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APENDICE 3

Geología y Tipos de Suelo

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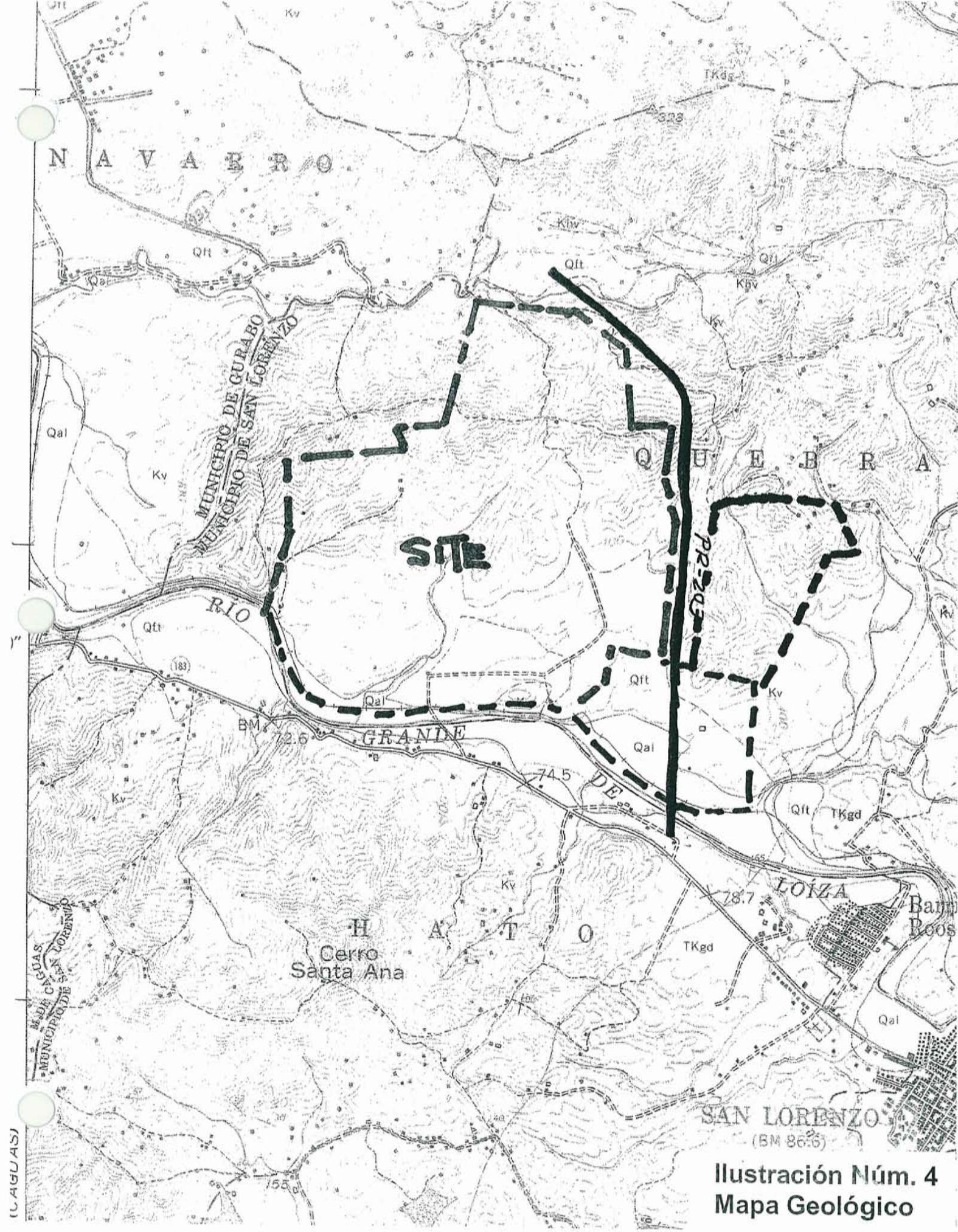


Ilustración Núm. 4
Mapa Geológico

a. Tipos de suelo (Ilustración Núm. 3)

Conforme a los mapas del Servicio de Conservación de Suelos Federal, los suelos en el área del proyecto están representados por los siguientes tipos:

CaF (Caguabo clay loam, 40 to 60 percent slope)

JuC (Juncos clay 5 to 12 percent slope)

MaB (Mabi clay 2 to 5 percent slope)

MaC (Mabi clay 5 to 12 percent slope)

MxD (Mucara clay 12 to 20 percent slope)

MxE (Mucara clay 20 to 40 percent slope)

MxF (Mucara clay 40 to 60 percent slope)

Vv (Vivi loam)

Ilustración Num 3

Mapa de Suelos

Removal of vegetation should be held to a minimum, temporary plant cover established quickly in denuded areas. Capability subclass VIIc.

CaF—Caguabo clay loam, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes and mountaintops of strongly dissected uplands. Slopes are 400 to 800 feet long. The areas range from 20 to 2000 acres.

Typically the surface layer is dark grayish brown, friable clay loam about 4 inches thick. The next layer is about 5 inches thick; it is brown, friable very gravelly clay loam. The substratum, beginning at a depth of 10 inches, is a mixture of weathered and partially weathered volcanic rocks. Consolidated rock is at a depth of 16 inches.

Included with this soil in mapping are small areas of Mucara and Naranjito soils and a few spots that have many boulders and stones on the surface. The surface layer of the Mucara soils is very dark grayish brown clay, and that of the Naranjito soils is dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and shallow. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The soil is fertile but has a shallow root zone. Controlling erosion is the major concern of management.

This soil has been used for tobacco and food crops such as sweet potatoes, bananas, and coffee. It is best suited, however, to pangolagrass and stargrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and eucalyptus trees. Production of Honduras pine is low, about 700 to 800 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep, shallow, and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIc.

CbF—Caguabo-Rock outcrop complex, 40 to 60 percent slopes. This complex consists of very steep, well drained soils and Rock outcrop on side slopes and narrow ridges. The areas range from 10 to 500 acres. The complex is about 60 percent Caguabo clay loam and 40 percent Rock outcrop and other minor soils. Caguabo and Rock outcrop form such an intricate pattern that they are not separated in mapping.

In a representative profile of Caguabo clay loam the surface layer is about 3 inches thick. The next layer, about 5 inches thick, is brown, friable very gravelly clay loam. It is underlain by a mixture of weathered and partially weathered volcanic rocks. Volcanic bedrock is at a depth of 10 to 20 inches.

Included with this soil complex in mapping are spots of deeper soils that formed between the rock outcrops. Also included are some areas of severely eroded Caguabo soils that have a thin surface layer of brown to dark grayish brown clay loam. These soils are on ridgetops.

Permeability is moderate in the Caguabo soil, and the available water capacity is low. The root zone is shallow. Tilth is fair to poor. Surface runoff is very rapid. In unlimed areas the soil is slightly acid.

The vegetation is shrubs, brush, and grass. This complex is not suited to cultivated crops. The potential for pasture is low. The Caguabo soil is suited to Honduras pine and eucalyptus trees. Production of Honduras pine is low, about 700 board feet per acre per year. The hazard of erosion and the limitations on the use of equipment are moderate. Logging roads, skid trails, and machine plantings should be on the contour to help control erosion. The use of equipment is restricted mainly by the very steep slopes and the many rock outcrops.

This complex is poorly suited to most urban uses, mainly because of the very steep slopes and shallow depth to the volcanic rock, which is at a depth of 10 to 20 inches. Most of the areas are subject to slides. Erosion is a severe hazard in areas not protected by vegetative cover. In areas that are used as construction sites, development should be on the contour. Removal of vegetative cover should be held to a minimum, and plant cover established quickly on denuded areas. Capability subclass VIIc.

Ce—Candelero loam. This is a gently sloping, somewhat poorly drained soil on terraces, alluvial fans, and foot slopes. Slopes are undulating and are 100 to 800 feet long. The areas range from 30 to 100 acres.

Typically the surface layer is dark grayish brown loam about 6 inches thick. The subsoil from 6 inches to a depth of 35 is mainly dark brown, dark gray, and very dark gray, firm sandy clay loam mottled with yellowish brown, greenish gray, and brownish yellow. From 35 inches to a depth of 60 inches, the subsoil is brownish yellow and yellowish brown, firm sandy clay mottled with gray, greenish gray, and yellowish red.

Included with this soil in mapping are small areas of Cayagua soils. The surface layer of the Cayagua soils is dark grayish brown sandy loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is medium. This soil is difficult to work due to wetness and the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, Merker grass, and paragrass.

This complex is limited for most urban uses because the soils are steep to very steep and rocky. Capability subclass VIIc.

Hydraquents, saline. These are nearly level, very poorly drained soils in lagoonlike places and in depressions adjacent to the coast. The areas range from 20 to 100 acres. These soils are covered with brackish water most of the year and are frequently flooded.

Color and texture vary throughout the profile of the soil. The underlying material ranges from sand to clay.

Permeability is very slow, and the available water capacity is very high. Runoff is very slow. Reclamation is very difficult and costly.

These soils support mangrove trees and other halophytic vegetation most of the time. They have severe limitations for most urban uses because they are very poorly drained and are subject to frequent overflow. Capability subclass VIIIw.

JaE2—Jagueyes loam, 20 to 40 percent slopes, eroded. This is a steep, well drained soil on side slopes and narrow ridgetops. Slopes are 100 to 500 feet long. The areas range from 10 to 100 acres.

Typically the surface layer is dark yellowish brown, friable loam about 5 inches thick. The subsoil is about 49 inches thick; it is yellowish red and red, friable clay loam to a depth of 41 inches. From 41 to 54 inches, it is red, friable sandy clay loam mottled with brownish yellow and light gray. The substratum, beginning at a depth of 54 inches, is yellowish red, friable, sandy clay loam saprolite.

Included with this soil in mapping are small areas of Jagueyes and Limones soils. Also included on some hilltops are areas of Jagueyes soils where slopes are less than 20 percent. The surface layer of the Lirios soil is brown silty clay loam, and that of the Limones soil is dark yellowish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is low. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for taniens and plantains. It is suited to pangolagrass, improved bermudagrass, Merker grass, and molasses grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine. Production of Honduras pine is moderate, about 1200 board feet per acre per year. The hazard of erosion and limitations on the use of logging equipment are the major concerns of management.

Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

JnD2—Juncal clay, 5 to 20 percent slopes, eroded. This is a sloping to moderately steep, moderately well drained soil on foot slopes and low rounded hills. Slopes are concave and are 100 to 200 feet long. The areas range from 10 to 100 acres.

Typically the surface layer is dark grayish brown, firm clay about 10 inches thick. The subsoil is about 38 inches thick; it is dark yellowish brown, yellowish brown, and brownish yellow, firm clay. The substratum, beginning at a depth of 48 inches, is brownish yellow, friable silty clay loam.

Included with this soil in mapping are small areas of Colinas soils. The surface layer of the Colinas soils is dark brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium, and erosion is a hazard. This soil is difficult to work because it is sloping to moderately steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond to heavy applications of fertilizers. Controlling erosion is the major concern of management.

This soil has been used for yams, taniens, and pigeon peas. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

Proper stocking rates and grazing of pasture, as well as fertilizing, are chief management needs.

This soil is suited to Honduras pine and Honduras mahogany. Production of Honduras pine is moderate, about 1200 board feet per acre per year. The hazard of erosion is the major concern of management. All logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is sloping to moderately steep. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

JuC—Juncos clay, 5 to 12 percent slopes. This is a sloping, moderately well drained soil on side slopes and foot slopes of strongly dissected uplands. Slopes are 100 to 500 feet long. The areas range from 5 to 100 acres.

Typically the surface layer is black, firm clay about 8 inches thick. The subsoil is about 10 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 18 inches, is olive brown, firm clay. Volcanic rock is at a depth of 40 inches.

Included with this soil in mapping are spots of Mabi soils. The surface layer of the Mabi soils is very dark grayish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is moderate in this soil. Runoff is medium, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because of stickiness and plasticity of clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers. Controlling erosion is the major concern of management.

This soil has been used for coffee, taniens, plantains, and pigeon peas. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Eucalyptus robusta, and Honduras mahogany. Production of Honduras pine is moderate, about 1000 board feet per acre per year. The hazard of erosion is the major concern of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because of slope, its clayey nature, and a high shrink-swell potential. If the soil is used as construction sites, development should be on the contour. Removal of the vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

JuD—Juncos clay, 12 to 20 percent slopes. This is a moderately steep, moderately well drained soil on side slopes and foot slopes of strongly dissected uplands. Slopes are 100 to 300 feet long. The areas range from 5 to 100 acres.

Typically the surface layer is black, firm clay about 8 inches thick. The subsoil is about 10 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 18 inches, is olive brown, firm clay. Volcanic rock is at a depth of 40 inches.

Included with this soil in mapping are spots of Mabi and Mucara soils. The surface layer of the Mabi and Mucara soils is very dark grayish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because of the slope and the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers. Controlling erosion is the major concern of management.

This soil has been used for coffee, taniens, plantains, and pigeon peas. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Eucalyptus robusta, and Honduras mahogany. Production of Honduras pine is moderate, about 1000 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because of slope, its clayey nature, and a high shrink-swell potential. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

LaB—Lares clay, 2 to 5 percent slopes. This is a gently sloping, somewhat poorly drained soil on terraces. Slopes are smooth and are 200 to 800 feet long. The areas range from 50 to 500 acres.

Typically the surface layer is dark brown, firm clay about 6 inches thick. The subsoil is about 30 inches thick; it is red and yellowish red, firm clay. The substratum, beginning at a depth of 36 inches, is brownish yellow, red, very pale brown, and dark yellowish brown, firm clay.

Included with this soil in mapping are spots of Daguey soils. The surface layer of the Daguey soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for sugarcane, plantains, and coffee. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Honduras mahogany, kadam, mahoe, and Eucalyptus robusta. Production of Honduras pine is moderate, about 1300 board feet per acre per year. The hazard of erosion is slight, and the limitations for the use of equipment is moderate.

This soil is limited for most urban uses because it is too clayey. Removal of vegetation should be held to a minimum, and a temporary plant cover established quickly in denuded areas. Capability subclass IIe.

LaC2—Lares clay, 5 to 12 percent slopes, eroded. This is a sloping, somewhat poorly drained soil on terraces. Slopes are smooth and are 200 to 800 feet long. The areas range from 50 to 500 acres. This soil has lost much of its original surface layer through erosion.

cluded are spots of Consumo soils. The surface layer of Consumo soils is reddish brown clay. These soils make up 20 percent of this mapping unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for coffee and bananas.

This soil is suited to Honduras pine and Eucalyptus robusta. Production of Honduras pine is low, about 1000 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of plant seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and every plant cover established quickly in denuded areas. Capability subclass VIIe.

MaA—Mabi clay, 0 to 2 percent slopes. This is a nearly level, somewhat poorly drained soil on alluvial fans and terraces above the river flood plains. Slopes are smooth and are 100 to 300 feet long. The areas range from 10 to 50 acres.

Typically the surface layer is very dark grayish brown, very firm clay about 7 inches thick. The subsoil is about 7 inches thick; it is dark yellowish brown and yellowish brown, very firm clay mottled with gray. The substratum, beginning at a depth of 24 inches, is yellowish brown, very firm clay mottled with gray and greenish gray.

Included with this soil in mapping are small areas of Montegrando soils. The surface layer of the Montegrando soils is very dark grayish brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of the high shrink-swell potential (fig. 9) and the flood hazard. Capability subclass IIw.

MaB—Mabi clay, 2 to 5 percent slopes. This is a gently sloping, somewhat poorly drained soil on alluvial fans and terraces above the river flood plains. Slopes are gently undulating and are 100 to 300 feet long. The areas range from 10 to 100 acres.

Typically the surface layer is very dark grayish brown, very firm clay about 7 inches thick. The subsoil is about 17 inches thick; it is dark yellowish brown and yellowish brown, very firm clay mottled with gray. The substratum, beginning at a depth of 24 inches, is yellowish brown, very firm clay mottled with gray and greenish gray.

Included with this soil in mapping are small areas of Montegrando soils. The surface layer of the Montegrando soils is very dark grayish brown clay. These soils make up 10 to 20 percent of the areas of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is limited for most urban uses because of the high shrink-swell potential and the flood hazard. Capability subclass IIw.

MaC—Mabi clay, 5 to 12 percent slopes. This is a sloping, somewhat poorly drained soil on alluvial fans and terraces above the river flood plains. Slopes are undulating and are 100 to 200 feet long. The areas range from 10 to 50 acres.

Typically the surface layer is very dark grayish brown, very firm clay about 7 inches thick. The subsoil is about 17 inches thick; it is dark yellowish brown and yellowish brown, very firm clay mottled with gray. The substratum, beginning at a depth of 24 inches, is yellowish brown, very firm clay mottled with gray and greenish gray.

Included with this soil in mapping are small areas of Montegrando soils. The surface layer of the Montegrando soils is very dark grayish brown clay. These soils make up 20 percent of this mapping unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is high. Crops respond well to heavy applications of fertilizers.

This soil has been used for sugarcane. It is suited to pangolagrass, improved bermudagrass, and Merker grass.

Proper stocking rates and deferred grazing, as well as fertilizing, are chief management needs.

This soil is limited for most urban uses because of the high shrink-swell potential and the flood hazard. Capability subclass IIIe.

Md—Made land. Made land consists of areas that have been covered with gravel, rock, concrete blocks, and other debris. It has been built up for industrial uses and is not suited to farming.

concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is very steep and subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

MxD—Mucara clay, 12 to 20 percent slopes. This is a moderately steep, well drained soil on foot slopes, side slopes, and rounded hilltops of strongly dissected uplands. Slopes are irregular and are 300 to 800 feet long. The areas range from 20 to 100 acres.

Typically the surface layer is very dark grayish brown, firm clay about 5 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 12 inches, is highly weathered volcanic rock. Bedrock is at a depth of 30 inches.

Included with this soil in mapping are spots of Juncos and Naranjito soils. The surface layer of the Juncos soils is black clay, and that of the Naranjito soils is brown to dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is moderately steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. This soil is fertile. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as coffee, tanners, plantains, and pigeon peas. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Eucalyptus robusta, and Honduras mahogany. Production of the Honduras pine is low, about 1000 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is moderately steep. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

MxE—Mucara clay, 20 to 40 percent slopes. This is a steep, well drained soil on side slopes and rounded hilltops of strongly dissected uplands. Slopes are irregular and are 200 to 1000 feet long. The areas range from 100 to 500 acres. A few shallow and deep gullies have formed.

Typically the surface layer is very dark grayish brown, firm clay about 5 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 12 inches, is highly weathered volcanic rock. Bedrock is at a depth of 30 inches.

Included with this soil in mapping are spots of Caguabo and Naranjito soils. Also included are some hilltops that have many rocks and boulders on the surface. The surface layer of the Caguabo soils is dark grayish brown clay loam, and that of the Naranjito soils is brown to dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. The soil is fertile. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs. This soil is suited to Honduras pine and Eucalyptus robusta. Production of Honduras pine is low, about 900 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is steep and is shallow to rock. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIe.

MxF—Mucara clay, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes and rounded hilltops of strongly dissected uplands. Slopes are irregular and are 100 to 800 feet long. The areas range from 100 to 1000 acres. A few shallow and deep gullies have formed.

Typically the surface layer is very dark grayish brown, firm clay about 5 inches thick. The subsoil is about 7 inches thick; it is dark brown, firm clay. The substratum, beginning at a depth of 12 inches, is highly weathered volcanic rock. Bedrock is at a depth of 30 inches.

Included with this soil in mapping are spots of Caguabo and Naranjito soils. Also included are some hilltops that

have many rocks and boulders on the surface. The surface of the Caguabo soils is dark grayish brown clay and that of the Naranjito soils is brown to dark brown silty clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is very rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. This soil is fertile. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass.

Proper stocking rates and grazing of pasture, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta. Production of Honduras pine is low, about 900 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of plant seedlings.

This soil is limited for most urban uses because it is steep and it is shallow to rock. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIe.

NaD2—Naranjito silty clay loam, 12 to 20 percent slopes, eroded. This is a moderately steep, well drained soil on strongly dissected volcanic uplands. Slopes are irregular and are 100 to 500 feet long. The areas range from 20 to 200 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is brown to dark brown, friable silty clay loam about 4 inches thick. The subsoil is about 20 inches thick; it is reddish brown and yellowish red firm clay. The substratum, beginning at a depth of 24 inches, is variegated yellowish red, red, and light yellowish brown, friable, clay loam saprolite. Bedrock is at a depth of 40 inches.

Included with this soil in mapping are spots of Mucara and Consumo soils. The surface layer of the Mucara soils is very dark grayish brown clay and that of the Consumo soils is reddish brown clay. These soils make up 10 to 20 percent of the areas of this mapping unit.

Permeability and the available water capacity are moderate in this soil. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is very steep. Hillside ditches and diversions are dif-

icult to lay out, establish, and maintain. The root zone is moderately deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as plantains and bananas. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine, Honduras mahogany, kadam, mahoe, and Eucalyptus robusta trees. Production of Honduras pine is moderate, about 1100 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soil is soft and slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of planted seedlings.

This soil is limited for most urban uses because it is moderately steep and is subject to landslides. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IVe.

NaE2—Naranjito silty clay loam, 20 to 40 percent slopes, eroded. This is a steep, well drained soil on strongly dissected uplands. Slopes are irregular and are 100 to 400 feet long. The areas range from 50 to 100 acres. This soil has lost most of its original surface layer through erosion. A few shallow and deep gullies have formed.

Typically the surface layer is brown to dark brown, friable silty clay loam about 4 inches thick. The subsoil is about 20 inches thick; it is reddish brown and yellowish red, firm clay. The substratum, beginning at a depth of 24 inches, is variegated yellowish red, red, and light yellowish brown, friable, clay loam saprolite.

Included with this soil in mapping are spots of Mucara and Caguabo soils. The surface layer of the Mucara soils is very dark grayish brown clay, and that of the Caguabo soils is dark grayish brown clay loam. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to lay out, establish, and maintain. The root zone is moderately deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

very dark grayish brown clay, and that of the Rio Arriba soils is brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability and the available water capacity are moderate. Runoff is medium, and erosion is a hazard. This soil is difficult to work because of the stickiness and plasticity of the clay. The root zone is deep. Natural fertility is medium. Crops respond well to heavy applications of lime and fertilizers. Controlling erosion is the major concern of management.

This soil has been used for crops such as sugarcane. It is suited to pangolagrass and Merker grass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil has moderate to severe limitations for most urban uses because of slope, seepage, and its clayey nature. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass IIIe.

Vv—Vivi loam. This is a nearly level, somewhat excessively drained soil on river flood plains. The areas range from 10 to 100 acres.

Typically the surface layer of this soil is dark brown, very friable loam about 9 inches thick. The subsoil is about 13 inches thick; it is dark yellowish brown, friable loam. The substratum, beginning at a depth of 22 inches, is dark yellowish brown loam from 22 inches to 34 inches, yellowish brown, very friable very fine sandy loam from 34 to 47 inches, and yellowish brown loamy sand from 47 to 58 inches.

Included with this soil in mapping are spots of Reilly soils. The surface layer of the Reilly soils is dark brown sandy loam. These soils make up 10 to 20 percent of the areas of this mapping unit.

Permeability is rapid, and the available water capacity is low. This soil is fertile and is easily worked. The root zone is deep. Crops respond well to heavy applications of lime and fertilizers and to irrigation.

This soil has been used for sugarcane.

This soil is limited for most urban uses because of the flood hazard and seepage. Capability subclass IIc.

YeE—Yunes silty clay loam, 20 to 40 percent slopes. This is a steep, well drained soil on side slopes of strongly dissected uplands. The slopes are irregular and are 100 to 300 feet long. The areas range from 20 to 300 acres. A few shallow and deep gullies have formed.

Typically the surface layer is dark reddish brown, friable silty clay loam about 2 inches thick. The subsoil is about 14 inches thick; it is dark brown and brown, friable very shaly silty clay loam. Below a depth of 16 inches is bedded fragmental shale. The beds are 1 to 4 inches thick. The shale is light red, strong brown, and pink.

Included with this soil in mapping are spots of Rio Piedras soils. The surface layer of the Rio Piedras soils is dark brown clay. These soils make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is not suited to cultivated crops because it is steep and shallow to bedded shale. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is very low, about 700 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion. The use of logging equipment is restricted at times because the soils are slippery when wet. Brush removal, careful hand planting, and fertilizing increase the survival of seedlings.

This soil is limited for most urban uses because it is steep and subject to landslides. If the soil is used for construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover established quickly in denuded areas. Capability subclass VIIc.

YeF—Yunes silty clay loam, 40 to 60 percent slopes. This is a very steep, well drained soil on side slopes of strongly dissected uplands. The slopes are irregular and are 100 to 300 feet long. The areas range from 30 to 250 acres. A few shallow and deep gullies have formed.

Typically the surface layer is dark reddish brown, friable silty clay loam about 2 inches thick. The subsoil is about 14 inches thick; it is dark brown and brown, friable very shaly silty clay loam. Below a depth of 16 inches is bedded fragmental shale. The beds are 1 to 4 inches thick. The shale is light red, strong brown, and pink.

Included with this soil in mapping are spots of Yunes soils with less than 40 percent slopes. Also included are a few small areas on tops of hills and along drainageways where the bedded shale is exposed. These soils and areas of shale make up 10 to 20 percent of this mapping unit.

Permeability is moderate, and the available water capacity is low. Runoff is rapid, and erosion is a hazard. Slippage is common in roadbanks, ditches, and drainageways. This soil is not suited to cultivated crops because it is very steep and shallow to bedded shale. Controlling erosion is the major concern of management.

This soil has been in brush and brushy pasture most of the time. It is suited to pangolagrass.

Proper stocking rates and deferred grazing, as well as liming and fertilizing, are chief management needs.

This soil is suited to Honduras pine and Eucalyptus robusta trees. Production of Honduras pine is low, about 700 board feet per acre per year. The hazard of erosion and limitations on the use of equipment are the major concerns of management. Logging roads, skid trails, and planting should be on the contour to help control erosion.

APENDICE 4
Estudio Arqueológico