil society, integrating its interests around a pact for the management of the territory[2]. In recent years, MacroZEE has been the Brazilian government's proposal to support the planning decisions for the development and use of the national territory on a sustainable basis, and has become a program of the federal government's Pluriannual Plan (PPA), managed by the Environment Ministry and with a decentralized execution by various federal and state agencies.

MacroZEE-MA was established in 2015 by State Law Nº. 10.316, with the objective of guiding the formulation and implementation of public and private policies, plans, programs and projects, taking into account the potentialities, vulnerabilities, restrictions of use and the need to protect natural resources. This legal instrument has as a collegiate the State Ecological-Economic Zoning Commission (CEZEE/MA), which is responsible for coordinating, articulating, proposing the formalization of partnerships and the conclusion of agreements with public or private, federal and/or state institutions, required to deploy and implement the state's MacroZEE. CEZEE/MA counts with representatives from both the public administration in different spheres of government and representatives of organized civil society.

Another state policy instrument that influences the dynamics of the proposed site's management refers to Maranhão's Strategic Development Plan for Tourism (PLANO MAIOR 2020). This plan, which runs until 2020, also guides the coastal municipalities to develop normative instruments that will enable the development of tourism activity, following the possibilities of attracting resources and incentives pointed out by the state and federal governments.

In this sense, the municipalities that comprise the proposed site were classified by this Plan as a high investment priority for the development of adventure tourism, ecotourism, nautical tourism and sun and beach tourism; and of average investment priority for cultural, sports and event/business tourism activities.

5.d Existing plans related to municipality and region in which the proposed property is located

The proposed site for natural world heritage is the target of different plans and programs, at regional, state and municipal scales, which guide the territorial, economic, social and environmental development of the region where the site is located. The following are the main Plans and Programs related to the region of the proposed property.

The National Tourism Development Tourism Plan and Macroprograma

The National Tourism Plan, comprising the 2018-2022 period, is the instrument that establishes guidelines and strategies for the implementation of the National Tourism Policy (Law No. 11,771, of September 17, 2008). The main objective of this Plan is to order the actions of the public sector, guiding the effort of the State and the use of public resources for the development of tourism.

Based on a diagnosis developed for the tourism sector, this Plan proposes strategic lines to guide the synergic action between the Union, the states, the Federal District and tourist regions and municipalities, which include the strengthening of regionalization, quality and competitiveness improvement of the sector, as well as the incentive for innovation and the promotion of sustainability.

[2] http://www.mma.gov.br/endere%C3%A7os-importantes/item/7531-programa-zee-brasil

Particularly, in relation to the proposed world heritage site, the strategic line related to planning, management and monitoring, which has as one of its initiatives the decentralized management of tourism in Brazil, plays an important role in the dynamics of the existing programs in the Lençóis Maranhenses National Park region.

Since 2004, with the implementation of the Tourism Regionalization Program, the Ministry of Tourism has established the Brazilian Tourism Map, organized by tourist regions, and proposed the installation of regional governance bodies, one for each tourist region, as a way to institutionalize regional management.

This program constitutes a coordinated and integrated public policy instrument whose principles are:

> *"Flexibility, articulation, mobilization, intersectional and inter-institutional cooperation and synergy of decisions (...), understanding as regionalization the organization of a geographic space in regions for planning; management and promotion purposes and integrated and shared commercialization of tourism activity" (BENI, 2006, p.30, apud DOS SANTOS et al., 2009).*

With the objective of developing tourism in the state, the Government of Maranhão, through its State Secretariat of Culture and Tourism (SECTUR/MA), has been developing actions of the Regionalization, Qualification and Tourism projects in the Lençóis Park Hub. This last program is related to the initiative to intensify the qualification in tourism as is foreseen in the National Tourism Plan.

The activities offered to the municipalities of the Lençóis Region by these programs are part of an agenda of technical meetings, lectures, qualification courses, attractiveness surveys, and fact-finding actions aimed at the new Tourism Register of Physical and Legal Persons (Cadastur) and Combating Child Sexual Exploitation in Tourism.

The municipality of Barreirinhas, which is the main gateway to the proposed site, is part of the National Regionalization Program of the Ministry of Tourism, which is part of the 65 destinations for regional tourist development determined by the Ministry of Tourism to obtain international quality standards.

To that end the Lençóis and Delta Tourism Superintendence was created in 2018, giving support, in addition to the decentralization of tourism management, to the qualification of 509 people (for the general community but focusing on people working in the tourism industry) and the staging of five lectures on Sustainable Tourism and Childhood (combating sexual exploitation and child labor) reaching up to 395 children, according to SECTUR/MA data.

The categorization of the municipalities within the Tourism Regions Map of Brazil (which was last updated in 2017) aims to identify the performance of the tourism activity in the municipalities in order to allocate national resources to support programs, projects and actions, in order to subsidize public management and implement specific policies for each municipality, striving to meet each municipality's unique characteristics.

According to the criteria, five categories (categories A, B, C, D and E) were created to classify the municipalities within this Map. The municipalities that make up the PNLM Hub are nestled in categories C, D and E, Barreirinhas being the best classified at category C, (municipalities that concentrate the flow of domestic and international tourists). The municipalities of Humberto de Campos and Santo Amaro do Maranhão were included in category D, which together with category E, which encompasses Primeira Cruz, represent destinations that do not have expressive national and international tourist flows, but are still important hubs in the regional tourist flow and need support for the generation and formalization of jobs and lodging establishments.

State of Maranhão Ecological-Economic Macrozoning

The most recent management planning elaborated for the region of the proposed site refers to the State of Maranhão Ecological-Economic Macrozoning (Macro-ZEE-MA), and constitutes a document that guides the use and occupation of the soil and the rational use of natural resources, a set of guidelines for public policies aimed at sustainable development and the promotion of the well-being of the population of the State of Maranhão.

Maranhão's MacroZEE operational context follows the guidelines and procedures defined by the methodological guidelines of the Brazilian EEZ Project and is executed following four work phases, covering Project Planning, Diagnosis, Prognosis and Implementation Subsidies. Each of these phases has a well-defined connection of activities, tasks and products, in order to provide an improvement and feedback routine (EMBRAPA, 2014).

According to article 3 of State Law 10,316 of 09/17/2015, which instituted the MacroZEE-MA, the Macrozoning aims to guide the formulation and implementation of public and private policies, plans, programs and projects for the improvement of the quality of life of the population taking into account potentialities, vulnerabilities, restrictions of use and the need to protect natural resources, allowing full economic development to be achieved in a sustainable way.

Maranhão's MacroZEE implementation, according to the law that instituted it, is based on its Zones (Figure 26) and respective guidelines, defined for the purpose of planning the actions to be developed. The proposed site for World Natural Heritage is one of the polygons delimited for Zone 4 of the MacroZEE (Figure 26), which represent the:

> *"(...) Special-purpose institutional areas composed of specially protected areas (conservation units, indigenous lands and military areas), provided for by law and instituted by the Union, by the state or by municipalities, with defined uses and restrictions of use by specific legislation" (Subsection IV of Law Nº. 10.316/2015).*

The guidelines for territorial planning purposes of the areas classified as Zone 4 are:

> *"Activities should be encouraged to ensure the maintenance and restoration of ecosystem integrity, the strengthening of existing protected areas, including the development of management plans and environmental and territorial management plans for indigenous lands and the creation of ecological corridors to contribute to the protection of biodiversity, to mitigate the effects of climate change, to ensure the safety of genetic heritage and maintain a balanced environment" (Paragraph IV of Law 10.316/2015).*

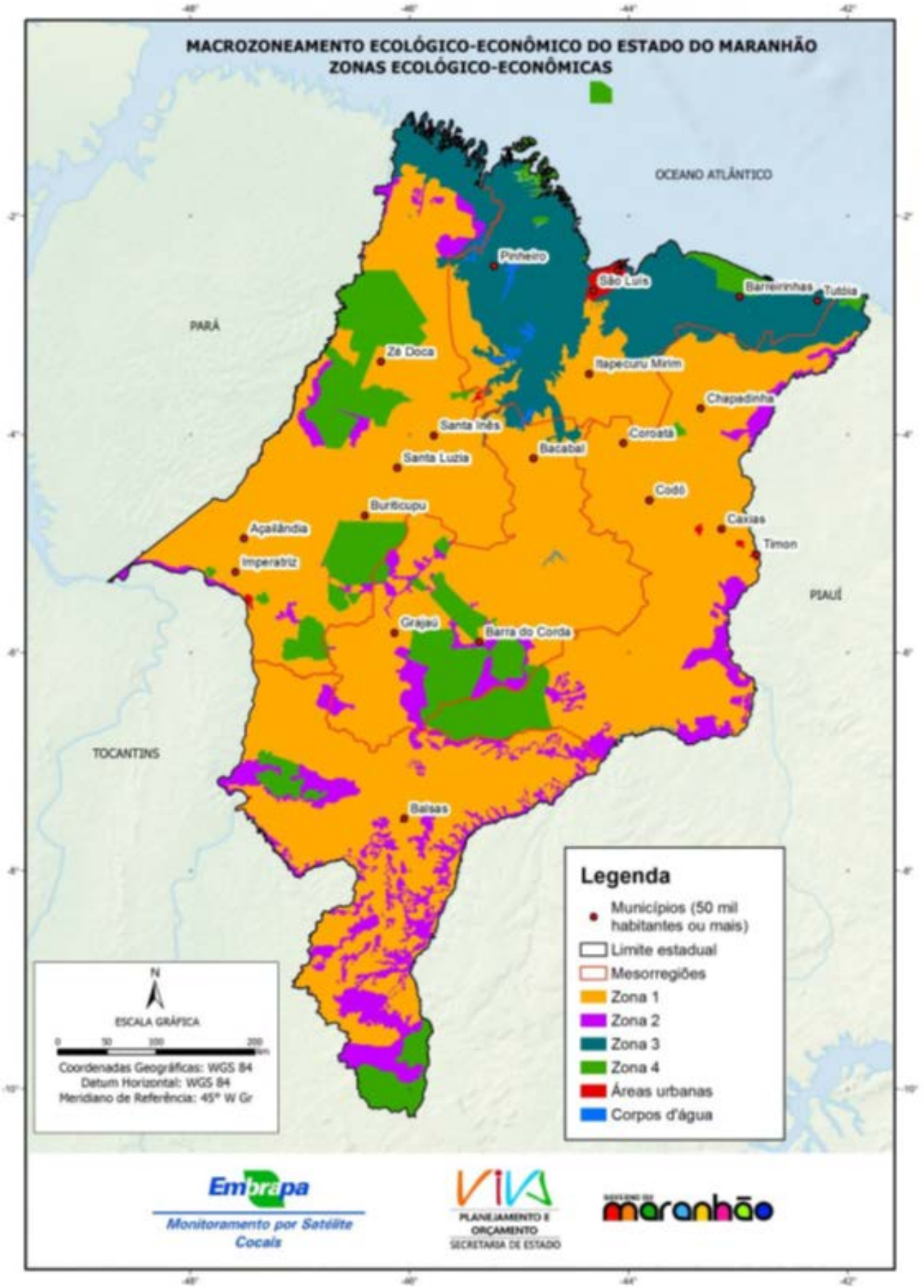

Figure 26: Map of Maranhão's ecological-economic zones (Source: EMBRAPA, 2014).

The proposed property's buffer zone, as well as the majority of the areas of the municipalities that integrate it together with the territory of Lençóis Maranhenses National Park, are included in Zone 3 of this Macrozoning (Figure X), and are described as.

> *"Areas of coastal influence, predominantly characterized by the coastal lowland, deflation plain, dune areas and coastal tabular areas of the State of Maranhão, estuarine complexes, restingas, mangroves, beaches, bays, islands, inlets, fixed dunes and mobile, deltaic systems, estuaries and lake basins" (Item III of Law 10,316/2015).*

Still according to this text, these areas can be described as

> *"(...) areas with predominantly low social potential, characterized by centuries-old processes of occupation and use, where a significant portion of the population of Maranhão lives" (Item III of Law 10.316/2015).*

Also according to this Law, the natural characteristics of this Zone portray a greater environmental fragility in scenarios of more intensive use. Therefore, as guidelines for Zone 3, the uses and exploits compatible with the socio-environmental characteristics and with the natural potentials observed in each situation should be prioritized. Stimulating the rational uses of natural resources, such actions should be adequate, considering the deficiencies of a social, technical-productive, infrastructural and institutional nature, which indicate the need for investments in order to generate and strengthen production chains compatible with their natural potentials and fragilities. It is possible to use other production systems as long as they meet the current environmental licensing criteria. Regional plans, programs, policies and projects must be fostered in order to take advantage of their productive potential and the well being of the population, respecting the environmental fragilities observed in each situation. In particular, energy (gas, oil, wind power), logistics and development projects of ecotourism, aquaculture and fishery resources should be planned, implemented and monitored in a manner compatible with the characteristics, potentials and limitations of each projects' areas of influence. The activities of local communities should be supported as they lack planning, organization, control and development. These are priority areas for complementary and more detailed studies on the impacts of climate change on the coastal dynamics and, therefore, on the configuration of their environmental attributes and the spatial distribution of economic activities (Item III of Law 10.316/2015).

Greater Plan 2020 - State of Maranhão Strategic Tourism Development Plan

With the objective of planning the development of tourism in the State by the year 2020, Maranhão's State Secretariat of Culture and Tourism of (SECTUR/MA) has elaborated as of 2010 the so-called Greater 2020 Plan - State of Maranhão Strategic Tourism Development Plan.

This Plan divides the State into 10 hubs of tourist interest (Figure 27), bringing together 68 municipalities. Each hub is named according to the natural and cultural characteristics of tourism in each region: Lençóis Park Hub, Delta of the Americas Hub, Munim Hub, São Luís Hub, Guarás Forest Hub and Amazônia Maranhense Hub, all located on the coast; besides the Mesas Hub; Lakes and Flower Fields Hub; Coconut Palms Hub, and, finally, Sierras, Guajajara, Timbira and Kanela Hub.

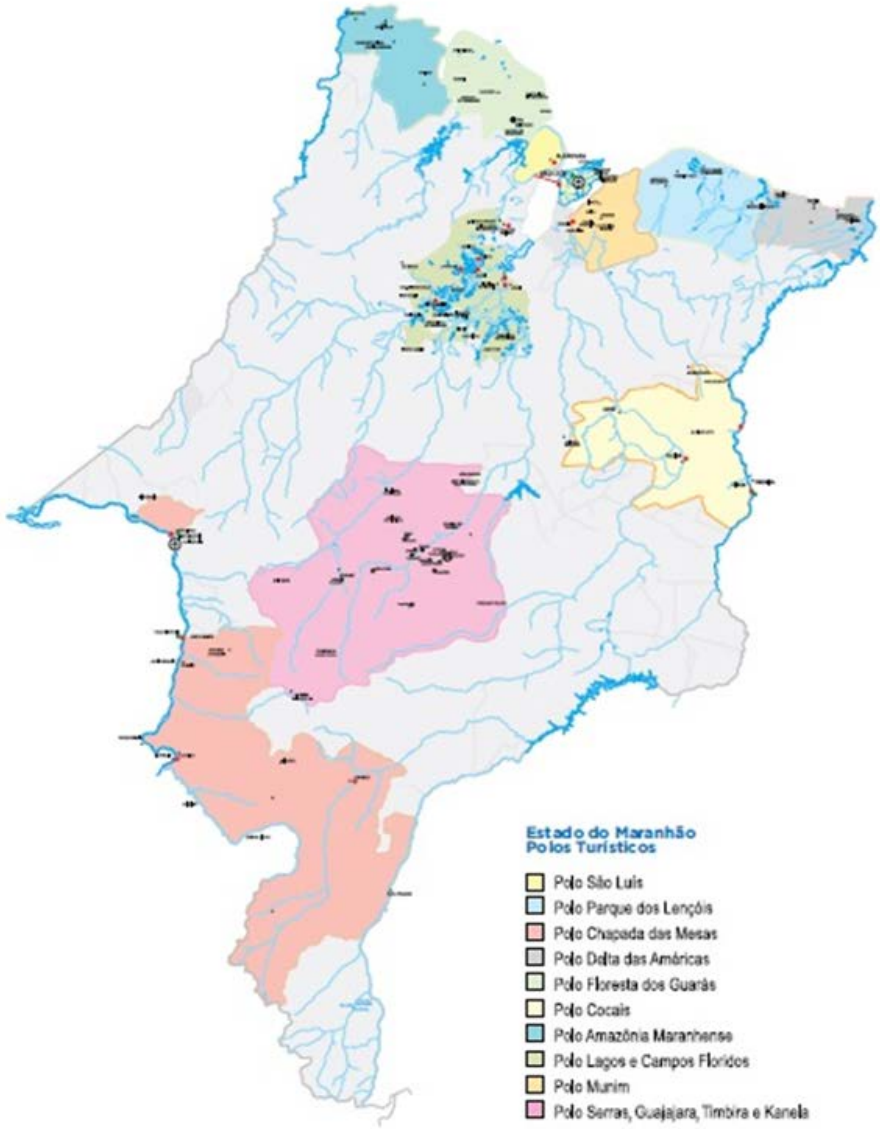

Figure 27: Maranhão State Tourist Hub Map (Source: SECTUR/MA).

These ten Hubs are segmented hierarchically into Inductive Hubs, Strategic Hubs and Development Hubs, and coastal municipalities are highlighted by their potentials for ecotourism without giving up sun and beach tourism. São Luís and Barreirinhas Hubs appear as those that bring together the main attractions and the best infrastructures for touristic activity in the coast of the state of Maranhão, being considered inducers of the development of tourism in the state (COSTA, 2015).

The site proposed for World Natural Heritage is part of the Park Lençóis Hub, classified as one of Maranhão's most important inducing hubs, on account of Lençóis Maranhenses National Park's attractiveness. This Hub includes the municipalities of Barreirinhas, Santo Amaro do Maranhão and Primeira Cruz, which covers the proposed property, besides the municipality of Humberto de Campos, inserted in the buffer zone and in the zone of influence of the National Park.

The Hubs' hierarchical distribution into categories indicates vectors of expansion of the tourist activity, where the inductive hubs are those that present:

> *"(...) capacity to obtain maximum profitability from the best optimization of current supply and existing products in the short and medium term. They are therefore capable of inducing tourism development in the State and catalyzing the development of other hubs" (SECTUR, 2012).*

With the Greater 2020 Plan, the coastal municipalities are oriented to develop normative instruments that allow the development of tourism activity, following the possibilities of fundraising and incentives pointed out by the state and federal governments (COSTA, 2015). In this sense, Lençóis Park Hub is classified with a high priority of investment for the development of the segments of adventure tourism, ecotourism, nautical tourism and sun and beach tourism; and average investment priority for cultural, sports and event/business tourism activities.

According to SECTUR/MA, the Greater 2020 Plan consists of a technical instrument with the objective of consolidating the State of Maranhão in national and international markets through the implementation of the Operational Plan for Development and the Operational Plan of Marketing.

> *The Development Plan aims to create and define products based on available resources[3], and its structure is constituted by five macro-programs:*
>
> *"Development macro-program for the Hubs - programs, projects and actions necessary for the development of the touristic potential of the Hubs regarding their specificities;*
>
> *Segments Development Macro-program - set of actions that aim to develop Maranhão's tourist potential in specific segments, in order to guarantee greater competitiveness;*
>
> *Training Macro-program - supports the development of Hubs and Segments based on the quality of experience, professionalism in management and services and the sustainability of tourism;*
>
> *Investment Promotion Macro-program - aims to promote public and private investments in order to create conditions for the implementation, evolution and sustainability of the Operational Plan for Development;*
>
> *Organization and Management Macro-program - proposes actions and programs for the organization of state tourism management, in order to make it even more efficient" (SECTUR, 2012).*

Based on the definition of existing products in the hubs (e.g. trekking in the Lençóis Maranhenses National Park, Lençóis flyby, etc.), these are explored in the Marketing Plan of the Greater 2020Plan. This Operational Marketing Plan is divided into Operational Product Plan and Operational Promotion Plan, regarding product types and priority segments (SECTUR, 2012).

The Operational Product Plan indicates what will be promoted in terms of product types and priority segments. The Operational Promotion Plan establishes the marketing projects proper, being constituted by 4 macro-programs:

> *"Communication Macro-program - aims to formally change Maranhão's image worked through various publics and markets;*
>
> *Market Promotion Macro-program - aims establish contact with the markets to inform, mobilize and elicit travel interest to Maranhão among the potential audiences of the priority geographic markets;*
>
> *Community Awareness Macro-program - defines actions to disseminate the main concepts inherent to the importance of tourism for the State's economic and social development and Maranhão's of the cultural and natural heritage value for the local population;*
>
> *Monitoring, Information and Control Macro-program - market information production for intelligent marketing and establishment of data and information necessary for more efficient management of the Operational Marketing Plan" (SECTUR, 2012).*

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[3] The Plan understands as Resources "the set of natural and cultural attractions of a territory, created and preserved by its people throughout history" (SECTUR, 2012).

Barreirinhas Municipal Master Plan

With the objective of adapting to the normative instruments for tourism planning and management as they are proposed in the federal and state spheres, as well as to face the impacts related to the increase of tourist flows received from the beginning of the XXI century, the municipality of Barreirinhas finalized in 2005 its Municipal Master Plan.

This Plan was established by Municipal Law Nº. 524/2005 and consists of a basic and regulatory instrument for the municipal planning process and development policy, which acts not only on public entities, but also on private entities, considering the Laws of Budgetary Guidelines of the Multiannual Investment Budget and of the Annual Budget of the Municipality.

Since its approval, the Municipal Master Plan has not undergone any revision, counting with ten chapters that deal with the definitions and preliminary dispositions (chapter I); the objectives of the Plan (Chapter II); guidelines of the Plan (chapter III); instruments (Chapter IV); environmental heritage, green and open areas preservation and sanitation (chapter V); cultural and social development policy (chapter VI); housing policy (chapter VII); economic development and tourism policy (chapter VIII); transport policy (IX); and finally, the planning and urban management policy of the municipality (chapter X).

In Article 130, the Master Plan states that the priorities of the municipal planning and urban management policy are "the development of local economic potential and the improvement of the quality of housing, transport and preservation of areas and areas of environmental and tourist interest". Therefore, the Master Plan directs the elaboration of other sectorial plans and municipal policies, as is the case of the Municipal Tourism Plan (established by Municipal Decree Nº. 034/2010), which guides the Municipal Tourism Department to consolidate the development of tourism in the municipality, through guidelines, targets, macro programs and programs; the Municipal Sanitation Basic Plan, which is in its final stage of approval, and whose objectives are to promote health, quality of life and the environment, as well as organize the management and establish the conditions for the provision of basic sanitation services, ensuring that they reach every citizen, in full, without interruption.

It should be emphasized that the existence of a municipal Master Plan does not necessarily mean the achievement of all the goals intended for its validity. However, they represent an instrument of great importance for municipal planning, with a view to synthesize and make explicit the objectives agreed upon for the municipality and establishes principles, guidelines and norms to be used as the basis for the decisions of the actors involved in the development, as far as possible, in the direction of these objectives (SABOYA, 2007).

5.e Property management plan or other management system

See Anex 4

5.f Sources and levels of financing

Protected areas established by federal governments have their own annual budget, as well as external sources resulting from environmental compensation, local partnerships and cooperation projects.

In 2009, the Environment Ministry (MMA) and the company EBX Holding Ltda. Signed a Term of Operational and Financial Cooperation (TCOF) to finance the Lençóis Maranhenses National Park with a total amount of R$ 4.2 million, of which R$1.8 million were assigned for infrastructure and annual stipend of R$240.000, for maintenance for the next 10 years, thus comprising the main source of funds

for the proposed World Natural Heritage site, as well as its own annual budget[4], which finances its staff, purchases of materials and other basic costs for the day-to-day running of the CU (water, energy, fuel , etc.).

Part of the funds provided by the partnership with the EBX Group for the structuring and maintenance of the Park, were allocated to the acquisition of two Toyota Hilux Pick-up Double Cabin vehicles, two quadricicles, a boat, a speedboat, as well as computers and photographic cameras. Some of these resources are still being used in the construction of infrastructure for the National Park, such as a shed for the boats, a bridge in the tourist circuit of Lagoa Azul, and the Park's new headquarters.

In addition to this funding source, the resources received from environmental compensation related to the World Cup Project, developed in partnership with the Environment and Tourism Ministries and approved by the World Cup Sustainability Chamber, recognized as an official program of the 2014 World Cup (BRAZIL, 2013). These funds were mainly used to build the Park's Visitor Center, which are still in progress.

As for future funding, in addition to those available from its annual budget, Lençóis Maranhenses National Park is among the Conversation Units that will benefit from Federal Law Nº. 13.668, dated May 28 of 2018[5], known as the Environmental Compensation Law, which authorizes the Chico Mendes Institute for Biodiversity Conservation (ICMBio) to directly select a public bank - such as BNDES, Banco do Brasil or Caixa - to create and manage a fund made up of funds raised through environmental compensation[6].

In this sense, the ICMBio estimates the resources that will be made available for the management of the federal conservation units in about R$ 1.4 billion. The money will be used to consolidate these areas, aiming at land regularization and infrastructure improvement for administration, protection, research, environmental education and visitation[7].

This law also allows the ICMBio to hire employees for a fixed period of time not exceeding two years, with a possible one year extension. Forest brigades, for example, can be used to prevent fires and environmental emergencies, as the contract will last year-round[8]. This initiative tends to greatly increase the park's management capacity, since it establishes the hiring of local personnel, a development factor for the region surrounding the CU.

5.g Sources of expertise and training in conservation techniques and management

The expertise of the Park's federal civil servants represents the set of skills necessary for teamwork focused on the conservation and management of their patrimony. Continuous training is required in the areas and disciplines required to perform at the highest level of excellence due to their location.

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4. Source: http://imirante.com/barreirinhas/noticias/2009/09/28/lencois-terao-r-4-2-milhoes-investidos-em-infraestrutura.shtml

5. Establishes that ICMBio, the manager of the PNLM, is authorized to select an official financial institution, exempt from bidding, to create and administer private fund to be paid in with funds proveniente from environmental compensation.

6. Source: https://atual7.com/noticias/politica/2018/06/lei-que-libera-fundo-de-compensacao-ambiental-vai-beneficiar-parque-dos-lencois/

7. Source: https://atual7.com/noticias/politica/2018/06/lei-que-libera-fundo-de-compensacao-ambiental-vai-beneficiar-parque-dos-lencois/

8. Source: https://atual7.com/noticias/politica/2018/06/lei-que-libera-fundo-de-compensacao-ambiental-vai-beneficiar-parque-dos-lencois/

The Biodiversity National Academy (Acadebio) is the source of expertise and training in conservation techniques and management of the proposed natural world heritage.

Acadebio was created in 2009 (Ordinance Nº. 528, of September 4, 2009) to attend the Chico Mendes Institute for Biodiversity Conservation (ICMBio) in the processes of training and qualification of its servants. This center is responsible for organizing, coordinating and executing activities to train employees and partners (SISNAMA bodies, universities, among others), to support environmental education actions and to strengthen the different processes of society's involvement in the management of Conservation Units and biodiversity.

According to its Annual Training Plan for the year 2018 (PAC 2018), Acadebio currently offers a number of face-to-face courses in various areas of knowledge and institutional management:

- 4 courses in the INFORMATION ADMINISTRATION AND TECHNOLOGY area (e.g., Budget, Financial and Contract Management, etc.);

- 2 courses on the subject of TERRITORIAL CONSOLIDATION (e.g., Georeferencing and Demarcation of Conservation Units, etc.);

- 2 courses on the subject of CU CREATION, PLANNING AND EVALUATION (eg, Training to elaborate specific plans related to the Management Plan, etc.);

- 2 courses in CONSERVATION STRATEGIES (e.g.: Assessment of the state of conservation of ecosystems, etc.);

- 2 courses in the MANAGEMENT area (e.g. Management for Results in Protected Areas, etc.);

- 5 courses in STAFF MANAGEMENT (e.g., Personal and Interpersonal Conflict Management, etc.)

- 2 courses on the subject of SOCIAL ENVIRONMENTAL MANAGEMENT (e.g.: Training cycle in Socio-environmental Management 2017/2018 - Module 3: Communication and Module 4: Planning, etc.);

- 6 courses in RESEARCH AND MONITORING area (e.g.: Training in protocols of the global targets of the Monitora - Mangrove Component, etc.);

- 2 courses in OPERATIONAL PLANNING AND BUDGET (e.g. Project Management, etc.);

- 2 courses on TRADITIONAL POPULATIONS (e.g., Public Policies for Social and Productive Inclusion of Traditional Populations, etc.);

- 10 courses on the subject of PROTECTION (e.g., Hunting Inspection (HAC01) - Training in service, etc.); and finally,

- 6 courses in the PUBLIC USE area, such as Planning and Management of land trails; Planning of Interpretive Exhibitions and Monitoring of Number of Visitors, among others.

In addition to the courses and events offered by Acadebio itself and/or partner institutions, the academy still offers distance courses through its Distance Education Academy. This type of training is supported by media and technologies, which enable interaction between people and interactivity with teaching materials, at different times and places.

As an example of the courses offered in Virtual Learning Environment for PAC 2018, the most important are those focused on the planning and evaluation of CUs, communication, territorial consolidation, staff management, environmental man-

agement, research and monitoring, as well as geo-processing.

ICMBio still offers a number of events, for public servants and society in general, promoting the exchange of experiences, the presentation of good practices and research, which contribute to the constant improvement of their actions, such as: the Brazilian Congress of Conservation Units - CBUC and the X Research Seminar for the year 2018.

In addition to the courses and events provided by the management institution of the proposed site, there are also programs aimed at improving the expertise and training in conservation and management techniques within the Brazilian Federal Conservation Units. One example is the Consolidation Project of the National System of Conservation Units (SNUC) - Life Web.

This project, in partnership with the German Federal Environment, Nature Conservation, Construction and Nuclear Safety Ministry (BMUB), includes actions in one of its five components (Organizational Development for the management of SNUC), which aim at the creation of a training and specialization program in management oriented to results in Conservation Units; and continuous updating of the training and specialization program, and the coaching, when necessary, of federal and state administrations and selected conservation units, among other actions pertinent to the improvement of the expertise and training in conservation and management techniques.

5.h Visitor facilities and infrastructure

To support the activities of public use, inspection, administration and research, the Lençois Maranhenses National Park counts with the following facilities, listed on the table 10.

Table 10: Lençóis Maranhenses National Park management Support Infrastructure.

INFRASTRUCTURE	AREA (M2)	EQUIPMENTS	OBSERVATIONS
Administrative Headquarters opened on 09.12.2016.	600	Tables, chairs, cabinets, air conditioners, computers, among others to support activities.	The headquarters counts with rooms for meetings, Environmental Education, Administration, Management and Secretariat, as well as feminine and masculine toilets, pantry, storeroom, porch and garden and attached accommodation with three beds and a toilet.
Vehicles and boats shed	243,75		Garage for 6 large vehicles, storage, workshop, bathroom, room for seized material.
Security box	10,5		Bathroom and hall
Atins Inspection office	120	Bunks, freezer, refrigerator and stove.	Contains living room, balcony, 02 bedrooms, kitchen, bathroom and laundry area.

Since 2009 the Lençóis Maranhenses National Park has been making improvements in its infrastructure to support public use activities, supervision and administration, as a new headquarters for the Park, and a boat shed. In addition to a bridge to support the visitation of the Azul Lagoon, one of the Park's most important attractions. Currently, the construction of a visitor center for the Conservation Unit is under way, which will count with equipment and structure to receive tourists and develop activities for the public use of the Park, such as environmental education. The proposed site still counts still with several equipments, some of them recently acquired and with the same objective of supporting the activities of public use, inspection, administration and research. Below, in table 11, the main equipment is identified and quantified.

Table 11: Lençóis Maranhenses National Park equipment list.

Equipements	Qty
1. Vehicles	
Toyota Hilux Double Cabin Pick-up truck	2
Land-Rover jeep	1
Land-Rover Pick-up truck	1
Quadricicles	3
New Holland tractor with wagon	1
Flexboat 190HP Speed Boat	1
115 hp Yamaha motorboat	1
2. Computer Hardware	
Laptops	5
Printers	2
Scanners	2
3. Equipamentos eletrônicos	
Camcorder	1
Digital camera	2
High-range binoculars	1
GPS	3

Regarding infrastructure related to the potential use of digital technologies and services, part of Lençóis Maranhenses National Park's territory is covered by mobile telephony and mobile data bands (2G and 3G). Tourism support services, such as overnight hotels, restaurants, parking lots, lavatories, search and rescue, among others, can be accessed mainly in the Park's immediate surroundings, especially in the urban centers of Barreirinhas and Santo Amaro, which offers lodging services, a search and rescue group, public security, as well as parking lots for vehicles and other services aimed at supporting tourist activity (tourist support center, Lan Houses , etc.).

It is worth mentioning that the management of the activity of visitation to Park still counts on the direct support of the local municipalities, in particular Barreirinhas, which through municipal legislation supported the access control of tourists to the attractions of the Park with the creation of the Digital Voucher and with the installation of a control box in each of the three ferries located in the municipality that give access to Conservation Unit, which also has municipal and state officials to implement this visitor control system.

Lastly, it should be considered that in the current economic crisis, the resources allocated to the management of Conservation Unit have not been in line with the needs of some of these protected areas, especially those receiving an increasing number of visitors, such as the Lencois Maranhenses National Park.

However, the management of this CU also counts with the technical and administrative support offered by the regional and national infrastructure of the Environment Ministry, in particular the Chico Mendes Institute for Biodiversity Conservation (ICMBio), being one of the 10 Brazilian units that counts with the most resources for environmental compensation that will be applied in the next years in the site's implementation and land regularization.

5.i Policies and Programmes Related to the Presentation and Promotion of the Property

The proposed site to World Natural Heritage and its buffer zone sits at one of the five Brazilian natural systems considered as National Heritage by the Brazilian Federal Constitution of 1988 (Article 225, § 4): the Brazilian Coastal Zone. Article 225 of the Constitution determined that the use of this space should be made in

the "... form of the law, under conditions that ensure the preservation of the environment, including the use of natural resources".

The 1988 Constitution defined that the territorial sea and the natural resources of the continental shelf and the exclusive economic zone, as well as lakes, rivers, river beaches and seashore, as well as the areas owned by the Brazilian Navy[9], are considered as "Union assets" (Article 20).

The awareness of the economic, environmental and social relevance of the Coastal Zone and of the marine areas under Brazilian jurisdiction has still led the public power in the last two decades to propose norms and to structure public policies for its management (MMA, 2010). The first of these policies was Law no. 7.661/1988, which determined the preparation of the National Coastal Management Plan (PNGC) with the objective of "guiding the rational use of resources in the Coastal Zone in order to contribute to raising the quality of life of its population, and protecting its natural, historical, ethnic and cultural heritage ".

Law 7.661 defines that the planning of uses and activities in the Coastal Zone should prioritize the conservation and protection of the fluvial, estuarine and lagoon systems; the inlets and beaches; restingas and dunes; coastal forests, mangroves and monuments that integrate the natural and landscape patrimony.

The implementation of the current version of the PNGC (Decree No. 5.300 of 2004) was made possible by the National Environmental Program (PNMA), implemented by the Environment Ministry through a specific component, called Gerenciamento Costeiro (Coastal Management), or Gerco (MMA, 2010).

Through Gerco, the Brazilian Government allocated financial resources and technical support to coastal states and municipalities to structure their environmental bodies so that they could apply the Coastal Zone management instruments foreseen in the PNGC, such as management plans, ecological and economic coastal zoning and state coastal management plans (MMA, 2010).

Besides this set of policies, the site proposed to world natural heritage is also the target of several policies and programs of promotion and protection linked to the Brazilian coastal areas, such as:

- The Convention on Biological Diversity (CBD), which has made a number of recommendations to its member countries, intended to enable actions promoting the conservation and sustainable use of biodiversity, as well as the sharing of benefits arising from their use.

- The Project for the Conservation and Sustainable Use of Brazilian Biological Diversity (Probio), whose purpose was to assist the National Biological Diversity Program (Pronabio) in developing the strategy, programs and plans necessary to fulfill the commitments made to the CBD.

- The National Strategic Plan for Protected Areas (PNAP), approved by Decree No. 5.758/2006, which defines principles, guidelines and actions for the establishment of a comprehensive, ecologically representative, effectively managed system of integrated protected areas integrated with broader terrestrial and marine areas. Its objectives and strategies are organized around four thematic axes: a) Planning, Strengthening and Management; b) Governance, Participation, Equity and Distribution of Costs and Benefits; c) Institutional Capacity, d) Evaluation and Monitoring; to which are related general and specific objectives, as well as strategies to give them effectiveness.

[9]. According to Article 1 of Federal Decree no. 2.490/1940, the navy lands are "(...) at a depth of 33 meters, measured towards the land, from the point where the 1831 mid-water line passed, those on the mainland, on the coast and on the banks of rivers and lagoons, as far out as the influence of the tides is felt; (...)".

- Project for Effective Conservation and Sustainable Use of Mangroves in Brazil in Protected Areas (GEF-Mangue), developed with the objective of developing and strengthening a network of protected areas for the mangrove ecosystem in Brazil, through political, financial and regulatory authorities; through the management of fishing ecosystemic; the coordination of territorial planning instruments with the management of Conservation Units and the dissemination of the importance and functions of mangroves; through which it is intend to build the basis for the improvement of the conservation and sustainable use of the country's mangroves (MMA, 2010).

Other specific programs, related to its conservation and promotion - especially sustainable tourism, also targets Lençóis Maranhenses' region. These include:

- Economic and Ecological Macro-zoning of the State of Maranhão (MacroZEE-MA), which defines the sponsoring of activities that seek to guarantee the maintenance and recovery of ecosystem integrity, the strengthening of existing protected areas, through the preparation of management plans and the creation of ecological corridors to contribute to the protection of biodiversity, to mitigate the effects of climate change, ensure the safety of genetic heritage and maintain a balanced environment; and

- Maranhão's Strategic Tourism Development Plan (Plano Maior 2020), which guides coastal municipalities to develop normative instruments that enable the development of tourism activity, following the possibilities of attracting resources and incentives pointed out by state and federal governments. In addition to defining the region of the Lençóis Maranhenses National Park as a touristic hub and classifying the Lençóis Park Hub with high investment priority for the development of the segments of adventure tourism, ecotourism, nautical tourism and sun and beach tourism; and average investment priority for cultural, sports and event/business tourism activities.

The elevation of the proposed property to heritage status as the second most important tourist hub in the state of Maranhão, since the beginning of sec. XXI, has been generating considerable increases in visitor flows to the Lençóis Maranhenses National Park. In this sense, there exists conflicts in relation to the conservation of the proposed property that has been the target of mitigating measures that mainly aim to control the of Park's public use activities.

In this sense, Lençóis Maranhenses National Park's management and the municipal management of Barreirinhas carried out the publication of two specific legal instruments for the control of tourist activity inside the proposed site, being these, respectively:

- ICMBio Ordinance No. 199, of May 18, 2017, which established rules and procedures for registration and authorization of onerous use for the provision of tourist service for driving visitors and essential transportation of passengers in vehicles in the PNLM area; and

- Municipal Law No. 762 of October 2, 2017, which established tourist flow control system to the attractions (known as Digital Voucher), which integrates the control over the information about the technology employed, the circulation load in the attractions, the security employed by the operation, the values agreed upon by the tourism products and visitor safety, as well as regulating the relationship between Tourism Agencies, Tourist Attractions, Tourism Guides, Local Guides, Tourist Carriers, Lodging and Food Service.

Among the various policies and programs of promotion and protection to which the proposed World Natural Heritage site is subject, stands out the perspectives inserted in the National System of Nature Conservation Units (SNUC).

The SNUC was designed to enhance the function of Brazilian Conservation Units, allowing the planning and actions of these protected areas to be carried out in an integrated way with the others, ensuring that significant and ecologically viable samples from different populations, habitats and ecosystems are adequately represented throughout the national territory.

This Federal Law provided tools for the managers of PAs not only to conserve national ecosystems and biodiversity, but also to generate income, employment, sustainable development and to provide an effective improvement in the quality of life of local populations.

The SNUC is composed of all the Conservation Units (UCs) created by the Public Sphere in its three levels, and it is managed by the Chico Mendes Institute for Biodiversity Conservation (ICMBio), responsible for the promotion and protection of the proposed site.

This federal institution is responsible for executing the actions of SNUC, in particular to implement, manage, protect, supervise and monitor the areas. It is also incumbent upon the Institute to promote and execute programs of research, protection, preservation and conservation of biodiversity and exercise the power of environmental police for the protection of the National Park.

The status of National Park (IUCN category II) established for the site proposed by Federal Decree No. 86.060, June 2, 1981, is the largest legal instrument guaranteeing its promotion and conservation, being its main instruments of promotion and protection and means of conflict settlement its Management Plan (IBAMA Order no. 48/03-N-2003) as well as its Advisory Council.

In the region where the National Park of the Lençóis Maranhenses is located, which includes the extreme north of the states of Maranhão and Piauí, already exists a broad and diverse network of official protected areas, both public and private, in different categories and governmental levels, forming an official protected area of more than 91,000,000 hectares, which increases the effectiveness of the conservation area. There are 26 protected areas, in addition to the Lençóis Maranhenses National Park, totaling 27 Protected Areas (Figure 03).

Of these, 20 are protected areas of sustainable use, including 09 Environmental Protection Areas, 07 Extractive Reserve, 01 National Forest (Categories V and VI of IUCN) and 3 Private Natural Heritage Reserve (totaling almost 89,000,000 hectares.

The other 07 are strictly protected areas of which 03 are National Parks (including Lençóis Maranhenses National Park), and 04 State Parks (Category II of IUCN), totaling more than 227,000 hectares, of which 155,000 are in the Lençóis Maranhenses National Park and the remaining in the other six parks.

This set of protected areas is in the vicinity of the proposed World Heritage site.

Several other important institutions for the implementation of policies, programs, plans and projects related to environmental conservation and sustainable development act in the proposed World Heritage Territory:

Federal Institutions

Federal Institute of Maranhão - Barreirinhas Campus

A higher education institute that conducts teaching, research and extension activities that conducts research and actions in the region of the Lençóis Maranhenses National Park

State Institutions

Barreirinhas Regional Articulation Superintendence

The local office of the Agricultural Research and Rural Extension State Agency (Agerp), linked to Rosario Regional Office, was implemented in partnership with the Barreirinhas Union of Rural Workers (STTR), with the objective of strengthening activities related to family agriculture, with the specific function of assisting family farmers with technical assistance in their properties and the implementation of public policies aimed at the development of the municipality.

Lençóis and Delta Tourism Superintendence.

Recently inaugurated and located in the municipality of Barreirinhas, this superintendence aims to support the development of sustainable tourism in the region of Lençóis Maranhenses and the Parnaíba Delta through the decentralization of tourism policy in the State of Maranhão. It aims to improve tourism services provided in this region, qualifying professionals in the area and assisting in the development of activities in the sector, with emphasis on sustainable development activities.

Municipal Institutions

Barreirinhas Culture and Tourism Municipal Secretariat

This Secretariat is responsible for the formulation and application of tourism policy in the municipality of Barreirinhas and has the objective of developing tourism in a sustainable way, with the Lençóis Maranhenses National Park as the main attraction.

Barreirinhas Education Municipal Secretariat

Responsible for the formulation and application of Barreirinhas' educational policy, aiming at developing education, including formal and non-formal Environmental Education.

Santo Amaro do Maranhão Tourism Municipal Secretariat

This Secretariat is responsible for the formulation and application of tourism policy in the municipality of Santo Amaro do Maranhão and has the objective of developing tourism in a sustainable way, with the Lençóis Maranhenses National Park as the main attraction

Santo Amaro do Maranhão Education Municipal Secretariat

Responsible for the formulation and application of educational policy in Santo Amaro do Maranhão, aiming to develop education, including formal and non-formal Environmental Education.

Primeira Cruz Tourism Municipal Secretariat

Its objective is to develop tourism in the municipality of Primeira Cruz in a sustainable way, with the Lençóis Maranhenses National Park as its main attraction.

Primeira Cruz Education Municipal Secretariat

It has the objective of developing education in the municipality of Primeira Cruz, including formal and non-formal environmental education.

Non-Governmental Institutions

Preguiça River Institute

This institute has as its main objective to support environmental conservation of the Preguiças River, one of the main rivers of the proposed site for World Heritage Site.

Vaga Lume Association

An institution that has been working since 2002 in the Lençóis Maranhenses National Park region and its surroundings and aims to create opportunities for cultural exchanges through reading, writing and orality, valuing the protagonism of people and rural communities of the Brazilian Amazon, including the region of the Lençóis Maranhenses National Park.

Barreirinhas Rural Workers Union (STTR)

This union acts as a representative for Barreirinhas Rural Workers, fighting for their rights.

Fisherman's Colony

Institution that includes the fishermen of the municipality of Barreirinhas

Barreirinhas Fishermen's Union

This union acts as representative of the Fishermen of Barreirinhas, fighting for their rights.

Santo Amaro do Maranhão Peace Community Council

A member of the Pact for Peace Program, this council seeks to discuss security issues in the municipality.

Santoamarocoop

Tourist Transport Cooperative of the City of Santo Amaro do Maranhão, acts in the accomplishment of tourist activities in the Lençóis Maranhenses National Park and surroundings.

AMARES Institute

This institute, created in 2008 and headquarteed in Barreirinhas, is a private non-profit association with the objective of promoting research and conservation of aquatic ecosystems and biota in them. It is a member of Brazilian Network of Strandings and Aquatic Mammals Information (REMAB) and its regional branch REMANOR.

5.j Staffing Levels and Expertise

All civil servants in the Lençóis Maranhenses National Park belong to the Federal Government staff, having been selected through a public tender, through which each servant had to prove their expertise and knowledge necessary to carry out their duties.

The proposed site counts on a team of 20 professionals, 4 of whom were selected by public tenders, who follow the rules mentioned above, and 16 outsourced employees working in support, cleaning, property security, logistics and administrative services duties.

The outsourced staff counts with 12 gatekeepers, who control the access of people to the buildings of the proposed site, 2 receptionists, 1 cleaning assistant and 1

driver. Outsourced employees are hired directly by the Chico Mendes Institute for Biodiversity Conservation (ICMBio), the managing institution of the PNLM, which follows administrative rules for the selection of hired personnel.

The team has adequate education and training for the development of its functions, and ICMBio itself does their professional qualification. Examples include courses in oversight and surveillance, weapons and shooting, courses in conflict management, geo-processing and socio-environmental management, among others.

The four federal officers are divided into: 1 Park Head, 1 Public Use Coordinator, 1 Environmental Analyst and 1 Environmental Technician. Table 12 presents the table of the allotted servers in the Lençóis Maranhenses National Park, identifying them regarding training and position, besides presenting considerations about their experiences.

Table 12: Human resources of the proposed site:

POST	INSTRUCTION	OBSERVATIONS
National Park Head	Graduate studies (Bachelor in Law Studies)	Posted at PNLM since 2009. Held the position of chief of inspection between 2010 and 2012, taking over the unit's leadership in July 2012.
Public Use Coordinator	Graduate studies (Journalism)	Environmental Analyst for the Federal Government since 2009. Developed activities of environmental analyst at a Federal Extractive Reserve before occupying the position in PNLM
Environmental Analyst	Graduate studies – Masters in Biology	Environmental Analyst for the Federal Government since 2009. He developed activities of environmental analyst in Federal Extractive Reserve before occupying the position in PNLM
Environmental Technician	Technical education in Environment	Technician posted at the PNLM since 1993
Receptionist 1	High school	Outsourced
Receptionist 2	High school	Outsourced
Gatekeeper 1	High school	Outsourced
Gatekeeper 2	High school	Outsourced
Gatekeeper 3	High school	Outsourced
Gatekeeper 4	High school	Outsourced
Gatekeeper 5	High school	Outsourced
Gatekeeper 6	High school	Outsourced
Gatekeeper 7	High school	Outsourced
Gatekeeper 8	High school	Outsourced
Gatekeeper 9	High school	Outsourced
Gatekeeper 10	High school	Outsourced
Gatekeeper 11	High school	Outsourced
Gatekeeper 12	High school	Outsourced
Driver	High school	Outsourced
Cleaning assistant	High school	Outsourced

6. Monitoring

The publication "Monitoring World Heritage. World Heritage Papers, 10 "(UNESCO WORLD HERITAGE CENTER/ICCROM, 2004, available at http://whc.unesco.org/documents/publi_wh_papers_10_en.pdf) is the most relevant reference for the construction of the proposed site's monitoring program, since this document, besides presenting experiences of programs that have been successful, points out the guidelines for the establishment of said program for the World Heritage site.

Another important reference is the Normative Instruction No. 3/2017/GABIN/ICMBIO, of September 4, 2017, establishing the National Program for Biodiversity Monitoring of the Chico Mendes Institute (available at http://www.icmbio.gov.br/portal/images/stories/portarias/intrucao_normativa_03_2017.pdf).

Regarding the Lençóis Maranhenses National Park, the conservation of the dunes and paleo-dune fields and the endangered endemic species of plants and animals, which are the main attributes to confer Universal Value and Authenticity to any site, should be one of the main focuses of the monitoring process and was therefore central to the definition of key indicators for such monitoring. On the other hand, it was essential to think of indicators that allow the monitoring of the management processes, in order to guarantee the integrity of the site, as these processes, on a large scale, will be responsible for ensuring Lençóis Maranhenses National Park's integrity.

In addition, just as the process of managing a Protected Area requires the discussion of the management of its surroundings, especially when it comes to Conservation Units (PAs) of Integral Protection, such as the Lençóis Maranhenses National Park, so does the management of a World Heritage Site of Humanity has to take into account the surroundings of the Protected Site. For this reason, both the Integral Protection and Heritage Sites conservation units define buffer areas in their surroundings. In other words, the key indicators should also be focused on the buffer zones of the Site, focusing on ways of monitoring the areas effectively protected by legislation as well as their environment (POUND, 2004). Therefore, it was important to think of monitoring mechanisms and evaluation of the Buffer Zone in the case of the Lençóis Maranhenses National Park, with the advantage that the limits of the Lençóis Maranhenses National Park and World Heritage Damage Zone are the same, thus making the management of the sites a bit easier.

Another relevant factor for the definition of the monitoring program and the key indicators was the monitoring of the impact of tourism. This is especially important in the case of the Lençóis Maranhenses National Park, since tourism is already an important activity that generates relevant impacts on the Park (Ibama, 2003), and it is expected that this activity should be intensified in case Lençóis Maranhenses National Park is included in the List of World Heritage Sites.

On the other hand, it is not possible to build a very broad and complex monitoring program, since the available resources will not be able to operationalize this program. Implementing a robust and efficient monitoring process, but relatively simple operationalization, is essential.

To address these challenges, the monitoring system for biodiversity conservation adopted in Brazil by the the-ICMBio prioritizes rapid evaluation protocols that optimize time, financial resources and human resources. As an important feature, it provides for the participation of local agents - community agents, environmental analysts and technicians - and specialists from the Research and Conservation Centers, as well as partners such as teaching and research institutions and NGOs. For that end, the system has two strong components: training (both internal and external) and data/information management. Based on international experience and an intensive consultative process, the Institute has established a set of principles and guidelines for in situ biodiversity monitoring for objectivity, effectiveness, as well as participatory processes with different stakeholders, from design to data analysis. The program adopts the following principles:

Fast and simple

Monitoring should be easy to implement because the operation of the program will often depend on the efforts of the local team and its more direct employees because their implementation cannot occur at the expense of other essential management activities.

Standardized and inexpensive

Adopt standardized procedures for all protected areas, with reduced costs in propagation, deployment and operation, as the program should aim to be accessible to any protected area because its long-term continuity is the basic reason for its existence.

Modular and gradual

To respond to several of the issues, monitoring can begin with few indicators, but allowing its gradual expansion and complexity, because the success of the program only begins after its implementation, and its results are the best justification for its expansion and intensification.

Program guidelines should be:

Inclusive and contextualized – Monitoring should promote social participation and be aligned with the perspectives and expectations of society, because the involvement of local actors is a key element for the sustainability of the program and because the social appropriation of the results feeds the interest back and mobilizes the forces that sustain its continuity.

Effective for management and environmental conservation – Oriented to inform management decisions, social agreements and conservation policies, because the program aims to consolidate practices and actions compatible with the conservation and sustainable use of resources. The greatest impact is to positively transform human relations with protected areas.

The monitoring program was designed with this set of principles and guidelines.

The biodiversity monitoring programs of continental environments are being implemented in selected protected areas in the Amazon, Cerrado, Atlantic Forest and Caatinga biomes. The monitoring of biodiversity in protected areas of these biomes is based on the collection of two sets of biodiversity indicators: minimum indicators and complementary indicators. Biological groups and their metrics were chosen considering their potential to discriminate impact gradients, including climate change, and to contribute to gathering reliable, low effort and cost information.

The minimum indicators allow the continuous in situ diagnosis of biodiversity in order to evaluate the effectiveness of the National System of Protected Areas, generating responses to climate changes and changes in the landscape.

6.1. Key Indicators for Measuring State of Conservation

The monitoring based on minimum indicators works with indicators, sampling system and protocols of data collection standardized for all the protected areas of each biome. Four common indicator groups for the Cerrado were selected: woody plants, selected groups of birds and mammals, and frugivorous butterflies. Sampling Stations common to other biomes are implemented. Basically, the Sampling Stations seek to integrate, in the same place, the Sampling Units (SU) of the four minimum indicators groups. Thus, three different Sampling Units comprise the Sampling Stations: each sample unit has a methodology, design and frequency of standardized samples, which can be accessed on the Institute web page:

http://www.icmbio.gov.br/portal/images/stories/Monitoramento_ da_Bi odi v e rsi dade_- _Rotei ro_metodol %C3%B3 gi co_de_ aplica%C3%A7%C3%A3o_I.pdf

However, these groups of indicators are not adequate for Lençois Maranhenses National Park, since the characteristics of this Conservation Unit are very specific, indicating the site's Unique Universal Value, a situation very aptly defined by Day:

> *"(...) the fact that World Heritage sites are, by definition, special and unique, hence there are no 'controls' for comparison and it is difficult to apply the more standard monitoring approaches". (Day, 2004, pg 76)*

Nevertheless, the monitoring process from the Sample Units and the Sample Stations will be used, as described above, as it is a relatively simple but effective process of biodiversity conservation monitoring. However, it is the group of indicators – biological indicators and others – that are proposed for the Nominated Property monitoring that varies a lot in relation to ICMBio's standard proposal.

After all, the monitoring focus of a World Heritage Site such as the Lençóis Maranhenses National Park should be on the site's universal value. Since this value is closely related to the unique characteristics of the field of mobile dunes, monitoring aspects related to this element of the landscape becomes essential. In addition, being a unique landscape, the groups of living beings indicators is very specific.

Based on this discussion, the key indicators presented in table 13 are proposed.

6.2. Administrative measures for the monitoring of the asset

Table 13 – Preliminary proposal of key indicators for monitoring

	INDICATOR	FREQUENCY	MONITORING PERSONNEL	STORAGE LOCATION
1	Size of populations of endangered species such as Charcharhinus limbatus and Epinephelus itajara	Biannual - Dry and wet seasons	To be defined	PNLM and SECTUR
2	Size of populations of restinga plant species endemic to the PNLM, such as the genus Polygalaa denophora and Hybantus solccolaris	Biannual - Dry and wet seasons	To be defined	PNLM and SECTUR
3	Size of populations of the tartaruga-pininga (Trachemysadiutrix)	Semiannual - Dry and wet seasons	To be defined	PNLM and SECTUR
4	Size of the dune field area	Biannual	To be defined	PNLM and SECTUR
5	Size of deforested restinga areas within the PNLM	Annual	To be defined	PNLM and SECTUR
6	Size of deforested mangrove areas within the PNLM	Annual	To be defined	PNLM and SECTUR
7	Number of visitors at the PNLM	Semiannual - Dry and wet seasons	Barreirinhas City Hall, Santo Amaro City Hall and PNLM	PNLM and SECTUR
8	Total amount of resources (in R $) allocated for the direct management of the PNLM	Annual	PNLM	PNLM
9	Staff size directly involved in the management of PNLM	Annual	PNLM	PNLM
10	Number of formal research projects studying the PNLM	Biannual	PNLM	PNLM
11	Number of vehicles registered for entry into the park	Annual	To be defined	PNLM and SECTUR
12	Rainfall index of each season	Semiannual - Dry and wet seasons	To be defined	PNLM and SECTUR
13	Number of inhabitants within the park	Biannual - Dry and wet seasons	To be defined	PNLM and SECTUR
14	N° aproximado de pousadas / hoteis/hostels/ hospedarias comunitárias restaurantes e guias Approximate number of hostels/lodgings/hotels/ hostels/bed and breakfast, as well as restaurants and guides	Biannual	To be defined	PNLM and SECTUR
15	Livestock reared within the area of the site (usually sheep and goats)	Biannual	Secretaria	PNLM and SECTUR

The monitoring of the property, as it is a protected area, should take into account not only its area as such, but also its surroundings, and should therefore be carried out periodically by the federal, state and municipal bodies responsible and involved in its management and supervision. ICMBio, through the Lençóis Maranhenses National Park, has as its specific attribution the monitoring and inspection of the site.

However, other state and municipal representatives are responsible for monitoring aspects that directly affect the site, and should prepare periodic reports, analyzing and approving projects that involve interventions in the area and applying administrative sanctions, such as embargoes and fines, whenever necessary. The information of the entities responsible for monitoring the property are listed below:

ICMBIO: Av. Joaquim Soeiro, 746, Barreirinhas-MA

SECTUR: Rua Portugal, 02/80, São Luís - MA

6.3. Results from Previous Reports and Evaluations to this Proposal

Lençóis Maranhenses National Park Management Plan (ICMBIO, 2003)

This document presents a wealth of information on the state of conservation of the property, such as topographic maps, satellite and aerial reconnaissance images. Seven sampling sites were defined based on landscape characteristics, with emphasis on vegetation, geomorphology and environmental integrity. Field activities also allowed the collection of information on flora and fauna, anthropic activities and land use, indicating places that demand a greater degree of protection and the need for further analysis. Strategic assessment was adopted to define areas with specific management actions, as well as to identify strengths, weaknesses, potentialities and threats. The analysis of the results showed that the forces are related to the diversity of environments, scenic beauty and the presence of paleo-environments, although the disordered public use and insufficient human resources weaken the conservation unit.

Cerrado Biome Monitoring in the 2010-2011 Period (IBAMA, 2015)

A part of the Satellite Deforestation Monitoring Project in the Brazilian Biomes (PMDBBS) that represents a relevant monitoring activity to evaluate the integrity of the site. A total of 724,667 hectares of deforested areas were identified in the Brazilian cerrado for the period, of which 131,062 ha were located in the State of Maranhão, but only 2 ha within the Park's area.

Comparative evaluation of the Rappam method applications in federal conservation units in the 2005-2006 and 2010 cycles (ICMBIO, 2011)

The Rappan method permits an evaluation of the management effectiveness of Brazilian protected areas, identifying the main trends and aspects that need to be considered in order to achieve a better effectiveness in a given protected area system or group of protected areas. Considering the differences between the estimated management effectiveness between the two seasons, 2005-2006 and 2010, the Lençóis Maranhenses National Park was considered a positive highlight, increasing by more than 25 percentage points and reaching the fourth position in the ranking of the highest increases in effectiveness of management. The results of the last evaluation cycle therefore attested a high management effectiveness (72%) and of research, evaluation and monitoring (77%). When this last segment considered the aggregation of specific themes to formulate an indicator of management effectiveness from the point of view of public use for environmental visitation and education, the park ranked 23rd among the 64 evaluated parks, reaching 57.1% of effectiveness (Table 7).

7. Documentation

7.a Photographs and audiovisual image inventory and authorization form

Id nº	Format (slide/ print/ vídeo	Date photo (mo/yr)	Photographer/ Director of Video	Copyright owner (if different of Photographer/ Director of Video)	Contact details of Copyright owner (Name, adress,tel/fax, e-mail	Non exclusive cession of rights
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	July, 2015	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	Nov., 2016	PNLM		Rua Principal, s/nº, Povoado Cantinho - Barreirinhas-MA - CEP: 65590-000 / pnlm@icmbio.gov.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	July, 2010	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	Oct., 2013	NASA STS064-215-045	Earth Science and Remote Sensing Unit, NASA Johnson Space Center	(http://eol.jsc.nasa.gov)	
	Digital	Nov., 2016	PNLM		Rua Principal, s/nº, Povoado Cantinho - Barreirinhas-MA - CEP: 65590-000 / pnlm@icmbio.gov.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	

Id nº	Format (slide/ print/ vídeo	Date photo (mo/yr)	Photographer/ Director of Video	Copyright owner (if different of Photographer/ Director of Video)	Contact details of Copyright owner (Name, adress,tel/fax, e-mail	Non exclusive cession of rights
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2014	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	Feb., 2012	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	July, 2010	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	May, 2008	Secretaria de Cultura e Turismo do Estado do Maranhão		Avenida dos Holandeses, 9, Quadra. 33, São Luís - MA / +55 98 3232-0995	
	Digital	Aug., 2007	Secretaria de Cultura e Turismo do Estado do Maranhão		Avenida dos Holandeses, 9, Quadra. 33, São Luís - MA / +55 98 3232-0996	
	Digital	May, 2017	Jeff Ava			
	Digital	Nov., 2016	PNLM		Rua Principal, s/nº, Povoado Cantinho - Barreirinhas-MA - CEP: 65590-000 / pnlm@icmbio.gov.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Priscila Steffen		mariobarila@yahoo.com.br	
	Digital	June, 2018	Priscila Steffen		mariobarila@yahoo.com.br	
	Digital	June, 2018	Priscila Steffen		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Projeto Queamar		laraufma@yahoo.com.br	
	Digital	July, 2010	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	Feb., 2017	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	July, 2015	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	

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	Digital	Nov., 2016	PNLM		Rua Principal, s/nº, Povoado Cantinho - Barreirinhas-MA - CEP: 65590-000 / pnlm@icmbio.gov.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	May, 2011	Yuri Teixeira		yuri.amaral@icmbio.gov.br	
	Digital	May, 2011	Yuri Teixeira		yuri.amaral@icmbio.gov.br	
	Digital	May, 2011	Yuri Teixeira		yuri.amaral@icmbio.gov.br	
	Digital	June, 2018	Priscila Steffen		mariobarila@yahoo.com.br	
	Digital	June, 2018	Priscila Steffen		mariobarila@yahoo.com.br	
	Digital	June, 2018	Priscila Steffen		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	July, 2015	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	April, 2018	Projeto Queamar		laraufma@yahoo.com.br	
	Digital	April, 2018	Luis Eduardo Ribeiro	Projeto Queamar	laraufma@yahoo.com.br	
	Digital	Mar., 2014	Eduardo C. de Macedo		educardocmacedo@gmail.com	
	Digital	April, 2018	Luis Eduardo Ribeiro	Projeto Queamar	laraufma@yahoo.com.br	
	Digital	May, 2015	Projeto Queamar		laraufma@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	Aug., 2018	Conservação Internacional do Brasil	Conservação Internacional do Brasil	psteffen@conservation.org	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	Feb., 2012	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	June, 2014	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	

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	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	Nov., 2016	PNLM		Rua Principal, s/nº, Povoado Cantinho - Barreirinhas-MA - CEP: 65590-000 / pnlm@icmbio.gov.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	July, 2010	Adriano Ricardo Damato Rocha de Souza		adriano.damato@icmbio.gov.br	
	Digital	Aug., 2018	Conservação Internacional do Brasil	Conservação Internacional do Brasil	psteffen@conservation.org	
	Digital	April, 2018	Projeto Queamar		laraufma@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	May, 2011	Yuri Teixeira		yuri.amaral@icmbio.gov.br	
	Digital	No information	No information	No information		
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	

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	Digital	Ago., 2007	Secretaria de Cultura e Turismo do Estado do Maranhão		Avenida dos Holandeses, 9, Quadra. 33, São Luís - MA / +55 98 3232-0995	
	Digital	Ago., 2007	Secretaria de Cultura e Turismo do Estado do Maranhão		Avenida dos Holandeses, 9, Quadra. 33, São Luís - MA / +55 98 3232-0995	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	June, 2018	Fabrício Black			
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	June, 2018	Mario Barila		mariobarila@yahoo.com.br	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	
	Digital	April, 2018	Priscila Steffen		psteffen@conservation.org	

AUTORIZAÇÃO

1. Eu, Larissa N. Barret, abaixo assinado e identificado, concordo a título gratuito, por todo o tempo, os direitos legais de propriedade, não exclusivo, de reproduzir e de utilizar no mundo inteiro, conforme os dispositivos do parágrafo 2 da presente autorização, a(s) fotografia(s) e/ou dispositivos descritos no parágrafo.
2. Estou ciente que a(s) fotografia(s) ou dispositivos descritos no parágrafo 4 da presente autorização será (serão) utilizados pela UNESCO para difundir as informações sobre os sítios protegidos com o título da Convenção de Patrimônio Cultural, das seguintes formas.
a) Publicações da UNESCO;
b) Co-edição com editoras privadas para as publicações sobre o patrimônio mundial: uma porcentagem dos benefícios será destinado ao Fundo do Patrimônio Mundial;
c) Cartões postais – vendidos nos sítios protegidos com o título da Convenção de Patrimônio Mundial por intermédio dos serviços dos parques nacionais ou de antiguidades (todos os benefícios eventuais serão repartidos entre os serviços em questão e o fundo do Patrimônio Mundial);
d) Série de dispositivos – vendidos às escolas, bibliotecas e outras instituições e eventualmente nos lugares protegidos (todos o benefício eventual será revertido ao Fundo do Patrimônio Mundial);
e) Exposição, etc.
3. Estou, também ciente de que conservo a liberdade de ceder os mesmo direitos a qualquer outra utilização eventual, porém, sem qualquer prejuízo aos direitos cedidos a UNESCO.
4. A lista da(s) foto(s) e/ou dispositivos autorizados constam de relação anexa (Favor descrever as fotografias no documento com legenda completa para cada uma delas, ano de sua realização ou, se está publicada, o ano de sua última publicação).
5. Toda fotografia ou dispositivo mencionarão o crédito das fotos publicadas. Os direitos do autor serão respeitados. (Pedimos intitular corretamente para o crédito da foto).
6. Declaro e certifico estar devidamente habilitada a ceder os direitos citados no parágrafo 1 a presente autorização.
7. Obrigo-me a indenizar a UNESCO e a desobrigá-la de toda responsabilidade por todos os prejuízos resultantes de qualquer transgressão da garantia mencionada no parágrafo 6 da presente autorização.
8. Toda contestação ou litigio que poderá advir dos direitos concedidos á UNESCO serão resolvidos de forma amigável. Fica excluído o recurso a tribunais ou á arbitragem.

Local, data. São Luís, MA, 27/08/18

Assinatura:

Nome: Larissa Nascimento Barreto

Identificação: RG 1340321-4 SSP/AM

AUTORIZAÇÃO

1. Eu, MARIO BARILA FILHO, abaixo assinado e identificado, concordo a título gratuito, por todo o tempo, os direitos legais de propriedade, não exclusivo, de reproduzir e de utilizar no mundo inteiro, conforme os dispositivos do parágrafo 2 da presente autorização, a(s) fotografia(s) e/ou dispositivos descritos no parágrafo.
2. Estou ciente que a(s) fotografia(s) ou dispositivos descritos no parágrafo 4 da presente autorização será (serão) utilizados pela UNESCO para difundir as informações sobre os sítios protegidos com o título da Convenção de Patrimônio Cultural, das seguintes formas.
a) Publicações da UNESCO;
b) Co-edição com editoras privadas para as publicações sobre o patrimônio mundial: uma porcentagem dos benefícios será destinado ao Fundo do Patrimônio Mundial;
c) Cartões postais – vendidos nos sítios protegidos com o título da Convenção de Patrimônio Mundial por intermédio dos serviços dos parques nacionais ou de antiguidades (todos os benefícios eventuais serão repartidos entre os serviços em questão e o fundo do Patrimônio Mundial);
d) Série de dispositivos – vendidos às escolas, bibliotecas e outras instituições e eventualmente nos lugares protegidos (todos o benefício eventual será revertido ao Fundo do Patrimônio Mundial);
e) Exposição, etc.
3. Estou, também ciente de que conservo a liberdade de ceder os mesmo direitos a qualquer outra utilização eventual, porém, sem qualquer prejuízo aos direitos cedidos a UNESCO.
4. A lista da(s) foto(s) e/ou dispositivos autorizados constam de relação anexa (Favor descrever as fotografias no documento com legenda completa para cada uma delas, ano de sua realização ou, se está publicada, o ano de sua última publicação).
5. Toda fotografia ou dispositivo mencionarão o crédito das fotos publicadas. Os direitos do autor serão respeitados. (Pedimos intitular corretamente para o crédito da foto).
6. Declaro e certifico estar devidamente habilitada a ceder os direitos citados no parágrafo 1 a presente autorização.
7. Obrigo-me a indenizar a UNESCO e a desobrigá-la de toda responsabilidade por todos os prejuízos resultantes de qualquer transgressão da garantia mencionada no parágrafo 6 da presente autorização.
8. Toda contestação ou litigio que poderá advir dos direitos concedidos á UNESCO serão resolvidos de forma amigável. Fica excluído o recurso a tribunais ou á arbitragem.

Local, data. SÃO PAULO 24/7/18

Assinatura: Mário Barila Filho

Nome: MARIO BARILA FILHO

Identificação: R.G. 9.895.094
CPF. 046.018.528-46.

AUTORIZAÇÃO

1. Eu, PRISCILA GEHA STEFFEN, abaixo assinado e identificado, concordo a título gratuito, por todo o tempo, os direitos legais de propriedade, não exclusivo, de reproduzir e de utilizar no mundo inteiro, conforme os dispositivos do parágrafo 2 da presente autorização, a(s) fotografia(s) e/ou dispositivos descritos no parágrafo.
2. Estou ciente que a(s) fotografia(s) ou dispositivos descritos no parágrafo 4 da presente autorização será (serão) utilizados pela UNESCO para difundir as informações sobre os sítios protegidos com o título da Convenção de Patrimônio Cultural, das seguintes formas.
a) Publicações da UNESCO;
b) Co-edição com editoras privadas para as publicações sobre o patrimônio mundial: uma porcentagem dos benefícios será destinado ao Fundo do Patrimônio Mundial;
c) Cartões postais – vendidos nos sítios protegidos com o título da Convenção de Patrimônio Mundial por intermédio dos serviços dos parques nacionais ou de antiguidades (todos os benefícios eventuais serão repartidos entre os serviços em questão e o fundo do Patrimônio Mundial);
d) Série de dispositivos – vendidos às escolas, bibliotecas e outras instituições e eventualmente nos lugares protegidos (todos o benefício eventual será revertido ao Fundo do Patrimônio Mundial);
e) Exposição, redes sociais, mídias digitais, website, etc.
3. Estou, também ciente de que conservo a liberdade de ceder os mesmo direitos a qualquer outra utilização eventual, porém, sem qualquer prejuízo aos direitos cedidos a UNESCO.
4. A lista da(s) foto(s) e/ou dispositivos autorizados constam de relação anexa (Favor descrever as fotografias no documento com legenda completa para cada uma delas, ano de sua realização ou, se está publicada, o ano de sua última publicação).
5. Toda fotografia ou dispositivo mencionarão o crédito das fotos publicadas. Os direitos do autor serão respeitados. Crédito das fotos: Priscila Steffen
6. Declaro e certifico estar devidamente habilitada a ceder os direitos citados no parágrafo 1 a presente autorização.
7. Obrigo-me a indenizar a UNESCO e a desobrigá-la de toda responsabilidade por todos os prejuízos resultantes de qualquer transgressão da garantia mencionada no parágrafo 6 da presente autorização.
8. Toda contestação ou litígio que poderá advir dos direitos concedidos à UNESCO serão resolvidos de forma amigável. Fica excluído o recurso a tribunais ou á arbitragem.

Rio de Janeiro, 24 de julho de 2018

Assinatura:

Nome: Priscila Geha Steffen

Identificação: RG 6622002-8 (SSP-PR)

AUTORIZAÇÃO

1. Eu, Hugo Ricardo de Paiva Veiga, abaixo assinado e identificado, concordo a título gratuito, por todo o tempo, os direitos legais de propriedade, não exclusivo, de reproduzir e de utilizar no mundo inteiro, conforme os dispositivos do parágrafo 2 da presente autorização, a(s) fotografia(s) e/ou dispositivos descritos no parágrafo.
2. Estou ciente que a(s) fotografia(s) ou dispositivos descritos no parágrafo 4 da presente autorização será (serão) utilizados pela UNESCO para difundir as informações sobre os sítios protegidos com o título da Convenção de Patrimônio Cultural, das seguintes formas.
a) Publicações da UNESCO;
b) Co-edição com editoras privadas para as publicações sobre o patrimônio mundial: uma porcentagem dos benefícios será destinado ao Fundo do Patrimônio Mundial;
c) Cartões postais – vendidos nos sítios protegidos com o título da Convenção de Patrimônio Mundial por intermédio dos serviços dos parques nacionais ou de antiguidades (todos os benefícios eventuais serão repartidos entre os serviços em questão e o fundo do Patrimônio Mundial);
d) Série de dispositivos – vendidos às escolas, bibliotecas e outras instituições e eventualmente nos lugares protegidos (todos o benefício eventual será revertido ao Fundo do Patrimônio Mundial);
e) Exposição, etc.
3. Estou, também ciente de que conservo a liberdade de ceder os mesmo direitos a qualquer outra utilização eventual, porém, sem qualquer prejuízo aos direitos cedidos a UNESCO.
4. A lista da(s) foto(s) e/ou dispositivos autorizados constam de relação anexa (Favor descrever as fotografias no documento com legenda completa para cada uma delas, ano de sua realização ou, se está publicada, o ano de sua última publicação).
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7. Obrigo-me a indenizar a UNESCO e a desobrigá-la de toda responsabilidade por todos os prejuízos resultantes de qualquer transgressão da garantia mencionada no parágrafo 6 da presente autorização.
8. Toda contestação ou litigio que poderá advir dos direitos concedidos á UNESCO serão resolvidos de forma amigável. Fica excluído o recurso a tribunais ou á arbitragem.

Local, data. São Luís, 31/07/2018

Assinatura: Hugo Veiga

Hugo Ricardo de Paiva Veiga
Secretário Adjunto de Turismo
SECTURIMA- Matrícula: 2611851

Nome: Hugo Ricardo de Paiva Veiga

Identificação: 1698359 5-8

AUTORIZAÇÃO

1. Eu, ADRIANO RICARDO DAMATO ROCHA DE SOUZA, abaixo assinado e identificado, concordo a título gratuito, por todo o tempo, os direitos legais de propriedade, não exclusivo, de reproduzir e de utilizar no mundo inteiro, conforme os dispositivos do parágrafo 2 da presente autorização, a(s) fotografia(s) e/ou dispositivos descritos no parágrafo.
2. Estou ciente que a(s) fotografia(s) ou dispositivos descritos no parágrafo 4 da presente autorização será (serão) utilizados pela UNESCO para difundir as informações sobre os sítios protegidos com o título da Convenção de Patrimônio Cultural, das seguintes formas.
a) Publicações da UNESCO;
b) Co-edição com editoras privadas para as publicações sobre o patrimônio mundial: uma porcentagem dos benefícios será destinado ao Fundo do Patrimônio Mundial;
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d) Série de dispositivos – vendidos às escolas, bibliotecas e outras instituições e eventualmente nos lugares protegidos (todos o benefício eventual será revertido ao Fundo do Patrimônio Mundial);
e) Exposição, etc.
3. Estou, também ciente de que conservo a liberdade de ceder os mesmo direitos a qualquer outra utilização eventual, porém, sem qualquer prejuízo aos direitos cedidos a UNESCO.
4. A lista da(s) foto(s) e/ou dispositivos autorizados constam de relação anexa (Favor descrever as fotografias no documento com legenda completa para cada uma delas, ano de sua realização ou, se está publicada, o ano de sua última publicação).
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6. Declaro e certifico estar devidamente habilitada a ceder os direitos citados no parágrafo 1 a presente autorização.
7. Obrigo-me a indenizar a UNESCO e a desobrigá-la de toda responsabilidade por todos os prejuízos resultantes de qualquer transgressão da garantia mencionada no parágrafo 6 da presente autorização.
8. Toda contestação ou litígio que poderá advir dos direitos concedidos á UNESCO serão resolvidos de forma amigável. Fica excluído o recurso a tribunais ou á arbitragem.

BARREIRINHAS, 20 DE AGOSTO DE 2018

Assinatura:

Nome: ADRIANO RICARDO DAMATO ROCHA DE SOUZA

Identificação: 296.226.138-88

AUTORIZAÇÃO

1. Eu, Yuri Teixeira Ramos, abaixo assinado e identificado, concordo a título gratuito, por todo o tempo, os direitos legais de propriedade, não exclusivo, de reproduzir e de utilizar no mundo inteiro, conforme os dispositivos do parágrafo 2 da presente autorização, a(s) fotografia(s) e/ou dispositivos descritos no parágrafo.
2. Estou ciente que a(s) fotografia(s) ou dispositivos descritos no parágrafo 4 da presente autorização será (serão) utilizados pela UNESCO para difundir as informações sobre os sítios protegidos com o título da Convenção de Patrimônio Cultural, das seguintes formas.
a) Publicações da UNESCO;
b) Co-edição com editoras privadas para as publicações sobre o patrimônio mundial: uma porcentagem dos benefícios será destinado ao Fundo do Patrimônio Mundial;
c) Cartões postais – vendidos nos sítios protegidos com o título da Convenção de Patrimônio Mundial por intermédio dos serviços dos parques nacionais ou de antiguidades (todos os benefícios eventuais serão repartidos entre os serviços em questão e o fundo do Patrimônio Mundial);
d) Série de dispositivos – vendidos às escolas, bibliotecas e outras instituições e eventualmente nos lugares protegidos (todos o benefício eventual será revertido ao Fundo do Patrimônio Mundial);
e) Exposição, etc.
3. Estou, também ciente de que conservo a liberdade de ceder os mesmo direitos a qualquer outra utilização eventual, porém, sem qualquer prejuízo aos direitos cedidos a UNESCO.
4. A lista da(s) foto(s) e/ou dispositivos autorizados constam de relação anexa (Favor descrever as fotografias no documento com legenda completa para cada uma delas, ano de sua realização ou, se está publicada, o ano de sua última publicação).
5. Toda fotografia ou dispositivo mencionarão o crédito das fotos publicadas. Os direitos do autor serão respeitados. (Pedimos intitular corretamente para o crédito da foto).
6. Declaro e certifico estar devidamente habilitada a ceder os direitos citados no parágrafo 1 a presente autorização.
7. Obrigo-me a indenizar a UNESCO e a desobrigá-la de toda responsabilidade por todos os prejuízos resultantes de qualquer transgressão da garantia mencionada no parágrafo 6 da presente autorização.
8. Toda contestação ou litigio que poderá advir dos direitos concedidos á UNESCO serão resolvidos de forma amigável. Fica excluído o recurso a tribunais ou á arbitragem.

Local, data. Brasília 22/08/2018

Assinatura:

Nome: Yuri Teixeira Ramos

Identificação: CPF 137.152.782-68

7.b Texts relating to protective designation, copies of property management plans or documented management systems and extracts of other plans relevant to the property

The official and complete documentation related to the items 5.b and 5.d is not available in the English or French languages. An executive summary for each of them was presented in the respective item. The nominated property Management Plan contains a summary of the management plans of the Lençóis Maranhenses National Park.

The following board presents the entire management and protection legislation applied to Lençóis Maranhenses National Park, in the three governmental spheres – federal, state and municipal – regarding the natural dimension.

1967 - Federal Law 5.197 / 67- Fauna Protection Law

1981 - Federal Law No. 6,902 / 81 - The creation of the Ecological Stations and Environmental Protection Areas.

1981 - Federal Decree 86,060 / 1981 - Creates the Lençóis Maranhenses National Park

1981 - Federal Law No. 6.938 / 81 - National Environmental Policy

1988 - Federal Law - Brazilian Federal Constitution

1988 - Federal Law n ° 7.661 / 88 - Determines the elaboration of the National Plan of Coastal Management (PNGC)

1988 - Federal Law No. 7.661 / 88 - National Plan of Coastal Management - imposes limits on the use of real states, land, subsoil and water.

2000 - Federal Law 9.985 / 00 - creates the National System of Protected Areas - SNUC.

2003 - IBAMA Ordinance No. 48/03-N-2003 - Institutes the Management Plan of the Lençóis Maranhenses National Park

2004 - Federal Decree 5.300 / 04 - Determines the implementation of the current PNGC version

2005 - Municipal Law n ° 524/2005 - Municipal Master Plan of Barreirinhas

2006 - Federal Decree No. 5.758 / 06 - National Strategic Plan for Protected Areas (PNAP)

2008 - Federal Law nº 11.771 / 08 - National Tourism Policy

2011 - Plano Maior 2020 - Strategic Development Plan for Tourism of the State of Maranhão

2015 - State Law nº 10.316 / 15 - Ecological-Economic Macrozoneamento of the State of Maranhão

2017 - Municipal Law nº 762/17 - Established a system of control of the flows of tourism to the attractions (VOUCHER DIGITAL),

2017 - Ordinance ICMBio nº 199/17 - Establishes norms and procedures for the registration and authorization of onerous use for the provision of the tourist service of conduction of visitors and essential transportation of passengers in vehicles in the area of the PNLM

2018 - Federal Law n ° 13.668 / 18 - Environmental Compensation Law

2018 - National Tourism Plan - http://www.turismo.gov.br/images/mtur-pnt-web2.pdf. Accessed on: July 29, 2018.

7.c Form and date of most recent records or inventory of property

Information on the property is available mainly in the Management Plan of the Lençóis Maranhenses National Park, which gathers information on the limits of the conservation unit and the physical, biological and administrative characteristics. The RADAM project documents (BRAZIL, 1973) also covers property information such as geology, geomorphology, soils and vegetation, as well as maps and photos. The book called "Summer, Winter and the Inverse: Lençóis Maranhenses" (D'Antona, 2002) is important for providing a characterization of time, space and human displacement, counting with more than 200 photographs, as well as maps and figures that show the reality of the site. Other records and inventories on the property can possibly be found in the park office under ICMBIO administration, in museums and inuniversities.

7.d Address where inventory, records and files are located

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5. Barreirinhas Municipal Government:
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6. Primeira Cruz do Maranhão Municipal Government
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7.e. Bibliography

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8.c Other local Institutions

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Municipal Government

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8.d Official Web Address

Lençóis Maranhenses National Park

Official Web address: http://www.icmbio.gov.br/parnalencoismaranhenses/

Visitor Guide Web address: http://www.icmbio.gov.br/parnalencoismaranhenses/guia-do-visitante.html

9. Signature of behalf of the State Party

Annexs

Annex 1

List of plant species in the Lençóis Maranhenses National Park.

Acanthaceae	
Ruellia sp.	Melosa
Anacardiaceae	
Anacardium microcarpum	Cajuí
Anacardium occidentale	Caju
Tapirira guianensis	Pau-pombo
Annonaceae	
Annona muricata	Graviola
Annona sp.	Araticum
Duguetia echinophora	Ameiju
Apocynaceae	
Cataranthus album	
Hancornia speciosa	Mangaba
Himathantus articulatus	Janaúba
Mandevilla subspicata	
Plumeria sp.	Arapuá
Araceae	
Caladium bicolor	
Dieffenbachia mirabilis	
Arecaceae	
Astrocaryum vulgare	Tucum
Cocos nucifera	Coqueiro
Copernicia prunifera	Carnaúba
Mauritia flexuosa	Buriti
Asteraceae	
Calendula oficinalis	
Avicenniaceae	
Avicennia germinans	Siriba
Avicennia schaueriana	Siriba
Bromeliaceae	
Bignoniaceae	
Arrabidaea argentea	Cipó-branco
Crescentia sp.	Cujubeira
Tabebuia serratifolia	Ipê
Bombacaceae	
Pachira aquatica	Mamorana
Boraginaceae	
Cordia sp.	Mata-fome
Burseraceae	
Protium heptaphyllum	Amescla (breu)
Cabombaceae	
Cabomba aff. pyauhiensis	
Cactaceae	
Cereus jamacuru	Mandacaru
Cereus albicaulis	
Caryocaraceae	
Caryocar cf. coriaceum	

Cecropiaceae	
Cecropia sp.	Embaúba
Chenopodiaceae	
Chenopodium ambrosioides	
Chrysobalanaceae	
Chrysobalanus icaco	Guajiru
Chrysobalanus sp.	
Parinari aff. campestris	Pedorreiro
Clusiaceae	
Clusia grandiflora	Orelha-de-onça
Clusia sp.	
Platonia insignis	Bacuri
Vismia sp.	Lacre
Cochlospermaceae	
Cochlospermum sp.	Algodão-brabo
Combretaceae	
Conocarpus erectus	Mangue-de-botão
Laguncularia racemosa	Mangue-branco
Terminalia catapa	Mirindiba
Convolvulaceae	
Ipomoea sp.	Salsa
Cyperaceae	
Cyperus sp.	Capim-agreste
Eleocharis sp.	
Eleocaris cf. interstincta	
Hypolytrum laxum	Tiririca
Scirpus sp.	Junco
Dileniaceae	Curatella americana
Doliocarpus spraguei	
Droseraceae	
Drosera aff. communis	
Eriocaulaceae	
Paepalanthus cf. politrichoides	
Euphorbiaceae	
Euphorbia splendens	
Jatropha gossypifolia	Pião-roxo
Ricinus communis	Mamona
Gentianaceae	
Schultesia stenophylla	
Humiriaceae	
Humiria balsamifera	Mirim
Labiatae	
Coleus blumei	
Leonotis nepetaefolia	
Melissa sp.	Melissa
Cassytha americana	
Leguminosae-Caesalpinioideae	
Cassia alata	
Cassia corymbosa	Fedegoso
Cassia occidentalis	Manjerioba
Cassia rotundifolia	Vassoura-amarela

Cassia tetraphylla	
Cassia tora	
Cassia sp.	Vassoura-embutida
Copaifera sp.	Copaíba
Hymenaea parvifolia	Jatobá
Hymenaea sp.	Pau-roxo
Senna georgica	Besouro
Leguminosae-Mimosoideae	
Abarema cochleata	Ingá-de-macaco
Mimosa sp.	
Parkia sp.	Fava-de-bolota
Stryphnodendron barbatiman	Barbatimão
Leguminosae-Papilionoideae	
Arachis sp.	Amendoim-da-roça
Dioclea aff. virgata	Trepadeira
Indigofera sp.	Anil
Zollernia sp.	Pau-santo
Lentibulariaceae	
Utricularia adpressa	
Utricularia sp.	
Lytraceae	
Cuphea flava	
Cuphea sp.	
Malpighiaceae	
Byrsonima amoena	Murici-pitanga
Byrsonima sp.	Murici
Malvaceae	
Hibiscus rosa-sinensis	
Pavonia sp.	Malva
Sida sp.	Vassourinha
Melastomataceae	
Acisanthera sp.	
Comolia sp.	
Mouriri cearensis	Puça
Mouriri guianensis	Pitanga
Menyanthaceae	
Nymphoides cf. humboldtianum	
Moraceae	
Ficus sp.	Pé-de-figa
Myrtaceae	
Campomanesia aromatica	Guabiraba
Eugenia sp1	Goiabinha
Eugenia sp2	Murta
Myrcia littoralis	
Myrcia sp.	Azeitona
Psidium guajava	Goiaba
Psidium litorale	Pirunga
Nymphaeaceae	
Nymphaea sp.	
Ochnaceae	
Ouratea spruceana	Azeitona

Ouratea sp.	
Onagraceae	
Ludwigia sp.	
Passifloraceae	
Passiflora sp.	Maracujá-do-mato
Poaceae	
Echinochloa colorum	Canarana
Polygalaceae	
Polygala adenophora	Polygala
Polygala sp.	
Polygonaceae	
Coccoloba ramosissima	Creoli
Pontederiaceae	
Eichornia sp.	Aguapé
Rhizophoraceae	
Rhizophora harisonii	Mangue vermelho
Rhizophora mangle	Mangue vermelho
Rubiaceae	
Alibertia sp.	Marmelada
Borreria verticilata	Vassoura-de-botão (pequena)
Borreria sp.	Vassoura-de-botão (grande)
Guettarda angélica	Angélica
Psychotria patens	
Rudgea sp.	Mulatinha-do-campo
Tocoyena sp.	Jenipapo-brabo
Rutaceae	
Citrus limonia	Limãozinho
Sapindaceae	
Talisia sp.	Pitomba
Sapotaceae	
Manilkara sp.	Maçaranduba
Schrophulariaceae	
Veloziella sp.	
Tiliaceae	
Luehea sp.	Açoita-cavalo
Violaceae	
Hybanthus solccolaris	
Vitaceae	
Cissus erosa	Cipó-de-fogo
Xyridaceae	
Xyris sp.	

Annex 2

List of phytoplankton species in the water bodies of the Lençóis Maranhenses National Park.

Bacillariophyceae
Actinella punctata
Actinoptychus annulatus
Actinoptychus senarius
Actinoptychus splendens
Amphora sp.
Asterionellopsis glacialis
Aulacodiscus beeveriae
Aulacodiscus margaritaceus
Aulacoseira sp.
Bacillaria paxillifer
Bacteriastrum delicatulum
Bacteriastrum hyalinum
Bellerochea malleus
Caloneis permagna
Calyptrella robusta
Campylodiscus clypeus
Cerataulus turgidus
Ceratium fusus
Ceratium trichoceros
Ceratium tripos
Chaetoceros atlanticus
Chaetoceros brevis
Chaetoceros coartactus
Chaetoceros didymus
Chaetoceros lorenzianus
Chaetoceros peruvianus
Cocconeis scutellum
Cocconeis sp.
Coscinodiscus oculusirides
Coscinodiscus rothii
Cyclotella meneghiniana
Cyclotella stylorum
Cylindroteca closterium
Diploneis bombus
Diploneis ovalis
Diploneis vacillans
Ditylium brigtwellii
Entomoneis alata
Eunotia binularis
Eunotia didyma
Eunotia dydima
Eunotia flexuosa
Eunotia kurziana
Eunotia praerupta
Eupodiscus antiquus
Eupodiscus radiatus
Fallacia forcipata
Fragilaria sp.
Frickea lewisiana
Frustulia rhomboides
Guinardia striata
Gyrosigma balticum
Hemiaulus membranaceus
Hemiaulus sinensis
Leptocylindrus danicus
Lyrella lyra
Lyrella lyra
Mastogloia braunii1
Navicula abunda
Nitzschia pacifica
Nitzschia sigma
Odontella aurita
Odontella aurita
Odontella aurita
Odontella longicruris
Odontella mobiliensis
Odontella regia
Paralia sulcata
Pinnularia krookii
Pinnularia rupestris
Pinnularia sp.
Proboscia alata
Proboscia alata
Psammodictyon panduriformes
Pseudoanabaena sp.

Pseudosolenia calcar-avis
Pseudo-nitzschia pungens
Rhaphoneis sp.
Rhizosolenia clevei
Rhizosolenia setigera
Rhopalodia gibberula
Skeletonema costatum
Stauroneis sp.
Surirella fastuosa
Surirella fastuosa
Surirella febigerii
Surirella linearis
Synedra ulna
Terpsinoe americana
Terpsinoe musica
Thalassiosira eccentrica
Thalassiosira letopus
Thalassiothrix frauenfeldii
Thalassiothrix nitschioides
Trachneis aspera
Triceratium alternans
Triceratium contortum
Triceratium favus
Triceratium favus var. quadrata
Triceratium reticulum
Cyanophyceae
Anabaena sp.
Aphanothece sp.
Aphanocapsa sp.
Chroococcus sp.
Lyngbya sp.
Merismopedia cf. glauca
Merismopedia tenuissi
Microcystis sp.
Oocystis sp.
Oscillatoria sp.
Chlorophyceae
Ankistrodesmus fusisformis
Arthrodesmus longispinus 1
Botryococcus sp.
Chlamydomonas pseudoelegans1
Chlorella sp.
Chloromonas lateovalis1
Coelastrum sphaericum1
Dimorphococcus lunatus1
Dictiosphaerium Näg sp.1
Eutetramorus fotti
Kirchneriella dianae1
Oocystis sp.
Pediastrum duplex
Pediastrum tetras
Scenedesmus acuminatus1
Scenedesmus quadricauda
Scenedesmus perforatus1
Zygnemaphyceae
Bambusina brebissonii
Bambusina longicollis
Closterium cf. gracille1
Cosmarium sp.1
Cosmarium cf. lagoense1
Cosmarium hammeri1
Cosmarium pyramidatum1
Desmidium baileyi1
Euastrum sp.1
Euastrum ansatum1
Euastrum attenuatum1
Euastrum gemmatum1
Euastrum verrucosum
Gonatozygon pilosum1
Hyalotheca dissilens1
Micrasterias arcuata
Micrasterias arcuata var. robusta
Micraterias furcata
Mougeotia sp.1
Mougeotia sp.2
Mougeotia sp.3
Pleurotaenium cf. minutum1
Pleurotaenium sp.2
Spirogyra sp.
Spondylosium monidiforme1
Spondylosium panduriforme1

Spondylosium sp.3	Dinobryon cf. sertularia1
Staurastrum alternans1	Dinophyceae
Staurastrum rotula1	Peridinium gatunense1
Staurastrum teliferum1	Peridinium umbonatum1
Staurodesmus validus1	Protoperidinium sp.
Triploceras gracile1	Euglenophyceae
Teilingia granulata1	Phacus longicauda1
Willea sp.	Trachelomonas sp.
Zygnema sp.	Ooedegoniophyceae
Chrysophyceae	Oedogonium tapeinosporum1

Annex 4

List of fish species in the Lençóis Maranhenses National Park.

Elasmobranchii	
Carcharhiniformes	
Carcharhinidae	
Carcharhinus porosus (Ranzani, 1840)	Junteiro
Carcharhinus limbatus (Müller & Henle, 1839)	Sacuri de galha preta
Carcharhinus leucas (Müller & Henle, 1839)	Boca redonda
Carcharhinus obscurus (Lesueur, 1818)	Lombo preto
Galeocerdo cuvier (Péron & Lesueur, 1822)	Jaguara
Rhizoprionodon porosus (Poey, 1861)	Figuinho
Rhizoprionodon lalandii (Müller & Henle, 1839)	Figuinho
Isogomphodon oxyrhynchus (Müller & Henle, 1839)	Quati
Sphyrnidae	
Sphyrna tiburo (Linnaeus, 1758)	Cornudo, rudela
Sphyrna lewini (Griffith & Smith, 1834)	Rudela, Panã branco
Sphyrna tudes (Valenciennes, 1822)	Panã amarelo
Rajiformes	
Dasyatidae	
Dasyatis geijskesi (Boeseman, 1948)	Arraia morcego
Dasyatis guttata (Bloch & Schneider, 1801)	Arraia bicuda
Gymnuridae	
Gymnura micrura (Bloch & Schneider, 1801)	Arraia baté
Myliobatidae	
Aetobatus narinari (Euphrasen, 1790)	Arraia pintada

Rhinoptera bonasus (Mitchill, 1815)	Arraia jaburana
Actinopterygii	
Elopiformes	
Elopidae	
Elops saurus (Linnaeus, 1766)	Urubarana
Megalopidae7	
Megalops atlanticus (Valenciennes, 1847)	Camurupim, pirapema
Anguilliformes	
Muraenidae	
Lycodontis funebris (Ranzani, 1840)	Moréia
Gymnothorax ocellatus (Agassiz, 1831)	Moréia
Ophichthidae	
Ophichthus cylindroideus (Ranzani, 1840)	
Clupeiformes	
Clupeidae	
Pellona flavipinnis (Valenciennes, 1836)	Sardinha dourada
Pellona castelnaeana (Valenciennes, 1847)	
Odontognathus mucronatus (Lacepéde, 1800)	
Opisthonema oglinum (Lesuer, 1818)	Sardinha peu
Rhinosardinia amazonica (Steindachner, 1880)	Sardinha de serra, arenque
Engraulidae	
Lycengraulis grossidens (Agassiz, 1829)	
Pterengraulis atherinoides (Linnaeus, 1766)	
Anchovia clupeoides (Swainson, 1839)	Sardinha gulelê
Anchoa spinifer (Valenciennes, 1848)	Sardinha vermelha
Cetengraulis edentulus (Cuvier, 1829)	Sardinha verdadeira
Engraulis eurystole (Swain & Meek, 1855)	
Lycengraulis batesii (Günther, 1868)	
Characiformes	
Curimatidae	
Curimata sp.	
Anostomidae	
Leporinus friderici (Bloch, 1794)	Piau
Erythrinidae	
Hoplias malabaricus (Bloch, 1794)	Traíra
Hoplerythrinus unitaeniatus (Spix & Agassiz, 1829)	Iú, Cabeça-seca
Characidae	
Bryconops melanurus (Bloch, 1794)	João-duro
Astyanax bimaculatus (Linnaeus, 1758)	Piaba
Cheirodon sp.	Piaba

Serrasalmus aff. brandti (Lütken, 1875)	Piranha
Metynnis sp.	Pataca
Acestrorhynchus lacustris (Lütken, 1875)	Flecheira
Siluriformes	
Ariidae	
Arius bonillai (Miles, 1945)	Uriacica
Arius couma (Valenciennes, 1840)	Bagre catinga
Arius grandicassis (Valenciennes, 1840)	Cambéua
Arius herzbergii (Bloch, 1794)	Bagre guribu
Arius parkeri (Traill, 1832)	Gurijuba
Arius proops (Valenciennes, 1840)	Uritinga
Arius quadriscutis (Valenciennes, 1840)	Cangatã
Arius rugispinis (Valenciennes, 1840)	Jurupiranga
Bagre bagre (Linaeus, 1766)	Bagre bandeirado
Cathorops spixii (Agassiz, 1829)	Bagrinho
Auchenipteridae	
Parauchenipterus galeatus (Linnaeus, 1766)	Cangati
Leporinus friderici (Bloch, 1794)	Papista
Heptapteridae	
Pimelodella cristata (Müller & Troschel, 1848)	Mandí
Ageneiosidae	
Ageneiosus sp.	Mandubé
Aspredinidae	
Aspredinichthys tibicen (Temminck, 1840)	Viola
Aspredo aspredo (Linnaeus, 1758)	Viola
Callichthyidae	
Callichthys callichthys (Linnaeus, 1758)	Cascudo
Loricariidae	
Hypostomus cf. verres (Valenciennes, 1840)	Acari bodó
Loricaria cataphracta (Linnaeus, 1758)	Cachimbo
Gymnotiformes	
Sternopygidae	
Sternopygus macrurus (Bloch & Schneider, 1801)	Lamprega
Distocyclus sp.	
Hypopomidae	
Hypopomus sp.	
Aulopiformes	
Synodontidae	
Synodus foetens (Linnaeus, 1766)	Jacaré
Batrachoidiformes	

Batrachoididae	
Batrachoides surinamensis (Bloch & Schneider, 1801)	Pacamão
Thalassophryne nattereri (Steindachner, 1876)	Niquim
Lophiiformes	
Ogcocephalidae	
Ogcocephalus vespertilio (Linnaeus, 1758)	Bacacuá
Atheriniformes	
Atherinidae	
Atherinella brasiliensis (Quoy & Gaimard, 1825)	
Cyprinodontiformes	
Anablepidae	
Anableps anableps (Linnaeus, 1758)	Tralhoto
Beloniformes	
Belonidae	
Strongylura marina (Walbaum, 1792)	Peixe agulha
Strongylura timucu (Walbaum, 1792)	
Syngnathiformes	
Syngnathidae	
Hippocampus sp1	Cavalo –marinho
Hippocampus sp2	Cavalo –marinho
Scorpaeniformes	
Scorpaenidae	
Scorpaena plumieri (Bloch, 1789)	Mangangá
Perciformes	
Centropomidae	
Centropomus parallelus (Poey, 1860)	Camurim branco
Centropomus undecimalis (Bloch, 1792)	Camurim preto
Serranidae	
Diplectrum radiale (Quoy & Gaimard, 1824)	Papa terra
Epinephelus itajara (Lichtenstein, 1822)	Mero
Epinephelus morio (Valenciennes, 1828)	Garoupa
Mycteroperca bonaci (Poey, 1860)	Sirigado
Rypticus randalli (Courtenay, 1967)	Peixe sabão
Pomatomidae	
Pomatomus saltator (Linnaeus, 1766)	Enchova
Rachycentridae	
Rachycentron canadum (Linnaeus, 1766)	Beijupirá
Echeneidae	
Echeneis naucrates (Linnaeus, 1758)	Rêmora
Carangidae	

Caranx crysos (Mitchill, 1815)	Xaréu branco
Caranx hippos (Linnaeus, 1766)	Xaréu
Caranx latus (Agassiz, 1831)	Xaréu
Chloroscombrus chrysurus (Linnaeus, 1766)	Arriba saia
Hemicaranx amblyrhynchus (Cuvier, 1833)	Xixarro
Oligoplites palometa (Cuvier, 1832)	Tibiro amarelo
Oligoplites saurus (Bloch & Schneider, 1801)	Tibiro
Selene vomer (Linnaeus, 1758)	Peixe galo
Trachinotus carolinus (Linnaeus, 1766)	Pampo
Trachinotus falcatus (Linnaeus, 1758)	Pampo
Lutjanidae	
Lutjanus analis (Cuvier, 1828)	Cioba
Lutjanus jocu (Bloch & Schneider, 1801)	Carapitinga
Lutjanus purpureus (Poey, 1876)	Pargo
Lutjanus synagris (Linnaeus, 1758)	Carapitanga
Ocyurus chrysurus (Bloch, 1791)	Guaiúba
Lobotidae	
Lobotes surinamensis (Bloch, 1790)	Crauaçu
Gerreidae	
Diapterus auratus (Ranzani, 1842)	Peixe prata
Diapterus rhombeus (Cuvier, 1829)	Peixe prata
Eucinostomus argenteus (Baird & Girard, 1855)	Escrivão
Eucinostomus gula (Quoy & Gaimard, 1824)	Escrivão
Eucinostomus melanopterus (Bleeker, 1863)	Escrivão
Eugerres brasilianus (Cuvier, 1830)	Carapitanga
Haemulidae	
Pomadasys corvinaeformis (Steindachner, 1868)	Jiquiri branco
Conodon nobilis (Linnaeus, 1758)	Jiquiri amarelo
Genyatremus luteus (Bloch, 1795)	Peixe pedra
Orthopristis ruber (Cuvier, 1830)	Cororoca
Sparidae	
Archosargus probatocephalus (Walbaum, 1792)	Sargo
Sciaenidae	
Bairdiella ronchus (Cuvier, 1830)	Cororoca
Cynoscion acoupa (Lacepede, 1802)	Pescada vermelha
Cynoscion leiarchus (Cuvier, 1830)	Corvina tinga
Cynoscion microlepidotus (Cuvier, 1830)	Corvina açu
Cynoscion steindachneri (Jordan, 1888)	Juruapara
Isopisthus parvipinnis (Cuvier, 1830)	Curvitinga

Macrodon ancylodon (Bloch & Schneider, 1801)	Pescada gó
Menticirrhus americanus (Linnaeus, 1758)	Boca de rato
Micropogonias furnieri (Desmarest, 1823)	Cururuca
Nebris microps (Cuvier, 1830)	Amor sem olho
Ophioscion cf. punctatissimus (Meek & Hildebrand, 1925)	
Sciaena sp.	
Stellifer brasiliensis (Schultz, 1945)	Cabeçudo
Stellifer griseus (Cervigón, 1966)	
Stellifer naso (Jordan, 1889)	Cabeçudo preto
Stellifer rastrifer (Jordan, 1889)	Cabeçudo vermelho
Stellifer stellifer (Bloch, 1790)	Cabeçudo vermelho
Umbrina broussonnetii (Cuvier, 1830)	
Polynemidae	
Polydactylus oligodon (Gunther, 1860)	Barbudo
Polydactylus virginicus (Linnaeus, 1758)	Barbudo
Mugilidae	
Mugil curema (Valenciennes, 1836)	Tainha sajuba
Mugil incilis (Hancock, 1830)	Tainha urixoca
Mugil gaimardianus (Desmarest, 1831)	Tainha pitiu
Mugil trichodon (Poey, 1875)	Tainha
Cichlidae	
Cichlasoma cf. orientale (Kullander, 1983)	Acará-roxo
Crenicichla saxatilis (Linnaeus, 1758)	Jacundá
Crenicihla cf. semifasciata (Heckel, 1840)	Jacundá
Satanoperca jurupari (Heckel, 1840)	Cará-bicudo
Tilapia rendalli (Boulenger, 1897)	Cará-pilatos
Eleotridae	
Guavina guavina (Valenciennes, 1837)	Muré
Gobiidae	
Gobionellus sp.	Muré
Gobioides sp.	
Ephippidae	
Chaetodipterus faber (Broussonet, 1782)	Paru
Trichiuridae	
Trichiurus lepturus (Linnaeus, 1758)	Guaravira
Scombridae	
Scomberomorus brasiliensis (Collette, Russo & Zavala-Camin, 1978)	Serra
Scomberomorus cavalla (Cuvier, 1829)	Cavala
Scomberomorus regalis (Bloch, 1793)	Serra
Sarda sarda (Bloch, 1793)	Bonito

Stromateidae	
Peprilus paru (Linnaeus, 1758)	Canguiro
Pleuronectiformes	
Paralichthyidae	
Citharichthys spilopterus (Günther, 1862)	Solha urumaçara
Etropus crossotus Jordan & Gilbert, 1882	Solha urumaçara
Paralichthys sp.	Linguado
Achiridae	
Achirus lineatus (Linnaeus, 1758)	
Achirus achirus (Linnaeus, 1758)	Solha verdadeira
Trinectes aff paulistanus (Miranda-Ribeiro, 1915)	Solha verdadeira
Cynoglossidae	
Symphurus cf. diomedeanus (Goode & Bean, 1885)	
Symphurus plagusia (Bloch & Schneider, 1801)	Linguado
Tetraodontiformes	
Balistidae	
Balistes vetula (Linnaeus, 1758)	Cangulo
Monacanthidae	
Alutera monoceros (Linnaeus, 1758)	Cangulo
Tetraodontidae	
Colomesus psittacus (Bloch & Schneider, 1801)	Baiacu açu
Lagocephalus laevigatus (Linnaeus, 1758)	Baiacu guará
Sphoeroides greeleyi (Gilbert, 1900)	Baiacu areia
Sphoeroides testudineus (Linnaeus, 1758)	Baiacu pininga
Diodontidae	
Chilomycterus antillarum (Jordan & Rutter, 1897)	Baiacu de espinho
Hyphessobrycon piorskii	
Anablepsoides vieirai (Nielsen, 2016)	
Apistogramma piauiensis (Kullander, 1980)	
Cichlasoma cf. zarskei	
Copella arnol¬di (Regan, 1912)	
Crenicichla brasiliensis (Bloch, 1792)	
Megalechis thoracata (Valenciennes, 1840)	
Nannostomus beckfordi (Günther, 1872)	
Synbranchus marmoratus (Bloch, 1795)	

Annex 5

List of species of reptiles in the Lençóis Maranhenses National Park

Sauria
Sphaerodactylidae
Gonatodes humeralis (Guichenot, 1855)
Gekkonidae
Hemidactylus mabouia (Moreau de Jonnès, 1818)
Gymnophthalmidae
Colobosaura modesta (Reinhardt and Lütken, 1862)
Iguanidae
Iguana iguana (Linnaeus, 1758)
Mabuyidae
Varzea bistriata (Spix, 1825)
Brasiliscincus heathi (Schmidt & Inger, 1951)
Polychrotidae
Polychrus acutirostris (Spix, 1825)
Teiidae
Ameiva ameiva (Linnaeus, 1758)
Ameivula ocellifera (Spix, 1825)
Kentropyx calcarata (Spix, 1825)
Tupinambis teguixin (Linnaeus, 1758)
Tropiduridae
Tropidurus hispidus (Spix, 1825)
Amphisbaenia
Amphisbaenidae
Amphisbaena ibijara (Rodrigues, Andrade & Lima, 2003)
Amphisbaena vermicularis (Wagler, 1824)
Serpentes
Boidae
Boa constrictor (Linnaeus, 1758)
Eunectes murinus (Linnaeus, 1758)
Colubridae
Chironius flavolineatus (Jan, 1863)
Drymarchon corais (Boie, 1827)
Leptophis ahaetulla (Linnaeus, 1758)
Mastigodryas bifossatus (Raddi, 1820)
Oxybelis aeneus (Wagler, 1824)
Oxybelis fulgidus (Daudin, 1803)
Spilotes pullatus (Linnaeus, 1758)

Tantilla melanocephala (Linnaeus, 1758)

Dipsadidae

Helicops angulatus (Linnaeus, 1758)

Hydrodynastes gigas (Duméril, Bribon & Duméril, 1854)

Erythrolamprus poecilogyrus (Wied-Neuwied, 1825)

Erythrolamprus taeniogaster (Jan,1866)

Leptodeira annulata (Linnaeus, 1758)

Lygophis meridionalis (Schenkel, 1902)

Oxyrhopus trigeminus (Duméril, Bibron & Duméril, 1854)

Philodryas nattereri (Steindachner, 1870)

Philodryas olfersii (Lichtenstein, 1823)

Psomophis joberti (Sauvage, 1884)

Taeniophallus occipitalis (Jan, 1863)

Thamnodynastes hypoconia (Cope, 1860)

Xenodon merremii (Wagler, 1854)

Elapidae

Micrurus ibiboboca (Merrem, 1820)

Testudines

Cheloniidae

Chelonia mydas (Linnaeus, 1758)

Dermochelyidae

Dermochelys coriacea (Vandelli, 1761)

Emydidae

Trachemys adiutrix (Vanzolini, 1995)

Crocodylia

Alligatoridae

Caiman crocodilus (Linnaeus, 1758)

Annex 6

List of bird species in the Lençóis Maranhenses National Park.

Tinamiformes	
Tinamidae	
Crypturellus parvirostris	Inhambu-chororó
Crypturellus tataupa	Inhambu-chintã
Pelecaniformes	
Phalacrocoridae	
Phalacrocorax olivaceus	Biguá
Fregatidae	
· Fregata magnificens	Tesourão-magnífico
Ciconiiformes	
Ardeidae	
Casmerodius albus	Garça-branca-grande
Egretta thula	Garçinha-branca
Florida caerulea	Garça-azul
Butorides striatus	Socozinho
Bubulcus ibis	Garça-vaqueira
Tigrisoma lineatum	Socó-boi-ferrugem
Threskiornithidae	
Theristicus caudatus	Curicaca-comum
Mesembrinis cayennensis	Corocoró
Eudocimus ruber	Guará
Cathartidae	
Coragyps atratus	Urubu-preto
Cathartes aura	Urubu-de-cabeça-vermelha
ANSERIFORMES	
Anatidae	
Dendrocygna autumnalis	Marreca-cabocla
Amazonetta brasiliensis	Ananaí
Anas bahamensis	Mareca-toicinho
Falconiformes	
Accipitridae	
Rupornis magnirostris	Gavião-carijó
Heterospizias meridionalis	Gavião-caboclo
Buteogallus aequinoctiallis	Gavião-caranguejeiro
Falconidae	
Micrastur semitorquatus	Falcão-relógio
Mivalgo chimachima	Carrapateiro
Polyborus plancus	Carcará
Galliformes	
Cracidae	
Penelope superciliaris	Jacu
GRUIFORMES	

Rallidae	
Aramides cajanea	Siricora
Cariamidae	
Cariama cristata	Seriema
Charadriiformes	
Jacanidae	
Jacana jacana	Jaçanã
Haematopodidae	
Haematopus palliatus	Piru-piru
Charadriidae	
Vanellus chilensis	Quero-quero
· Charadrius semipalmatus	Batuíra
· Charadrius collaris	Batuíra-de-coleira
· Charadrius wilsonia	Batuíra-bicuda
· Arenaria interpres	Vira-pedra
· Pluvialis squatarola	Batuíra-cinzenta
Scolopacidae	
· Calidris canutus	Ruiva
· Calidris minutilla	Maçariquinho
· Calidris pusilla	Maçarico-miúdo
· Calidris alba	Maçarico-branco
· Numenius phaeopus	Maçarico-galego
· Actitis macularia	Maçarico-pintado
·Catoptrophorus semipalmatus	Maçarico-de-asa-branca
· Limnodromus griseus	Maçarico-de-costa-branca
· Tringa melanoleuca	Maçarico-tititiu
· Tringa flavipes	Maçarico-de-perna-amarela
Recurvirostridae	
Himantopus himantopus	Pernalonga-comum
Laridae	
Larus atricilla	Gaivota-alegre
Larus cirrocephalus	Gaivota-de-cabeça-cinza
Sterna nilotica	Trinta-réis-de-bico-preto
Phaetusa simplex	Trinta-réis-grande
Rynchopidae	
Rynchops niger	Talha-mar
Columbiformes	
Columbidae	
Columba cayennensis	Pomba-galega
Columbina talpacoti	Rolinha
Leptotila verreauxi	Juriti
Psittaciformes	
Psittacidae	
Ara nobilis	Maracanã-pequena
Aratinga solstitialis	Jandaia-verdadeira
Pyrrhura perlata	Tiriba-pérola

Amazona aestiva	Papagaio
Cuculiformes	
Cuculidae	
Crotophaga major	Anum-coroca
Crotophaga ani	Anum-preto
Guira-guira	Anum-branco
Piaya cayana	Alma-de-gato
Strigiformes	
Tytonidae	
Tyto alba	Suindara
Strigidae	
Glaucidium brasilianum	Caburé
Speotyto cunicularia	Coruja-buraqueira
Apodiformes	
Trochilidae	
Campylopterus largipennis	Asa-de-sabre-cinza
Thalurania furcata	Beija-flor-de-barriga-violeta
Coraciformes	
Alcedinidae	
Ceryle torquata	Martim-pescador-grande
Chloroceryle amazona	Martim-pescador-verde
Momotidae	
Momotus momota	Udu-coroado
Piciformes	
Galbulidae	
Galbula ruficauda	Ararimba-de-cauda-ruiva
Bucconidae	
Nystalus maculatus	Chilu-chilu
Ramphastidae	
Pteroglossus inscriptus	Araçari-letrado
Pteroglossus bitorquatus	Araçari-de-nuca-vermelha
Ramphastus toco	Tucanuçu
Picidae	
Piculus chrysochlorus	Picapau-da-copa
Celeus flavescens	Picapau-velho
Celeus flavus	Picapau-amarelo
Veniliornis affinis	Picapau-de-asa-vermelha
Passeriformes	
Suboscines	
Furnariidae	
Furnarius leucopus	Amassa-barro
Formicariidae	
Taraba major	Choró-boi
Thamnophilus punctatus	Choca-bate-rabo
Formicivora grisea	Formigueiro-pardo
Pyriglena leuconota	Olho-de-fogo-selado

Sclateria naevia	Formigueiro-do-igarapé
Pipridae	
Chiroxiphia pareola	Tangará-de-costa-azul
Manacus manacus	Rendeira-branca
Neopelma pallescens	Fruchu-do-cerradão
Tyrannidae	
Fluvicola nengeta	Lavadeira-mascarada
Tyrannus melancholicus	Suiriri-tropical
Pitangus sulphuratus	Bem-te-vi
Casiornis fusca	Maria-enxofre
Myarchus swainsoni	Maria-irré
Myarchus sp.	
Elaenia sp.	
Oscines	
Hirundinidae	
Tachycineta albiventer	Andorinha-do-rio
Corvidae	
Cyanocorax cyanopogon	Gralha-cancã
Mimidae	
Mimus gilvus	Sabiá/tejo-da-praia
Turdidae	
Turdus rufiventris	Sabiá-laranjeira
Motacillidae	
Anthus lutescens	Caminheiro-zumbidor
Icteridae	
Cacicus cela	Japiim-xexéu
Gnorimopsar chopi	Pássaro-preto
Icterus cayanensis	Encontro
Leistes militaris	Polícia-inglesa-do-norte
Thraupidae	
Thraupis episcopus	Pipira-azul
Thraupis palmarum	Pipira-verde
Ramphocelus carbo	Pipira-vermelha
Tachyphonus rufus	Pipira-preta
Nemosia pileata	Saíra-de-chapéu-preto
Schistochlamys melanopis	Pipira-cinza
Fringilidae	
Oryzoborus angolensis	Curió
Ammodramus humeralis	Tico-tico-do-campo

· Espécie migratória

Annex 7

List of mammal species in the Lençóis Maranhenses National Park.

Didelphidae	
Didelphis albiventris	Mucura
Myrmecophagidae	
Tamandua tetradactyla	Mambira
Bradypodidae	
Bradypus variegatus	Preguiça
Dasypodidae	
Euphractus sexcinctus	Tatu-peba
Cebidae	
Cebus apella	Macaco-prego
Canidae	
Cerdocyon thous	Raposa
Procyonidae	
Procyon cancrivorus	Guaxinim
Mustelidae	
Lontra longicaudis	Lontra
Felidae	
Leopardus tigrinus	Pintadinho, gato-do-mato
Herpailurus yagouaroundi	Gato-mourisco/preto/vermelho
Delphinidae	
Sotalia fluviatilis	Boto
Trichechidae	
Trichechus manatus	Peixe-boi
Tayassuidae	
Tayassu tajacu	Caititu
Cervidae	
Mazama gouazoubira Veado-catingueiro	Veado-catingueiro
Dasyproctidae	
Dasyprocta prymnolopha	Cutia
Agoutidae	
Agouti paca	Paca
Caviidae	
Galea spixii	Preá

Annex 8

List of insect species in the Lençóis Maranhenses National Park.

Hymenoptera

Anthophila

Apis mellifera

Melipona ruviventris

Melipona compressipes

Melipona subnitida

Trigona fulcipennis

Centris flavivrons

Ptilotopus sp.

Centris leprieuri

Centris aenea

Centris tarsata

Centris trigonoides

Centris byrsonimae

Centris frontalis

Centris sp1

Centris sp2

Centris sp3

Centris sp4

Xylocopa carbonaria

Xylocopa frontalis

Mesoplia sp.

Centris caxiensis (Ducke, 1907)

Centris tarsata (Smith, 1874)

Centris sponsa (Smith, 1854)

Centris longimana (Fabricius, 1804)

Epicharis umbraculata (Fabricius, 1804)

Centris analis (Fabricius, 1804)

Paratetrapedia globulosa (Friese, 1899)

Trigona fulviventris (Guérin, 1835)

Trigonisca extrema

Melipona flavolineata (Friese, 1900)

Melipona flavolineata (Friese, 1900)

Xylocopa cearensis (Ducke, 1910)

Eulaema cingulata

Euglossa cordata

Eufriesea nigrescens

Eufriesea ornata

Eulaema nigrita

Euglossa modestior

Eufriesea surinamensis

Eufriesea superba

Euglossa chalybeata

Euglossa gaianii

Euglossa liopoda

Euglossa melanotricha

Euglossa fimbriata

Eulaema meriana

Diptera

Ceratopogonidae

Culicoides filariferus (Hoffman, 1939)

Culicoides ignacioi (Forattini, 1957)

Culicoides insignis (Lutz, 1913)

Culicoides leopoldoi (Ortiz, 1951)

Culicoides boliviensis (Spinelli & Wirth, 1984)

Culicoides foxi (Ortiz, 1950)

Culicoides paucienfuscatus (Barbosa, 1947)

Culicoides travassosi (Forattini, 1957)

Culicoides guyanensis (Floch & Abonnenc, 1942)

Culicoides sp.

Culicoides aitkeni (Wirth & Blanton, 1968)

Culicoides fernandoi (Tavares & Sousa, 1978)

Culicoidesparaensis (Goeldi, 1905)

Psychodidae

Lutzomyia whitmani (Antunes & Coutinho, 1939)

Lutzomyia longipalpis (Lutz &Neiva, 1912)

Lutzomyia lenti (Mangabeira, 1938)

Lutzomyia sordellii (Shannon & Del Ponte, 1927)

Lutzomyia flaviscutellata (Mangabeira Fo, 1942)

Lutzomyia evandroi (Costa Lima & Antunes, 1936)

Lutzomyiatermitophila (Martins, Falcão & Silva, 1964)

Lutzomyia intermedia (Lutz & Neiva, 1912)

Lutzomyia wellcomei (Fraiha, Shaw & Lainson, 1971)

Hemiptera

Reduviidae

Eratyrus mucronatus

Panstrongylus diasi

Panstrongylus lignarius

Panstrongylus geniculatus

Psammolestes tertius

Rhodnius nasutus

Rhodnius neglectus

Rhodnius pictipes

Rhodnius robustus

Triatoma rubrofasciata

Annex 09

Maps

Annex 11

Management plan - see Vol. II