APPENDIX F

Archeological Study (Phase 1A-B)

November 2010

Environmental Impact Statement – Preliminary

Renewable Power Generation and Resources Recovery Plant

BARRIO CAMBALACHE OF ARECIBO

EnergyAnswers Arecibo

ARCHEOLOGICAL ASSESSMENT REPORT
PHASE IA-IB

RENEWABLE POWER GENERATION AND RESOURCE RECOVERY PLANT

ROAD PR-2, KM 72.8, CAMBALACHE WARD
ARECIBO, PUERTO RICO

PREPARED FOR

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RENEWABLE POWER GENERATION AND RESOURCE RECOVERY PLANT

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INTRODUCTION

This report shows the results of the Archaeological Assessment Phase IA-IB, for the site intended for the construction of a Renewable Power Generation and Resource Recovery Plant, on a property located at Road PR-2, km 72.8, Cambalache Ward in the Municipality of Arecibo (see Figure 1).

The Project is located on a property measuring approximately 81.30255 *cuerdas* with the following boundaries: to the East, Road PR-2; to the South a lot belonging to the Puerto Rico Land Authority; and West, the right-of-way for the *Rio Grande de Arecibo* (see map at end of this report).

This report is prepared for CSA Group, in accordance with Section 10 of Law 112 of July 20, 1988, also known as the Terrestrial Archeology Act of Puerto Rico, and Section 106 of the National Historic Preservation Act and the Code of Federal Regulations (36CFR), Title 36. However, the Archeology and Ethnohistory Program of the Institute of Puerto Rican Culture, in a letter dated August 27, 2010 states that this program "*revisó y evaluó los documentos relacionados al proyecto de referencia*" and comments that "*La evaluación realizada sugiere que, basado en los datos existentes al presente, las probabilidades de impactar un recurso arqueológico, según definido por la Ley 112 del 20 de julio de 1988, según enmendada, son mínimas*", and concludes; "*Por lo tanto, y en virtud de la delegación para la evaluación de Fases I y II del Consejo para la protección del Patrimonio Arqueológico Terrestre de Puerto Rico, se autoriza a intervenir el terreno con el proyecto de una Planta de Recuperación de Recursos Energy Answers Arecibo LLC* [same project as this investigation], *localizado en la PR-*

FIG. NUM. 1
PROJECT SITE

ARECIBO QUADRANGLE	**SCALE 1:20,000**

EDUARDO QUESTELL Y ASOCIADOS

2, Km. 72.8 del Barrio Cambalache en el Municipio de Arecibo", " pertaining to cultural resources (see Appendix A), so that our report will not be evaluated by the Archeology and Ethnohistory Program.

However, the letter from the Archeology Program states that: "*Este proceso es paralelo al del Programa de Patrimonio Edificado del Instituto de Cultura Puertorriqueña, si aplica, permiso que el proponente deberá gestionar de modo adicional al nuestro para cumplir con las regulaciones de la Ley 374 de 1949 y la Ley 89 de 1955*". Understanding that we have been contracted to perform an archaeological assessment of the site were this project will be established and since our report may help obtain the permit from the above mentioned Historic Built Heritage Program, if required, we are submitting the results from the Phases IA-IB for the stated site.

These phases have been defined by Arch. John Vetten from the Federal Environmental Protection Agency (EPA), New York Region, as follows:

"Stage IA: Literature Search and Sensibility Study

> The stage IA is the initial level of survey and requires comprehensive documentary research designed to identify any known or potential historical, architectural and / or archaeological resources within a project area. A primary objective of the study, is to evaluate the differential sensibility of the project area for the presence of cultural resources, this information will be used to guide the field investigations that follow.
>
> In carrying out the literature search, sources at the State Preservation Office (S.H.P.O.), universities, local libraries, museums, historical societies and the like, are to be consulted.
>
> In addition, the nature and extend of the proposed project is evaluated, an initial walk-over reconnaissance and surface inspection is completed and the effect of prior ground disturbance of the probability of identifying cultural resources is assessed.
>
> The final document must focus on the project area and minimally includes:
> - a brief description;
> - a description of the environmental setting as it pertains to actual or potential cultural resources locations;
> - a synthesis of prehistoric and historic and cultural development and land use patterns; and
> - a definition of sensitivity zones with explicit criteria for ranking undertaking.

Stage IB: Field Investigation

Subsurface testing is the major component of this level of survey and is required unless the presence or absence of resources can be determined by direct observation or by examination of specific document references.

The areas to be subjected to survey are selected on the basis of the data gathered in the Stage IA evaluation and the probable location (s) of the undertaking.

The careful location of identified resources with respect to areas of impact of the proposed project must be established.

The final Stage IB report presents the results of the field investigation, including:

- Description of the survey design and methodology (based on the result of the stage IA);
- Complete records of soil stratigraphy; an artifact catalogue including identification, estimated date range and quantity on weight, as appropriate.

The location of all test units must be accurately plotted on a project area map, with location of identified resources clearly defined. Photographs which illustrate salient prints of the survey area are a necessary component of the final report.

Detailed recommendation and supporting rational for additional investigation must be incorporated into the conclusions of the Stage IB study.

If all cultural resources identified through the Stage IA and / Stage IB surveys will not be impacted by the proposed project, the survey process is completed".

In our report we have followed the *Guidelines for Archeological Research* of the State Historic Preservation Office and the *Regulation for Filing and Archaeological Evaluation of Construction and Development Projects* from the Council for the Protection of the Terrestrial Archeological Heritage of Puerto Rico, ascribed to the Institute of Puerto Rican Culture.

PHASE IA SURVEY

As established, a Phase IA of an archaeological assessment includes: a description of the project; a description of the environmental setting of the location; a synthesis of prehistoric and historic and cultural development, with a sensibility study of the studied site and its land use patterns.

Project Description

The project consists in the construction of a Renewable Power Generation and Resource Recovery Plant, were municipal solid wastes will be processed to produce electric energy and other byproducts (see plan at the end of this report) on a site of approximately 81.30255 *cuerdas*, located at Road PR-2, Km 72.8, Cambalache Ward in the Municipality of Arecibo. A paper mill existed previously on this site.

Environmental Setting

Figure 1 shows the Project location on the Cambalache Ward of the Municipality of Arecibo. The landscape is predominantly flat with some slopes along several small artificial ponds (now dry) that comprised part of the infrastructure of the Global Fibers Inc. paper mill which existed previously on this site. The maximum elevation on the lot is close to 4 meters above sea level at the southeastern boundary of the property. The *Río Grande de Arecibo* flows along the western boundary.

Generally, the Municipality of Arecibo has a pleasant climate with a mean annual temperature of approximately 77ºF (R. Picó, 1964 p.5) and a mean annual precipitation of close to 60 inches of rain (*ibid*, p.6). Most of the municipality is located in the region called "Northern Coastal Plain" (*Llano costero del norte*), and belong to the "Alluvial Moist Section" (*Sección Húmeda Aluvial*) (*Ibid*, p.10).

Geology for the Arecibo quadrangle was done by Reginald P. Briggs in 1968. He states that the primary soil at the site consists of floodplains Alluvium (Qa, sand, gravel, lime and

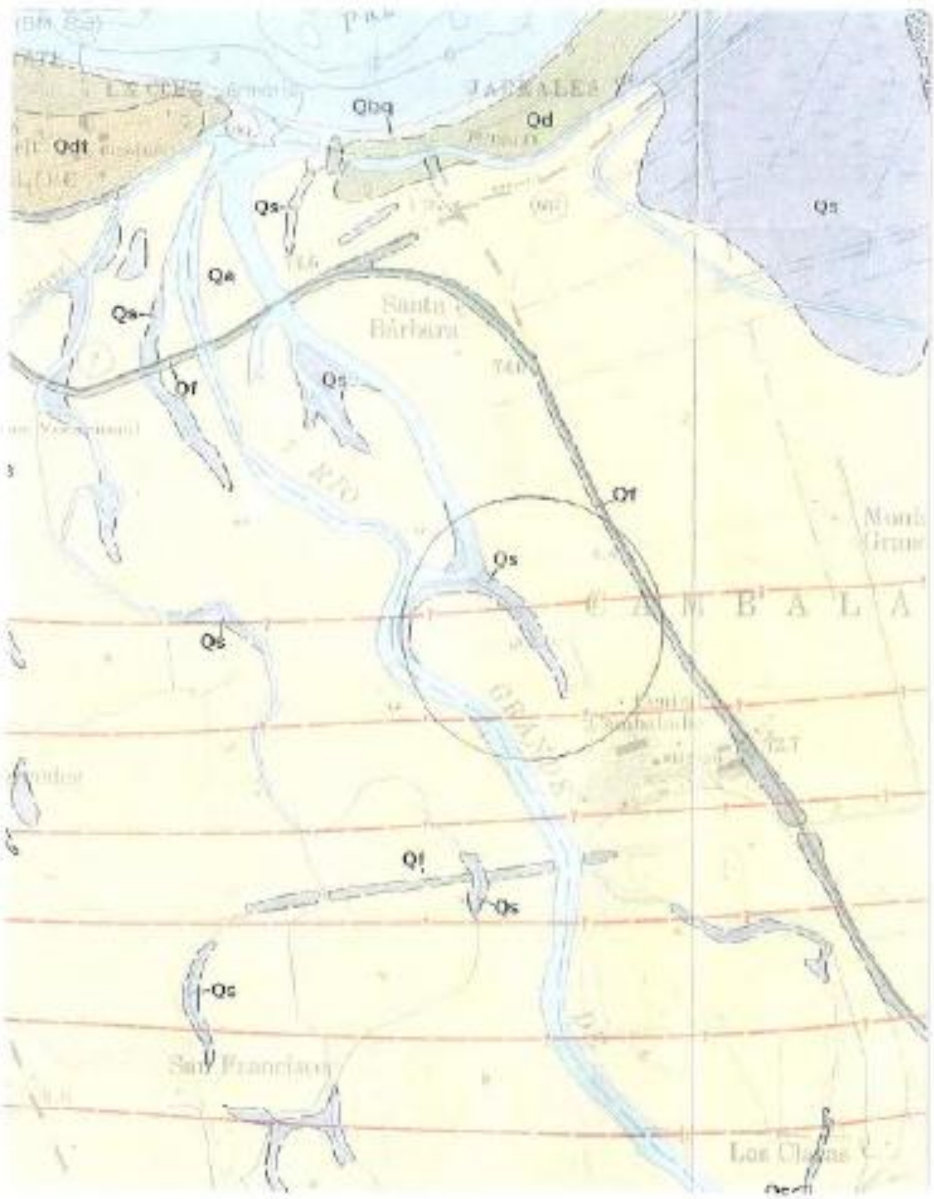

FIG. NUM. 2
GEOLOGY IN THE PROJECT AREA

GEOLOGIC QUADRANGLE OF ARECIBO | **SCALE 1:20,000**

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clay). In several places along the river and near the center of the site we find swamp deposits (Qs). Figure 2 (page 7) shows the geology of the Project area.

The soils of the zone were studied by Gilberto Acevedo in 1982 (*Soil Survey of Arecibo Area Northern Puerto Rico*). He states (leaf no. 3) that the soil to the East of the Project area is Coloso Clay (Cn, p. 16). This is a deep soil, naturally fertile with high water retention and poor drainage. Runoff is slow, with limited agricultural crop applications for being prone to flooding and expansive. To the West the predominant soil is the Toa silty clay loam (To, p. 39). Toa soil is deep, with moderate permeability and moderate water retention capability. It has a slow runoff and high natural fertility. The danger of flooding is its main limitation. Figure 3 (p. 9) shows the soils of the area.

Currently the predominant flora consists of: African tulip tree, tall albizia, Guinea grass, zarcilla, cocklebur, moriviví (*Mimosa*), Oxhorn bucida and Madras thorn. Wildlife was represented by Gray Kingbird, Greater Antillean Grackle, Bananaquit, Cattle Egret, Northern Mockingbird, White-winged Dove, frogs and lizards.

Synthesis of Cultural Development

The prehistory of the Municipality of Arecibo has been well studied, although the existing information makes it difficult to adequately reconstruct its past. As we know, Arecibo is located on the northern coast of Puerto Rico. This condition, in a way, forces the reconstruction of its past to be set spatially and chronologically within the context of the prehistory of the North coast. We understand this is an essential framework even if one wishes to study only the traditional problems of time and space. For the purpose of the present work, we refer to the prehistory of the North coast as defined by Dr. Irving B. Rouse in his "Scientific Survey of Porto Rico and the Virgin Islands" (Rouse, 1952, Vol XVIII, part 3, pages 403-405). We consider these studies essential to our prehistory.

As per Dr. Rouse, the North coast encompasses all the lowlands that drain into the Atlantic Ocean, encompassing 150 kilometers of seashore and adjacent land, which extend approximately 15 kilometers inland. Altogether, the area comprises 2,000 square kilometers. The North coast begins at the west of Punta Borinquen, forms a curve towards the interior

through the hills and returns out to arrive at the cape of San Juan. This boundary between the area of the North coast and the rest of the Island form an arc. The most significant rivers which constitute topographic features are, from West to East: *Río Guajataca, Río Grande de Arecibo, Río Grande de Manatí, Río Cibuco, La Plata, Bayamón*, and *Río Grande de Loíza*. These rivers have established floodplains along their banks. A chain of limestone hills with abundant caverns is found between these plains. Behind these hills are the foothills of the interior mountains. In front of these, vast marshes prevent walking between them. Dr. Rouse considered the indians probably had difficulty traveling along the North coast, due to the currents, strong winds and surf. He points out that the soil is fertile (except for the western end), and has a good supply of water, so it was possible it could sustain a large pre-Columbian population.

However Dr. Rouse noted very few sites had been found along the North coast, possibly due to the scarcity of shell middens, which makes it difficult to detect archaeological sites. It was also possible that the strong winds from the Atlantic Ocean, combined with the shortage of protected bays and beaches, made the aboriginal population to concentrate in other, more favorable parts of the Island.

As discussed below, the last 10 years have seen the North coast of Puerto Rico become the subject of various systematic archaeological surveys that have yielded a complex picture as to the spatial distribution and chronological placement of many newly discovered archaeological sites. The picture originally presented by Dr. Rouse has been complicated as new work is systematically carried out.

In his work "Porto Rican Prehistory" (1952:370) Dr. Rouse follows Coll y Toste and places 19 chiefdoms on a map, locating the following seven (7) caciques in the northern region: *Mabodomaca* in the valley of the Guajataca River, the *Río Grande de Arecibo* and possibly the *Río Grande de Manatí* was ruled by the chief *Arasibo*; a third cacique, *Guacabo*, governed the area of *Río Cibuco*. Chief *Aramaná* lived along Río La Plata on the village of Toa. The cacique *Majagua* was found on the *Río Bayamón*. *Canóbana* was the chieftain located upstream of the *Río Grande de Loíza*, with his village *Cayniabón*. The name of the cacique that controlled the lower course of the *Río Grande de Loíza*, in historic times, is unknown, as he died and was succeeded by a woman, *Loiza*. It is likely, as indicated by Dr. Rouse, that the existence of this many chiefs on the North coast responds to this region was widely populated by the settlers and therefore better known than the rest of the Island.

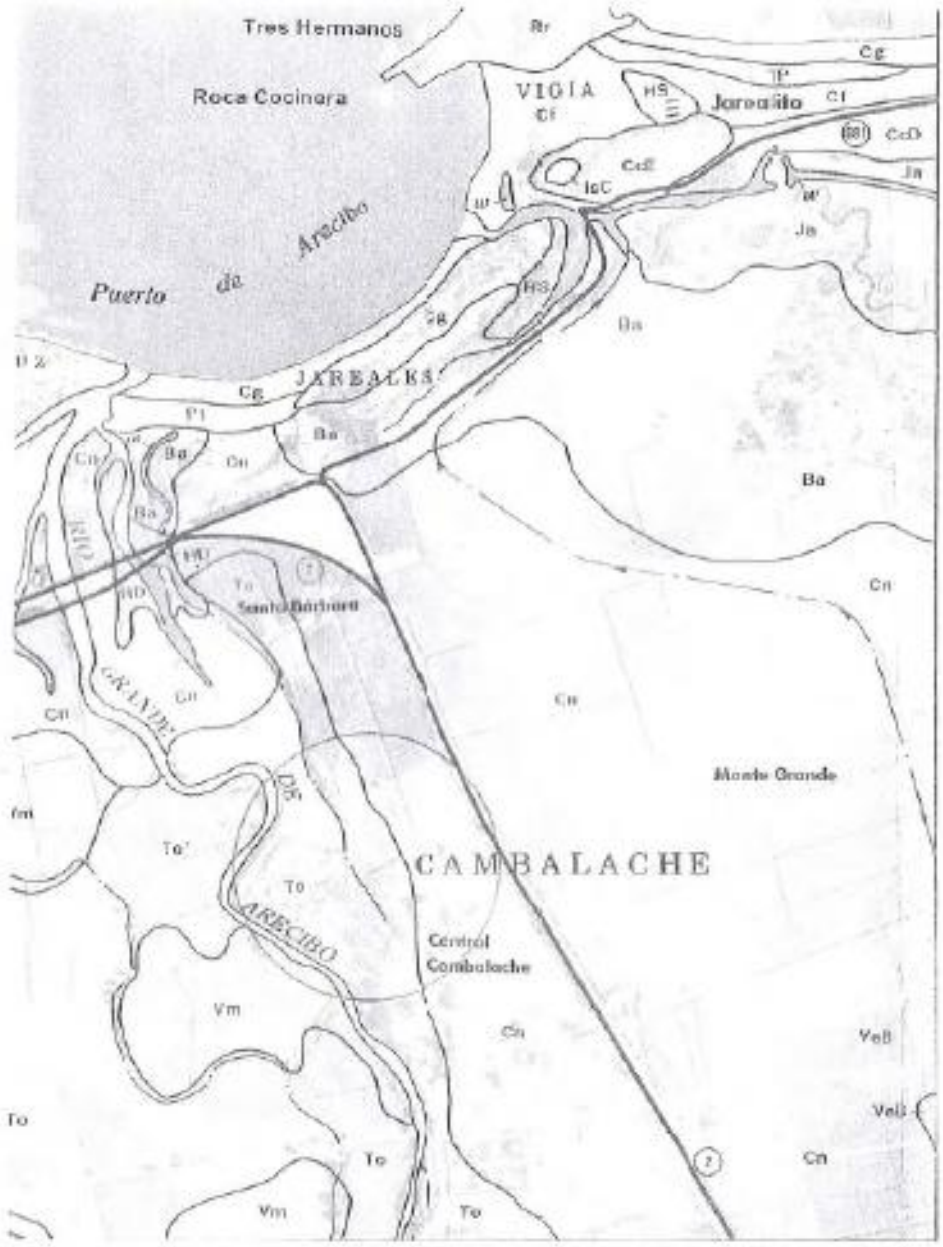

FIG. NUM. 3
SOILS IN THE PROJECT AREA

SOIL SURVEY OF ARECIBO AREA	**SCALE 1:20,000**
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During the last thirty (30) years, research in the Spanish archives has been intense, and as a result our knowledge of the ethnohistory of Puerto Rico at the moment of the conquest and colonization has been expanded. The vast amount of information collected provides new and more extensive relationships of the caciques of Puerto Rico. Studies in our history, when analyzing the conquest of Puerto Rico, offer a variety of names and regions pertaining to the caciques and their chiefdoms, remaining a subject of much controversy. We refer the reader to the excellent work by Dr. Ricardo Alegría "*Apuntes para el Estudio de los Caciques de Puerto Rico*" included in the bibliography of this report.

Among the most prominent researchers who first focused their work primarily on the North coast of Puerto Rico we find: A.L. Pinart (1893) and Agustín Stahl (1889-90), in the decade of the1880's; Cayetano Coll y Toste, (1907:40-41) visited various sites on the decade of 1890; Adolfo de Hostos, S.K. Lothrop and J. Alden Mason (1941: 289) in the decade of 1910; and R.L. Junghams, R. López de Azua and Pablo Morales Cabrera collected some objects from the years 1920 and of 1930 (Morales Cabrera 1932: 51). J. Walter Fewkes, in 1902, excavated at the Golondrinas Cave, near Manatí and published his results in 1907 (Fewkes, 1907: 80-89, 155, 181-184). In 1917, De Hostos excavated at the Golondrinas Cave and two caves in the Municipality of Morovis. Also, in 1923 he excavated a ball court (*batey*) at the Espíritu Santo River in Río Grande, and in 1940 at Monserrate, Luquillo. Froelich G. Rainey, then with Yale University, excavated at the Coto Ward of Isabela and in Monserrate, Luquillo in 1934. Rainey found the same sequence at both sites: the Crab Culture, characterized by pottery of the Cuevas Style, and the Shell Culture, with ceramic associated to the Ostiones Style.

This distinguished researcher introduces the method of digging by arbitrary levels and also, for the first time in Puerto Rico, defines stratigraphically the existence of two pre-Columbian cultures. By 1934, Rainey, then a graduate student from Yale University, performed the first systematic excavation in the South portion of Puerto Rico at the Canas site in Ponce. He called the oldest Crab Culture and Shell Culture the later.

This sequence was also observed at the Coto Ward of Isabela and at the site known as Monserrate in Luquillo. Using the correlation of these sequences as the basis, Dr Rainey postulated a hypothesis in which the two cultural components defined represented the migration of two distinct groups or populations with a possible common origin in South America.

Later work by Dr. Rouse demonstrated that, in the case of Puerto Rico, the Shell Culture component corresponded to a local development which had evolved from the Crab Culture. By defining the chronologic and stylistic sequences for Puerto Rico, Dr Rouse demonstrated the existence of a transition.

On the other hand, together with the previous group, or maybe previously, another group called Huecoid arrived. Huecoids made unpainted pottery and amulets which possibly represent the Andean condor, and had an origin in the Andes of Venezuela. Huecoids have been documented at the sites of La Hueca on the island of Vieques and at the site called Punta Candelero in Humacao. Dr. Osvaldo García Goyco tells us that some archeologists group the Huecoids with the Saladoids, and differ with regard to the bird-shaped amulets interpretation as being condors, and therefore point to a migration originating from the Andean mountain range. Huecoids are also characterized by the manufacture of beads and ornaments made of semiprecious stones and pearl oyster. Despite the great work done by previous investigators, it was Dr. Irving B. Rouse, as part of the Scientific Survey of Puerto Rico, who carried out, during 1936 and 1938 a program of stratigraphic excavations of the North coast of Puerto Rico. During the summers of 1936 to 1938 this investigator dug seven (7) sites that he considered with the most potential, obtaining said sequences and establishing the correlations with the other regions of Puerto Rico already defined. The aforementioned researcher tells us that, from a geographical perspective, his excavations did not cover satisfactorily the area of the North coast. He excavated only at five sites associated to five of the seven main rivers in the region. During his survey he couldn't locate, and thereafter excavate, any site associated to the caves and valleys of the *Río Grande de Arecibo* and *Río Cibuco*. In his stylistic and chronological sequence for the North coast he did not find evidence for his Period I or preceramic, but he did find evidence supporting the remaining three periods; II, III, and IV. The following sites were excavated: Carmona (Loíza 4), Coto (Isabela I), Cuevas (Trujillo Alto 4), Los Indios (Manatí 3), Monserrate (Luquillo 1), Puerta de Tierra (San Juan 1) and Santa Elena (Toa Baja 2).

It is important to highlight some aspects of the conclusions from the excavations of Dr. Rouse during 1936-1938. He states that four (4) of the seven (7) sites were stratigraphically significant. The stratigraphical profiles from Rainey's excavations at Coto Ward confirm the stylistic and chronological sequence covering periods II, III, and IV. Furthermore, the excavation at the Cuevas site clearly demonstrated the stylistic transition from Period IIa to

Period IIb. At the Santa Elena site he found one of the best examples of the succession of periods from IIb to IVa and IVb. The Santa Elena site is where the type style Santa Elena was defined; its stylistic manifestations subsequently classified within the archaeological series known as Elenoid, whose origin and dissemination point is the Canal de Vieques, to the East of Puerto Rico. He associated the Santa Elena site with the chiefdom of *Aramaná*, from the Toa region, and with the Toa Royal farm established by the Spaniards during the first years of colonization. The sequence clearly showed the presence of the Santa Elena and Capá styles, which chronologically went from Period IIIa to Period IVa, respectively.

As for the correlation of the chronological and stylistic sequences, the North coast differs from other regions in the absence of occupation during period I and by the presence of the Santa Elena style during periods IIIb to IVa, which seems to point to a development limited to a certain area of the geography of Puerto Rico.

We have presented these brief data concerning the excavations of Dr. Irving B. Rouse during the years 1930-1938, because as of today it is one of the few stratigraphic excavations with published results for the North coast of Puerto Rico. Another reason is the fact that its spatial time frame, comprising archaeological periods and series for Puerto Rico and the Caribbean, remains an instrument on which to support archaeological research today.

On the prehistory of Arecibo in particular we have information from the documents related to the beginning of Spanish colonization which states:

> "…*Toda la vega Arecibeña regada por el Río Grande y Tanamá donde residían el Cacique Arecibo y 200 indios y naborías, fue donada por la Corona a Don Lope de Conchillos; residente en la isla a Pedro Moreno, con el encargo de administrar los 200 indios y al Cacique Aracibo*." (Villas Roces, 1976).

Of the several sites related to the *Aborigines* who lived around this municipality and have been reported in the literature, the one with more antiquity is known as the *Cueva del Indio*. The same was reviewed by a French researcher named Alphonse Pinart, who visited the island in the last third of the last (19th) century:

> "… *se trove a la Cueva del Islote sur de la Punta Braba a enviaron 5 lieves a l'est d'Arecibo et sur la cote nord de l'isle de Porto Rico. La grotte se trouve dans une inmense masse noiratre de roche ignee formante ponte*

> *e'avancant dans la mer qui deferle contra elle avec furie elle comunique par le fond avec la rt l'eoiu un penetrant par ce colouir qui est assez etroit product un migissement formidable*."

The distinguished historian of Puerto Rico, native of Arecibo, Don Cayetano Coll y Toste, did research around his hometown, and in notes written about another cave in the mountainous area, wrote:

> "*La Cueva de Miraflores en la jurisdicción de Arecibo, en un taller de piedra de los indígenas. La hemos explorado cuidadosamente, tenemos en nuestra colección un buril de pedernal obtenido por Mr Denton, propietario de la finca donde radica esta gruta. Todavía se encuentran allí iniciados los trabajos de algunos* "pillar pebbles" *de las casas*" (Coll y Toste, 1987)

After the change of sovereignty experienced by the Island in 1898, studies were begun on different aspects of Puerto Rican People, sponsored by American educational institutions. Among the first researchers who came, Jesse W. Fewkes conducted studies on pre-Columbian cultures and wrote:

> "The ball courts examined by the present author were situated for the most part on terraces or on land fringing rivers, elevated high enough to be above freshets and yet lying river valleys that could be cultivated.
>
> Along the banks of the *Río Grande de Arecibo* and its tributaries there are still many remnants of ball courts, especially in the high mountain in the middle of the Island" (Fewkes, 1904).

In 1914 the late researcher, Samuel L. Lothrop, made a list of numerous indian sites. In this list, Lothrop reported several sites within the territorial limits of Arecibo:

> Sabana Hoyos Ward ……..Cave/Pictographs
>
> Miraflores Ward ……...Cave/Petroglyphs
>
> Esperanza Ward ……..Ball Court
>
> Arrozal Ward …….Ball Court
>
> Arenalejos Ward ……..Cave/Petroglyphs

We have already noted that in the 1930s, then-student at Yale University, Dr. Irving B. Rouse, visited the Arecibo region and inspected previously known sites, but excavated none.

In 1979 archaeologist Juan Gonzalez Colons made an inventory of sites in Puerto Rico and reported several in Arecibo:

Poza del Obispo……..…..Residuary
Hato Abajo……Residuary
El Caney……Residuary
Cueva de Crosier……..….Petroglyphs
Cueva de Matos……..…..…Petroglyphs
Cueva de Carreras……..Petroglyphs

By taking into consideration information from known sites within the boundaries of the municipality, it is understood that Igneri, pre Taíno and Taíno groups inhabited the area. In the case of the Taíno there is evidence in historical sources that subsequently survived the early years of colonization of the Island.

Among the most recent studies in this county, stands out the inventory carried out by archaeologist Roberto Martinez, between 1994-1996. The researcher pointed out fifteen places for the town of Arecibo, highlighting the presence of petroglyphs on rock shelters (Marlene Ramos Vélez, 1998, p. 8-11).

As for the historical aspects we find that the city of Arecibo is one of the oldest in Puerto Rico, with its origins linked to the early years of Spanish colonization. The existence of Cacique *Arecibo* is known due to his being commissioned with some of his indians for the year 1515. Don José Limón de Arce, in his pamphlets "Arecibo History" (1935) wrote:

> "*En la primera división que se hizo de la Isla de Puerto Rico, Arecibo formaba parte de ésta, en el censo de almas de 1530. Arecibo abarcaba los pueblos de Ciales, Morovis, Jayuya y Utuado, así como Hatillo, Camuy y Quebradillas. Se cultivaba el azúcar, el café, tabaco y maíz. Luego, este Mercado se pierde quedando la caña de azúcar solo*".

"Es interesante señalar que el lugar de la fundación de la ciudad de Arecibo nunca ha sido cambiado. Por el contrario, Caparra y San Germán fueron movidos de sus lugares

originales a otras localizaciones: Caparra fue movida al lugar donde se encuentra San Juan actualmente en el 1519; San Germán fue trasladada desde la costa sur hacia el centro de la Isla, en el 1570, al lugar que se encuentra en la actualidad, para protegerse de los ataques de los indios Caribe" (Cinthia Velásquez: Arecibo… así era, 1998, p. 19).

In Malgarejos' "Memoria" (1582) he notes that by then several neighbors had gathered at the mouth of the *Río Grande de Arecibo*. The village was officially recognized as a town in the early seventeenth century. The so-called "village" on the banks of Arecibo, which already had some 80 families, was named town with parish on May 1, 1616.

On the other hand, we find the first available graphical representation of Arecibo in a subsection of a plan by Francisco Fernández Valdelomar, commissioned by Governor Matías de Abadía, dated 1737, a copy of which we have included as our Figure no. 4. Architect Sepulveda notes that: "*A diferencia de los planos de Aguada y Añasco, [este plano] muestra un pueblo de considerable tamaño. El pueblo costero estaba compuesto por 95 viviendas de diferentes tamaños, que formaban una plaza rectangular en la cual se hallaban dos grandes estructuras, la iglesia parroquial y la capilla de la Concepción. Las siete hileras de casa aparecen alineadas de este a oeste y definen al menos seis calles. Hacia el este se destaca lo que parece ser otra capilla (podría ser la del Rosario) y el sitio previsto para una fortificación que en efecto se construyó poco después. El plano tiene escala gráfica en toesas (antigua medida francesa de longitud) [equivalente a un metro y 946 milímetros]. El plano ilustra el puerto de Arecibo, la Boca Vieja del río, la desembocadura del mismo y el morrillo. Incluye una rosa de los vientos. Muestra los rasgos de la topografía e indica los tipos de sembrados en la periferia del pueblo: platanares y caña de azúcar. También indica la red de caminos de acceso al pueblo*" (*Ibid*, p.63). The original plan by Fernández Valdelomar, titled *Plano del pequeño puerto de San Felipe de Arecibo, distante doce leguas de la Aguada sobre la costa norte de la isla de Puerto Rico*, is found at the *Archivo General de Indias*, in Sevilla, and a copy at the General Archive of Puerto Rico (*Ibid*, p.62)

There is a second plan of eighteenth century Arecibo, a copy of which (figure no. 5) we have again taken from Volume 1 of the said publication by architect Sepúlveda Rivera (p. 63), titled *Plano del puerto de San Felipe del Arecibo, situado en la costa septentrional de la isla de San Juan de Puerto Rico, entre dicho puerto y el de la Aguada de San Francisco*. This plan is dated close to 1770. Arquitect Sepúlveda states that: "*El mapa tiene escala en toesas. Muestra*

la topografía e incluye las profundidades del canal del surtidero de puerto y del río desde la desembocadura al pueblo. Ilustra las tierras de labor de caña de azúcar y los caminos de acceso. El trazado del pueblo aparece definido por cinco estructuras institucionales (iglesia, tres capillas y la batería) y por 45 casa alineadas la mayoría de este a oeste. La plaza rectangular se conforma según las disposiciones legales establecidas al comienzo de la colonización…" (*Ibid*). The original of this plan is found at the *Servicio Geográfico del Ejército*, in Madrid.

The militia infantry captain, Don Fernando Miyares González, published in 1777 his *Noticias Particulares de la Isla y Plaza de San Juan Bautista de Puerto Rico*, where he wrote about the Arecibo Party the following (p.67-68):

> "*Siempre se ha distinguido este pueblo desde su fundación, que fue la cuarta de la isla. Así lo acreditó el ano de setecientos dos [1702], que habiendo desembarcado el enemigo inglés la gente de dos bajeles de guerra, no hallándose en el pueblo más que once hombres con su capitán don Antonio Correa, por estar los demás retirados en sus labranzas, los resistió dicho capitán y sin permitirles unirse en formación les acometió con intrepidez, haciéndole retirar atropelladamente, de modo que con sumo trabajo pudieron tomar sus lanchas, pues hasta dentro del mismo mar les siguió. Por esta acción tan gallarda hizo S. M. [merced] al dicho don Antonio correa, de la medalla de su real efigie y el título de capitán de infantería con sueldo situado en las caxas de México, que se le remitía aparte antes que falleciese.*
>
> *La aplicación de sus vecinos ha hecho floreciente este partido. Hállase situado en una legua de tierra formada por el mar y el río. Elévase poco sobre el nivel de ambos, pero hubiera estado mejor fundado en una altura inmediata que domina los alrededores. Tiene más de doscientas casas unidades, con la tercera parte de texa, formando calles regulares. Además de una mediana iglesia, hay tres ermitas y la mejor casa de piedra que sirve de cuartel a las dos compañías de infantería y una de caballería de milicias disciplinadas. Los campos vecinos son deliciosos, cubiertos de diferentes géneros de arboledas y con muchos arroyos. Encuéntrense casas por todas partes; en los montes hay muchos palos de tinte y maderas de construcción. En suma, no falta más a este partido que los buenos puertos que sobran a otros*".

As we have seen, by the eighteenth century the town had continued to grow and its development was recognized by the *Casa Real* which awarded it with the title of Villa on January 14, 1778.

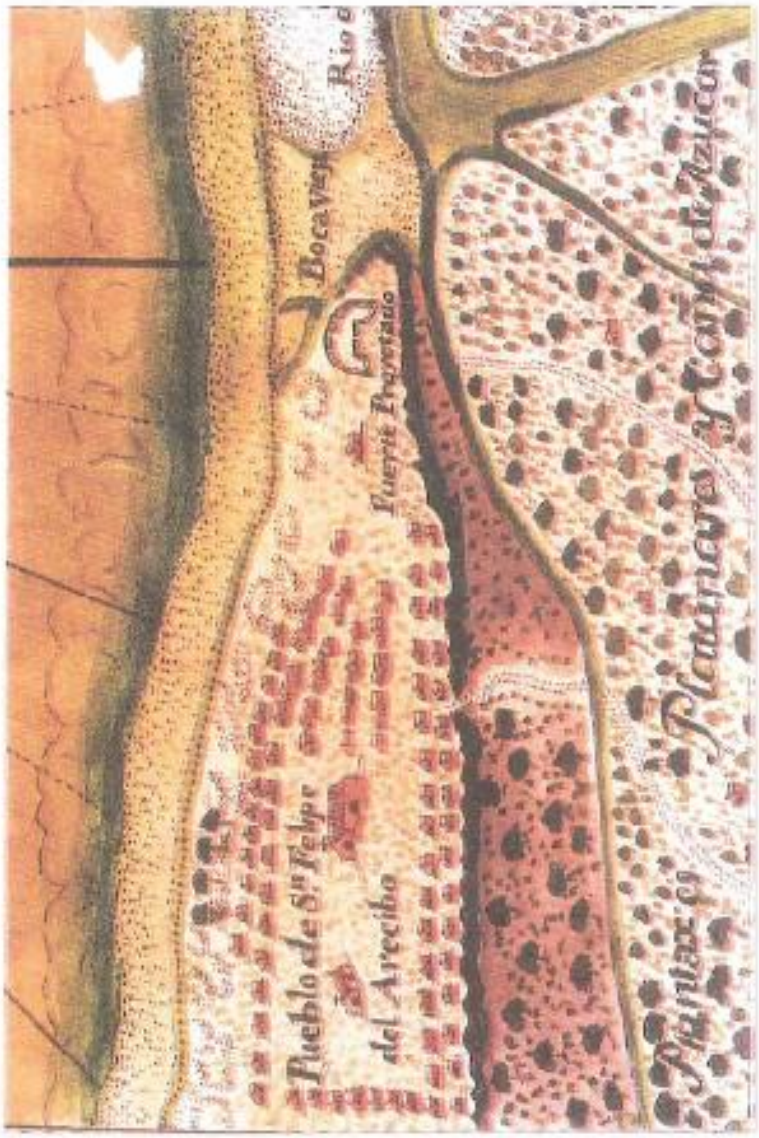

FIG. NUM. 4
ARECIBO MAP OF 1737

ANÍBAL SEPÚLVEDA RIVERA, 2004, TOMO 1	**NOT TO SCALE**
EDUARDO QUESTELL Y ASOCIADOS	

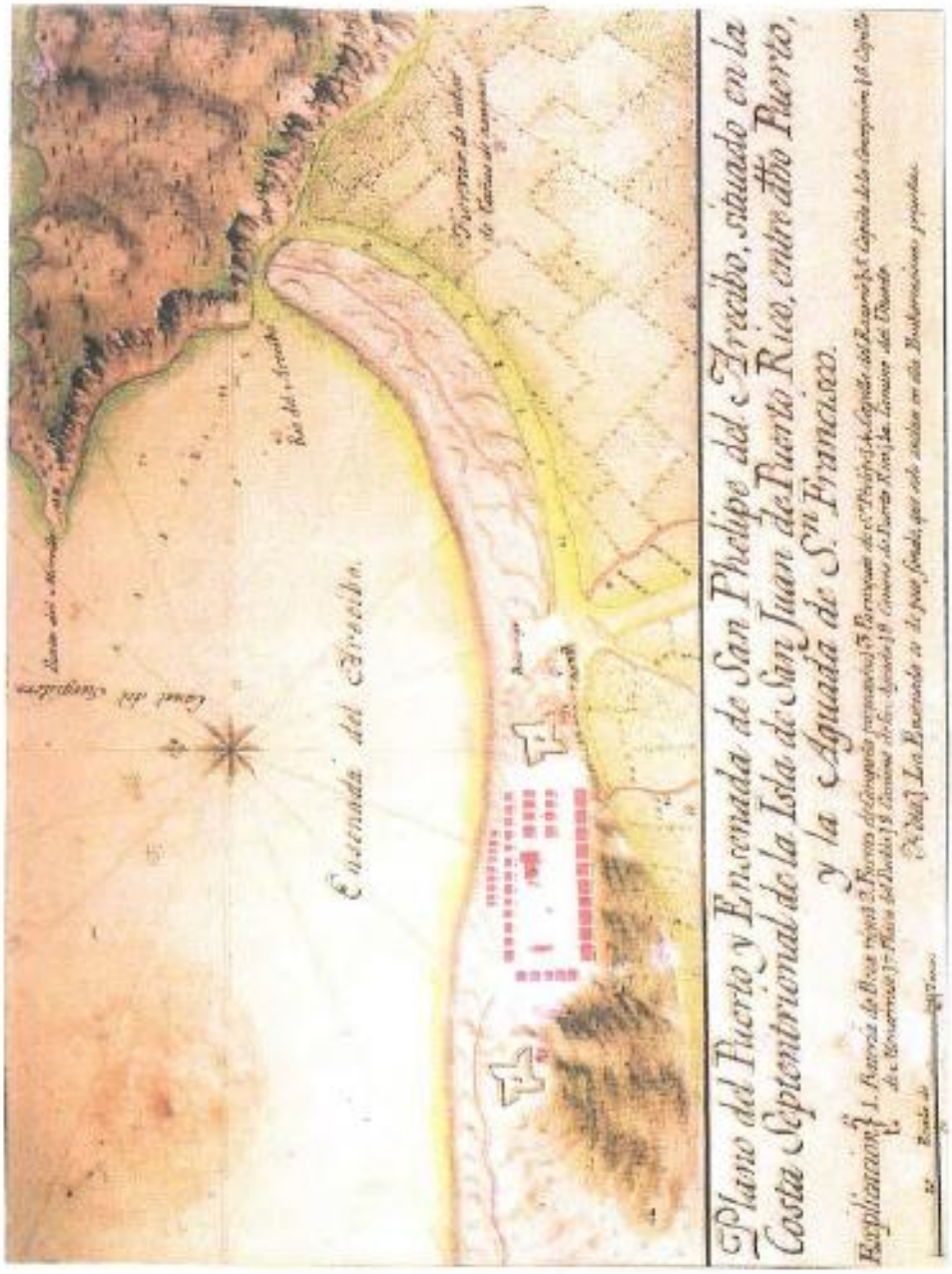

FIG. NUM. 5
MAP OF THE ARECIBO PORT 1770

ANÍBAL SEPÚLVEDA RIVERA, 2004, TOMO 1 | **NOT TO SCALE**

EDUARDO QUESTELL Y ASOCIADOS

For those years, Fray Iñigo Abbad y Lasierra describes the named Villa de Arecibo as follows (1788, p. 12):

> "*Después de la ribera de Manatí siguiendo la costa del norte hacia el poniente, hay dos leguas de monte llano, cerrado de robustos árboles, hasta entrar en la ribera del río Arecibo, que es más extensa y tan feraz como la antecedente, aunque no mejor empleada, pues toda está dedicada a la cría de ganados, sin cultivar otros frutos que los regulares y precisos; a esto se ciñe toda su industria y labranza.*
>
> *El pueblo dista de la antecedente 7 leguas, tiene tres hileras de casas, que dejan una buena plaza; situado en una península o arenal formado de la mar y río Arecibo, que lo circundan. Entre la punta del arenal del Arecibo, la del Morrillo y un peñasco que se avanza al noroeste, queda una caleta en la cual desemboca el río, cuyas avenidas forman bancos de arena, e impiden la entrada a las embarcaciones que calen más de dos brazas de agua, y así rara vez llega alguna a la caleta de este pueblo. Su iglesia es reducida para el vecindario, que asciende a 700 familias; estas viven en sus estancias, que se extienden mas de tres leguas a lo largo de las riberas del río*."

Moreover, the *Viaje a la Isla de Puerto Rico en el ago 1797*, was published in Paris in 1810, by the French botanist André Pierre Ledrú, where he mentioned the town of Arecibo (p. 71):

> "*Su situación es en la desembocadura del río de su nombre, y en el que no puede entrar ningún buque que cale más de tres metros de agua, por los bancos de arena que obstruyen el paso. Hay en todo el partido 5,155 habitantes, dedicados al cultivo del arroz, maíz, tabaco y a la crianza de gran número de ganado vacuno. Tan indolentes como los de Manatí, no saben utilizarse de la posición ventajosa en que los ha colocado la naturaleza. El río Arecibo nace en las alturas de la cordillera que atraviesa la Isla en toda su extensión de este a oeste*".

In 1824 the population had grown to 9.546 souls (De Córdova, p.105) and in 1828 reached 9.963, of which 4.862 were white, 3,256 brown (*pardos*), 645 blacks and 915 slaves (Ibid).

Pedro Tomás de Córdova himself, secretary to the Spanish government, provides a good description of the Arecibo from the decade of 1820:

> "*Sus terrenos en la mayor parte son vegas frondosas y muy abundantes en pastos, y en general todas las tierras con fertilísimas para la crianza y labor. Se*

> *cosecha con abundancia caña, café, plátanos, tabaco y toda clase de menesteres. Los caminos están despojados y buenos en tiempo de seca pero se ponen intransitables en las lluvias, por los muchos pantanos que se forman en las bajuras y las extraordinarias crecientes de los ríos. Abunda de Piedra de cal y de sillería, lo mismo que maderas. El partido está dividido en los barrios del pueblo, Hato Grande, Cuatro Calles, Hato Viejo, Rio Arriba, Arenalejos, Santana, Factor, Cambalache e Islote. En 1828 había entre los vecinos 112 artesanos, 43 extranjeros domiciliados y naturalizados y 43 emigrados; 119 casas y 126 bojíos en el barrio, y en la jurisdicción 187 casas y 1,366 bojíos, 35 tiendas de todas clases y 28 ventorrillos*." (1831, *páginas* 105-106)".

In 1878 Arecibo comprised the Cambalache, Islote, Santana, Factor, Garrochales, Río Arriba, Hato Arriba, Dominguito and Esperanza wards (Ubeda y Delgado, p.156). In Cambalache ward there were 175 families, 40 houses, 8 huts and 2 stores. (*Ibid.* p.157).

For many years since its origin, agriculture was the mainstay of the economy of this town. During the nineteenth century, a large agricultural development took place in area. Numerous sugar plantations and coffee estates were developed as well as farms dedicated to other crops. However, sugar cane was always the major product. In 1841 there were no less than 18 estates, among which were the Santa Bárbara, property of Doña Bárbara Balseiro, the Cambalache, owned by Don Francisco Uranga, and Hacienda Claras, property of Francisco Stuard whom "*lo administraba el mismo*" (Eileen Y. Cruz Ramirez, 1986, p.29-30). The Santa Bárbara became the property of the heirs of Don Antonio Roses. It consisted of 360 *cuerdas*; 200 of which were planted with sugar cane by 1902. The Hacienda Cambalache became a major sugar mill during the twentieth century, being called Central Cambalache Sugar Mill. Cruz Ramírez states about the land belonging to the Central Cambalache Sugar Mill: "*Hoy forma parte de las tierras que antes se cultivaban de cana, ahora [1986] se están utilizando para la siembra de arroz*" (*Ibid*, p. 30). By 1841 there also was the Hacienda Caños, whose owner was Doña Francisca Torrin, and agent representative José Ramón Lerrieu (*Ibid*).

Since the 1950s, several high technology companies have established in Arecibo, which linked to a number of different shops, distilleries and major refineries produce a large number of jobs. In the 1980 census, Arecibo had 86.776 inhabitants, who had risen to 97.549 by the 1990 census.

Archival Research

The archival research consisted of the consultation and detailed study of documents held by the following main sources:

- Council for the Protection of the Terrestrial Archeological Heritage of Puerto Rico.
- State Historic Preservation Office (S.H.P.O.)
- Archeological Sites in Puerto Rico of S.K. Lothrop; manuscript copy held by the authors of this Phase IA-IB report.
- Field notes of the archeological sites of Puerto Rico of Dr. Irving B. Rouse; manuscript copy corresponding to the municipality of Arecibo held by the State Historic Preservation Office.
- Inventory of Historic Engineering and Industry of Puerto Rico by Carlos Rosado/ W. Rodríguez/ L. Pumarada- President Office-University of Puerto Rico-San Juan 1977. Manuscript in the State Historic Preservation Office (S.H.P.O).
- Historic American Engineering Record (HAER), Inventory by Osvaldo Rivera/ W Rodríguez-UPR San Juan 1997. Copy of inventory held by S.H.P.O. Office.
- Puerto Rico Architectural Resources Inventory, State Historic Preservation Office.
- Archeological, historical, geographical, geological, etc. literature, included in the bibliography of this Phase IA-IB evaluation.
- Local informants.
- Consultation with other archeologists from Puerto Rico.

Detailed consultation of the records related to the inventory of archaeological sites in Puerto Rico, held by the Council for the Protection of the Terrestrial Archeological Heritage of Puerto Rico and the State Historic Preservation Office revealed no prehistoric or historic evidence in the specific area where the Project object of this assessment will be developed. The nearest reported and/or known archeological site in the topographic quadrangle of Arecibo

(which is the quadrangle where the Project site is located) is the one designated as AR005 "El Caney" located 1,500 meters to the North Northwest of the Project. This site is a residuary under the streets and residencies of the urban zone of Arecibo, where pottery fragments and remains of human bones were found. Archeologist Fernando Alvarado (*Segregación de treinta y ocho solares, Arecibo, Puerto Rico*, page 15) tells us: "*En los años 1940 hasta el 1950 se realizaron varias excavaciones en el yacimiento conocido como el Caney por el doctor José Oliver, éste menciona lo siguiente: "En las décadas del 1940 y 1950 efectuó varias excavaciones en solares al este de la Catedral. Recuerdo cuando hizo excavaciones en el solar en donde hoy existe el área de aparcamiento del Hospital El Buen Pastor y cuando se reconstruyó la parte del casino de Arecibo, donde está el salón de baile. Informa el Dr. Oliver haber hallado restos humanos, no solo de cristianos, sino también de indios, los que distinguió, porque los indios acostumbraban a enterrar a sus muertos en posición encorvada, con las rodillas pegadas al pecho" (Lago, 1987)".* Archeologist Alvarado (Ibid, pages 17-18) adds that: "*Para el año 1992 se realizó otra incursión al yacimiento registrado como el Caney, por los arqueólogos Juan González, María Cashion y Jaime Vélez. El arqueólogo González informa: "La data obtenida y analizada del sector en donde se harán las mejoras, indican la existencia de un sitio multicomponente; el mismo fue afectado a través de los años por el desarrollo urbano de la parte antigua de la ciudad de Arecibo. Dentro del perímetro de la propiedad específicamente en el subsuelo todavía permanecen materiales de origen precolombino e histórico que no han sido afectados adversamente" (González, 1993)*".

Another place depicted and relatively near is the one called AR004 (Poza del Obispo), which is located near 2.4 kilometers to the North Northeast of the Project area. Archeologist Fernando Alvarado (page 16) tells us about this site: "*Para el 1987, los arqueólogos Pedro Alvarado y Harry Alemán, realizaron una Fase II en las cercanías al Faro de Arecibo, exactamente en el lugar llamado Poza del Obispo (AR-4). En este lugar ellos determinaron lo siguiente: Las actividades humanas en el lugar las remociones han impedido estudiar el sitio AR-4 en su contexto cultural original. Pero no todo en vano, ya que de acuerdo a las muestras de cerámica podemos inferir que el sitio fue habitado por los grupos representativos estilísticamente por la cerámica estilo Ostiones y Santa Elena" (Alvarado, 1987)*".

Moreover, K.S. Lothrop mentions in his listing several places for Arecibo: a cave with petroglyphs in Arenalejos Ward; another cave with petroglyphs and two ball courts (*bateyes*) in

Arrozal Ward, one of which he locates at the Biáfara site of this ward, when Biáfara is really located on Miraflores Ward, and also mentions *Cueva Bonilla*, with petroglyphs (according to Pinart) in this ward of Arrozales; the so called "*Cueva de los Indios*", with petroglyphs, in Islote ward; the cave "Miraflores" with petroglyphs in Miraflores Ward, inside M. Denton property; a cave called the "Convento", also with petroglyphs, in Sabana Hoyos Ward; and a cave and a ball court (*batey*) in Esperanza Ward.

In the National Register of Historic Places, revised on February 4, 2010, there existed thirteen (13) places listed for the Municipality of Arecibo, all of which are far from the Project and would not be affected by it. The site with historic value nearest to the Study area is possibly the one that contains some of the ruins of the old *Hacienda Santa Bárbara*, which is located nearly 700 meters to the North Northeast of the Study area, and will not be impacted at all by the Project.

Included in Appendix D is a photocopy of a portion of the Arecibo quadrangle where the sites with prehistoric or historic value near the Study area are depicted.

Land Use Pattern

The oldest map that we found for the general area under study (1936, West-Central Sheet, R.C. Roberts, Soil Survey), tells us that the current Road PR-2 already existed with that number and crossed to the East of the site. Likewise, it is observed that a branch of the train railway, that joined the Railroad Company of Puerto Rico railway, ran through the center of the property, surely for collecting the canes from Hacienda Santa Bárbara and other surrounding lands and take them to Central Cambalache Sugar Mill. No structure is observed then inside the property boundaries. Today there is not the slightest evidence of the passage of a train track around the property. Our figure num. 6 illustrates part of the map of Robert's soil survey where the Project area is located.

This is the second time that we conduct an archeological survey of this site. The first time, in November of 1998, was to evaluate approximately 105 *cuerdas* for the construction of an industrial development in the property, belonging then to Global Fibers Inc., a paper mill that was established on the Site. A report of the archeological assessment was submitted, and apparently it was never sent to the Institute of Puerto Rican Culture. The current Project

includes approximately 81.30255 *cuerdas*, which comprise some of the *cuerdas* previously surveyed, and areas not surveyed, or not adequately surveyed then, due to environmental challenges.

The property was planted with sugar cane until the decade of 1950. In our 1998 evaluation we talked with informant Ángel Lescano Correa, 63 years old (then), neighbor of the area, and then employed as a security guard at the paper mill. Mr. Lescano Correa informed us in 1998 that the paper mill began operations at the site in 1957 under the name Grace Paper Co., with the purpose of producing paper in rolls. Afterward, the mill was known as Arecibo Paper Mill, and later on as International Mill. Its name in 1998, as we said before, was Global Fiber Inc. The mill closed operations, according to informant Lescano Correa, on December 15 of 1995. In our 1998 property visit, we observed fences, earthen irrigation channels, a concrete and concrete-blocks warehouse and abundance of modern trash (wood, paper, plastic, care tires, metal, etc), especially near and on the back (West) of the paper mill. In 1998, the existing structures were: offices, warehouse, boiler room, operations building and infirmary. All were abandoned and some rapidly deteriorating. The first floor of the structures was of concrete and blocks. The walls and ceiling of the second floor were of asbestos-cement sheets.

On the other hand, for the current Project we interviewed Mr. Luis Ocasio as informant. He worked at the paper mill since 1970 until 1996. Mr. Ocasio stated that the structures associated to the paper mill were in construction between 1957 and 1959, being the facility inaugurated in 1960. As from 1957 fill was brought from elsewhere to stabilize certain areas and roads in the paper mill property. The existing "lagoons" are all artificial, and were built as part of the paper manufacturing process. Some of these "lagoons" were in use until 1977, and others until 1996, year when the industry ceased operations. For the construction of these "lagoons" all their surface was altered with heavy equipment, extracting superficial material in order to construct the side walls that form the borders.

All the existing structures in the North-Northeast side of the property, says Mr. Ocasio, were part of the paper manufacturing process. Some structures identified near the river were part of a pumping system for fire control. During the paper manufacturing process the sugar cane bagasse form the adjacent Central Cambalache Sugar Mill was used.

Other parts of the property are currently vacant and unused, covered by pastures, weeds and mounds. Included as Appendix E is a copy of the Title Study and of a Deed of Sale with the pertinent data from the Registry of Property, for Property (*finca*) num. 20,522, registered on Page

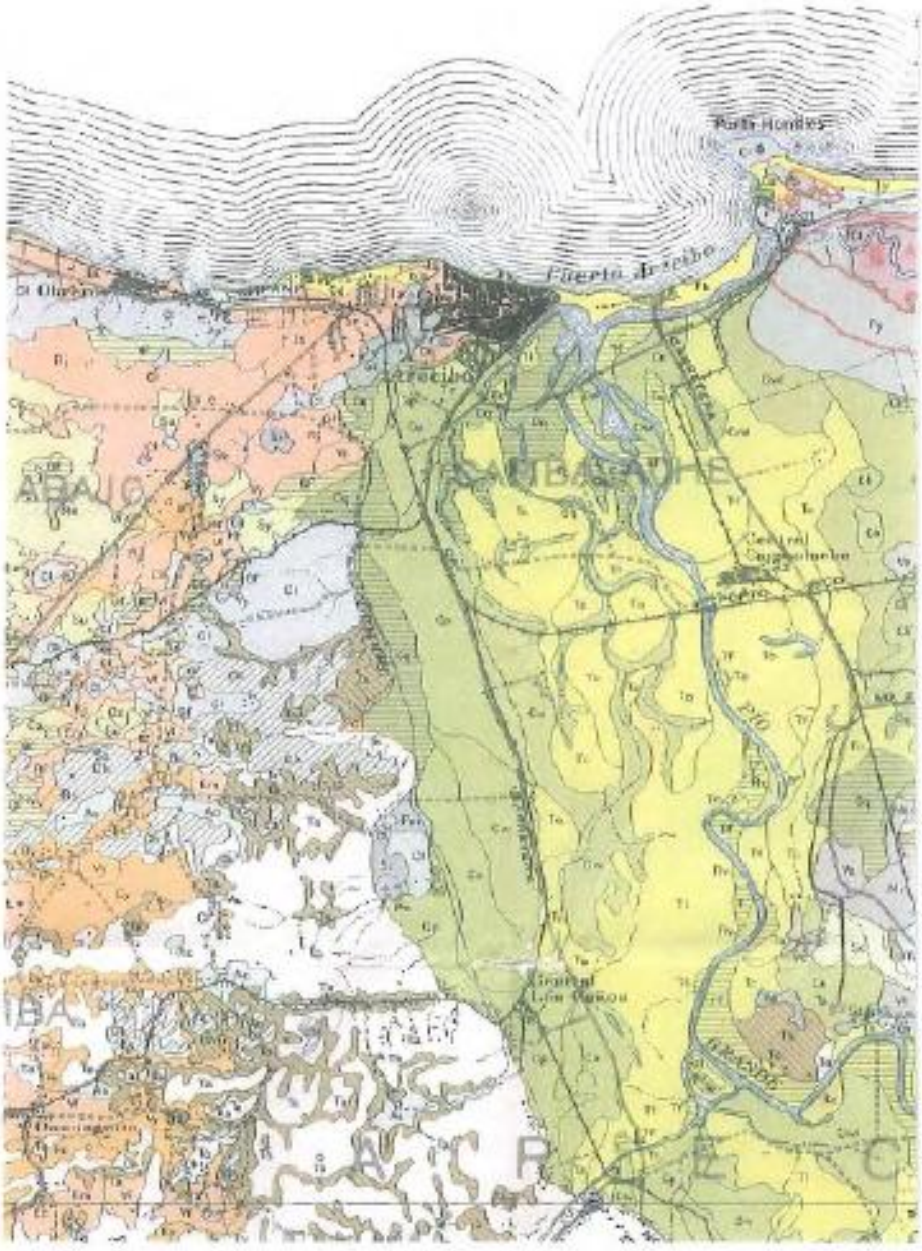

FIG. NUM. 6
PROJECT SITE (1936)

SOIL SURVEY OF ROBERTS AND OTHERS | **SCALE 1:50,000**

EDUARDO QUESTELL Y ASOCIADOS

(*folio*) 30, of Volume (*tomo*)1248 of Arecibo, which is the property that is the Study area. Appendix F includes aerial photographs dating from 1936, 1950, 1963 and 1990, and shows the Project area.

Surface Inspection and Sensitivity Study

We visited the Project site again in order to perform a surface reconnaissance of the entire terrain surface. The property is currently vacant, with abundant bushes and shrubs, and the structures mentioned before are deteriorated (see photos). Modern debris and junk were observed in several places. Several dirt roads that date from the time of construction of the paper mill were also seen. Structures associated to the fire pumping system were also observed (see photos).

The site seems to have a low archeological sensitivity. No evidence of prehistoric or historic cultural material was detected on the terrain surface other than what was indicated pertaining to the paper mill. The nearest prehistoric site is located some 1,500 meters to the North-Northeast of the Project area.

Conclusion of Phase IA

The Project is located in a sector with low sensitivity, with reported or mentioned archeological sites far away, the nearest being a residuary under the Arecibo urban zone, some 1,500 meters to the North-Northeast of the North limit of the Project area. All the recovered data of our surface reconnaissance tends to indicate that the land is sterile to the presence of archeological artifacts, but the above data makes a Phase IB survey for the property necessary.

PHASE IB SURVEY

The phase IB includes, as its main component, the execution of test pits under the land surface. The areas to be tested by means of subsoil test pits are selected bases on the Phase IA

results. This phase's report should include: the surveys design and its methodology; the results with the terrain stratigraphy; a catalog of artifacts, if applies; the location of the test pits excavated; and photographs to clarify certain aspects. Final conclusions and recommendations have to be included in the report.

Survey Design and Methodology

As we mentioned earlier, part of the Project site was surveyed in 1998. In that occasion, approximately 105 *cuerdas* were evaluated. Our figure number 7 shows, at a 1:50,000 scale, the limits of that project. The Site was then divided into three areas: A, B and C, corresponding to the current areas B and C. The limits of the areas evaluated in 1998 are included in a copy of the plan used in said year (1998) and the end of this report. Because on area B of the 1998 evaluation six (6) systematic transects were completed, and sixty-two (62) of 106 planned stratigraphic test pits were excavated, and additional random surface inspections were made, all with negative results for prehistoric and historic cultural resources, we understand that it is not necessary to carry out additional studies in said area B. The surface reconnaissance on this area B was then hampered by a small pond. Other test pits in these area were not dug (mostly those on the West half of the area) because they were located in sectors that were previously impacted by the construction of other small ponds, or by the extraction of sand. These last ponds were dry by 1998, but the soil where they were located was completely removed up to a depth of more than 2 meters.

In the land corresponding to the then area C, in 1998, eleven (11) transects were inspected and five (5) stratigraphic test pits were excavated. Even though all resulted negative for cultural resources, we understand that the area can be evaluated now in a more appropriate or accurate way, therefore we proceeded to design a research and a methodology for its archeological assessment.

First, the surface was inspected along some open roads within the property. Most of them date, as we previously indicated, to the construction epoch of the paper mill. During the surface inspection we were observant to the possible presence of archeological artifacts over the surface,

paying particular attention to dirt accumulations at the roadsides, made by heavy equipment (see photos 1 and 2, and Appendix C). Currently most of the property in covered by dense vegetation

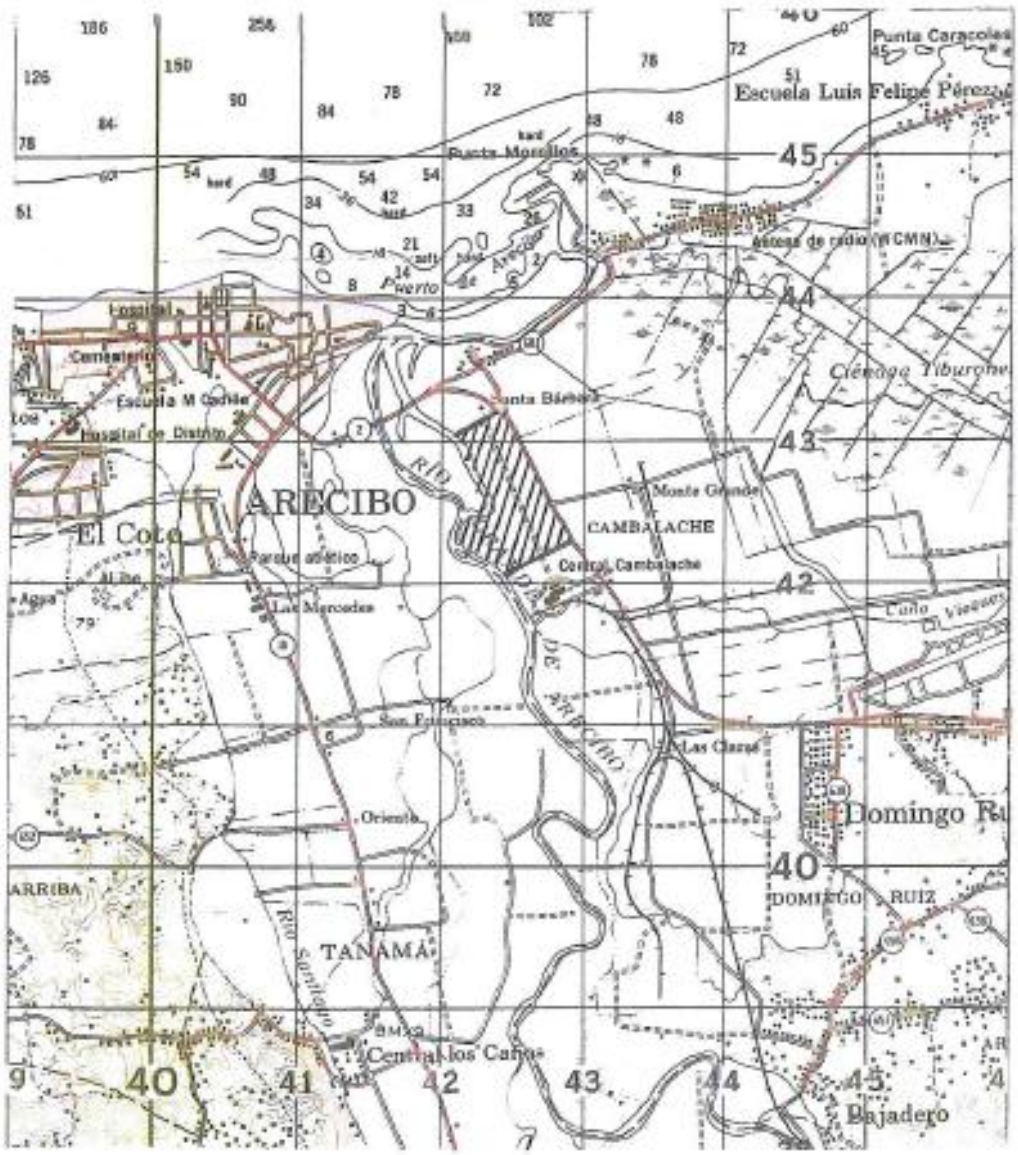

FIG. NUM. 7
LOCATION OF THE 1998 PROJECT

ARECIBO QUADRANGLE	**SCALE 1:50,000**

EDUARDO QUESTELL Y ASOCIADOS

(see photos 3 and 4). The roads and other areas clean of vegetation were the most favorable for surface inspection.

In the surface inspection, as already indicated, some structures associated to the fire control system of the old paper mill were found (as was indicated to us by the informant Luis Ocasio, pump system by the river, see photos 5 and 6), as well as a pair of disperse brick fragments. Also were evident sector with modern debris accumulations (see photo 7), and flooded sectors (see photo 8). Likewise, the buildings associated with the paper industry were evident (see photos 9 and 10), as well as smaller structures, all located in the North-Northeast side of the property, near the entrance that limits with Road PR-2.

After the above observations and taking in consideration all the parameters previously indicated, it was decided to use the following methodology to survey the terrain:

1. A series of non-systematic transects will be open with the same equipment or heavy machinery, throughout the site, with the purpose of clearing vegetation from the sites where the test pits will be excavated. The transects will be opened across all the West part of this area, so as to cover a representative portion of it and therefore identify the sectors with less probability of being altered or impacted by previous terrain movements and agricultural practices.
2. The survey will be complement with manual and mechanic test pits, spaced at a 40-meter intervals in those sectors where the environmental conditions permit (see report's final site plan).

All the manual test pits will be excavated with a post hole digger, resulting in a pit of approximately 25 x 25 cm and of variable depth. The depth of the pits is always variable, and depends, often on the depth of the soil over the decomposed or hard rock, or on the experience and knowledge of the investigator. The material obtained from the test pits will be sifted, when necessary, as a measure of control that will allow us to detect any evidence of cultural resources material.

Phase IB Survey Results

The site was investigated as planned, following the study scheme mentioned in the survey design. Visibility was adequate thanks to the transects and cleaning performed with heavy equipment.

The terrain presented ample evidence of impact to the subsoil, both for the construction of the paper mill as for the original roads, as well as for the small artificial ponds associated to the said industry. As we said, these small ponds are currently dry, and their entire surface was impacted in order to extract the soil and create their lateral walls (according to informant Luis Ocasio). Our observations over the terrain corroborate such information, evidencing the impact from the construction of the small ponds on the original soil of the area. In addition, the entire site surface, down to at least plowing depth (46 centimeters) must have been previously impacted by agricultural practices.

The use of a backhoe allowed reaching depths of over a meter, particularly on the alluvial sector near the riverbank. This proved methodologically sound due to the possibility of archaeological remains buried at more than one meter of depth by alluvial deposition and flood events.

The manual test pits were excavated using post hole diggers and digging bar. Each had a minimum depth of one meter, except in those were fill or rocks were found. Sometimes the manual test pits were excavated to a maximum depth of 1.20 meters (see photos 11 and 12).

Thirty five manual test pits were excavated and 35 units or trenches, dug with heavy equipment, were made, for a total of 70 archeological probes. In addition, all the road profiles and mounds of removed material were inspected for archeological artifacts.

The excavation trenches had a mean size of 2 meters long by 60 centimeters wide. These trenches had a mean depth of 2 meters, with a maximum depth of 2.75 meters in some. The machines' movement during excavations was always supervised by an archeologist or an archeo-technician (see photos 13 and 14).

All the soil extracted by the manual test pit excavations was sifted thru a ¼ inch mesh. The excavation trenches were inspected with shovels and trowels, and a representative portion of the material extracted from them was also sifted.

The stratigraphy included clay, fill, and river sand. This river sand was present in much of the site, particularly on the South section adjacent to the *Río Grande de Arecibo*.

The first stratum we found was clay and sand, mostly corresponding to the Munsell color 10 YR 3/3 or 3/2. These initial strata had an average thickness of approximately 20-25 centimeter. In some sectors, mainly along the roads, we documented a limestone fill deposited on the surface. According to informant Luis Ocasio, this fill was deposited in 1977.

As second stratum, we identified both sand and clay, predominant color 10 YR 4/4, with slight variations and varying depths. We also documented very fine sand, corresponding to the Munsell color 10 YR 5/2 or 5/4, and sometimes a plastic clay corresponding to the Munsell color 7.5 YR 4/4. In many occasions we identified a kind of "*babote*" or muddy soil (dark gray or very dark gray clay, 10 YR 4/1 or 3/1) at the bottom of the trenches, even below the water table. This "*babote*" and water table was documented from a 2 m depth. For detailed information on the stratigraphy in the test pits and trenches refer to Appendix B.

As results for identified materials, beside the modern debris, three test pits resulted positive to the presence of brick fragments, one in each of the three test pits. These were stray findings and without any kind of context. The rest of the excavation results were completely negative to the presence of prehistoric or historic cultural materials.

In general terms the field investigation evidenced that the area has a high level of impact in large part of its surface, and that it is completely barren of any kind of archeological artifacts.

In Appendix B, as we indicated before, there is a general description of the test pits made in 1998 and their stratigraphy, and of those carried out in the current Project. Appendix C includes an index of photographs with many of the photos taken in 1998, plus those taken for the current evaluation.

CONCLUSIONS AND RECOMMENDATIONS

We have conducted an archeological survey of the terrain of a property of approximately 55 acres (81.30255 *cuerdas*) in the Cambalache Ward, Road PR-2, KM 72.8, of the Municipality of Arecibo.

The archival, reference literature and other sources investigated did not indicate the presence of prehistoric or historic archeological sites in the specific Project area. The nearest reported and/or known archeological sites are: site AR005 ("*El Caney*"), which is a residuary located under the streets and residences of the Arecibo urban zone, and that is some 1,500 meters to the North-Northeast of the Study area; and site AR004 ("*Poza del Obispo*"), with is another residuary located some 2,400 meters to the North-Northeast. On the other hand, the nearest place with historic value may be the ruins of the former *Hacienda Santa Bárbara*, which are located some 700 meters to the North-Northeast of the Project site.

This is the second time that we conduct an archeological survey in these lands. The first time, in November of 1998, was to evaluate approximately 105 *cuerdas* for the construction of an industrial development in the property, belonging then to Global Fibers, Inc, a paper mill that was established at the site. A report of the archeological assessment was submitted, and apparently it was never sent to the Institute of Puerto Rican Culture. The current Project includes approximately 81.30255 *cuerdas*, which comprise some of the *cuerdas* previously surveyed, and also some of the land not surveyed, or not adequately surveyed then, due to environmental challenges.

The site of the 1998 study was divided in three areas: A, B and C, of which the so-called areas B and C correspond to the area of the current Project. The limits of the areas evaluated in 1998 are included in a copy of the site plan used in the year 1998 at the end of this report. Given the circumstance that in area B of the 1998 survey six (6) systematic transects were conducted, and that of the 106 test pits planned, sixty-two (62) were made, plus random surface inspections throughout the area, all with negative results for the presence of prehistoric or historic cultural resources, we understand that it is not necessary to conduct additional studies in area B. The results of the 1998 survey for area B are included in this report.

In the land corresponding to the former area C, in 1998, eleven (11) transects were inspected and five (5) test pits were made. Even though all resulted negative to cultural resources, we understand that the land of the former area C could now be evaluated in a more adequate or accurate way, therefore we proceeded with a research and methodology design for its archeological assessment.

In this area the property was inspected by means of non-systematic transects, manual test pits and excavation trenches, using for the latter a mechanical backhoe. A total of 35 manual test

pits and also 35 excavation trenches were made. The average size of the trenches was 2 meters long, by 60 centimeters wide.

The inspection of transects, test pits and excavation trenches showed negative evidence to prehistoric or historic cultural material in the study area, with the exception of three scattered test pits where a brick fragment was found in each.

According to the data presented, we conclude and recommend that the Project development continue as planned. Naturally, it is also recommended that if material remains of cultural resources are found at any moment during the development of the Project, the works stop and the authors and concerned agencies be notified.

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Appendix A

ESTADO LIBRE ASOCIADO DE PUERTO RICO
INSTITUTO DE CULTURA PUERTORRIQUEÑA

PO BOX 9024184
SAN JUAN DE PUERTO RICO 00902-4184
Tel. (787) 723-2524
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27 de agosto de 2010

AUTORIZACION

Sra. Raquel Cortés
CSA GROUP
CSA Plaza
1064 Ave. Ponce de León Ste. 500
San Juan, Puerto Rico 00907-3740

PLANTA RECUPERACION DE RECURSOS
ENERGY ANSWERS ARECIBO LLC., BARRIO CAMBALACHE, ARECIBO

Estimada señora Cortés:

El Programa de Arqueología y Etnohistoria del Instituto de Cultura Puertorriqueña ha revisado y evaluado los documentos relacionados al proyecto de referencia.

La evaluación realizada sugiere que, basado en los datos existentes al presente, las probabilidades de impactar un recurso arqueológico, según definido por la Ley 112 del 20 de julio de 1988, según enmendada, son mínimas.

Por lo tanto, y en virtud de la delegación para la evaluación de Fases I y II del Consejo para la Protección del Patrimonio Arqueológico Terrestre de Puerto Rico, se autoriza a intervenir el terreno con el proyecto ***Planta de Recuperación de Recursos Energy Answers Arecibo LLC, localizado en la PR-2, Km. 72.8 del Bario Cambalache en el Municipio de Arecibo,*** en lo concerniente a recursos culturales.

Este proceso es paralelo al del Programa de Patrimonio Histórico Edificado del Instituto de Cultura Puertorriqueña, si aplica, permiso que el proponente deberá gestionar de modo adicional al nuestro para cumplir con las regulaciones de la Ley 374 de 1949 y la Ley 89 de 1955.

Le notificamos que esta autorización es de tipo parcial y que el proponente queda sujeto a las responsabilidades y obligaciones que impone la Ley 112 del 20 de julio de 1988, según enmendada. Esta establece que, se deberá paralizar todo tipo de actividad de excavación, movimiento y remoción de la corteza terrestre, y notificar en un plazo de veinticuatro (24) horas al Consejo, en caso de que, durante el desarrollo del proyecto, se descubra o impacte algún depósito, elemento, estructura o vestigio de naturaleza arqueológica.

Se le apercibe que el incumplimiento de estos requerimientos podrá ser objeto de sanciones administrativas según lo establecido en la Ley 89 y en la Ley 112.

Esta autorización tiene una **vigencia de un (1) año.**

Esta autorización debe estar disponible en las áreas en que se realizan los proyectos para revisión de los oficiales que así lo requieran. De no estar disponible la autorización, se procederá a emitir una Orden de Paralización hasta tanto se pueda corroborar la existencia de ésta. La autorización debe estar acompañada de copia del plano presentado con la Consulta de Ubicación a la Junta de Planificación. La autorización del Consejo relacionada con un permiso o autorización de la Junta de Planificación, la Administración de Reglamentos y Permisos o el Departamento de Recursos Naturales y Ambientales deberá estar acompañada de tales permisos o autorizaciones, incluyendo sus planos aprobados en un lugar accesible del proyecto.

Cordialmente,

Arqla. Laura Del Olmo Frese
Directora
Programa de Arqueología y Etnohistoria

BMM/rmd

VERDE

Appendix B

Table of Test Pits and Excavation Trenches

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
1, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-120 cm	Sandy clay	10yr 4/4	Dark yellowish brown	Loose, with pebbles	Negative
2, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-110 cm	Sandy clay	10yr 4/4	Dark yellowish brown	Loose, with pebbles	Negative
3, manual	0-25 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	25-100 cm	Sandy clay	10yr 4/4	Dark yellowish brown	Loose, with pebbles	Negative
4, with digger	0-100 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	100-175 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
5, with digger	0-30 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Positive, brick fragment
	30-180 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
6, with digger	0-30 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
	30-180 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
7, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
8, with digger	0-25 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	25-200 cm	Sandy clay	10yr 4/4	Dark yellowish brown	Loose, with pebbles	Negative
9, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
10, with digger	0-10 cm	Limestone fill				
	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-190 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
11, with digger	0-10 cm	Limestone fill				
	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Positive, brick fragment
	20-200 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
	200 cm	Water table				

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
12, manual	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-100 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
13, manual	0-25 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	25-100 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
14, with digger	0-25 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	25-190 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
	190-200 cm	*Babote*	10yr 2/1	Black	Plastic, humid	Negative
	200 cm	Water table				
15, with digger	0-30 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	30-180 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
16, with digger	0-30 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	30-180 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
17, with digger	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-180 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
18, with digger	0-30 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	30-180 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
19, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
20, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
21, with digger	0-30 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	30-180 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
22, with digger	0-25 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	25-180 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
	180-200 cm	*Babote*	10yr 2/1	Black	Plastic, humid	Negative
	200 cm	Water table				
23, with digger	0-25 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	25-190 cm	Sand	10yr 4/4	Dark yellowish	Loose, without pebbles	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
				brown		
	190-200 cm	*Babote*	10yr 2/1	Black	Plastic, humid	Negative
	200 cm	Water table				
24, with digger	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-185 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
	185-200 cm	*Babote*	10yr 2/1	Black	Plastic, humid	Negative
	200 cm	Water table				
25, manual	0-100 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
26, with digger	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-200 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
	200 cm	Water table				
27, with digger	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-185 cm	Fine sand	10yr 5/2	Grayish brown	Loose, without pebbles	Negative
28, with digger	0-30 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	30-185 cm	Fine sand	10yr 5/4	Yellowish brown	Loose, without pebbles	Negative
29, with digger	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-185 cm	Fine sand	10yr 5/4	Yellowish brown	Loose, without pebbles	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
30, manual	0-100 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
31, manual	0-30 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	30-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
32, with digger	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-180 cm	Granular clay	7.5yr 4/4	Brown	Medium compaction, with pebbles	Negative
33, with digger	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-180 cm	Clayey fill	7.5yr 4/4	Brown	Mixed with pebbles and rubble	Negative
34, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Clayey fill	7.5yr 4/4	Brown	Mixed with pebbles and rubble	Negative
35, manual	0-30 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	30-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
36,	0-20 cm	Granular clay	10yr 3/3	Dark	Medium	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
manual				brown	compaction, roots, disperse pebbles	
	20-100 cm	Plastic clay	7.5yr 4/4	Brown	Compact, with pebbles	Negative
37, with digger	0-25 cm	Sand	10yr 3/2	Very dark grayish brown	Loose, roots, disperse pebbles	Negative
	25-200 cm	Fine sand	10yr 5/4	Grayish brown	Loose, without pebbles	Negative
38, manual	0-25 cm	Sand	10yr 3/2	Very dark grayish brown	Loose, roots, disperse pebbles	Negative
	25-100 cm	Fine sand	10yr 5/4	Grayish brown	Loose, without pebbles	Negative
39, manual	0-5 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	5-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
40, with digger	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-200 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
41, with digger	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-200 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
	200 cm	Water table				
42, with digger	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-200 cm	Sand	10yr 4/4	Dark	Loose, without	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
				yellowish brown	pebbles	
43, manual	0-25 cm	Sand	10yr 3/2	Very dark grayish brown	Loose, roots, disperse pebbles	Negative
	25-100 cm	Fine sand	10yr 5/2	Grayish brown	Loose, without pebbles	Negative
44, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Plastic clay	7.5yr 4/4	Brown	Compact, with pebbles	Negative
45, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Plastic clay	7.5yr 4/4	Brown	Compact, with pebbles	Negative
46, manual	0-30 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	30-100 cm	Plastic clay	7.5yr 4/4	Brown	Compact, with pebbles	Negative
47, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Plastic clay	7.5yr 4/4	Brown	Compact, with pebbles	Negative
48, manual	0-25 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	25-100 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
49, with digger	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-200 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
50, manual	0-25 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	25-100 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
51, with digger	0-20 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	20-185 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
	185-200 cm	*Babote*	10yr 2/1	Black	Plastic, humid	Negative
	200 cm	Water table				
52, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
53, with digger	0-30 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	30-175 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
54, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
55, with digger	0-30 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Positive, brick fragment
	30-190 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
56, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
57, with digger	0-25 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	25-180 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
58, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
59, with digger	0-25 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	25-180 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
60, with digger	0-25 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	25-190 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
61,	0-25 cm	Sand	10yr 3/3	Dark	Loose, roots,	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
manual				brown	disperse pebbles	
	25-100 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
62, manual	0-25 cm	Sand	10yr 3/3	Dark brown	Loose, roots, disperse pebbles	Negative
	25-100 cm	Sand	10yr 4/4	Dark yellowish brown	Loose, without pebbles	Negative
63, manual	0-25 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	25-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
64, manual	0-25 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	25-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
65, manual	0-25 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	25-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
66, manual	0-25 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	25-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
67, manual	0-10 cm	Limestone fill				
	10-25 cm	Granular clay	10yr 3/3	Dark	Medium	Negative

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
				brown	compaction, roots, disperse pebbles	
	25-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
68, manual	0-10 cm	Limestone fill				
	10-25 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	25-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
69, manual	0-5 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	5-100 cm	Granular clay	10yr 4/3	Brown	Loose, with pebbles	Negative
70, manual	0-20 cm	Granular clay	10yr 3/3	Dark brown	Medium compaction, roots, disperse pebbles	Negative
	20-100 cm	Clayey fill	7.5yr 4/4	Brown	Mixed with pebbles and rubble	Negative

AREA B

C-1	74 centimeters.	0-37 centimeters, brown clay 10YR 4/3; 37-74 centimeters, dark gray clay 10YR4/1; sterile.
C-2	71 centimeters.	0-38 centimeters, brown clay 10YR 4/3; 38-71 centimeters, dark gray clay 10YR4/1; sterile.
C-3	70 centimeters.	0-39 centimeters, brown clay 10YR 4/3; 39-70 centimeters, dark gray clay 10YR4/1;

		sterile.
C-4	76 centimeters.	0-36 brown clay 10YR 4/3; 36-76 centimeters, dark gray clay 10YR4/1; sterile.
C-5	70 centimeters.	0-37 centimeters, brown clay 10YR 4/3; 37-70 centimeters dark gray clay 10YR4/1; sterile.
C-6	69 centimeters.	0-39 centimeters, brown clay 10YR 4/3; 39-69 centimeters, dark gray clay 10YR4/1; sterile.
C-7	73 centimeters.	0-38 centimeters, brown clay 10YR 4/3; 38-73 centimeters, dark gray clay 10YR4/1; sterile.
C-8	79 centimeters.	0-36, centimeters brown clay 10YR 4/3; 36-79 centimeters dark gray clay 10YR4/1; sterile.
C-9	78 centimeters.	0-37 centimeters, brown clay 10YR 4/3; 37-78 centimeters, dark gray clay 10YR4/1; sterile.
C-10	Not made	Pond.
C-11	71 centimeters.	0-45 centimeters, dark brown clay; 45-71 centimeters, brown clay; sterile.
C-12	73 centimeters.	0-73 centimeters, light brown sand; sterile.
C-13	Not made	Dry pond.
C-14	Not made	Dry pond.
C-15	Not made	Dry pond.
C-16	Not made	Dry pond.
C-17	Not made	Dry pond.
C-18	Not made	Dry pond.
C-19	Not made	Dry pond.
C-20	Not made	Dry pond.
C-21	Not made	Dry pond.
C-22	Not made	Dry pond.
C-23	Not made	Dry pond.
C-37	80 centimeters.	0-36 centimeters, brown clay 10YR 4/3; 36-80 centimeters, dark gray clay 10YR4/1; sterile.

C-38	72 centimeters.	0-37 centimeters, brown clay 10YR 4/3; 37-72 centimeters, dark gray clay 10YR4/1; sterile.
C-39	71 centimeters.	0-39 centimeters, brown clay 10YR 4/3; 39-71 centimeters, dark gray clay 10YR4/1; sterile.
C-40	71 centimeters.	0-35, centimeters brown clay 10YR 4/3; 35-71 centimeters, dark gray clay 10YR4/1; sterile.
C-41	69 centimeters.	0-33 centimeters, brown clay 10YR 4/3; 33-69 centimeters, dark gray clay 10YR4/1; sterile.
C-42	75 centimeters.	0-38 centimeters, brown clay 10YR 4/3; 38-75 centimeters, dark gray clay 10YR4/1; sterile.
C-43	76 centimeters.	0-36 centimeters, brown clay 10YR 4/3; 36-76 centimeters, dark gray clay 10YR4/1; sterile.
C-44	70 centimeters.	0-39 centimeters, brown clay 10YR 4/3; 39-70 centimeters, dark gray clay 10YR4/1; sterile.
C-45	71 centimeters.	0-37 centimeters, brown clay 10YR 4/3; 37-71 centimeters, dark gray clay 10YR4/1; sterile.
C-46	73 centimeters.	0-32 centimeters, brown clay 10YR 4/3; 32-73 centimeters, dark gray clay 10YR4/1; sterile.
C-47	Not made	Pond.
C-48	Not made	Flooded.
C-49	Not made	Flooded.
C-50	Not made	Dry pond.
C-51	Not made	Dry pond.
C-52	Not made	Dry pond.
C-53	Not made	Dry pond.
C-54	Not made	Dry pond.
C-55	Not made	Dry pond.
C-56	Not made	Dry pond.
C-57	Not made	Dry pond.
C-58	Not made	Dry pond.

C-59	Not made	Dry pond.
C-60	Not made	Dry pond.
C-61	Not made	Dry pond.
C-62	Not made	Dry pond.
C-63	Not made	Dry pond.
C-64	Not made	Dry pond.
C-65	Not made	Dry pond.
C-66	Not made	Dry pond.
C-67	Not made	Dry pond.
C-68	Not made	Dry pond.
C-69	Not made	Flooded.
C-70	Not made	Flooded.
C-71	Not made	Pond.
C-72	72 centimeters.	0-37 centimeters, brown clay 10YR 4/3; 37-72 centimeters, dark gray clay 10YR4/1; sterile.
C-73	72 centimeters.	0-36 centimeters, brown clay 10YR 4/3; 32-72 centimeters, dark gray clay 10YR4/1; sterile.
C-74	71 centimeters.	0-39 centimeters, brown clay 10YR 4/3; 39-71 centimeters, dark gray clay 10YR4/1; sterile.
C-75	75 centimeters.	0-38 centimeters, brown clay 10YR 4/3; 38-75 centimeters, dark gray clay 10YR4/1; sterile.
C-76	79 centimeters.	0-34 brown clay 10YR 4/3; 34-79 cms. dark gray clay 10YR4/1; sterile.
C-77	80 centimeters.	0-33 centimeters, brown clay 10YR 4/3; 33-80 centimeters,. dark gray clay 10YR4/1; sterile.
C-78	71 centimeters.	0-35 centimeters, brown clay 10YR 4/3; 35-71 centimeters, dark gray clay 10YR4/1; sterile.
C-79	73 centimeters.	0-38 centimeters, brown clay 10YR 4/3; 38-73 centimeters, dark gray clay 10YR4/1; sterile.
C-80	70 centimeters.	0-37 centimeters, brown clay 10YR 4/3; 37-70 centimeters, dark gray clay 10YR4/1; sterile.

C-81	69 centimeters.	0-39 centimeters, brown clay 10YR 4/3; 39-69 centimeters, dark gray clay 10YR4/1; sterile.
C-82	75 centimeters.	0-37 centimeters, brown clay 10YR 4/3; 37-75 centimeters, dark gray clay 10YR4/1; sterile.
C-83	78 centimeters.	0-32 centimeters, brown clay 10YR 4/3; 32-78 centimeters, dark gray clay 10YR4/1; sterile.
C-84	78 centimeters.	0-38 centimeters, brown clay 10YR 4/3; 38-78 centimeters, dark gray clay 10YR4/1; sterile.
C-85	74 centimeters.	0-36 centimeters, brown clay 10YR 4/3; 36-74 centimeters, dark gray clay 10YR4/1; sterile.
C-86	81 centimeters.	0-39 centimeters, brown clay 10YR 4/3; 39-81 centimeters, dark gray clay 10YR4/1; sterile.
C-87	79 centimeters.	0-36 centimeters, brown clay 10YR 4/3; 36-79 centimeters, dark gray clay 10YR4/1; sterile.
C-88	75 centimeters.	0-38 centimeters, brown clay 10YR 4/3; 38-75 centimeters, dark gray clay 10YR4/1; sterile.
C-89	74 centimeters.	0-34 centimeters, brown clay 10YR 4/3; 34-74 centimeters, dark gray clay 10YR4/1; sterile.
C-90	76 centimeters.	0-37 centimeters, brown clay 10YR 4/3; 37-76 centimeters, dark gray clay 10YR4/1; sterile.
C-91	77 centimeters.	0-45 centimeters, dark brown clay; 45-77 centimeters, brown clay 10YR4/1; sterile.
C-92	72 centimeters.	0-47 centimeters, dark brown clay; 47-72 centimeters, brown clay 10YR4/1; sterile.
C-93	76 centimeters.	0-44 dark brown clay; 44-76 centimeters. brown clay 10YR4/1; sterile.
C-94	Not made	Dry pond.
C-95	Not made	Dry pond.
C-96	Not made	Dry pond.
C-97	Not made	Dry pond.
C-98	Not made	Dry pond.

C-99	Not made	Dry pond.
C-100	Not made	Dry pond.
C-101	Not made	Dry pond.
C-102	Not made	Dry pond.
C-103	79 centimeters.	0-79 centimeters, light brown sand; sterile
C-104	Not made	Dry pond.
C-105	Not made	Dry pond.
C-106	81 centimeters.	0-81 centimeters, light brown sand; sterile

AREA C

C-1	78 centimeters.	0-78 centimeters, light brown sand; sterile
C-2	73 centimeters.	0-73 centimeters, light brown sand; sterile
C-3	79 centimeters.	0-79 centimeters, light brown sand; sterile
C-4	77 centimeters.	0-77 centimeters, light brown sand; sterile
C-5	75 centimeters.	0-38 centimeters, brown clay with pebbles 10YR 4/3; 38-75 centimeters. dark grayish brown clay; sterile.

Appendix C

Appendix C

List of Photos

Photo Num. 1:	View to the West of part of Project's North boundary.
Photo Num. 2:	Another view to the West of part of the same boundary.
Photo Num. 3:	Wood and corrugated steel house over the ruins of a concrete structure in the sector of *Hacienda Santa Bárbara*.
Photo Num. 4:	View to the West of a concrete and block warehouse in the area of *Hacienda Santa Bárbara*.
Photo Num. 5:	View to the East of the same warehouse.
Photo Num. 6:	View to the North of a road in the West limit of the Project, Area A.
Photo Num. 7:	Excavating test pit C-8 in Area A.
Photo Num. 8:	Modern debris in Area A.
Photo Num. 9:	Excavating test pit C-34 in Area A.
Photo Num. 10:	Metal pipes possibly signaling soil probes in Area A.
Photo Num. 11:	Excavating test pit C-83 in Area A.
Photo Num. 12:	Hay bale carried by the floods in Area A.
Photo Num. 13:	Excavating test pit C-105 in Area A.
Photo Num. 14:	Excavating test pit C-193 in Area A.
Photo Num. 15:	View to the South of part of the drainage channel in the East boundary of the property, Area A / Example of excavated trench.
Photo Num. 16:	View to the South of part of the East boundary in Area B/ Example of water table.
Photo Num. 17:	Excavating test pit C-5 in Area B.
Photo Num. 18:	Excavating test pit C-8 in Area B.
Photo Num. 19:	Small pond in Area B.
Photo Num. 20:	Excavating test pit C-54 in Area B.
Photo Num. 21:	Excavating test pit C-106 in Area B.
Photo Num. 22:	Excavating test pit C-1 in Area C.
Photo Num. 23:	Metal in Area C.
Photo Num. 24:	Pump to extract water from the river in Area C.

Photo Num. 25: Excavating test pit C-4 in Area C.

Photo Num. 26: View to the North of *Río Grande de Arecibo* in the West boundary.

Photo Num. 27: Structure for the office of the paper mill.

Photo Num. 28: Paper rolls from the paper mill deteriorating behind the warehouse.

Photo Num. 29: Deteriorating structure from the paper mill.

Photo Num. 30: Another deteriorating structure.

Photo Num. 31: Excavating test pit C-5 in Area C.

Photo Num. 32: Bail of hay carried by the floods in Area C.

Photo 1: Example of one of the roads in the property, looking west.

Photo 2: Removed soil midden, surface inspection. Looking south.

Photo 3: Partial view of the site, note vegetation and road. Looking north.

Photo 4: Note vegetation and river. Looking south.

Photo 5: Pumping structure associated to the paper mill.

Photo 6: Pumping structure. Detail.

Photo 7: Modern debris concentration, looking northwest.

Photo 8: Vegetation and flooded area.

Photo 9: Partial view of paper mill, looking south.

Photo 10: Partial view of the paper mill, looking northwest.

Photo 11: Excavation of manual test pit, looking north

Photo 12: Example of manual test pit.

Photo 13: Excavation of trench with heavy machinery and archeological supervision. Oriented south.

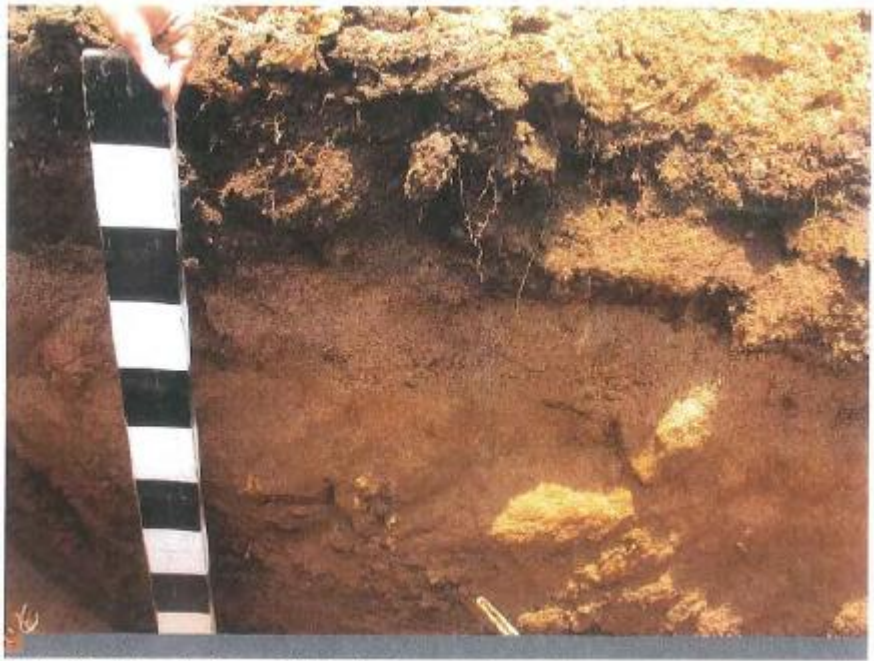


Photo 14: Example of trench profile. Note clay and sand, North profile.

Photo 15: Example of trench excavated with heavy machinery, note river sand stratigraphy and water table at the bottom.

Photo 16: Example of water table.

PHOTO NUM. 15

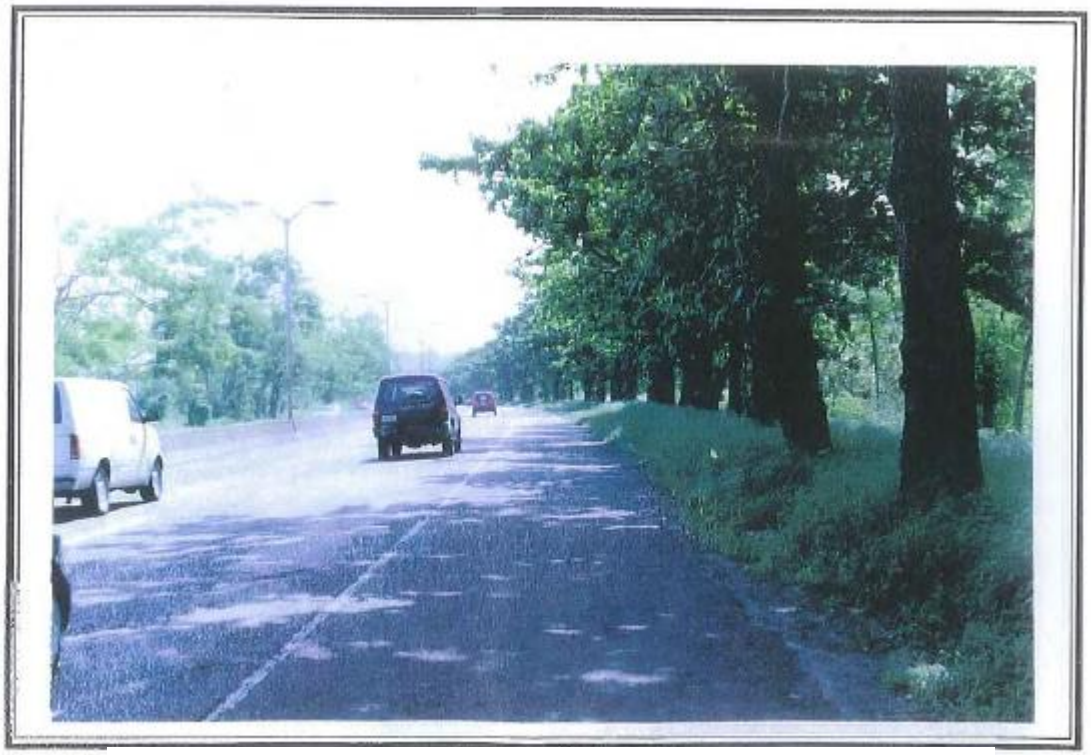


PHOTO NUM. 16

PHOTO NUM. 19

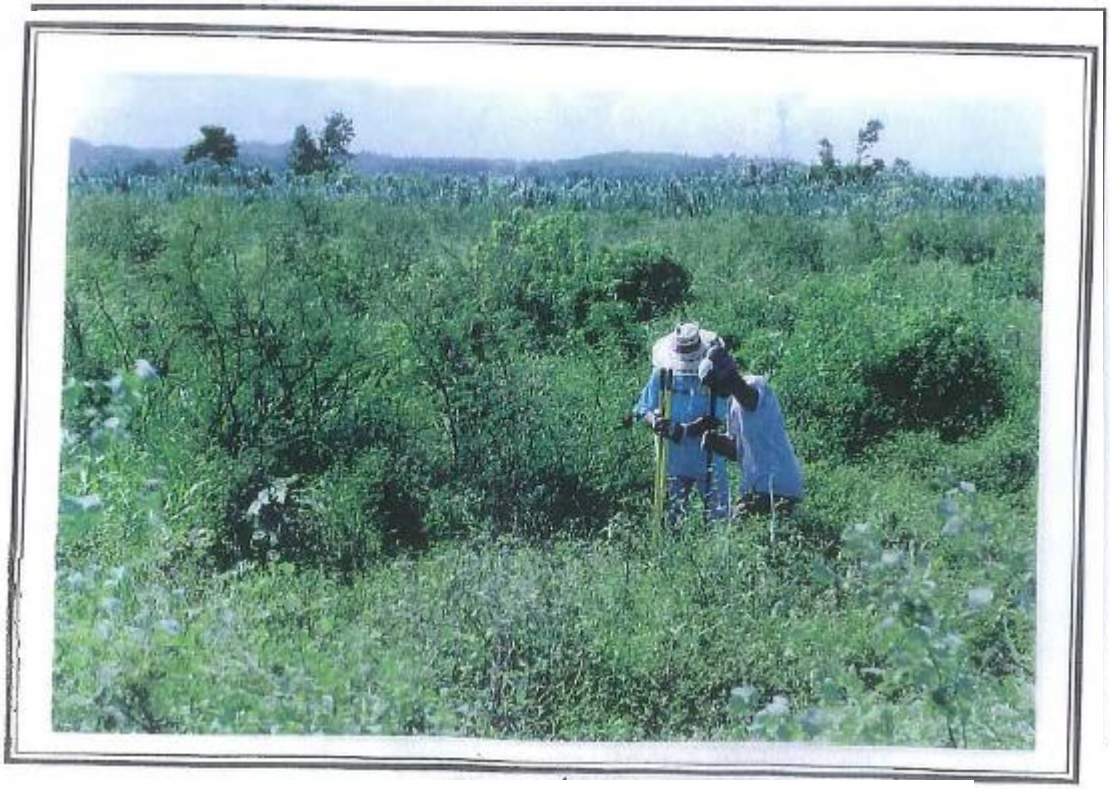


PHOTO NUM. 20

PHOTO NUM. 21

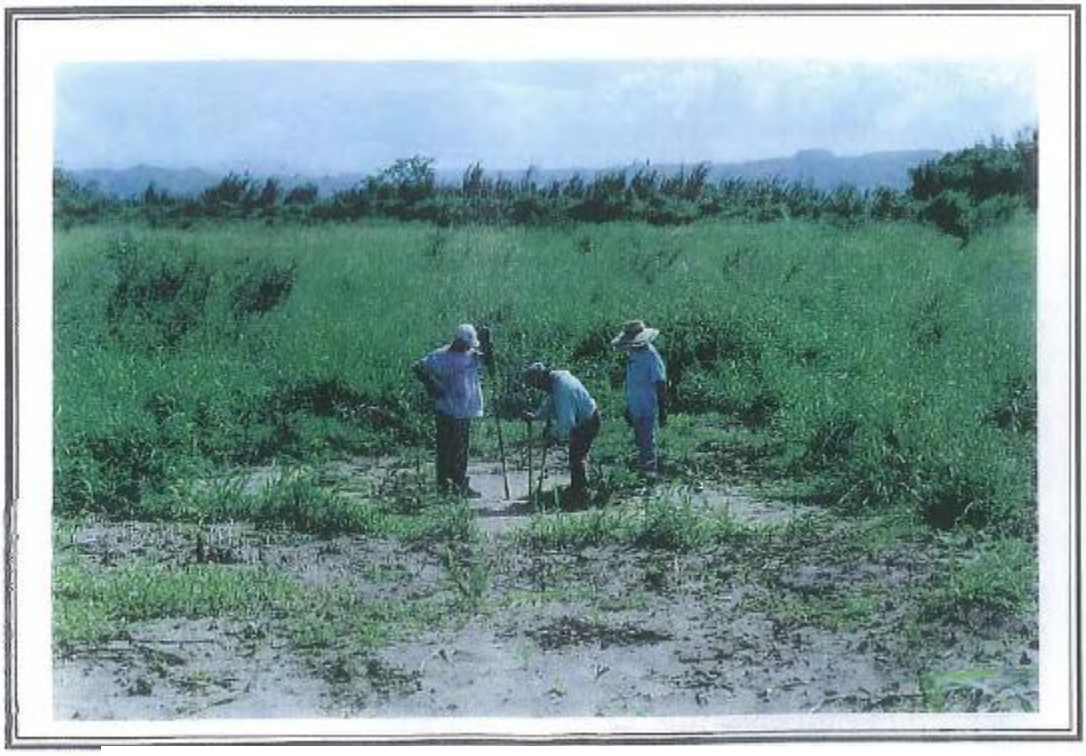
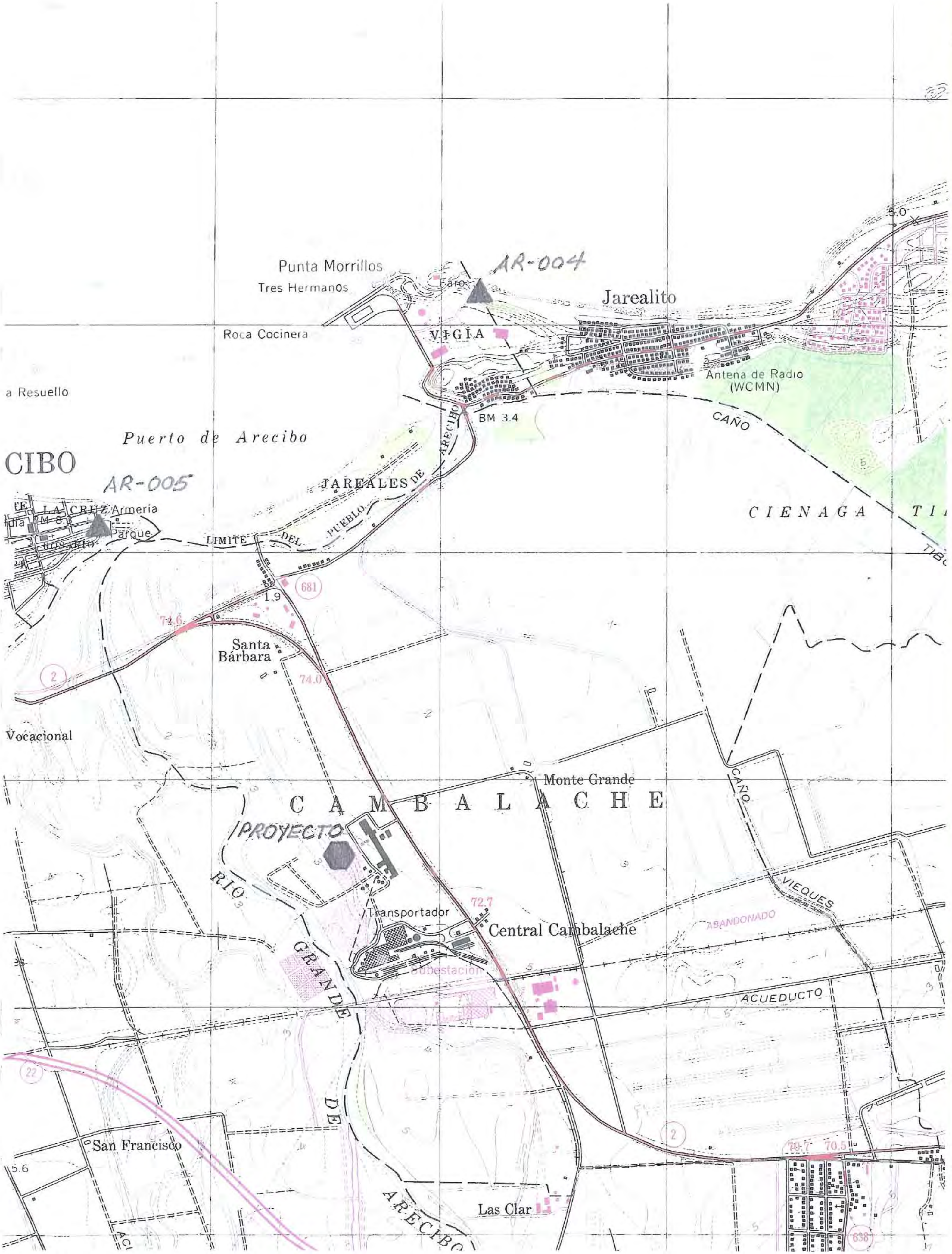


PHOTO NUM. 22

Appendix D



AR-004
Punta Morrillos
Tres Hermanos
Faro
Jarealito
Roca Cocinera
VIGÍA
Antena de Radio
(WCMN)
a Resuello
BM 3.4
CAÑO
Puerto de Arecibo
CIBO
AR-005
JAREALES DE ARECIBO
LA CRUZ
Armería
Parque
ROSARIO
LIMITE DEL PUEBLO
CIENAGA
681
1.9
74.6
Santa Bárbara
74.0
2
Vocacional
Monte Grande
CAÑO
CAMBALACHE
PROYECTO
RIO GRANDE DE ARECIBO
Transportador
72.7
Central Cambalache
VIEQUES
ABANDONADO
Subestación
ACUEDUCTO
22
San Francisco
5.6
70.7
70.5
Las Clar
638

Appendix E

HATO REY TITLE INSURANCE AGENCY, INC

BANKTRUST PLAZA, OFFICE 809
255 PONCE DE LEON AVENUE
HATO REY, PUERTO RICO 00917

TELEPHONE: (787) 274-1200
FAX: (787) 753-5081
FAX: (787) 759-8055

ESTUDIO DE TITULO

NOTICE

CLIENTE: NEVAREZ & SANCHEZ-ALVAREZ #09-31386

FINCA : Numero 20522, inscrita al folio 30 del tomo 1248 de ARECIBO; SECCION I de ARECIBO.

DESCRIPCION:

RUSTICA: parcel of tract of land situated in the Cambalache Ward of the municipality of Arecibo, Puerto Rico with a total area of ninety two cuerdas and seven thousand six hundred ninety two ten-thousands of a cuerda, (92.7692) equivalent to three hundred sixty four thousand, six hundred nineteen (364,619.13) square meters with boundaries as follows: North with finca Santa Barbara owned by the land authority of Puerto Rico ; South with property from the Land Authority of Puerto Rico ; East with Land Authority of Puerto Rico and State Highway number 2 leading to the city of Arecibo and west by the Rio Grande de Arecibo .

De esta finca se expropio parcela de 1704.25 metros cuadrados sin que se halla tomado en cuenta para la descripcion de remanente.

DOMINIO:

Inscrita a favor de Millenium Properties Corp., quien adquiere por compra de la Global Fibers Inc., por precio de $ 2,067,785.00, todo según consta de la escritura # 10 otorgada en San Juan el día 26 de junio de 2005 ante el notario Eddie López Alonso, inscrita al folio 32 del tomo 1248 de Arecibo inscripción 10ma . (139/825)

GRAVÁMENES:

Por su procedencia: Sujeta a servidumbre a favor de Autoridad de Tierras de Puerto Rico, Autoridad de Fuentes Fluviales, Estado Libre Asociado y otra de paso a favor de una propiedad de Grace y Compañía y a condiciones restrictivas de uso y edificación.

Afecta por si a:

Hipoteca en garantía de un pagaré a favor de Westernbank Puerto Rico por la suma de $6,000,000.00 con intereses al Prime Rate anual y vencimiento a la presentación según consta la escritura #8 otorgada en San Juan, el 31 de enero de 2007 ante el notario Francisco J. Biagg Landrón, inscrito al folio 32vto del tomo 1248 de Arecibo inscripción 11ma.

DEBIDO AL SISTEMA DE BITACORA ELECTRONICA UTILIZADO EN ESTA SECCION, NO PODEMOS PRECISAR QUE EXISTA ALGUN DOCUMENTO ADICIONAL RELACIONADO CON ESTA FINCA.

REVISADOS: Registro de Embargos, Sentencias, Contribuciones Federales y Bitácora; a 15 de diciembre de 2009.

kms/WNQ

Today July **ninth (9th)**, two thousand ten (2010), I Issued a First Certified Copy at the request of Energy Answers--------- Development Puerto Rico, LLC. I the Norary, Attest.----------

NOTARY PUBLIC

----------**NUMBER THIRTY ONE (31)**----------

--------**DEED OF OPTION TO PURCHASE AND SALE**------

---In the City of San Juan, Commonwealth of Puerto Rico, on this **ninth (9th)** day of July, two thousand ten (2010).----------

----------BEFORE ME----------

---**ERIC R. HUOT CALDERÓN**, Attorney-at-Law and Notary Public in and for the Commonwealth of Puerto Rico, with offices and residence in the city of Guaynabo, Puerto Rico.----------

----------**APPEAR**----------

---**AS FIRST PARTY: ENERGY ANSWERS DEVELOPMENT PUERTO RICO, LLC** (hereinafter "PURCHASER"), Employer Identification Number 32-0312663, a corporation duly organized and existing under the laws of the Delaware, represented herein by Mark Green Joseph, of legal age, married, executive and resident of Brooklyn, New York, duly authorized and empowered to execute this deed on behalf of the Corporation as appears from a Written Consent of the Sole Member of the Purchaser executed on July first (1st), two thousand ten (2010) signed by Patrick F. Mahoney, President of ENERGY ANSWERS PUERTO RICO HOLDING, LLC, being the sole Member of Purchaser.----------

---**AS SECOND PARTY: MILLENIUM PROPERTIES CORPORATION** ("SELLER" or "MILLENIUM"), Employer Identification Number 66-0548620, a corporation duly organized and existing under the laws of the Commonwealth of Puerto Rico, represented herein by its Vice-President, Jan René Benvenutti Fox, of legal age, single, attorney and resident of San Juan, Puerto Rico, duly authorized and empowered to execute this deed on behalf of the Corporation as appears from a

Certificate of Corporate Resolution executed on Jule two (2nd), two thousand ten (2010) signed by Ramón Luis Pérez Vázquez, as Secretary of the Corporation, under affidavit number four hundred seventy-eight (478), before Luis F. Piñeiro Enriquez, Notary Public .----------

---I, the Notary, do hereby certify that I personally know the persons appearing herein and by their statements, I also certify as to their age, civil status, occupation and residence. The appearing parties assure me that they have, and in my judgment they do have, the necessary legal capacity and understanding of the English language to execute this instrument and, therefore, freely:----------

----------**STATE**----------

---**FIRST**: Seller is the owner of record in fee simple ("pleno dominio") of that certain property described below and identified as the former Global Fibers property of approximately ninety-two cuerdas and seven thousand six hundred ninety two ten thousands of a cuerda (92.7692) located on the southwest side of State Road Number Two (2) in Arecibo, Puerto Rico, and the improvements, fixtures and other structures thereon, each such area being more particularly described in Exhibit A (hereinafter, the "Property").----------

-----RUSTICA: parcel of tract of land situated in the Cambalache Ward of the municipality of Arecibo, Puerto Rico with a total area of ninety two cuerdas and seven thousand six hundred ninety two ten-thousands of a cuerda, (92.7692) equivalent to three hundred sixty four thousand, six hundred nineteen (364,619.13) square meters with boundaries as follows: North with finca Santa Barbara owned by the land authority of Puerto Rico; South with property from the Land Authority of Puerto Rico; East with Land Authority of Puerto Rico and State Highway number 2 leading to the city of Arecibo and west by the Rio Grande de Arecibo.----------

---A parcel of one thousand seven hundred four point twenty-five square meters (1704.25) was segregated from this parcel which has not been taken into consideration for the description of the remnant.---

---**SECOND:** Purchaser desires to obtain from Seller, and Seller desires to grant to Purchaser, the option to purchase the Property other than those fixtures and structures thereon described in detail in Exhibit B (the "Excluded Property"; the Property less the Excluded Property hereafter being referred to as the "Optioned Property").----------

---**THIRD:** Purchaser and Seller agree that the value to Purchaser of the Property is materially dependent on the timely execution and delivery to Purchaser by Banco Popular de Puerto Rico (hereinafter, "BPPR" and/or "Mortgagee"), a financial institution organized and existing under the laws of Puerto Rico and the holder of the Mortgage Note on the Property (as defined below), of a Non-Disturbance Agreement, such agreement to be in the form attached hereto as Exhibit C (the "Non-Disturbance Agreement"), pursuant to which the Mortgagee shall agree to (i) cooperate with Purchaser on a timely basis in connection with Purchaser's exercise of the Purchase Option (as defined below), (ii) deliver the Mortgage Note (as defined below) on the Closing Date (as defined below), and (iii) honor the Purchase Option (as defined below) in the event that Mortgagee forecloses upon the Property, effects a sale without foreclosure or otherwise assumes or disposes of title to the Property in accordance with the Mortgage.----------

----------TITLE AND LIENS----------

---**The Property is registered to the name of the**

MILLENIUM PROPERTIES CORPORATION at Volume One Thousand Two Hundred Forty-Eight (1248), Page Thirty (30), Property Number Twenty Thousand Five Hundred Twenty-Two (20,522), Registry of the Property of Puerto Rico, Section One (I) of Arecibo (the "Registry").----------

---MILLENIUM represents and warrants that the above described property is subject to the following liens and encumbrances:----------

-----(A) By its origin to:----------

--------(1) Easement in favor of the Land Authority, pursuant to the terms of Deed Number Fifty-Eight (58) executed on the fifteenth (15th) day of December, nineteen hundred sixty (1960) before Notary Public Fernando Ruiz recorded at volume two hundred eighty-nine (289), page one hundred fifty (150).----------

--------(2) Easement in favor of the Land Authority, pursuant to the terms of Deed Number Fifty-Eight (58) executed on the fifteenth (15th) day of December, nineteen hundred sixty (1960) before Notary Public Fernando Ruiz recorded at volume two hundred ninety-one (291), page twenty-eight (28).----------

--------(3) Easement in favor of the Puerto Rico Power Authority, recorded at volume one hundred sixty-two (162), page fifty-eight (58).----------

--------(4) Easement in favor of Grace and Company, recorded at volume three hundred fifty-two (352), page thirty-nine (39).----------

-----(B) By itself to:----------

--------(1) As appears from the Registry, the Property is subject to a mortgage in guarantee of a note to the order of Westernbank Puerto Rico in the

principal amount of Six Million Dollars ($6,000,000.00) (the "Mortgage Note"), pursuant to the terms of Deed Number Eight (8), interest thereon at Prime Rate and due on demand, executed on the thirty-first (31st) day of January, two thousand seven (2007) before Notary Public Francisco J. Biaggi Landrón, recorded at volume one thousand two hundred forty-eight (1248), page thirty-two (32) (the "Mortgage").----------

----------**PURCHASE OPTION**----------

---**FOURTH:** Grant of Purchase Option. Seller hereby grants to Purchaser the exclusive and irrevocable right and option (the "Purchase Option") to purchase the Option Property upon the terms and conditions set forth in this Option Agreement. Seller and Mortgagee have agreed that any and all payments under this Option Agreement shall be delivered by Purchaser directly to Mortgagee. The initial term of the Purchase Option shall be nine (9) months and shall commence on the date of payment by Purchaser to Seller, or its designee, of Three Hundred Thousand Dollars ($300,000.00) (such term being referred to herein as the "Initial Term," and such payment being referred to herein as the "Initial Option Payment"). Seller hereby acknowledges receipt of the Initial Payment from Purchaser on the date hereof. Purchaser shall have three (3) options to extend the Initial Term for an additional period of three (3) months taking into consideration that Purchaser shall need to complete the closing of the construction financing of the Resource Recovery Facility (as defined below) in connection with Purchaser's purchase, ownership and operation of the Option Property (such period being

referred to herein as an "Extension Period"). Such options to extend shall be exercisable by written notice of exercise thereof from Purchaser to Seller not less than fifteen (15) days prior to the expiration of the Initial Term or the then current Extension Period (other than the third such Extension Period). Upon execution and delivery of the Non-Disturbance Agreement by each party thereto, Purchaser shall pay to Seller or its designee the amount of One Hundred Thousand Dollars ($100,000.00) for each of the Extension Periods elected by Purchaser (each an "Option Extension Payment"). The Initial Term, as so extended by any and all applicable Extension Periods, is referred to herein as the "Option Term," provided that the Option Term shall terminate upon the earlier conveyance of the Property pursuant to Purchaser's exercise of the Purchase Option as contemplated herein. Any Option Extension Payments hereunder shall be made by wire transfer or in such other form mutually acceptable to the parties. There shall be no separate amount payable by Purchaser for or upon the exercise of the Purchase Option solely by reason of such exercise.----------

---**FIFTH:** Purchase Price. The purchase price for the Property shall be (i) Five Million Seven Hundred Sixty Seven Thousand Dollars $(5,767,000.00) (the "Purchase Price") (ii) from which Purchaser shall deliver the Initial Option Payment in the amount of Three Hundred Thousand Dollars ($300,000.00) upon execution of this Option Agreement and which amount shall be credited towards the Purchase Price; and, (iii) the remaining balance of the Purchase Price, less any and all Extension Period Payments and the

Initial Option Payment, shall be delivered by Purchaser upon the execution of the Purchase-Sale Deed and upon the delivery of the Mortgage Note to the Property; provided, that to the extent Purchaser incurs any costs or Losses (as defined below) resulting from (1) any breach by Seller of its representations, warranties, covenants or other obligations under this Option Agreement (including costs or Losses in connection with the exercise by Purchaser of any of its rights under this Option Agreement to preserve the Property or to cure any such breach by Seller) or (2) the failure of Mortgagee, Seller and Purchaser to enter into the Non-Disturbance Agreement, or (3) following the execution and delivery by the parties thereto of the Non-Disturbance Agreement, the exercise by Purchaser of any of its rights under the Non-Disturbance Agreement to preserve the Property, then Purchaser shall be entitled to deduct the amount of such costs or Losses from the Purchase Price.----------

---**SIXTH:** Exercise of Purchase Option. Purchaser may exercise the Purchase Option by written notice (the "Option Notice") to Seller at any time from the date of this Option Agreement until the expiration of the Option Term. The Option Notice shall specify a date for closing of the purchase of the Option Property (the "Closing Date"), which shall be no earlier than ten (10) calendar days after the date of the Option Notice. Purchaser may withdraw an Option Notice prior to the Closing Date and reissue the Option Notice at a later date, or otherwise delay the Closing Date.----------

---**SEVENTH:** Closing. On the Closing Date, subject

to satisfaction of the conditions precedent set forth in Section Eight (8) (or the waiver thereof in writing (i) by Purchaser of any condition precedent set forth in Section Eight (8)(a) or (ii) by Seller of any condition precedent set forth in Section Eight (8)(b)), Seller shall sell the Option Property to Purchaser free and clear of all liens or encumbrances and all defects to title other than those items expressly set forth in Exhibit D (such items on Exhibit D, the "Permitted Title Exceptions") and Purchaser shall pay to Seller the Purchase Price, as described in Section 5 (the "Closing"); provided, that if Seller is unable to satisfy any conditions precedent described in Section Eight (8)(a) by the scheduled Closing Date, Purchaser shall have the right to take all reasonable and necessary steps to effect the satisfaction of such conditions precedent and shall have the right to deduct the costs and Losses incurred by Purchaser to effect the satisfaction of such conditions precedent from the Purchase Price. In connection with the Closing, Seller and/or Purchaser, as applicable, shall take the actions and provide the deliverables described in clauses (a) - (f) below.----------

-----(a) Seller and Purchaser shall execute and deliver to each other a public deed in the form attached hereto as Exhibit E (the "Purchase-Sale Deed") before a Notary Public in Puerto Rico selected by Purchaser, which Purchase-Sale Deed contains any and all representations and warranties customary for this type of transaction and satisfactory to Purchaser, including but not limited to title in fee simple (pleno dominio), absence of liens or other

encumbrances [eviction and/or hidden defects in accordance with the dispositions of the Puerto Rico Civil Code] and representations and warranties regarding environmental compliance and liabilities and Hazardous Material. For purposes of this Option Agreement (and the Purchase-Sale Deed), "Hazardous Material" shall mean Hazardous Substances, Oils, Pollutants or Contaminants as defined in the National Oil and Hazardous Substances Pollution Contingency Plan (40 C.F.R. Section 300.5), toxic mold, or any substance defined as a hazardous material by any environmental law.----------

-----(b) Purchaser shall record the executed Purchase-Sale Deed in the Registry of the Property of Puerto Rico and in accordance with all applicable laws and regulations promptly after the Closing Date and in any event within three (3) business days following the Closing Date.----------

---(c) Seller shall pay the fees to the notary public, the stamps on the original and first certified copy of the Purchase-Sale Deed, all transfer taxes and the stamps, vouchers and fees related to the recording of the Purchase-Sale Deed in the Registry of the Property of Puerto Rico.------

-----(d) Seller shall deliver to Purchaser the lien release from Mortgagee and the other documentation and evidence described in Section 8(a)(i).----------

-----(e) Seller shall deliver to Purchaser or the title company all affidavits, gap indemnity agreements and other documents reasonably required by the title company tc issue the Title Policy, each in form and substance reasonably acceptable to Sellers.----------

-----(f) The parties shall exchange such other certifications and assurances as are customary for a transaction of this type. Purchaser may withdraw an Option Notice prior to the Closing Date and reissue the Option Notice at a later date, or otherwise delay the Closing Date limited to the agreed extension term on the fourth clause of this agreement.----------

---**EIGHTH:** Conditions Precedent and Simultaneous to Closing.----------

-----(a) Conditions of Purchaser. Notwithstanding anything to the contrary in this Option Agreement, the Closing shall not occur unless and until each of the following conditions precedent has been satisfied, as of the Closing Date, in Purchaser's reasonable determination or expressly waived in writing by Purchaser:----------

--------(i) the Seller shall execute a Deed of Purchase-Sale and the Mortgagee shall simultaneously deliver the Mortgage Note to the Property and release any and all other encumbrances upon the Property held by the Mortgagee in form and substance reasonably satisfactory to the Purchaser and shall be legal, valid and binding upon the Mortgagee in accordance with its terms and all documentation that Purchaser may reasonably request evidencing the termination and removal of all such liens and encumbrances;------

--------(ii) Purchaser shall have obtained at Purchaser's cost a commitment for title insurance reasonably satisfactory to Purchaser from a title company of Purchaser's choice (the "Title Insurance Commitment") and an American Land Title Association/American Congress on Surveying and Mapping (A.L.T.A./A.C.S.M.) survey (the "Survey") of

the Property prepared by a licensed professional surveyor selected by Purchaser and the title company shall be irrevocably prepared to issue an A.L.T.A. owner's policy of title insurance with extended coverage in favor of Purchaser in an amount not less than the amount of the Purchase Price (the "Title Policy"); provided, that if (i) any exceptions appear in the Title Insurance Commitment other than Permitted Title Exceptions and the standard pre-printed exceptions (the "Objectionable Title Matters"), or (ii) the Survey shows any easements, rights-of-way, encroachments, or other matters affecting the Option Property other than Permitted Title Exceptions ("Objectionable Survey Matters"), Seller shall have cured all such Objectionable Title Matters and Objectionable Survey Matters or, in Purchaser's sole discretion, shall have provided an indemnity in favor of Purchaser's title company causing the title company to remove such Objectionable Survey Matters, as well as a gap indemnity for any liens and encumbrances first appearing in public record or attaching subsequent to the effective date of the Title Insurance Commitment or related preliminary report which are caused by Seller or of which the Seller may have knowledge;----------

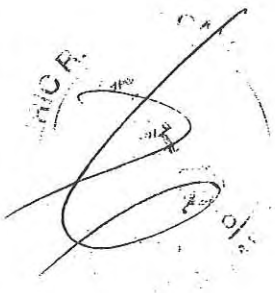
--------(iii) Seller shall have removed all equipment, materials, vehicles, storage tanks, debris and Excluded Property from the Property and Seller shall have left the Option Property in good condition and any buildings or structures thereon in broom clean condition and in good order and repair;----------

--------(iv) no casualty event of loss affecting the Property shall have occurred that could reasonably be expected to have a material adverse effect Purchaser's intended enjoyment, development and/or operation of the Option Property;----------

--------(v) Purchaser shall have achieved closing of the financing of the Resource Recovery Facility (as defined below);----------

--------(vi) this Option Agreement shall be in full force and effect and Seller shall not have breached in any material respect any of its representations, warranties, covenants or other material obligations set forth in this Option Agreement, which breach (or the impact thereof) has not been cured as of the Closing Date; and--------

--------(viii) the Non-Disturbance Agreement shall have been executed and be in full force and effect and Mortgagee shall not have breached in any material respect any of its representations, warranties, covenants or other material obligations set forth in the Non-Disturbance Agreement, which breach (or the impact thereof) has not been cured as of the Closing Date.----------



-----(b) Conditions of Seller. Notwithstanding anything to the contrary in this Option Agreement, the Closing shall not occur unless (i) this Option Agreement shall be in full force and effect and Purchaser shall not have breached in any material respect any of its representations, warranties, covenants or other material obligations set forth in this Option Agreement, which breach (or the impact thereof) has not been cured as of the Closing Date or (ii) Seller shall have expressly waived in writing

satisfaction of the condition precedent set forth in clause (i).----------

---**NINTH:** Covenants of Seller.----------

-----(a) During the Option Term, Seller shall:-----

--------(i) grant full access to Purchaser to the Property for the purposes of: (1) conducting such legal, environmental, scientific and other investigations and studies of the Property as it shall deem necessary or advisable in order to assess the suitability of the Option Property as a site for a resource recovery facility to be developed by Purchaser (the "Resource Recovery Facility") and to investigate the presence of any environmental liabilities; and (2) subject to Section Seven (7)(d), conducting such other activities as Purchaser determines are reasonably necessary to ensure Purchaser's compliance with the eligibility requirements under the U.S. Department of Treasury program for grants in lieu of certain tax credits, including the commencement of site preparation or other construction-related work on the Option Property.----------

--------(ii) work on an exclusive basis with Purchaser, Energy Answers Arecibo, LLC, Energy Answers International, Inc. a New York corporation ("Energy Answers"), and their respective agents, consultants, contractors and representatives (collectively, the "Purchaser Representatives") with regard to the Property and shall provide each of the foregoing entities and persons full access to reasonably available and relevant existing information and shall make the Property available to the foregoing entities and persons for the purposes

described in Section Six (6)(a)(i); provided, that Seller shall also enjoy full access to the Property for the purpose of conducting commercial activities that do not (1) interfere with the conduct by Energy Answers, Purchaser or Purchaser Representatives of the activities referred to in (i) above or (2) damage, alter or impair the Option Property, limit the future use or value of the Option Property, or result in a reasonable possibility that any of the foregoing shall occur.----------

--------(iii) maintain the Property in good condition in the ordinary course of business;----

--------(iv) provide prompt notice to Purchaser of any casualty event or any pending or threatened condemnation affecting any portion of the Property after the date hereof;----------

--------(v) provide and maintain appropriate insurance coverage for the Property against property damage and liability for injuries to persons or property;----------

--------(vi) deliver to Purchaser promptly after receipt by Seller copies of all notices issued by any governmental authority or by Mortgagee with respect to the Property received by Seller after the date hereof;----------

--------(vii) refraining from taking any action detrimental thereto in securing any governmental permits, approvals or licenses necessary or appropriate to develop the Option Property;--------

--------(viii) advise Purchaser promptly of any threatened or pending litigation, arbitration or other judicial or administrative proceeding of which Seller has knowledge that concerns the Property, the

ability of Seller to perform its obligations under this Option Agreement or the ability of Purchaser to exercise its rights or remedies under this Option Agreement;----------

--------(ix) furnish to Purchaser, or make available to Purchaser for inspection at the Property, all information in Seller's possession relating to the Property, including, without limitation, all internal reports and audits relating to environmental compliance, site cleanup and improvements, Hazardous Materials, health and safety conditions, operating and maintenance logs, and promptly upon receipt or delivery thereof all correspondence with governmental authorities or with the Mortgagee, provided that Purchaser shall make arrangements for the copying of any such information at its expense and return the originals to Seller within a reasonable period of time;----------

--------(x) take such action, at Seller's own expense, which Purchaser reasonably requests based on environmental investigations of the Property conducted by Purchaser Representatives, to remove or otherwise address any Hazardous Materials indicated by such investigations to be on the Property, and to take such other remedial actions with respect to any adverse environmental condition which Purchaser Consultants may recommend be taken; and----------

--------(xi) upon execution and delivery of the Non-Disturbance Agreement by the parties thereto, comply in a timely manner with all of its Seller's obligations under the Non-Disturbance Agreement.---

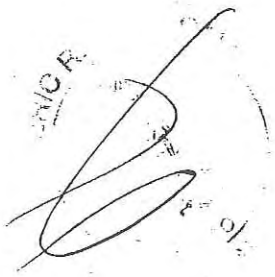
-----(b) During the Option Term, Seller shall not:-

--------(i) directly or indirectly transfer any

interest in the Property or enter into any agreement (other than any deliverables executed in connection with the Closing) relating to any such transfer of interest;----------

--------(ii) grant, create, assume or permit to be created any mortgage, lien, encumbrance, lease, easement, covenant, condition, right-of-way or restriction upon the Property or take or permit any action adversely affecting the title to, or use or value of, the Property as it exists on the date hereof;----------

--------(iii) enter into any new agreement or service contract (including, without limitation, any management, service, equipment, supply, maintenance or concession agreement) or equipment lease relating to all or any part of the Property that would bind Purchaser, or survive the Closing;----------



--------(iv) make any alteration to the Property, except in the case of an emergency, provided that Purchaser is given prompt notice of such emergency alteration; or----------

--------(v) demolish, destroy or damage any portion of the Property.----------

---This Section Nine (9) shall survive Purchaser's exercise of the Purchase Option, any expiration or termination of the Purchase Option and the conveyance of the Option Property as contemplated herein.----------

---**TENTH:** Representations, Warranties and Indemnities.----------

-----(a) Seller represents and warrants that:-----

--------(i) Seller is duly organized and in good standing in the jurisdiction of its organization, has the power and authority to enter into this Option Agreement and has obtained all internal and third party consents and approvals and any permits or authorizations from governmental authorities necessary for it to enter into this Option Agreement and to perform its obligations hereunder;----------

--------(ii) this Option Agreement has been duly authorized, executed and delivered and is a binding obligation of Seller;----------

--------(iii) Seller's execution and delivery of this Option Agreement and its performance of its obligations hereunder do not conflict with its organizational documents, conflict with or violate any applicable laws, governmental orders or judgments or conflict with or cause a breach under any contracts to which it or any of its affiliates is a party;----------

--------(iv) to Seller's knowledge, there is no pending or threatened litigation (except items listed on Schedule A), condemnation or other proceeding that would or could adversely affect the use or value of the Property, Seller's ability to perform in accordance with this Option Agreement or the ability of Purchaser to exercise its rights or remedies under this Option Agreement;----------

--------(v) Seller owns good and marketable fee simple title of the Property free and clear of all liens and encumbrances, other than the interests of Mortgagee under the Mortgage and Permitted Title Exceptions, and no person or entity leases, licenses

or otherwise has any right to possession of the Property other than Seller;----------

--------(vi) no Hazardous Materials have been brought to, released at, under or from or disposed of on or under the Property; and all asbestos and other dangerous materials that may have been present on the Property at any time in the past have been removed from the Property and properly disposed of;--

--------(vii) there are no actions, activities, circumstances, conditions, events or incidents, including, without limitation, the presence of any Hazardous Material, related to or affecting the Property that would or could reasonably be likely to result in liability under any applicable environmental laws; and----------

--------(viii) to Seller's knowledge, there are no other liabilities or obligations running with the Option Property that would or could have an adverse effect on Purchaser's proposed ownership, enjoyment, development and/or operation of the Option Property.

-----(b) Purchaser represents and warrants that:--

--------(i) Purchaser is duly organized and in good standing in the jurisdiction of its organization and has the power and authority to enter into this Option Agreement and has obtained all internal and third party consents and approvals and any permits or authorizations from governmental authorities necessary for it to enter into this Option Agreement and to perform its obligations hereunder;----------

--------(ii) this Option Agreement has been duly authorized, executed and delivered and is a binding obligation of Purchaser;----------

--------(iii) Purchaser's execution and delivery of this Option Agreement and its performance of its obligations hereunder do not conflict with its organizational documents, conflict with or violate any applicable laws, governmental orders or judgments or conflict with or cause a breach under any contracts to which it or any of its affiliates is a party; and----------

--------(iv) there is no pending or threatened litigation that would or could adversely affect Purchaser's ability to perform in accordance with this Option Agreement. ----------

-----(c) Seller agrees to indemnify, defend, reimburse and hold harmless Purchaser, Energy Answers, the Purchaser Representatives and their respective employees, officers, directors and shareholders for all losses, damages, claims, causes of action and other liabilities (including reasonable attorneys' fees) (collectively, "Losses") incurred or suffered by them and arising out of or relating to (i) the presence of Hazardous Material in, on, above, under or migrating from the Property at any time prior to the Closing or any non-compliance with applicable environmental laws, or (ii) a breach of any representation, warranty or covenant of Seller in this Option Agreement, subject in each case to the Comparative Fault Standard.----------

-----(d) Purchaser agrees to indemnify, defend, reimburse and hold harmless Seller and its employees, officers, directors and shareholders for all Losses incurred or suffered by them and arising out of or relating to (i) any damage to the Property caused by Purchaser or Purchaser Representatives or (ii) a

breach of any representation or warranty of Purchaser in this Option Agreement, subject in each case to the Comparative Fault Standard.----------

---As used herein, "Comparative Fault Standard" means the requirement that the liability of a party under this Option Agreement for Losses incurred by another person or entity with respect to a particular matter for which indemnity would otherwise be provided under this Section 10 shall be reduced or eliminated to the extent that the circumstances giving rise to such party's potential liability are caused by the negligence or willful misconduct of the other party and/or its Indemnitees, and/or the breach by such other party and/or its Indemnitees of any of the terms, covenants and conditions of this Option Agreement. "Indemnitees" means, with respect to each party, its respective successors and assigns, lenders (including Mortgagee, in the case of Seller), affiliates, directors, officers, equity-holders, partners, employees, representatives, consultants, agents and contractors.----------

---This Section Ten (10) shall survive Purchaser's exercise of the Purchase Option, any expiration or termination of the Purchase Option and the conveyance of the Property as contemplated herein.----------

---**ELEVENTH:** Confidentiality. Any non-public information concerning the parties, the Property, its possible future use or the Purchase Option, that is disclosed by one party (the "Disclosing Party") to the other party (the "Receiving Party") or its agents, consultants and representatives in connection with the potential transactions contemplated by this Option Agreement, shall be

treated as confidential by the Receiving Party (subject to the same standard of care against unauthorized disclosure as such party affords its own confidential and proprietary information). Without the prior written consent of the Disclosing Party, such information may not be disclosed by the Receiving Party to any person or entity other than the Receiving Party's employees and affiliates and their respective legal, financial, technical and other advisors or potential lenders, investors or rating agencies on a need-to-know basis (it being understood that such affiliates, employees and advisors shall be informed of the confidential nature of such information and shall be directed to treat such information confidentially, and that the Receiving Party shall remain responsible for any unauthorized disclosure of any such information made by any such affiliate, employee or advisor). Any and all information within the scope of this Section 11 disclosed shall be returned to the relevant Disclosing Party by the Receiving Party promptly at the request of the Disclosing Party; and the Receiving Party shall retain no copies thereof in any form, including electronic, and shall certify in writing to the disclosing party the receiving party's compliance with this requirement.----------

---In addition, the parties shall cooperate with each other in connection with the timing and content of any press release or similar public disclosure concerning this Option Agreement or such potential transactions.----------

---This Section Eleven (11) shall survive Purchaser's exercise of the Purchase Option, any

expiration or termination of the Option and the conveyance of the Property as contemplated herein.----------

---**TWELFTH:** Broker. Seller shall be responsible for the payment of all brokers commissions due in connection with this transaction, and shall indemnify Purchaser against any claims made by any broker that alleges it was retained by Seller with respect to the Property. Purchaser represents that it has not dealt with any broker in connection with this transaction and shall indemnify Seller against any claims made by any broker that alleges it was retained by Purchaser with respect to the Property.----------

---**THIRTEENTH:** Notices. All notices given in connection herewith shall be in writing and shall be delivered by hand or by reputable overnight delivery service, and shall be deemed to have been validly given on the date of such hand delivery or on the date following delivery to the overnight delivery service, whichever is applicable, addressed to the party so notified at the address set forth below (or at such other address(es) notified in writing to the appropriate address by one Party to the other from time to time):----------

-----Seller: Millenium Properties Corporation---
----------Ramón Pérez Vázquez----------
----------PMB 275 Box 2020----------
----------Barceloneta, Puerto Rico 00617-----

----------with a copy to:----------

-----Purchaser:Patrick F. Mahoney----------
----------President----------
----------Energy Answers Development Puerto
----------Rico, LLC----------
----------c/o Energy Answers International,
----------Inc.----------
----------79 North Pearl Street, 4th Floor----
----------Albany, NY 12207----------

----------with a copy to:----------

----------Andrés R. Nevares----------
----------Nevares & Sánchez-Alvarez, PSC----------
----------El Caribe Building, Suite 1501----------
----------53 Palmeras Street----------
----------San Juan, Puerto Rico 00901-2418---------

---**FOURTEENTH**: Defaults; Remedies. (a) In the event Purchaser defaults in the performance of any of its obligations contained herein, written notice of such default shall be promptly given by Seller to Purchaser. Purchaser shall have twenty (20) days thereafter to cure such default, or if such default is not capable of being cured within said twenty (20) day period, to commence curing such default. If such default is not cured within said twenty (20) day period, or such reasonable additional time as may be required if such default is not capable of being cured within said twenty (20) day period, Seller shall have the right to terminate this Option Agreement and retain all amounts previously paid by Purchaser to Seller pursuant to Section Five (5).----------

-----(b) In the event Seller defaults in the performance of any of its obligations contained herein, or if Seller is unable to transfer title to the Property to Purchaser in accordance with the terms of this Option Agreement regardless of whether Purchaser has exercised the Option, written notice of such default shall be promptly given by Purchaser to Seller. Seller shall have 20 days thereafter to cure such default, or if such default is not capable of being cured within said twenty (20) day period, to commence curing such default; provided that in lieu of an extension to such twenty (20) day cure period, Purchaser shall have the right to cure

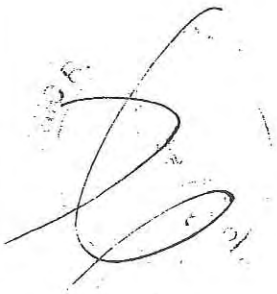
Seller's default and deduct the costs and Losses associated with effecting such cure from the Purchase Price. In addition, if such default is not cured within said twenty (20) day period, or such reasonable additional time as may be permitted by Purchaser, Purchaser shall have the right to seek all remedies which may be available to it at law or in equity, including specific performance of this Option Agreement.----------

---Notwithstanding the foregoing provisions of this clause (b) and the provisions of clause (a) of this Section Fourteen (14), the parties understand and agree that money damages may not be a sufficient remedy for a breach of Section Nine (9) or the first paragraph of Section Eleven (11) and that the non-breaching Party shall be entitled to specific performance and injunctive or other equitable relief for any such breach and may proceed directly to seek such relief without regard to the waiting periods prescribed in this clause (b) and in clause (a) above, and each Party hereby waives any requirement for the posting of a bond or other security in connection with such remedies. Each Party further agrees that such equitable remedies shall not be deemed to be the exclusive remedies for a breach of Section Nine (9) or the first paragraph of Section Eleven (11) but shall be in addition to all other remedies available at law or equity to the Disclosing Party.----------

-----(c) Whenever a default has occurred hereunder beyond all applicable notice and cure periods pursuant to this Section Eleven (11) have expired, the defaulting party shall pay all out-of-pocket expenses of the non-defaulting party (including the

reasonable fees and expenses of its counsel) in connection with the enforcement of this Option Agreement.----------

---**FIFTEENTH:** Assignment. This Option Agreement shall not be assigned by either Party without the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed, except that (a) Purchaser may assign its interest hereunder to another affiliate of Energy Answers, (b) Purchaser may collaterally assign this Option Agreement to its development and or project lenders or to development or project lenders of an affiliate which affiliate lends proceeds to enable Purchaser to perform its obligations hereunder, and (c) Mortgagee may be an assignee of Seller's interest if and to the extent permitted in the Non-Disturbance Agreement.----------



---**SIXTEENTH:** Termination of Memorandum of Understanding. The parties acknowledge that simultaneously with the execution of this Option Agreement, Seller and Purchaser are terminating that certain Memorandum of Understanding, dated as of August 25th, two thousand nine (2009), as heretofore amended or extended.----------

---**SEVENTEENTH:** Entire Agreement. This Option Agreement and (upon execution) the Non-Disturbance Agreement constitute the entire Agreement between the parties regarding the subject matter hereof and can be changed only by a document executed by both parties.----------

---**EIGHTEENTH:** Time is of the Essence. The parties hereto acknowledge and agree that time is of the essence in respect of each party's performance of its

obligations hereunder.----------

---**NINETEENTH**: Miscellaneous.----------

-----(a) This Option Agreement shall be binding upon and inure to the benefit of Purchaser and Seller and their respective permitted successors and assigns.----------

-----(b) The risk of loss or damage to the Property prior to the Closing is assumed by Seller, subject to Section Ten (10)(d) hereof.----------

-----(c) Upon the execution of this Option Agreement, the parties shall execute a memorandum of this Option Agreement in recordable form which shall disclose the existence of this Option Agreement and the term of the Option Term (but shall not disclose the Purchase Price unless required by law), which memorandum of Option Agreement shall be recorded at Purchaser's expense.----------

-----(d) This Option Agreement shall be governed and construed in accordance with the laws of the Commonwealth of Puerto Rico.----------

-----(e) The sole and exclusive forum for the initial determination of any disputed matter to be determined in a judicial proceeding relating to this Option Agreement shall be any court of competent jurisdiction in the Commonwealth of Puerto Rico, including the United States District Court for the District of Puerto Rico. Notwithstanding the foregoing, either party may submit a dispute concerning the scope and specific details of the parties' obligations under clauses a(ii), a(viii), a(x) and a(xi) of Section Nine (9), to binding arbitration before an adjudicator in accordance with the Expedited Arbitration Rules of the American

Arbitration Association (the "AAA") upon written notice to the other party and to such adjudicator. Such adjudicator shall be selected by mutual written agreement of the parties within sixty (60) days following the date of this Option Agreement (which selection may thereafter be changed by mutual written agreement of the parties) or, if not so selected, shall be selected by the AAA upon the written request of either party. Such arbitration shall take place in San Juan, Puerto Rico, unless otherwise agreed by the parties.----------

-----(f) This Option Agreement has been negotiated at arms length by both Seller and Purchaser, and no rule of construction shall be invoked against either party with respect to the authorship thereof. This Option Agreement is solely between Seller and Purchaser and, except as expressly provided herein with respect to Purchaser or a party's indemnities, is not intended to create any third party beneficiaries, nor is it intended to benefit any third parties.----------

---**TWENTIETH:** Recordation of Lease, Fees and Recording Costs.----------

---Seller and Purchaser have agreed that this Option Agreement be recorded in the Registry of Property and respectfully request the Registrar to record this Option Agreement in the Registry of Property under his custody. The notary fees, the internal revenue stamps required by law to be canceled on the original and first certified copy of this deed, and the internal revenue stamps and receipt payable for the presentation thereof and recordation in the Registry of Property shall be for the account of Purchaser,

as well as any expenses necessary to remove this Lease from said Registry.----------

---**TWENTYFIRST:** Petition to the Registrar.---------

---The parties to this Option Agreement respectfully request that the Honorable Registrar of Property record this Option Agreement in the Registry.-------

--------**ACCEPTANCE, WARNINGS AND EXECUTION**-------

---The appearing parties fully ratify and confirm the statements contained herein, and find this Deed drafted to its entire satisfaction, having I the Notary, made to the appearing parties the necessary legal warnings concerning the execution of this Deed.----------

---In particular, I the Notary, have advised the parties hereto and the parties hereto have acknowledged that from the date of preparation of the title study up to the filing of a certified copy of this Deed in the Registry, there is the possibility that documents might be filed in the Registry which may affect the status of the Property as to its title, liens or encumbrances.----------

---

---I, the Notary, do hereby certify that this Deed was read by the appearing parties and that I advised them of their right to have witnesses present at the execution hereof, which right they waived; that I advised them of the legal effect of this Deed and that they acknowledged that they understood the contents of this Deed and such legal effect; and that thereupon they signed this Deed before me, having also written their initials on the left margin of each page of this document, all and everything before me, the Notary, and in my presence, and about all of which, as well as about all other matters contained in this Deed, I, the Notary, do hereby certify.----------

Appendix F

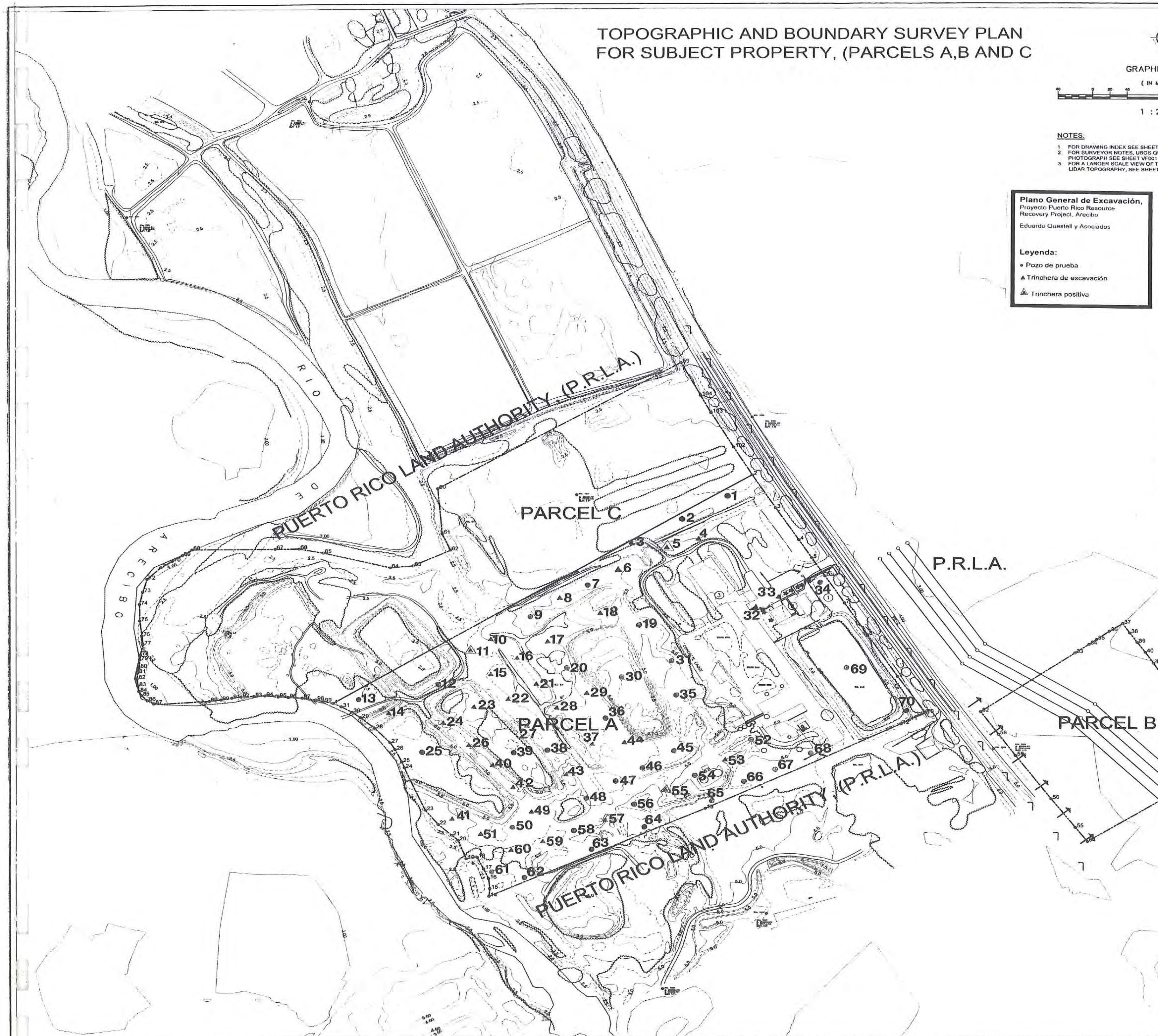
1936

1950

1963

1990

TOPOGRAPHIC AND BOUNDARY SURVEY PLAN FOR SUBJECT PROPERTY, (PARCELS A,B AND C



GRAPHIC SCALE

(IN METERS)

1 : 2,000

NOTES:

1. FOR DRAWING INDEX SEE SHEET VF001
2. FOR SURVEYOR NOTES, USGS QUADRANGLE, FEMA FLOOD MAP AND AERIAL PHOTOGRAPH SEE SHEET VF001
3. FOR A LARGER SCALE VIEW OF THE SITE WITHIN THE RIVER VALLEY WITH LIDAR TOPOGRAPHY, SEE SHEET VF003

Plano General de Excavación,
Proyecto Puerto Rico Resource Recovery Project, Arecibo

Eduardo Questell y Asociados

Leyenda:

- Pozo de prueba
- ▲ Trinchera de excavación
- Trinchera positiva

LEGEND

- PAVED ROAD
- GRAVEL ROADS
- TRAIL
- PAVED PARKING
- GUARDRAIL
- PAVED DRIVEWAY
- CULVERT
- LAKE/POND
- DRAINAGE LINE
- TREE
- TREE COVER
- BRUSHLINE
- FENCE
- WALL
- BUILDING ROOFLINE
- UNIDENTIFIELD STRUCTURES
- SWIMMING POOL
- TANK
- SIGN
- POLES
- TRAFFIC_SIGNAL
- TRANS_TOWER
- INDEX CONTOURS
- OBSCURED CONTOURS
- INTERMEDIATE CONTOURS
- DEPRESSION CONTOURS
- X 101.50 SPOT ELEVATION
- GROUND CONTROL - HORZ/VERT

PARCEL NAME: PARCEL "A" OWNER: ENERGY ANSWERS

SURVEY DATA

LINE	BEARING	DISTANCE	POINT	COORDINATES NORTH (Y)	COORDINATES EAST (X)	DESCRIPTION
1-2	N 32°43'36" E	570.64	1	269279.6032	171220.1706	TO BE ESTABLISHED
2-3	N 59°27'29" W	51.87	2	269588.1103	171700.2209	STEEL ROD
3-4	N 58°47'39" W	50.52	3	269543.4744	171726.6575	STEEL ROD
4-5	N 58°58'49" W	28.84	4	269500.2649	171752.8276	STEEL ROD
5-6	N 58°42'12" W	28.83	5	269475.5617	171767.7018	STEEL ROD
6-7	N 58°49'7" W	42.81	6	269450.9255	171782.6709	STEEL ROD
7-8	N 58°43'0" W	50.46	7	269414.2806	171804.6557	STEEL ROD
8-9	N 58°44'47" W	66.47	8	269371.1396	171831.0686	STEEL ROD
9-10	N 57°31'53" W	58.57	9	269314.3568	171865.5364	STEEL ROD
10-11	S 27°3'11" W	21.20	10	269264.9409	171896.9736	STEEL ROD
11-12	S 29°15'58" W	10.57	11	269255.3006	171878.0969	STEEL ROD
12-13	S 27°8'31" W	250.66	12	269250.1313	171868.8724	STEEL ROD
13-14	S 25°32'20" W	273.61	13	269135.7794	171645.8114	TO BE ESTABLISHED
14-15	N 84°45'3" E	10.49	14	269017.8125	171398.9374	TO BE ESTABLISHED
15-16	S 84°15'5" E	13.60	15	269026.2541	171389.8957	TO BE ESTABLISHED
16-17	S 66°53'33" E	14.27	16	269041.7828	171398.5346	TO BE ESTABLISHED
17-18	S 63°42'27" E	17.51	17	269054.9086	171392.9341	TO BE ESTABLISHED
18-19	S 9°24'23" W	12.64	18	269070.6027	171385.1780	TO BE ESTABLISHED
19-20	S 60°27'34" E	26.87	19	269058.6409	171372.7059	TO BE ESTABLISHED
20-21	S 42°3'39" E	10.17	20	269093.5165	171363.3476	TO BE ESTABLISHED
21-22	S 43°29'4" E	21.44	21	269100.2901	171355.8374	TO BE ESTABLISHED
22-23	S 52°25'43" E	24.30	22	269116.0501	171340.2784	TO BE ESTABLISHED
23-24	S 67°22'20" E	67.57	23	269134.3123	171325.4600	TO BE ESTABLISHED
24-25	S 69°27'25" E	8.26	24	269197.0059	171301.3050	TO BE ESTABLISHED
25-26	S 65°13'23" E	18.36	25	269199.8077	171299.4855	TO BE ESTABLISHED
26-27	S 58°24'36" E	11.20	26	269216.4800	171290.7891	TO BE ESTABLISHED
27-28	S 48°3'54" E	26.15	27	269226.0183	171284.9242	TO BE ESTABLISHED
28-29	S 41°59'40" E	21.78	28	269245.4059	171267.4490	TO BE ESTABLISHED
29-30	S 37°54'25" E	12.26	29	269260.0405	171251.2644	TO BE ESTABLISHED
30-31	S 31°33'27" E	13.90	30	269267.5749	171241.5865	TO BE ESTABLISHED
31-1	S 26°21'56" E	10.60	31	269274.8648	171229.6701	TO BE ESTABLISHED

AREA = 191962.3300 SQ.MTS. = 48.8405 CUERDAS

PARCEL NAME: PARCEL "B" OWNER: ENERGY ANSWERS

SURVEY DATA

LINE	BEARING	DISTANCE	POINT	COORDINATES NORTH (Y)	COORDINATES EAST (X)	DESCRIPTION
32-33	N 36°14'41" E	134.69	32	269266.6460	171960.3115	STEEL ROD
33-34	N 35°46'13" E	19.95	33	269346.2818	172068.9418	TO BE ESTABLISHED
34-35	N 37°22'14" E	11.03	34	269357.9410	172085.1262	TO BE ESTABLISHED
35-36	N 37°2'24" E	16.87	35	269364.8346	172093.8890	TO BE ESTABLISHED
36-37	N 33°10'9" E	18.34	36	269376.0009	172108.9514	TO BE ESTABLISHED
37-38	N 57°20'45" W	14.92	37	269386.0352	172124.3035	TO BE ESTABLISHED
38-39	N 56°14'56" W	15.40	38	269373.4749	172132.3529	TO BE ESTABLISHED
39-40	N 55°12'17" W	16.25	39	269360.6685	172140.9103	TO BE ESTABLISHED
40-41	N 57°22'39" W	17.53	40	269347.3266	172150.1815	TO BE ESTABLISHED
41-42	N 60°12'39" W	26.36	41	269332.5662	172159.6293	TO BE ESTABLISHED
42-43	N 56°48'54" W	9.94	42	269309.6865	172172.7269	TO BE ESTABLISHED
43-44	N 50°33'17" W	17.08	43	269301.3715	172178.1649	TO BE ESTABLISHED
44-45	N 52°42'0" W	14.06	44	269288.1834	172189.0152	TO BE ESTABLISHED
45-46	N 53°5'8" W	21.96	45	269270.9969	172197.5371	TO BE ESTABLISHED
46-47	N 53°28'36" W	20.31	46	269259.4397	172210.7203	TO BE ESTABLISHED
47-48	N 56°15'28" W	30.45	47	269243.1123	172222.8109	TO BE ESTABLISHED
48-49	N 60°2'58" W	14.59	48	269217.7891	172239.7264	TO BE ESTABLISHED
49-50	S 43°47'7" W	18.53	49	269205.1501	172247.0069	TO BE ESTABLISHED
50-51	S 34°42'12" W	11.08	50	269192.3257	172233.6268	TO BE ESTABLISHED
51-52	S 34°48'58" W	19.06	51	269186.0196	172224.5229	TO BE ESTABLISHED
52-53	S 34°43'6" W	18.00	52	269175.1381	172208.8756	TO BE ESTABLISHED
53-54	S 33°29'55" W	133.65	53	269164.8862	172194.0802	STEEL ROD
54-55	S 53°50'40" E	23.58	54	269091.0099	172082.4569	STEEL ROD
55-56	S 54°8'54" E	47.55	55	269110.0497	172068.5465	STEEL ROD
56-57	S 55°13'13" E	71.37	56	269148.5914	172040.0964	STEEL ROD
57-58	S 55°59'46" E	34.61	57	269207.2143	171999.9834	STEEL ROD
58-32	S 56°32'21" E	36.65	58	269235.9066	171980.6271	STEEL ROD

AREA = 44120.3384 SQ.MTS. = 11.2254 CUERDAS

PARCEL NAME: PARCEL "C" OWNER: ENERGY ANSWERS

SURVEY DATA

LINE	BEARING	DISTANCE	POINT	COORDINATES NORTH (Y)	COORDINATES EAST (X)	DESCRIPTION
59-60	S 31°21'59" W	326.83	59	269740.2995	171619.6400	STEEL ROD
60-61	N 85°32'5" W	61.42	60	269570.1600	171340.7726	TO BE ESTABLISHED
61-62	N 87°8'51" W	24.31	61	269508.9510	171345.5640	TO BE ESTABLISHED
62-63	S 26°17'17" W	47.61	62	269486.5503	171354.9946	TO BE ESTABLISHED
63-64	S 5°20'5" W	28.60	63	269465.4644	171312.3080	TO BE ESTABLISHED
64-65	S 18°6'34" E	79.43	64	269462.9917	171285.8281	TO BE ESTABLISHED
65-66	S 11°41'19" E	28.00	65	269483.6951	171209.1464	TO BE ESTABLISHED
66-67	S 0°14'7" W	27.39	66	269489.3675	171181.7299	TO BE ESTABLISHED
67-68	S 0°14'7" W	95.35	67	269489.2551	171154.3441	TO BE ESTABLISHED
68-69	S 34°40'35" W	13.50	68	269486.8636	171058.9986	TO BE ESTABLISHED
69-70	S 33°23'47" W	13.97	69	269481.1654	171047.6997	TO BE ESTABLISHED
70-71	S 32°51'24" W	15.45	70	269473.4082	171036.2369	TO BE ESTABLISHED
71-72	S 45°27'44" W	22.26	71	269465.1116	171023.2548	TO BE ESTABLISHED
72-73	S 73°17'47" W	17.96	72	269449.2478	171007.6448	TO BE ESTABLISHED
73-74	S 77°36'41" W	17.41	73	269432.0464	171002.4830	TO BE ESTABLISHED
74-75	N 88°56'35" W	22.16	74	269415.0411	170998.7476	TO BE ESTABLISHED
75-76	N 83°27'41" W	20.36	75	269392.8872	170999.1563	TO BE ESTABLISHED
76-77	N 84°12'11" W	11.68	76	269372.6641	171001.4742	TO BE ESTABLISHED
77-78	S 78°12'7" W	14.50	77	269360.8490	171002.6737	TO BE ESTABLISHED
78-79	S 84°7'30" W	6.33	78	269346.6563	170999.7092	TO BE ESTABLISHED
79-80	S 84°47'11" W	10.67	79	269340.3627	170999.0616	TO BE ESTABLISHED
80-81	S 77°29'45" W	7.30	80	269329.7337	170998.0917	TO BE ESTABLISHED
81-82	S 86°1'31" W	8.00	81	269322.6049	170996.5106	TO BE ESTABLISHED
82-83	N 85°48'15" W	9.65	82	269314.6216	170995.9561	TO BE ESTABLISHED
83-84	N 79°57'41" W	7.56	83	269305.0024	170996.6816	TO BE ESTABLISHED
84-85	N 62°30'41" W	8.13	84	269297.5654	170997.9783	TO BE ESTABLISHED
85-86	N 45°17'25" W	10.04	85	269292.1297	171000.6065	TO BE ESTABLISHED
86-87	N 31°41'7" W	8.52	86	269284.9925	171007.6716	TO BE ESTABLISHED
87-87	N 4°5'48" W	8.06	87	269280.5190	171015.1191	TO BE ESTABLISHED
87-89	N 3°46'18" E	55.34	87	269279.9429	171023.1627	TO BE ESTABLISHED
89-90	N 7°31'59" E	13.64	89	269283.5832	171078.3627	TO BE ESTABLISHED
90-91	N 10°37'12" E	12.74	90	269285.3714	171091.9059	TO BE ESTABLISHED
91-92	N 8°1'36" E	10.62	91	269287.7202	171104.4323	TO BE ESTABLISHED
92-93	N 3°6'26" E	14.66	92	269289.2026	171114.9444	TO BE ESTABLISHED
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94-95	N 5°31'4" W	15.29	94	269290.5606	171142.2609	TO BE ESTABLISHED
95-96	N 4°39'20" W	11.65	95	269289.0909	171157.4771	TO BE ESTABLISHED
96-97	N 3°3'16" W	15.66	96	269288.1454	171169.0877	TO BE ESTABLISHED
97-98	N 10°2'35" W	15.62	97	269287.3001	171184.9297	TO BE ESTABLISHED
98-99	N 14°44'14" W	8.88	98	269284.5761	171200.3097	TO BE ESTABLISHED
99-1	N 13°32'9" W	11.59	99	269282.3168	171208.8990	TO BE ESTABLISHED
1-2	N 32°43'36" E	570.64	1	269279.6032	171220.1706	TO BE ESTABLISHED
2-102	S 60°39'3" E	43.12	2	269588.1103	171700.2209	STEEL ROD
102-103	S 61°45'2" E	53.01	102	269625.6941	171679.0954	STEEL ROD
103-104	S 62°52'5" E	26.30	103	269672.3940	171654.0033	STEEL ROD
104-59	S 63°31'4" E	49.71	104	269695.8015	171642.0086	STEEL ROD

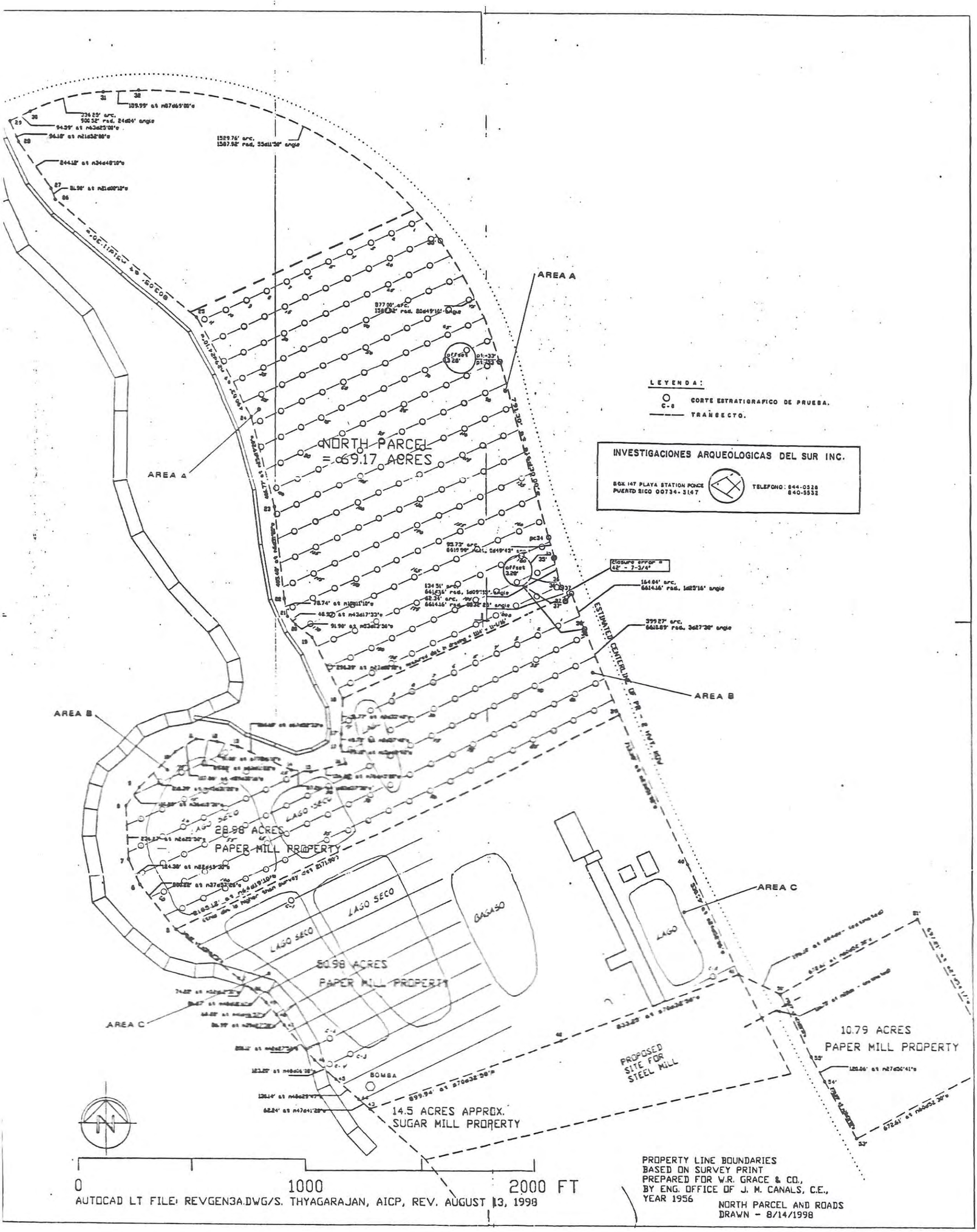
AREA = 127589.1807 SQ.MTS. = 32.4622 CUERDAS

THE UNDERSIGNED, PROFESSIONAL LAND SURVEYOR AUTHORIZED TO EXERCISE HIS PROFESSION IN THE COMMONWEALTH OF PUERTO RICO, DOES HEREBY CERTIFIES THAT THE PLAN HEREON DRAWN IS A TRUE REPRESENTATION OF THE EXISTING GENERAL CONDITIONS IN THE DATE THE SURVEY WAS PERFORMED AND THAT IT WAS CONDUCTED BY HIM OR UNDER HIS SUPERVISION.

ALEXIS OCASIO AGOSTO — AGRIMENSOR LICENCIADO — PUERTO RICO

01/SEP/2010

ALEXIS OCASIO AGOSTO
PROFESSIONAL LAND SURVEYOR
LICENSE NO. 14879


AREA A
AREA A
NORTH PARCEL
= 69.17 ACRES
AREA B
AREA B
28.98 ACRES
PAPER MILL PROPERTY
LAGO SECO
LAGO SECO
BASIN
80.98 ACRES
PAPER MILL PROPERTY
AREA C
AREA C
LAGO
PROPOSED
SITE FOR
STEEL MILL
10.79 ACRES
PAPER MILL PROPERTY
BOMBA
14.5 ACRES APPROX.
SUGAR MILL PROPERTY
ESTIMATED CENTERLINE OF PR-2 HWY.
LEYENDA:
C-6 CORTE ESTRATIGRAFICO DE PRUEBA.
TRANSECTO.
INVESTIGACIONES ARQUEOLOGICAS DEL SUR INC.
BOX 147 PLAYA STATION PONCE
PUERTO RICO 00734-3147
TELEFONO: 844-0328
840-5532
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1000
2000 FT
AUTOCAD LT FILE: REVGEN3A.DWG/S. THYAGARAJAN, AICP, REV. AUGUST 13, 1998
PROPERTY LINE BOUNDARIES
BASED ON SURVEY PRINT
PREPARED FOR W.R. GRACE & CO.,
BY ENG. OFFICE OF J. M. CANALS, C.E.,
YEAR 1956
NORTH PARCEL AND ROADS
DRAWN - 8/14/1998

ARCHEOLOGICAL ASSESSMENT REPORT
PHASE IA-IB

CONNECTION ROUTES OF THE BRACKISH WATER LINE AND THE ELECTRICAL LINE FOR THE RENEWABLE POWER GENERATION AND RESOURCE RECOVERY PLANT

ISLOTE AND CAMBALACHE WARDS
ARECIBO, PUERTO RICO

PREPARED FOR

CSA GROUP
CSA Plaza, Suite 500, 1064 Ponce de León Ave.
San Juan, Puerto Rico 00907-3740

PREPARED BY
EDUARDO QUESTELL Y ASOCIADOS

EDUARDO QUESTELL RODRÍGUEZ FEDERICO FREYTES RODRÍGUEZ

SEPTEMBER 2010

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ARCHEOLOGICAL ASSESSMENT REPORT
PHASE IA-IB

CONNECTION ROUTES OF THE BRACKISH WATER LINE AND THE ELECTRICAL LINE FOR THE RENEWABLE POWER GENERATION AND RESOURCE RECOVERY PLANT

ISLOTE AND CAMBALACHE WARDS
ARECIBO, PUERTO RICO

INTRODUCTION

This report shows the results of the Archaeological Assessment Phase IA-IB of the route intended for a new line of brackish waters and also a new electrical line for the project of a Renewable Power Generation and Resource Recovery Plant, that would be located in a property near Road PR-2, KM 72.8, Cambalache Ward of Arecibo (see figures num. 1 and num. 2 for the location of the new lines).

The project of the new brackish water line includes the excavation of trench for the pipes in a stretch of about 3,100 linear meters in segments of roads PR-681, PR-6681 and PR-2, in Islote and Cambalache wards of the Municipality of Arecibo. The project of the new electric line includes extending such line, part underground and part aerial, along a section of approximately 1,335 linear meters which is: about 485 linear meters inside de Project area, and about 850 linear meters, mostly cross country, in lots belonging to the Lands Authority, South of the planned Project, in Cambalache Ward of Arecibo (see maps at the end of report).

This report has been prepared for CSA Group, in accordance with Section 10 of Law 112 from July 20, 1988, also known as Terrestrial Archeology Act of Puerto Rico, and Section 106 of the National Historic Preservation Act and the Code of Federal Regulations (36CFR), Title 36.

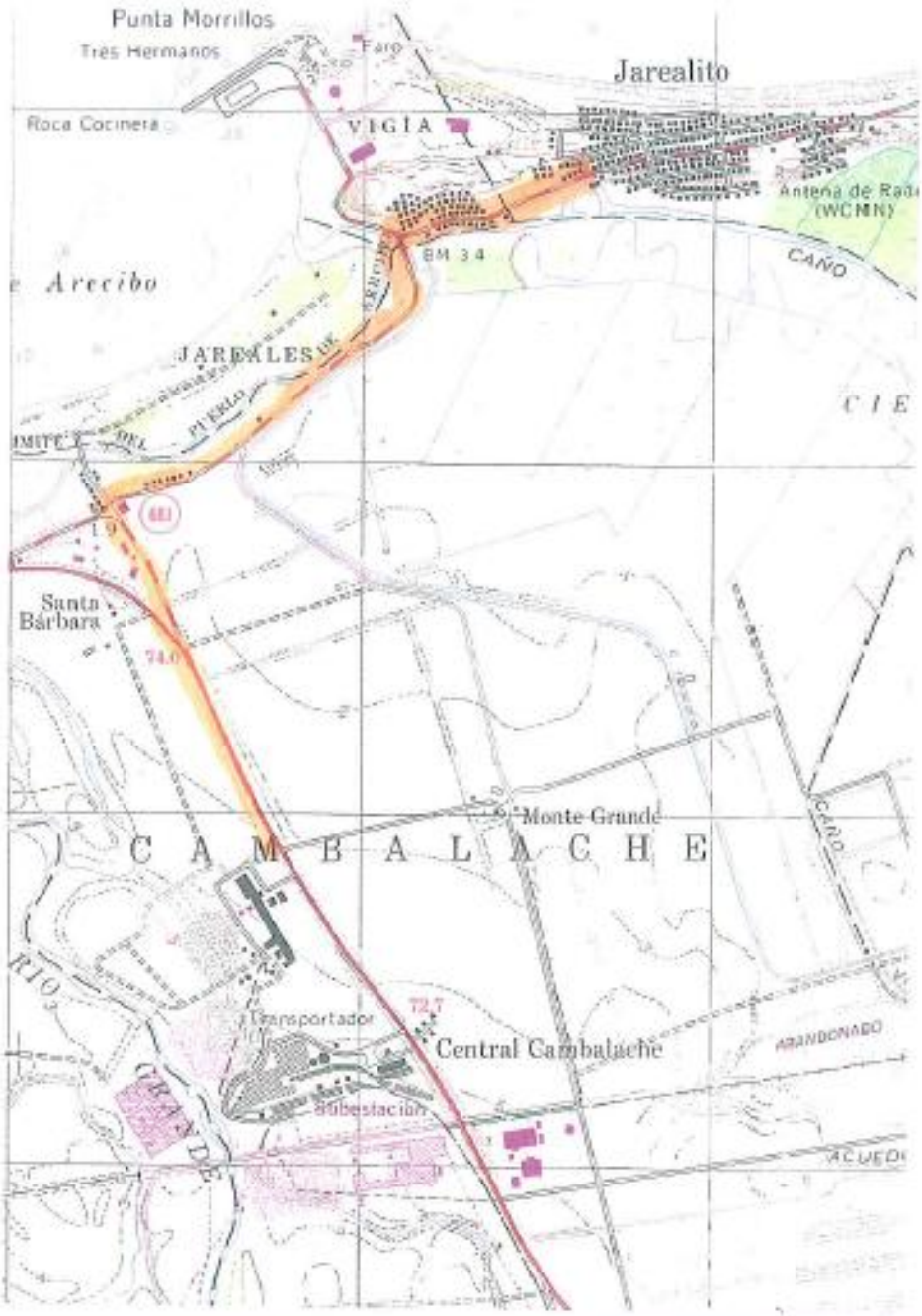

FIG. NUM. 1
LOCATION OF THE NEW BRACKISH WATER LINE

ARECIBO QUADRANGLE	**SCALE 1:20,000**

EDUARDO QUESTELL Y ASOCIADOS

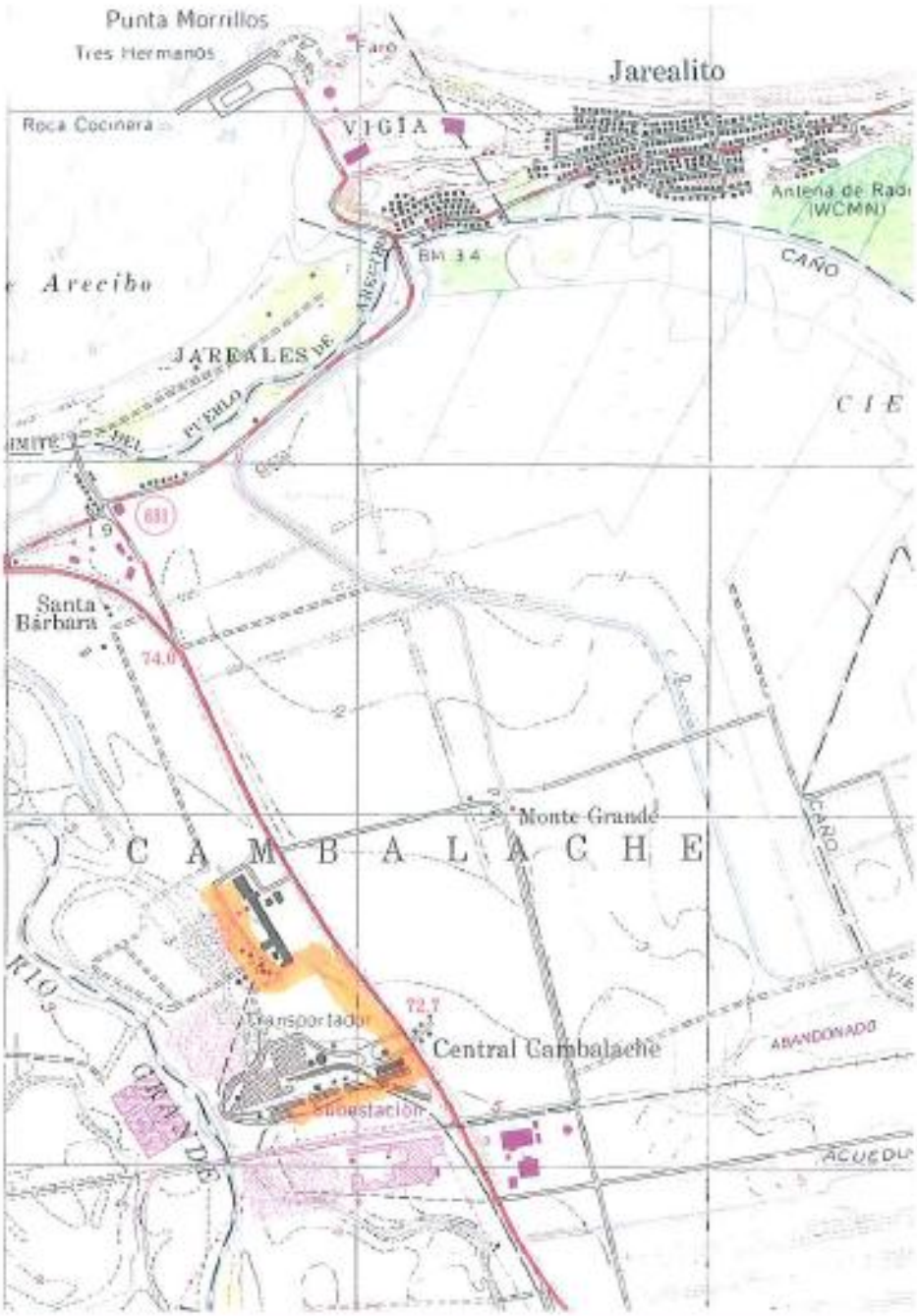

FIG. NUM. 2
LOCATION OF THE NEW ELECTRIC LINE

ARECIBO QUADRANGLE	**SCALE 1:20,000**

EDUARDO QUESTELL Y ASOCIADOS

In general terms, agencies may request a Phase IA-IB archeological assessment for the areas where it is planned to establish both new lines.

This phase has been defined by Arch. John Vetten from the Federal Environmental Protection Agency (EPA), New York Region, as follows:

"Stage IA: Literature Search and Sensibility Study

> The stage IA is the initial level of survey and requires comprehensive documentary research designed to identify any known or potential historical, architectural and / or archaeological resources within a project area. A primary objective of the study, is to evaluate the differential sensibility of the project area for the presence of cultural resources, this information will be used to guide the field investigations that follow.
>
> In carrying out the literature search, sources at the State Preservation Office (S.H.P.O.), universities, local libraries, museums, historical societies and the like, are to be consulted.
>
> In addition, the nature and extend of the proposed project is evaluated, an initial walk-over reconnaissance and surface inspection is completed and the effect of prior ground disturbance of the probability of identifying cultural resources is assessed.
>
> The final document must focus on the project area and minimally includes:
> - a brief description;
> - a description of the environmental setting as it pertains to actual or potential cultural resources locations;
> - a synthesis of prehistoric and historic and cultural development and land use patterns; and
> - a definition of sensitivity zones with explicit criteria for ranking undertaking.

Stage IB: Field Investigation

> Subsurface testing is the major component of this level of survey and is required unless the presence or absence of resources can be determined by direct observation or by examination of specific document references.
>
> The areas to be subjected to survey are selected on the basis of the data gathered in the Stage IA evaluation and the probable location (s) of the undertaking.
>
> The careful location of identified resources with respect to areas of impact of the proposed project must be established.

The final Stage IB report presents the results of the field investigation, including:

- Description of the survey design and methodology (based on the result of the stage IA);
- Complete records of soil stratigraphy; an artifact catalogue including identification, estimated date range and quantity on weight, as appropriate.

The location of all test units must be accurately plotted on a project area map, with location of identified resources clearly defined. Photographs which illustrate salient prints of the survey area are a necessary component of the final report.

Detailed recommendation and supporting rational for additional investigation must be incorporated into the conclusions of the Stage IB study.

If all cultural resources identified through the Stage IA and / Stage IB surveys will not be impacted by the proposed project, the survey process is completed".

In our report we have followed the *Guidelines for Archeological Research* of the State Historic Preservation Office and the *Regulation for Filing and Archaeological Evaluation of Construction and Development Projects* from the Council for the Protection of the Terrestrial Archeological Heritage of Puerto Rico, ascribed to the Institute of Puerto Rican Culture.

PHASE IA SURVEY

As established, a Phase IA of an archaeological assessment includes: a description of the project; a description of the environmental setting of the location; a synthesis of prehistoric and historic and cultural development, with a sensibility study of the studied site and its land use patterns.

Project Description

As we said before, the project of the new brackish water line includes the excavation of a trench for the pipes in a stretch of about 3,100 linear meters in segments of roads PR-681, PR-6681 and PR-2, in Islote and Cambalache wards of the Municipality of Arecibo, up to the site of the proposed Renewable Power Generation and Resource Recovery Plant. The project of the new electric line includes extending such line, part underground and part aerial, along a section of approximately 1,335 linear meters which is: about 485 linear meters inside de Plant area, and about 850 linear meters, mainly cross country, in lots belonging to the Puerto Rico Land Authority, South of the planned Project, in Cambalache Ward of Arecibo (see plans at the end of report).

Environmental Setting

Figures num. 1 and 2 show the location of both, the new brackish water line, and electrical line projects, that as we said, are in Islote and Cambalache Wards (the new brackish water line) and Cambalache Ward (the new electric line), of the Municipality of Arecibo. The topography is predominantly flat along both routes. The maximum elevation on the lot is close to 5 meters above sea level at the South boundary of the electric line project. The *Río Grande de Arecibo* flows at 400 meters West at its closest point.

Generally, the Municipality of Arecibo has a pleasant climate with a mean annual temperature of approximately 77ºF (R. Picó, 1964 p.5) and a mean annual precipitation of close to 60 inches of rain (*ibid*, p.6). Most of the municipality is located in the region called "Northern Coastal Plain" (*Llano costero del norte*), and belongs to the "Alluvial Moist Section" (*Sección Húmeda Aluvial*) (*Ibid*, p.10).

Geology for the Arecibo quadrangle was done by Reginald P. Briggs in 1968. He states that the primary soil at the new electric line consists of floodplains Alluvium (Qa, sand, gravel, lime and clay). The West side of the new brackish water line, is predominantly alluvium with fill deposits (Qf). To the East of this route are swamp deposits (Qs), and at the route's Eastern limit emerge cemented dunes (Qcd) and sand from dunes (Qdt). Figure num. 3 shows the geology of the Project area.

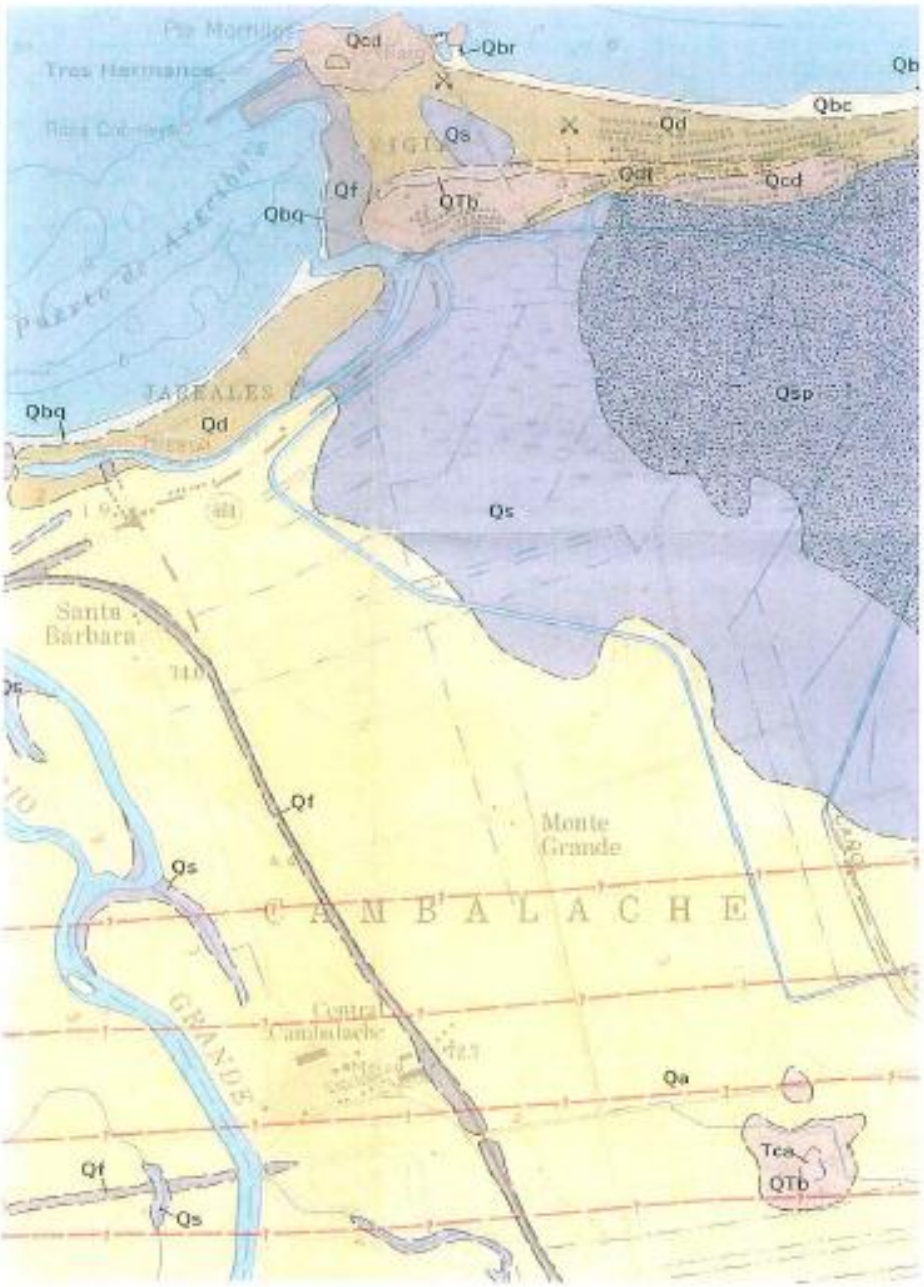

FIG. NUM. 3
GEOLOGY IN THE PROJECT AREA

GEOLOGIC QUADRANGLE OF ARECIBO	**SCALE 1:20,000**

EDUARDO QUESTELL Y ASOCIADOS

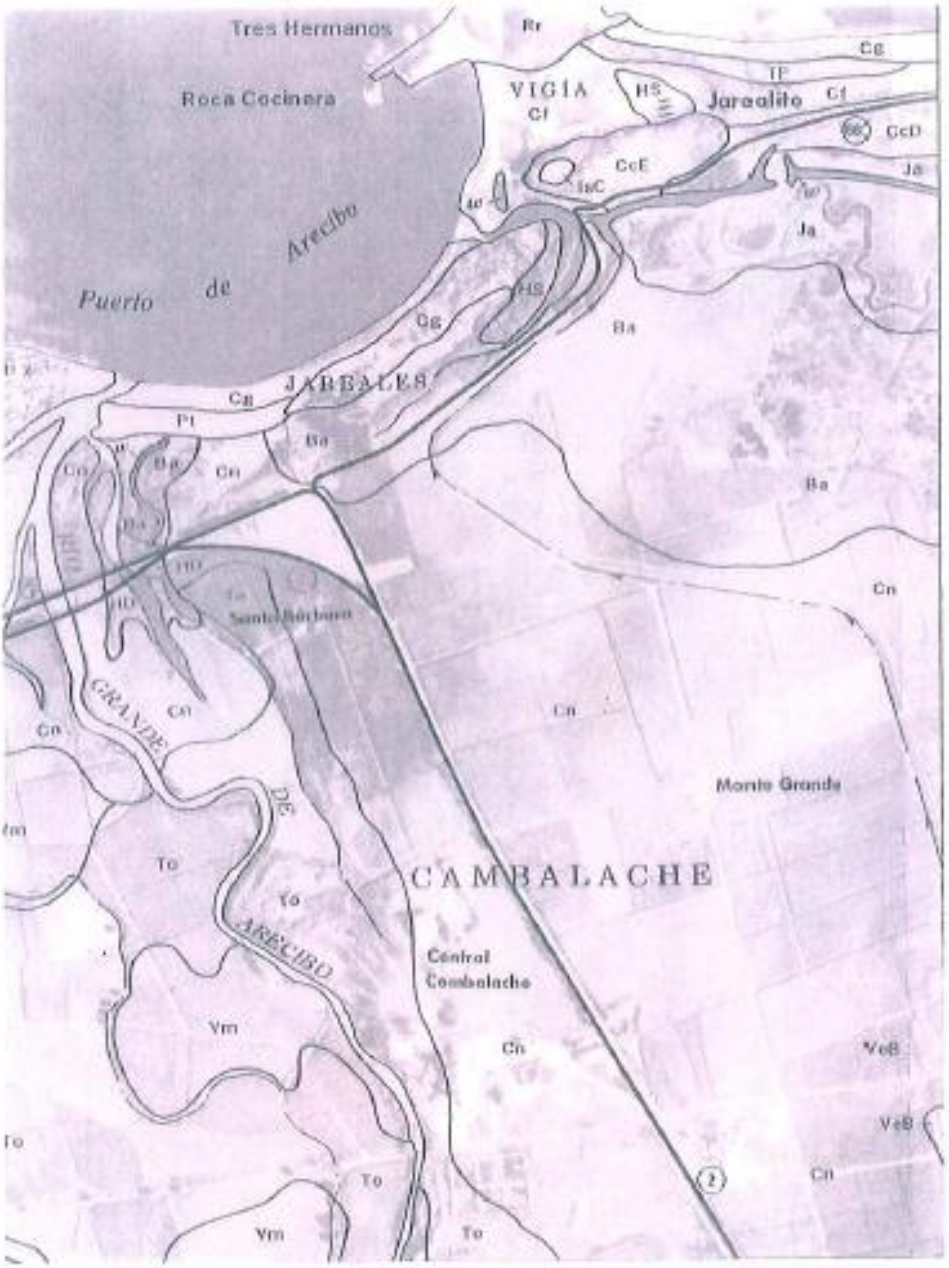

FIG. NUM. 4
SOILS IN THE PROJECT AREA

SOIL SURVEY OF ARECIBO AREA	**SCALE 1:20,000**
EDUARDO QUESTELL Y ASOCIADOS	

The soils of the zone were studied by Gilberto Acevedo in 1982 (*Soil Survey of Arecibo Area Northern Puerto Rico*). He states (leaf no. 3) that the soil along the new electric line is Coloso Clay (Cn, p. 16). This is a deep soil, naturally fertile with high water retention and poor drainage. Runoff is slow, with limited agricultural crop applications for being prone to flooding and expansive. To the West of the new brackish water line we also find mostly Coloso Clay soil (Cn). Towards the East there is Bajura Clay soil (Ba), and then Cataño Sand (Cf), Caracoles Loam, with a slope of 20 to 40 per cent (CcE), and finally Caracoles Loam with a 5 to 20 per cent slope (CcD). Bajura soil is deep, poorly drained, and with a slow permeability and high water retention. Runoff is slow and has high natural fertility. Potential flooding represents a limitation. Caracoles soils are shallow, with slopes and well drained. Figure 4 shows the soils of the area.

Currently the predominant flora consists of: African tulip tree, tal albizia, Guinea grass, zarcilla, red mangrove, coconut palm, Indian almond tree and Madras thorn. Wildlife was represented by Gray Kingbird, Greater Antillean Crackle, Bananaquit, Cattle Egret, Northern Mockingbird, White-winged Dove, iguanas and lizards.

Synthesis of Cultural Development

The prehistory of the Municipality of Arecibo has been well studied, although the existing information makes it difficult to adequately reconstruct its past. As we know, Arecibo is located on the northern shore of Puerto Rico This condition, in a way, forces the reconstruction of its past to be set spatially and chronologically within the context of the prehistory of the North coast. We understand this is an essential framework even if one wishes to study only the traditional problems of time and space. For the purpose of the present work, we refer to the prehistory of the North coast as defined by Dr. Irving B. Rouse in his "Scientific Survey of Porto Rico and the Virgin Islands" (Rouse, 1952, Vol XVIII, part 3, pages 403-405). We consider these studies essential to our prehistory.

As per Dr. Rouse, the North coast encompasses all the lowlands that drain into the Atlantic Ocean, encompassing 150 kilometers of seashore and adjacent land, which extend approximately 15 kilometers inland. Altogether, the area comprises 2,000 square kilometers. The North coast begins at the west of Punta Borinquen, forms a curve towards the interior

through the hills and returns out to arrive at the cape of San Juan. This boundary between the area of the North coast and the rest of the Island forms an arc. The most significant rivers which constitute topographic features are, from West to East: *Río Guajataca, Río Grande de Arecibo, Río Grande Manatí, Río Cibuco, La Plata, Bayamón*, and *Río Grande de Loíza*. These rivers have established floodplains along their banks. A chain of limestone hills with abundant caverns is found between these plains. Behind these hills are the foothills of the interior mountains. In front of these, vast marshes prevent walking between them. Dr. Rouse considered the indians probably had difficulty traveling along the North coast, due to the currents, strong winds and surf. He points out that the soil is fertile (except for the western end), and has a good supply of water, so it was possible it could sustain a large pre-Columbian population.

However Dr. Rouse noted very few sites had been found along the North coast, possibly due to the scarcity of shell middens, which makes it difficult to detect archaeological sites. It was also possible that the strong winds from the Atlantic Ocean, combined with the shortage of protected bays and beaches, made the aboriginal population to concentrate in other, more favorable parts of the Island.

As discussed below, the last 10 years have seen the North coast of Puerto Rico become the subject of various systematic archaeological surveys that have yielded a complex picture as to the spatial distribution and chronological placement of many newly discovered archaeological sites. The picture originally presented by Dr. Rouse has been complicated as new work is systematically carried out.

In his work "Porto Rican Prehistory" (1952:370) Dr. Rouse follows Coll y Toste and places 19 chiefdoms on a map, locating the following seven (7) caciques in the northern region: *Mabodomaca* in the valley of the Guajataca river, the *Río Grande de Arecibo* and possibly the *Río Grande de Manatí* was ruled by the chief *Arasibo*; a third cacique, *Guacabo*, governed the area of *Río Cibuco*. Chief *Aramaná* lived along *Río La Plata* on the village of Toa. The cacique *Majagua* was found on the *Río Bayamón*. *Canóbana* was the chieftain located upstream of the *Río Grande de Loíza*, with his village *Cayniabón*. The name of the cacique that controlled the lower course of the *Río Grande de Loíza*, in historic times, is unknown, as he died and was succeeded by a woman, Loiza. It is likely, as indicated by Dr. Rouse, that the existence of this many chiefs on the North coast responds to this region being widely populated by the settlers and therefore better known than the rest of the Island.

During the last thirty (30) years, research in the Spanish archives has been intense, and as a result our knowledge of the ethnohistory of Puerto Rico at the moment of the conquest and colonization has been expanded. The vast amount of information collected provides new and more extensive relationships about the caciques of Puerto Rico. Studies in our history, when analyzing the conquest of Puerto Rico, offer a variety of names and regions pertaining to the caciques and their chiefdoms, remaining a subject of much controversy. We refer the reader to the excellent work by Dr. Ricardo Alegría "*Apuntes para el Estudio de los Caciques de Puerto Rico*" included in the bibliography of this report.

Among the most prominent researchers who first focused their work primarily on the North coast of Puerto Rico we find: A.L. Pinart (1893) and Agustín Stahl (1889-90), in the decade of the1880's; Cayetano Coll y Toste, (1907:40-41) visited various sites on the decade of 1890; Adolfo de Hostos, S.K. Lothrop and J. Alden Mason (1941: 289) in the decade of 1910; and R.L. Junghams, R. López de Azua and Pablo Morales Cabrera collected some objects from the years 1920 and of 1930 (Morales Cabrera 1932: 51). J. Walter Fewkes, in 1902, excavated at the Golondrinas Cave, near Manatí and published his results in 1907 (Fewkes, 1907: 80-89, 155, 181-184). In 1917, De Hostos excavated at the Golondrinas Cave and two caves in the municipality of Morovis. Also, in 1923 he excavated a ball court (*batey*) at the Espíritu Santo River in Río Grande, and in 1940 at Monserrate, Luquillo. Froelich G. Rainey, then with Yale University, excavated at the Coto Ward of Isabela and in Monserrate, Luquillo in 1934. Rainey found the same sequence at both sites: the Crab Culture, characterized by pottery of the Cuevas Style, and the Shell Culture, with ceramic associated to the Ostiones Style.

This distinguished researcher introduces the method of digging by arbitrary levels and also, for the first time in Puerto Rico, defines stratigraphically the existence of two pre-Columbian cultures. By 1934, Rainey, then a graduate student from Yale University, performed the first systematic excavation in the South portion of Puerto Rico at the Canas site in Ponce. He called the oldest Crab Culture and Shell Culture the later.

This sequence was also observed at the Coto Ward of Isabela and at the site known as Monserrate in Luquillo. Using the correlation of these sequences as the basis, Dr Rainey postulated a hypothesis in which the two cultural components defined represented the migration of two distinct groups or populations with a possible common origin in South America.

Later work by Dr. Rouse demonstrated that, in the case of Puerto Rico, the Shell culture component corresponded to a local development which had evolved from the Crab Culture. By defining the chronologic and stylistic sequences for Puerto Rico, Dr Rouse demonstrated the existence of a transition.

On the other hand, together with the previous group, or maybe earlier, another group called Huecoid arrived. Huecoids made unpainted pottery and amulets which possibly represent the Andean condor, and had an origin in the Andes of Venezuela. Huecoids have been documented at the sites of La Hueca on the island of Vieques and at the site called Punta Candelero in Humacao. Dr. Osvaldo García Goyco tells us that some archeologists group the Huecoids with the Saladoids, and differ with regard to the bird-shaped amulets interpretation as being condors, and therefore point to a migration originating from the Andean mountain range. Huecoids are also characterized by the manufacture of beads and ornaments made of semiprecious stones and pearl oyster.

Despite the great work done by previous investigators, it was Dr. Irving B. Rouse, as part of the Scientific Survey of Puerto Rico, who carried out, during 1936 and 1938 a program of stratigraphic excavations of the North coast of Puerto Rico. During the summers of 1936 to 1938 this investigator dug seven (7) sites that he considered with the most potential, obtaining said sequences and establishing the correlations with the other regions of Puerto Rico already defined. The aforementioned researcher tells us that, from a geographical perspective, his excavations did not cover satisfactorily the area of the North coast. He excavated only at five sites associated to five of the seven main rivers in the region. During his survey he couldn't locate, and thereafter excavate, any site associated to the caves and valleys of the *Río Grande de Arecibo* and *Río Cibuco*. In his stylistic and chronological sequence for the North coast he did not find evidence for his Period I or preceramic, but he did find evidence supporting the remaining three periods; II, III, and IV. The following sites were excavated: Carmona (Loíza 4), Coto (Isabela I), Cuevas (Trujillo Alto 4), Los Indios (Manatí 3), Monserrate (Luquillo 1), Puerta de Tierra (San Juan 1) and Santa Elena (Toa Baja 2).

It is important to highlight some aspects of the conclusions from the excavations of Dr. Rouse during 1936-1938. He states that four (4) of the seven (7) sites were stratigraphically significant. The stratigraphical profiles from Rainey's excavations at Coto Ward confirm the stylistic and chronological sequence covering periods II, III, and IV. Furthermore, the

excavation at the Cuevas site clearly demonstrated the stylistic transition from periods IIa to IIb. At the Santa Elena site he found one of the best examples of the succession of periods from IIb to IVa and IVb. The Santa Elena site is where the type style Santa Elena was defined; its stylistic manifestations subsequently classified within the archaeological series known as Elenoid, whose origin and dissemination point is the Canal de Vieques, to the east of Puerto Rico. He associated the Santa Elena site with the chiefdom of *Aramaná*, from the Toa region, and with the Toa Royal farm established by the Spaniards during the first years of colonization. The sequence clearly showed the presence of the Santa Elena and Capá styles, which chronologically went from periods IIIa to IVa, respectively.

As for the correlation of the chronological and stylistic sequences, the North coast differs from other regions in the absence of occupation during Period I and by the presence of the Santa Elena style during periods IIIb to IVa, which seems to point to a development limited to a certain area of the geography of Puerto Rico.

We have presented these brief data concerning the excavations of Dr. Irving B. Rouse during the years 1930-1938, because as of today it is one of the few stratigraphic excavations with published results for the North coast of Puerto Rico. Another reason is the fact that its spatial time frame, comprising archaeological periods and series for Puerto Rico and the Caribbean, remains an instrument on which to support archaeological research today.

On the prehistory of Arecibo in particular we have information from the documents related to the beginning of Spanish colonization which states:

> "…*Toda la vega Arecibeña regada por el Río Grande y Tanamá donde residían el Cacique Arecibo y 200 indios y naborías, fue donada por la Corona a Don Lope de Conchillos; residente en la isla a Pedro Moreno, con el encargo de administrar los 200 indios y al Cacique Aracibo*." (Villas Roces, 1976).

Of the several sites related to the Aborigines who lived around this municipality and have been reported in the literature, the one with more antiquity is known as the *Cueva del Indio*. The same was reviewed by a French researcher named Alphonse Pinart, who visited the island in the last third of the last century:

> "*… se trove a la Cueva del Islote sur de la Punta Braba a enviaron 5 lieves a l'est d'Arecibo et sur la cote nord de l'isle de Porto Rico. La grotte se*

> *trouve dans une inmense masse noiratre de roche ignee formante ponte e'avancant dans la mer qui deferle contra elle avec furie elle comunique par le fond avec la rt l'eoiu un penetrant par ce colouir qui est assez etroit product un migissement formidable*."

The distinguished historian of Puerto Rico, native of Arecibo, Don Cayetano Coll y Toste, did research around his hometown, and in notes written about another cave in the mountainous area, wrote:

> "*La Cueva de Miraflores en la jurisdicción de Arecibo, en un taller de piedra de los indígenas. La hemos explorado cuidadosamente, tenemos en nuestra colección un buril de pedernal obtenido por Mr Denton, propietario de la finca donde radica esta gruta. Todavía se encuentran allí iniciados los trabajos de algunos "*pillarstones*" de las casas*" (Coll y Toste, 1987)

After the change of sovereignty experienced by the island in 1898, studies were begun on different aspects of Puerto Rican People, sponsored by American educational institutions. Among the first researchers who came, Jesse W. Fewkes conducted studies on pre-Columbian cultures and wrote:

> "The ball courts examined by the present author were situated for the most part on terraces or on land fringing rivers, elevated high enough to be above freshets and yet lying river valleys that could be cultivated.
>
> Along the banks of the *Río Grande de Arecibo* and its tributaries there are still many remnants of ball courts, especially in the high mountain in the middle of the Island" (Fewkes, 1904).

In 1914 the late researcher, Samuel L. Lothrop, made a list of numerous indian sites. In this list, Lothrop reported several sites within the territorial limits of Arecibo:

> Sabana Hoyos Ward …….…Cave/Pictographs
>
> Miraflores Ward ……...Cave/Petroglyphs
>
> Esperanza Ward ……...Ball Court
>
> Arrozal Ward ……..….Ball Court
>
> Arenalejos Ward ……...Cave/Petroglyphs

We have already noted that in the 1930s, then-student at Yale University, Dr. Irving B. Rouse, visited the Arecibo region and inspected previously known sites, but excavated none.

In 1979 archaeologist Juan Gonzalez Colon made an inventory of sites in Puerto Rico and reported several in Arecibo:

Poza del Obispo……Residuary
Hato Abajo……Residuary
El Caney……Residuary
Cueva de Crosier……..….Petroglyphs
Cueva de Matos……...……Petroglyphs
Cueva de Carreras…….Petroglyphs

By taking into consideration information from known sites within the boundaries of the municipality, it is understood that Igneri, pre Taíno and Taíno groups inhabited the area. In the case of the Taíno there is evidence in historical sources that subsequently survived the early years of colonization of the Island.

Among the most recent studies in this county, stands out the inventory carried out by archaeologist Roberto Martinez, between 1994-1996. The researcher pointed out fifteen places for the town of Arecibo, highlighting the presence of petroglyphs on rock shelters (Marlene Ramos Vélez, 1998, p. 8-11).

As for the historical aspects we find that the city of Arecibo is one of the oldest in Puerto Rico, with its origins linked to the early years of Spanish colonization. The existence of Cacique *Arecibo* is known due to his being commissioned with some of his indians for the year 1515. Don José Limón de Arce, in his pamphlets "Arecibo History" (1935) wrote:

> "*En la primera división que se hizo de la Isla de Puerto Rico, Arecibo formaba parte de ésta, en el censo de almas de 1530. Arecibo abarcaba los pueblos de Ciales, Morovis, Jayuya y Utuado, así como Hatillo, Camuy y Quebradillas. Se cultivaba el azúcar, el café, tabaco y maíz. Luego, este Mercado se pierde quedando la caña de azúcar solo*".

"*Es interesante señalar que el lugar de la fundación de la ciudad de Arecibo nunca ha sido cambiado. Por el contrario, Caparra y San Germán fueron movidos de sus lugares*

originales a otras localizaciones: Caparra fue movida al lugar donde se encuentra San Juan actualmente, en el 1519: San Germán fue trasladada desde la costa sur hacia el centro de la isla, en el 1570, al lugar que se encuentra en la actualidad, para protegerse de los ataques de los indios Caribe" (Cinthia Velásquez: Arecibo… así era, 1998, p. 19).

In Malgarejos' "Memoria" (1582) he notes that by then several neighbors had gathered at the mouth of the *Río Grande de Arecibo*. The village was officially recognized as a town in the early seventeenth century. The so-called "village" on the banks of Arecibo, which already had some 80 families, was named town with parish on May 1, 1616.

On the other hand, we find the first available graphical representation of Arecibo in a subsection of a plan by Francisco Fernández Valdelomar, commissioned by Governor Matías de Abadía, dated 1737, a copy of which we have included as our Figure no. 4. Architect Sepulveda notes that: "*A diferencia de los planos de Aguada y Añasco, [este plano] muestra un pueblo de considerable tamaño. El pueblo costero estaba compuesto por 95 viviendas de diferentes tamaños, que formaban una plaza rectangular en la cual se hallaban dos grandes estructuras, la iglesia parroquial y la capilla de la Concepción. Las siete hileras de casa aparecen alineadas de este a oeste y definen al menos seis calles. Hacia el este se destaca lo que parece ser otra capilla (podría ser la del Rosario) y el sitio previsto para una fortificación que en efecto se construyó poco después. El plano tiene escala gráfica en toesas (antigua medida francesa de longitud) [equivalente a un metro y 946 milímetros]. El plano ilustra el puerto de Arecibo, la Boca Vieja del río, la desembocadura del mismo y el morrillo. Incluye una rosa de los vientos. Muestra los rasgos de la topografía e indica los tipos de sembrados en la periferia del pueblo: platanares y caña de azúcar. También indica la red de caminos de acceso al pueblo*" (*Ibid*, p.63). The original plan by Fernández Valdelomar, titled *Plano del pequeño puerto de San Felipe de Arecibo, distante doce leguas de la Aguada sobre la costa norte de la isla de Puerto Rico*, is found at the *Archivo General de Indias*, in Sevilla, and a copy at the General Archive of Puerto Rico (*Ibid*, p.62).

There is a second plan of eighteenth century Arecibo, a copy of which (Figure no. 5) we have again taken from Volume 1 of the said publication by architect Sepúlveda Rivera (p. 63), titled *Plano del puerto de San Felipe del Arecibo, situado en la costa septentrional de la isla de San Juan de Puerto Rico, entre dicho puerto y el de la Aguada de San Francisco*. This plan is dated close to 1770. Arquitect Sepúlveda states that: "*El mapa tiene escala en toesas. Muestra*

la topografía e incluye las profundidades del canal del surtidero de puerto y del río desde la desembocadura al pueblo. Ilustra las tierras de labor de caña de azúcar y los caminos de acceso. El trazado del pueblo aparece definido por cinco estructuras institucionales (iglesia, tres capillas y la batería) y por 45 casa alineadas la mayoría de este a oeste. La plaza rectangular se conforma según las disposiciones legales establecidas al comienzo de la colonización…" (*Ibid*). The original of this plan is found at the *Servicio Geográfico del Ejército*, in Madrid.

The militia infantry captain, Don Fernando Miyares González, published in 1777 his *Noticias Particulares de la Isla y Plaza de San Juan Bautista de Puerto Rico*, where he wrote about the Arecibo Party the following (p.67-68):

> "*Siempre se ha distinguido este pueblo desde su fundación, que fue la cuarta de la isla. Así lo acreditó el año de setecientos dos [1702], que habiendo desembarcado el enemigo inglés la gente de dos bajeles de guerra, no hallándose en el pueblo más que once hombres con su capitán don Antonio Correa, por estar los demás retirados en sus labranzas, los resistió dicho capitán y sin permitirles unirse en formación les acometió con intrepidez, haciéndole retirar atropelladamente, de modo que con sumo trabajo pudieron tomar sus lanchas, pues hasta dentro del mismo mar les siguió. Por esta acción tan gallarda hizo S. M. [merced] al dicho don Antonio Correa, de la medalla de su real efigie y el título de capitán de infantería con sueldo situado en las caxas de México, que se le remitía aparte antes que falleciese.*
>
> *La aplicación de sus vecinos ha hecho floreciente este partido. Hállase situado en una legua de tierra formada por el mar y el río. Elévase poco sobre el nivel de ambos, pero hubiera estado mejor fundado en una altura inmediata que domina los alrededores. Tiene más de doscientas casas unidades, con la tercera parte de texa, formando calles regulares. Además de una mediana iglesia, hay tres ermitas y la mejor casa de piedra que sirve de cuartel a las dos compañías de infantería y una de caballería de milicias disciplinadas. Los campos vecinos son deliciosos, cubiertos de diferentes géneros de arboledas y con muchos arroyos. Encuéntrense casas por todas partes; en los montes hay muchos palos de tinte y maderas de construcción. En suma, no falta más a este partido que los buenos puertos que sobran a otros*".

As we have seen, by the eighteenth century the town had continued to grow and its development was recognized by the *Casa Real* which awarded it with the title of Villa on January 14, 1778.

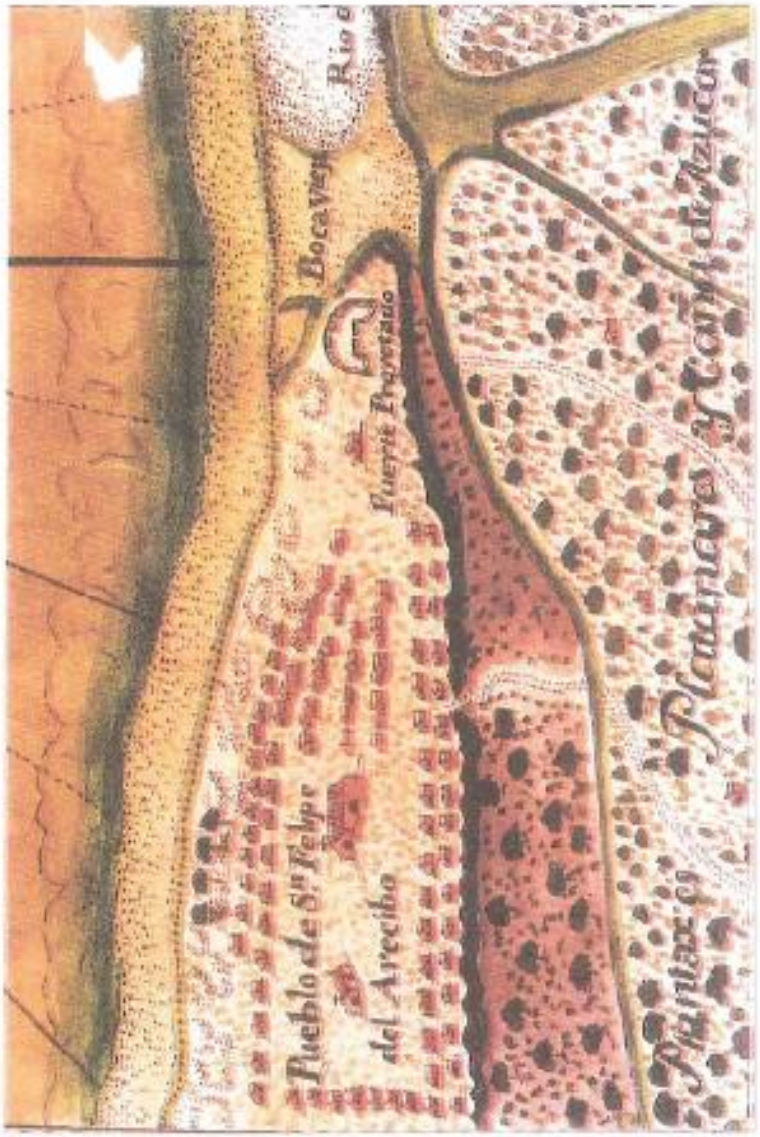

FIG. NUM. 5
ARECIBO MAP OF 1737

ANÍBAL SEPÚLVEDA RIVERA, 2004, TOMO 1	**NOT TO SCALE**
EDUARDO QUESTELL Y ASOCIADOS	

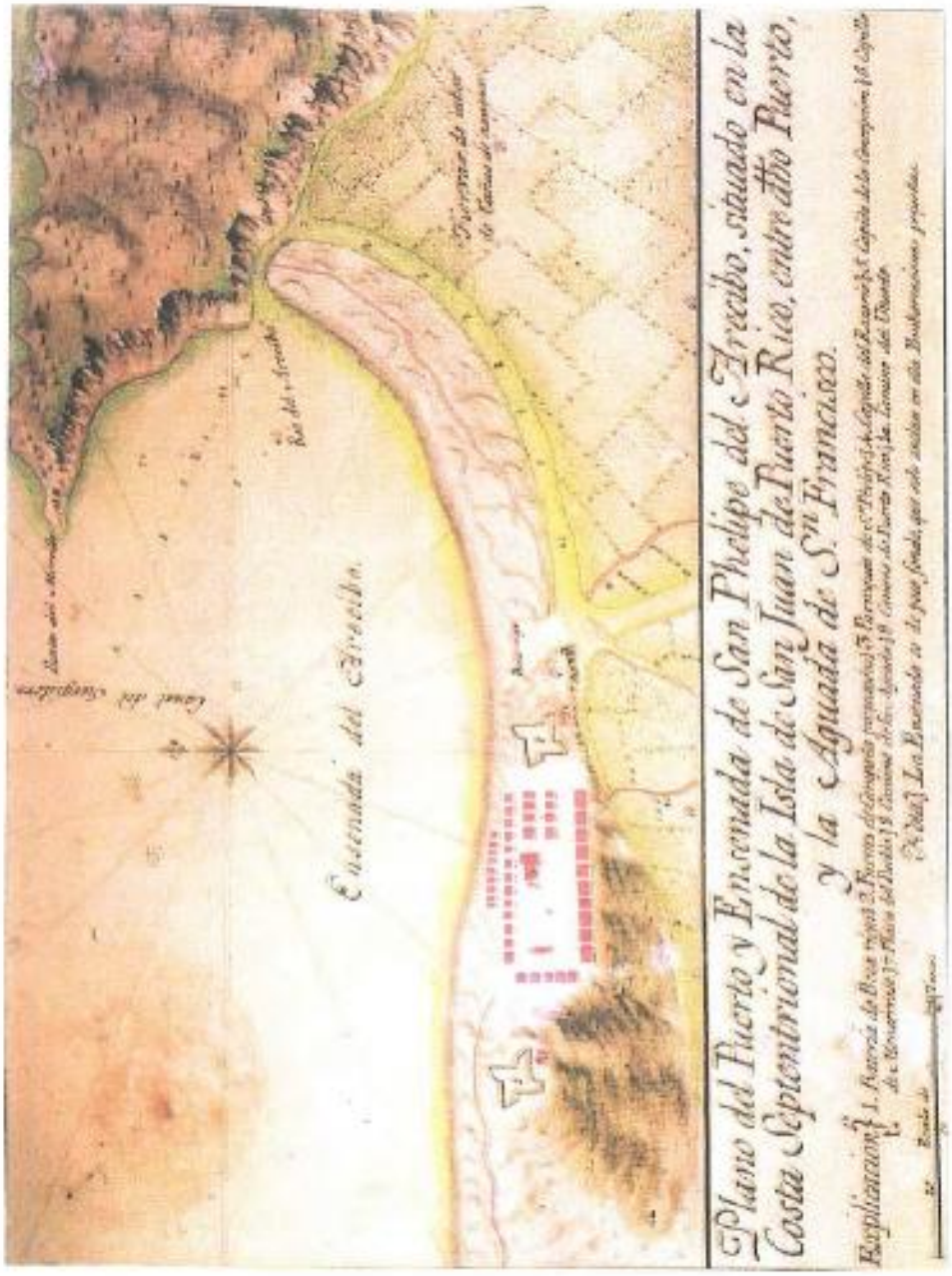

FIG. NUM. 6
MAP OF THE ARECIBO PORT 1770

ANÍBAL SEPÚLVEDA RIVERA, 2004, TOMO 1	**NOT TO SCALE**

EDUARDO QUESTELL Y ASOCIADOS

For those years, Fray Iñigo Abbad y Lasierra describes the named Villa de Arecibo as follows (1788, p. 12):

> "Después de la ribera de Manatí siguiendo la costa del norte hacia el poniente, hay dos leguas de monte llano, cerrado de robustos árboles, hasta entrar en la ribera del río Arecibo, que es más extensa y tan feraz como la antecedente, aunque no mejor empleada, pues toda está dedicada a la cría de ganados, sin cultivar otros frutos que los regulares y precisos; a esto se ciñe toda su industria y labranza.
>
> El pueblo dista de la antecedente 7 leguas, tiene tres hileras de casas, que dejan una buena plaza; situado en una península o arenal formado de la mar y río Arecibo, que lo circundan. Entre la punta del arenal del Arecibo, la del Morrillo y un peñasco que se avanza al noroeste, queda una caleta en la cual desemboca el río, cuyas avenidas forman bancos de arena, e impiden la entrada a las embarcaciones que calen más de dos brazas de agua, y así rara vez llega alguna a la caleta de este pueblo. Su iglesia es reducida para el vecindario, que asciende a 700 familias; estas viven en sus estancias, que se extienden más de tres leguas a lo largo de las riberas del río."

Moreover, the *Viaje a la Isla de Puerto Rico en el ago 1797*, was published in Paris in 1810, by the French botanist André Pierre Ledrú, where he mentioned the town of Arecibo (p. 71):

> "*Su situación es en la desembocadura del río de su nombre, y en el que no puede entrar ningún buque que cale más de tres metros de agua, por los bancos de arena que obstruyen el paso. Hay en todo el partido 5,155 habitantes, dedicados al cultivo del arroz, maíz, tabaco y a la crianza de gran número de ganado vacuno. Tan indolentes como los de Manatí, no saben utilizarse de la posición ventajosa en que los ha colocado la naturaleza. El río Arecibo nace en las alturas de la cordillera que atraviesa la Isla en toda su extensión de este a oeste*".

In 1824 the population had grown to 9.546 souls (De Córdova, p.105) and in 1828 reached 9.963, of which 4.862 were white, 3,256 brown (*pardos*), 645 blacks and 915 slaves (Ibid).

Pedro Tomás de Córdova himself, secretary to the Spanish government, provides a good description of the Arecibo from the decade of 1820:

> "*Sus terrenos en la mayor parte son vegas frondosas y muy abundantes en pastos, y en general todas las tierras con fertilísimas para la crianza y labor. Se*

> *cosecha con abundancia caña, café, plátanos, tabaco y toda clase de menesteres. Los caminos están despojados y buenos en tiempo de seca pero se ponen intransitables en las lluvias, por los muchos pantanos que se forman en las bajuras y las extraordinarias crecientes de los ríos. Abunda de Piedra de cal y de sillería, lo mismo que maderas. El partido está dividido en los barrios del pueblo, Hato Grande, Cuatro Calles, Hato Viejo, Rio Arriba, Arenalejos, Santana, Factor, Cambalache e Islote. En 1828 había entre los vecinos 112 artesanos, 43 extranjeros domiciliados y naturalizados y 43 emigrados; 119 casas y 126 bojíos en el barrio, y en la jurisdicción 187 casas y 1,366 bojíos, 35 tiendas de todas clases y 28 ventorrillos*." (1831, *páginas* 105-106)".

In 1878 Arecibo comprised the Cambalache, Islote, Santana, Factor, Garrochales, Río Arriba, Hato Arriba, Dominguito and Esperanza wards (Ubeda y Delgado, p.156). In Cambalache ward there were 175 families, 40 houses, 8 huts and 2 stores. (*Ibid.* p.157).

For many years since its origin, agriculture was the mainstay of the economy of this town. During the nineteenth century, a large agricultural development took place in the area. Numerous sugar plantations and coffee estates were developed as well as farms dedicated to other crops. However, sugar cane was always the major product. In 1841 there were no less than 18 estates, among which were the Santa Bárbara, property of Doña Bárbara Balseiro, the Cambalache, owned by Don Francisco Uranga, and *Hacienda Claras*, property of Francisco Stuard whom "*lo administraba el mismo*" (Eileen Y. Cruz Ramirez, 1986, p.29-30). The Santa Bárbara became the property of the heirs of Don Antonio Roses. It consisted of 360 *cuerdas*; 200 of which were planted with sugar cane by 1902. The hacienda Cambalache became a major sugar mill during the twentieth century, being called Central Cambalache Sugar Mill. Cruz Ramírez states about the land belonging to the Central Cambalache Sugar Mill: "*Hoy forma parte de las tierras que antes se cultivaban de cana, ahora [1986] se están utilizando para la siembra de arroz*" (*Ibid*, p. 30). By 1841 there also was the *Hacienda Caños*, whose owner was Doña Francisca Torrin, and agent representative José Ramón Lerrieu (*Ibid*).

Since the 1950s, several high technology companies have established in Arecibo, which linked to a number of different shops, distilleries and major refineries produce a large number of jobs. In the 1980 census, Arecibo had 86.776 inhabitants, who had risen to 97.549 by the 1990 census.

Archival Research

The archival research consisted of the consultation and detailed study of documents held by the following main sources:

- Council for the Protection of the Terrestrial Archeological Heritage of Puerto Rico.
- State Historic Preservation Office (S.H.P.O.)
- Archeological Sites in Puerto Rico of S.K. Lothrop; manuscript copy held by the authors of this Phase IA-IB report.
- Field notes of the archeological sites of Puerto Rico by Dr. Irving B. Rouse; manuscript copy corresponding to the municipality of Arecibo held by the State Historic Preservation Office.
- Inventory of Historic Engineering and Industry of Puerto Rico by Carlos Rosado/ W. Rodríguez/ L. Pumarada- President Office-University of Puerto Rico-San Juan 1977. Manuscript in the State Historic Preservation Office (S.H.P.O).
- Historic American Engineering Record (HAER), Inventory by Osvaldo Rivera/ W Rodríguez-UPR San Juan 1997. Copy of inventory held by S.H.P.O. Office.
- Puerto Rico Architectural Resources Inventory, State Historic Preservation Office.
- Archeological, historical, geographical, geological, etc. literature, included in the bibliography of this Phase IA-IB evaluation.
- Local informants.
- Consultation with other archeologists from Puerto Rico.

Detailed consultation of the records related to the inventory of archaeological sites in Puerto Rico, held by the Council for the Protection of the Terrestrial Archeological Heritage of Puerto Rico and the State Historic Preservation Office revealed no prehistoric or historic evidence in the specific area where the Project object of this assessment will be developed. The nearest reported and/or known archeological site in the topographic quadrangle of Arecibo

(which is the quadrangle where the Project site is located) is the one designated as AR004 (Poza del Obispo), located 500 meters North of the new brackish water line. About this site archeologist Fernando Alvarado (*Segregación de treinta y ocho solares, Arecibo, Puerto Rico*, page 16) tells us: "*Para el 1987, los arqueólogos Pedro Alvarado y Harry Alemán, realizaron una Fase II en las cercanías al Faro de Arecibo, exactamente en el lugar llamado Poza del Obisto (AR-4). En este lugar ellos determinaron lo siguiente: Las actividades humanas en el lugar las remociones han impedido estudiar el sitio AR-4 en su contexto cultural original. Pero no todo en vano, ya que de acuerdo a las muestras de cerámica podemos inferir que el sitio fue habitado por los grupos representativos estilísticamente por la cerámica estilo Ostiones y Santa Elena" (Alvarado, 1987)*".

Another site, relatively close, is AR005 "El Caney", which is located 800 mesters North-northwest of the new brackish water line, in its closest point. This site is a residuary under the streets and residencies of the urban zone of Arecibo, where pottery fragments and remains of human bones were found. Archeologist Fernando Alvarado (Ibid, page 15) tells us: "En los años 1940 hasta el 1950 se realizaron varias excavaciones en el yacimiento conocido como el Caney por el doctor José Oliver, éste menciona lo siguiente: "*En las décadas del 1940 y 1950 efectuó varias excavaciones en solares al este de la Catedral. Recuerdo cuando hizo excavaciones en el solar en donde hoy existe el área de aparcamiento del Hospital El Buen Pastor y cuando se reconstruyó la parte del casino de Arecibo, donde está el salón de baile. Informa el Dr. Oliver haber hallado restos humanos, no solo de cristianos, sino también de indios, los que distinguió, porque los indios acostumbraban a enterrar a sus muertos en posición encorvada, con las rodillas pegadas al pecho" (Lago, 1987)".* Archeologist Alvarado (Ibid, pages 17-18) adds that: "*Para el año 1992 se realizó otra incursión al yacimiento registrado como el Caney, por los arqueólogos Juan González, María Cashion y Jaime Vélez. El arqueólogo González informa: "La data obtenida y analizada del sector en donde se harán las mejoras, indican la existencia de un sitio multicomponente; el mismo fue afectado a través de los años por el desarrollo urbano de la parte antigua de la ciudad de Arecibo. Dentro del perímetro de la propiedad específicamente en el subsuelo todavía permanecen materiales de origen precolombino e histórico que no han sido afectados adversamente" (González, 1993)*".

Moreover, K.S. Lothrop mentions in his listing several places for Arecibo: a cave with petroglyphs in Arenalejos Ward; another cave with petroglyphs and two ball courts (*bateyes*) in

Arrozal Ward, one of which he locates at the Biáfara site of this ward, when Biáfara is really located on Miraflores Ward, and also mentions Cueva Bonilla, with petroglyphs (according to Pinart) in the ward of Arrozales; the so called "Cueva de los Indios", with petroglyphs, in Islote ward; the cave "Miraflores" with petroglyphs in Miraflores Ward, inside M. Denton property; a cave called the "Convento", also with petroglyphs, in Sabana Hoyos Ward; and a cave and a ball court (*batey*) in Esperanza Ward.

In the National Register of Historic Places, revised on February 4, 2010, there existed thirteen (13) places listed for the Municipality of Arecibo, all of which are far from the Project and would not be affected by it. The site with historic value nearest to the Study area is possibly the one that contains some of the ruins of the old *Hacienda Santa Bárbara*, which is located nearly 700 meters to the North Northeast of the Study area, and will not be impacted at all by the Project. Included in Appendix A is a photocopy of a portion of the Arecibo quadrangle where the sites with prehistoric or historic value near the Study area are depicted.

In the archival research conducted for this archeological assessment of the new brackish water and electric lines of the Renewable Power Generation and Resource Recovery Plant we examined with detail all the archeological studies conducted in the Islote and Cambalache wards of the Municipality of Arecibo. Two of them: *Estudio Arqueológico Fases IA y IB para el Proyecto Línea de Agua Cruda, turbinas de Combustión de Cambalache, Arecibo, Puerto Rico*, conducted by archeologist María A. Cashion Lugo in 1996, and *Informe de Estudio Arqueológico Fase IA-IB Proyecto Mejoras al Sistema de Abastos de Agua del Municipio de Arecibo, Área Costera de Arecibo, Barrios Islote y Cambalache*, conducted by archeologists Miguel Rodríguez and Yasha N. Rodríguez in 1998, deals precisely with water lines that cross by the current Project route, in which were excavated several test pits along their routes, all with negative results in the segment of the current water line route. Additionally, the Phase IA-IB archeological assessment entitled *Reestructuración Comunidad El Vigía, Arecibo, Puerto Rico*, conducted by archeologist Adalberto Maurás Casillas in 2004, carried out in the community adjacent to the water line route of this Project, also resulted negative.

Land Use Pattern

The oldest map that we found for the general area under study (1936, West-Central Sheet, R.C. Roberts, Soil Survey), tells us that the current Road PR-2 already existed with that number and crossed the study area. Also, current Road PR-681 existed then. Likewise, it is observed that a branch of the train railway, that joined the Railroad Company of Puerto Rico railway, ran adjacent to the property, surely for collecting the canes from Hacienda Santa Bárbara and other surrounding lands and take them to Central Cambalache Sugar Mill. No structures are observed inside the study area boundaries, besides the roads themselves. Today there is no trace of evidence of the passage of a train track near the study area. Our Figure num. 7 illustrates part of the map of Robert's soil survey where the study area is located.

The environs of the site under study were planted with sugar cane until the decade of 1950. In our 1998 evaluation for another project, we talked with informant Ángel Lescano Correa, 63 years old (then), neighbor of the area, and then employed as a security guard of a paper mill that was located on Renewable Power Generation and Resource Recovery Plant site. Mr. Lescano Correa informed us in 1998 that the paper mill began operations at the site in 1957 under the name Grace Paper Co., with the purpose of producing paper in rolls. Afterward, the mill was known as Arecibo Paper Mill, and later on as International Mill. Its name in 1998, as we said before, was Global Fiber Inc. The mill closed operations, according to informant Lescano Correa, on December 15 of 1995. In our 1998 property visit, we observed fences, earthen irrigation channels, a concrete and concrete-blocks warehouse and abundance of modern trash (wood, paper, plastic, care tires, metal, etc), especially near and on the back (West) of the paper mill. In 1998, the existing structures were: offices, warehouse, boiler room, operations building and infirmary. All were abandoned and some rapidly deteriorating. The first floor of the structures was of concrete and blocks. The walls and ceiling of the second floor were of asbestos-cement sheets.

On the other hand, for the current Project we interviewed Mr. Luis Ocasio as informant. He worked at the paper mill since 1970 until 1996. Mr. Ocasio stated that the structures associated to the paper mill were constructed between 1957 and 1959, being the facility

inaugurated in 1960. Since 1957, fill was brought from elsewhere to stabilize certain areas and roads in the paper mill property. The existing "lagoons" are all artificial, and were built as

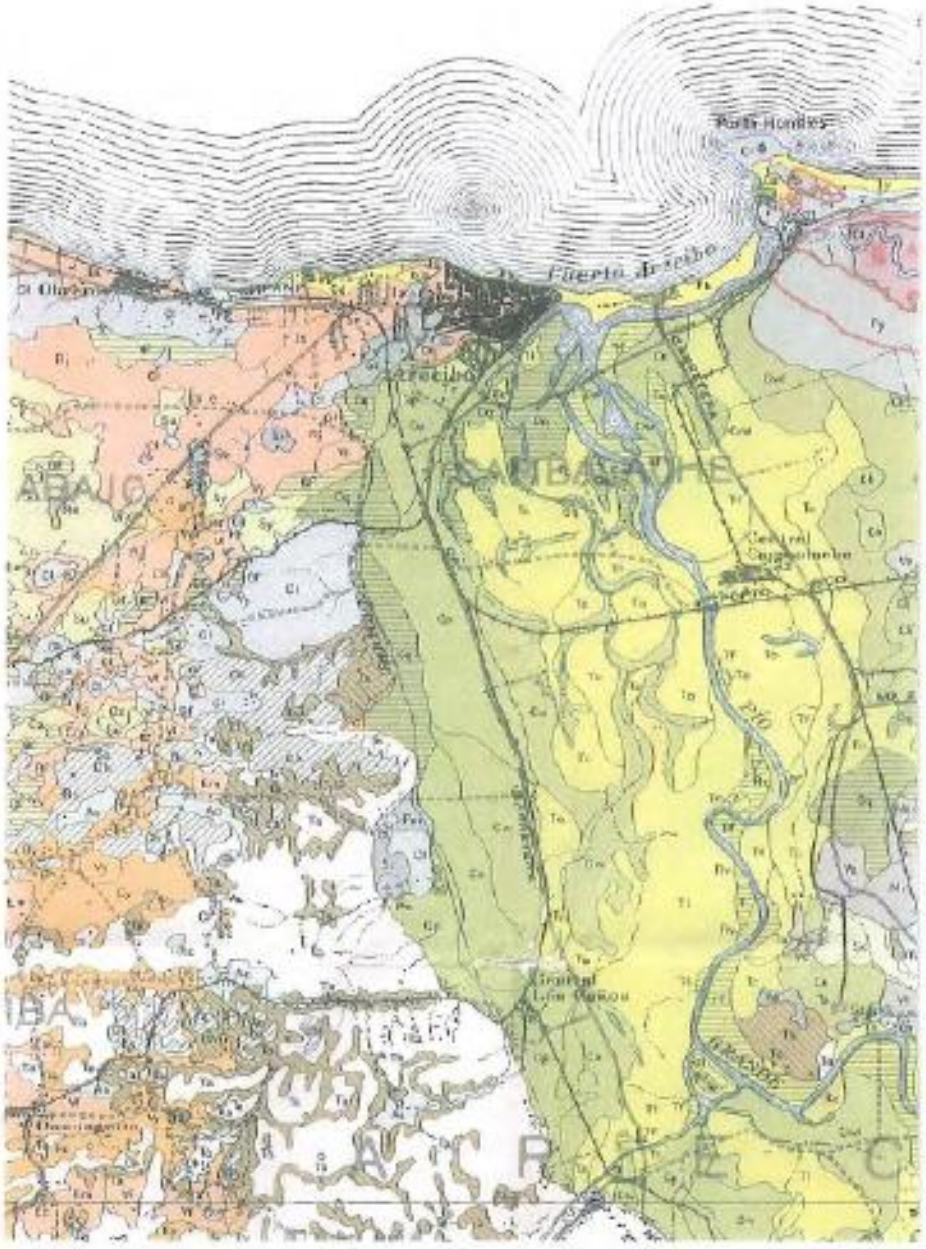

FIG. NUM. 7
PROJECT SITE (1936)

SOIL SURVEY OF ROBERTS AND OTHERS | **SCALE 1:50,000**

EDUARDO QUESTELL Y ASOCIADOS

part of the paper manufacturing process. Some of these "lagoons" were in use until 1977, and others until 1996, year when the industry ceased operations. For the construction of these "lagoons" all their surface was altered with heavy equipment, extracting superficial material in order to construct the side walls that form the borders.

All the existing structures in the North-Northeast side of the property, says Mr. Ocasio, were part of the paper manufacturing process. Some structures identified near the river were part of a pumping system for fire control. During the paper manufacturing process the sugar cane bagasse form the adjacent Central Cambalache Sugar Mill was used.

Other parts of the property are currently vacant and unused, covered by pastures, weeds and mounds. Included as Appendix E, from our archeological assessment (*Planta de Generación de Energía Renovable y Recuperación de Recursos, PR-2, KM 72.8, barrio Cambalache, Arecibo, Puerto Rico*, Eduardo Questell Rodríguez and Federico Freytes Rodríguez, August 2010) is a copy of the Title Study and of a Deed of Sale with the pertinent data from the Registry of Property, for Property (*finca*) num. 20,522, registered on Page (*folio*) 30, of Volume (*tomo*)1248 of Arecibo, which is the property that is the Study area. Appendix F of said assessment includes aerial photographs dating from 1936, 1950, 1963 and 1990, showing its study area, and also including the current line routes.

Surface Inspection and Sensitivity Study

We visited all the route of the new water line of the Renewable Power Generation Plant to conduct a surface inspection, and we could verify that the route crosses through land of roads that has been impacted previously several times. Vegetation and adjacent structures were observed, and photographs were taken along the stretch (see Appendix C). The route begins at the El Vigía Pumping Station, in Islote Ward of Arecibo, and continues North up to Road PR-681. From there it continues along the North side of road PR-681 up to the intersection with Road PR 6681 where it follows the road's West side and continues South. The route continues to Road PR 2 where it takes the road's East side and continues South to the new renewable power generation plant, where it intersects Road PR 2 towards the plant, and where the route ends. Appendix D contains the plan of the new water line alignment. We did not identify any structure of cultural value along the route.

The stretch of the new electric line was also visited. This crosses in part through a lot located northeast of the remnants of the old Central Cambalache Sugar Mill, penetrating thence to the West-southwest until connecting to the power generation plant located to the South side of the Sugar Mill. The stretch surveyed covers approximately 850 linear meters. The surface inspection was completed by two people along its entire trajectory (see photo num. 1). We could verify that the lot located northeast of the sugar mill is completely waterlogged (see photo num. 2). All the 300 meters of this route's segment were found under water. Apparently this area is a seasonal wetland, which in the rainy season turns into a zone covered by runoffs of pluvial precipitation. The stretch that runs from Road PR 2 up to the power generating plant was not covered by water. This traverses the properties adjacent to the main structures of Central Cambalache Sugar Mill. It was evident, based on the debris accumulations and mounds of removed soil, that this area has been severely impacted by dirt movements caused by heavy machinery.

One of the researches (Freytes) had the opportunity to visit the remnants of Central Cambalache Sugar Mill. The main buildings were recently destroyed to be sold as scrap (see photos num. 3 and 4). Only the two chimneys remained standing and some secondary structures (see photo num. 5). We could observe fragmented bricks dispersed in the area near the Project's route. Those bricks correspond to the former structures of Central Cambalache Sugar Mill. On the surface of the specific study area we did not identify any kind of archeological resource or remnant.

The study area along the new water line rout seems to have low archeological sensitivity. The construction of roads must have impacted the entire route. Also, two previous archeological assessments carried out on it had negative results. No prehistoric or historic cultural evidence was detected on the surface of this route, other than what was indicated regarding the paper mill. The nearest archeological site is 500 meters North of the study area.

The route for the new electric power line is different. The closeness to the old Central Cambalache makes this route one with a high archeological sensitivity that merits adequate investigation.

Conclusion of Phase IA

The Project is located in two sectors: one with a relatively low sensitivity, with a route along roads that surely impacted any cultural resources evidence and previous assessments with negative results, and another very near structures with cultural value. The nearest known archeological site is located 500 meters north of the new water line route that runs along the roads. All the information gathered in our surface inspection tends to indicate that the study area is sterile to archeological material, but the above mentioned data makes it necessary to carry out a Phase IB survey for the new electric line route.

PHASE IB SURVEY

The phase IB includes, as its main component, the execution of test pits under the land surface. The areas to be tested by means of subsoil test pits are selected according to the Phase IA results. This phase's report should include: the surveys design and methodology; the results with the terrain stratigraphy; a catalog of artifacts, if applicable; the location of the test pits excavated; and photographs to clarify certain aspects. Final conclusions and recommendations have to be included in the report.

Survey Design and Methodology

As we mentioned earlier, this Project consists of a new water line for a power generation plant and resource recovery plant where a phase IB will not be conducted, and a new electric line where such phase will be conducted.

For the electric line route, after having made the observations mentioned above and taking into account all the parameters previously indicated, it was decided to use the following methodology for surveying the area:

1. One systematic transect (Thomas F. King, 1979, p. 87) along the segment located inside the Puerto Rico Land Authority property, because the segment located inside the renewable power generation plant was surveyed in the plant's assessment.

2. The survey will be complement with manual test pits, spaced at a 25-30 meter interval in those sectors where the environmental conditions allow it.

All the manual test pits will be excavated with a post hole digger, resulting in a pit of approximately 25 centimeters x 25 centimeters and of variable depth. The depth of the pits is always variable, and depends, often on the depth of the soil over the decomposed or hard rock, or on the experience and knowledge of the investigator. The soil obtained from the test pits will be sifted, when necessary, as a measure of control that will allow us to detect any evidence of cultural resources material.

Phase IB Survey Results

After conducting the surface inspection, we continue with the excavation of test pits, in the subsoil. This test pits were made, as we said, using a digging bar and a post hole digger (see photos num. 6 and 7). All the excavated soil was sifted using a ¼-inches mesh sifter. The test pits were dug up to a maximum depth of 1.20 meters (see photo num 8). Since almost all the test pits showed modern trash, the interval between them was expanded to 50 meters. These test pits were made in the segment that crosses from Road PR-2 towards the west-southwest, connecting with the power generation plant, for a total of approximately 425 lineal meters.

Generally, we found fill in the first 20 centimeters of most of the test pits, followed by a dark yellowish brown (10YR 4/4) granular clay, usually with modern trash and traces of having been impacted in the past. With the exception of two of the test pits, in the rest we reached the water table between one meter and one meter twenty deep. The last test pit before the power generation plant could not be excavated due to the presence of several meters of fill. All 8 test pits excavated were negative to the presence of archeological materials.

For detailed data regarding the stratigraphy of the test pits refer to Appendix B. Appendix E contains an aerial photograph depicting the location of these test pits.

CONCLUSIONS AND RECOMMENDATIONS

We have conducted an archeological survey of the planned route for the installation of new water and electric lines for a renewable power generation and resource recovery plant in the Municipality of Arecibo.

The archival, reference literature and other sources investigated did not show the presence of prehistoric or historic archeological sites in the specific Project area. The nearest reported and/or known archeological sites are: site AR004 ("*Poza del Obispo*"), with is a residuary located some 500 meters to the North of the new water line route; and site AR005 ("*El Caney*"), which is another residuary located under the streets and residences of the Arecibo urban zone, located near 140 m West of the said water line route.

For the archival research conducted for this Project we carefully examined all the archeological studies carried out at the Islote and Cambalache wards of the Municipality of Arecibo. Two of them: *Estudio Arqueológico Fases IA y IB para el Proyecto Línea de Agua Cruda, turbinas de Combustión de Cambalache, Arecibo, Puerto Rico*, conducted by archeologist María A. Cashion Lugo in 1996, and *Informe de Estudio Arqueológico Fase IA-IB Proyecto Mejoras al Sistema de Abastos de Agua del Municipio de Arecibo, Área Costera de Arecibo, Barrios Islote y Cambalache*, conducted by archeologists Miguel Rodríguez and Yasha N. Rodríguez in 1998, deal precisely with water lines that cross through the current Project route, in which several test pits were excavated along their routes, all with negative results in the segment of the current water line route. Additionally, the Phase IA-IB archeological assessment entitled *Reestructuración Comunidad El Vigía, Arecibo, Puerto Rico*, conducted by archeologist Adalberto Maurás Casillas in 2004, carried out in the community adjacent to the water line route of this Project, also resulted negative. For that reason, and given that the construction of roads must have impacted the entire new water line route, it was decided to conduct a Phase IB only for the new electric line route.

This route was surveyed by means of a systematic transect and the excavation of manual test pits. A total of 8 test pits were excavated up to a maximum depth of 1.20 meters.

The transect and the test pits showed negative evidence for prehistoric or historic cultural material in the study area. The excavated area belonged to what were the environs of the main buildings of Central Cambalache Sugar Mill. As such, the construction and operation activities

of the sugar mill must have impacted the subsoil multiple times. The subsoil excavations substantiated said data. We documented fill, trash and impacted strata along the entire route of the proposed Project. We could not find any evidence of archeological material or cultural resources in the test pits excavated.

According to the data presented, we conclude and recommend that the Project development continues as planned. Naturally, it is also recommended that if material remains of cultural resources are found at any moment during the development of the Project, the works stop and the authors and concerned agencies be notified.

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Appendix A


AR-004
Punta Morrillos
Tres Hermanos
Jarealito
Roca Cocinera
VIGIA
Antena de Radio (WCMN)
a Resuello
Puerto de Arecibo
CIBO
AR-005
JAREALES
CAÑO
CIENAGA
Santa Bárbara
Vocacional
Monte Grande
J C A M B A L A C H E
RIO
Transportador
Central Cambalache
Subestación
ACUEDUCTO
VIEQUES
San Francisco
Las Clar
ARECIBO

Appendix B

Table of Test Pits

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
1	0-20 cm	Fill	-	-	-	-
	20-120 cm	Granular clay	10yr 4/4	Dark yellowish brown	Medium compaction, with pebbles	Negative, modern trash
	120 cm	Water table	-	-	-	-
2	0-20 cm	Fill	-	-	-	-
	20-120 cm	Granular clay	10yr 4/4	Dark yellowish brown	Medium compaction, with pebbles	Negative, modern trash
	120 cm	Water table	-	-	-	-
3	10-100 cm	Granular clay	10yr 4/4	Dark yellowish brown	Medium compaction, roots, disperse pebbles	Negative, modern trash
4	0-15 cm	Fill	-	-	-	-
	15-100 cm	Granular clay	10yr 4/4	Dark yellowish brown	Medium compaction, with pebbles	Negative, modern trash
	100 cm	Water table	-	-	-	-
5	0-20 cm	Fill	-	-	-	-
	20-110 cm	Granular clay	10yr 4/4	Dark yellowish brown	Medium compaction, with pebbles	Negative, modern trash
	110 cm	Water table	-	-	-	-
6	0-20 cm	Fill	-	-	-	-
	20-120 cm	Granular clay	10yr 4/4	Dark yellowish brown	Medium compaction, with pebbles	Negative, modern trash
	120 cm	Water table	-	-	-	-
7	0-15 cm	Fill	-	-	-	-
	15-90 cm	Granular clay	10yr 4/4	Dark yellowish brown	Medium compaction, with pebbles	Negative, modern trash
	90 cm	Water table	-	-	-	-

Test Pit Num.	Stratum Thickness	Stratum Composition	Munsell Num.	Munsell Color	Texture	Neg. Pos.
8	0-100 cm	Granular clay	10yr 4/4	Dark yellowish brown	Medium compaction, with pebbles	Negative, modern trash
9	-	Fill several feet deep	-	-	-	Could not be excavated.

Appendix C

Appendix C

List of Photos

Photo Num. 1:	Area northeast of Central Cambalache Surgar Mill, waterlogged.
Photo Num. 2:	Illustrates the waterlogged area.
Photo Num. 3:	Shows the ruins of the destroyed buildings of Central Cambalache Sugar Mill.
Photo Num. 4:	Archeotechnician observing the sugar mill debris.
Photo Num. 5:	Illustrates the two chimneys of Central Cambalache Sugar Mill.
Photo Num. 6:	Test pit excavation using digging bar.
Photo Num. 7:	Test pit excavation using post hole digger.
Photo Num. 8:	Representative test pit, note water table.
Photo Num. 9:	View South of beginning point of new water line route.
Photo Num. 10:	View East of route on road PR-681.
Photo Num. 11:	Another view in the same road.
Photo Num. 12:	Curve in road PR-681 at the intersection with the lighthouse road.
Photo Num. 13:	Continuation of route by the Nautical Club of Arecibo.
Photo Num. 14:	Other segment of route on road PR-681.
Photo Num. 15:	The route continues on road PR-681.
Photo Num. 16:	The route at the intersection of roads PR-681 and PR-6681.
Photo Num. 17:	Segment of route on road PR-6681.
Photo Num. 18:	Route arrives to the intersection of roads PR-6681 and PR-2/
Photo Num. 19:	Intersection of the two roads above.
Photo Num. 20:	Segment of route on road PR-2.
Photo Num. 21:	Another segment of route on said road.
Photo Num. 22:	Segment of rout also on road PR-2.
Photo Num. 23:	View to the East where the route crosses West of PR-2.
Photo Num. 24:	Place where the new water line ends.

Photo 1. Area northeast of Central Cambalache Surgar Mill, waterlogged. Looking south-southwest.

Photo 2. Illustrates the waterlogged area.

Photo 3. Shows the ruins of the destroyed buildings of Central Cambalache Sugar Mill.

Photo 4. Archeotechnician observing the sugar mill debris.

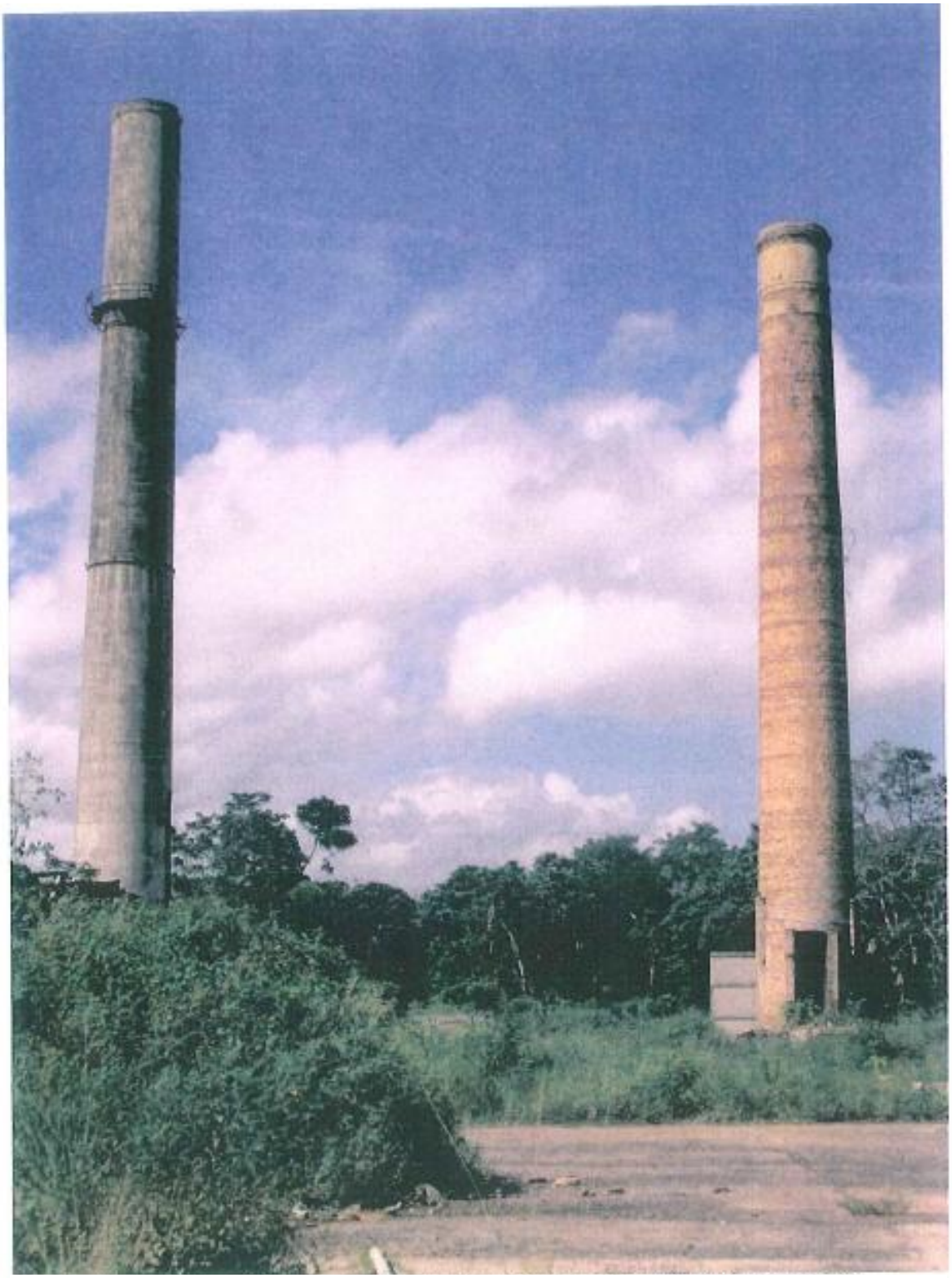

Photo 5. Illustrates the two chimneys of Central Cambalache Sugar Mill. Looking west-southwest.

Photo 6. Test pit excavation using a digging bar. Looking west.

Photo 7. Test pit excavation using a post hole digger. Looking west.

Photo 8. Representative test pit, note water table.

PHOTO NUM. 9

PHOTO NUM. 10

PHOTO NUM. 11

PHOTO NUM. 12

PHOTO NUM. 13

PHOTO NUM. 14

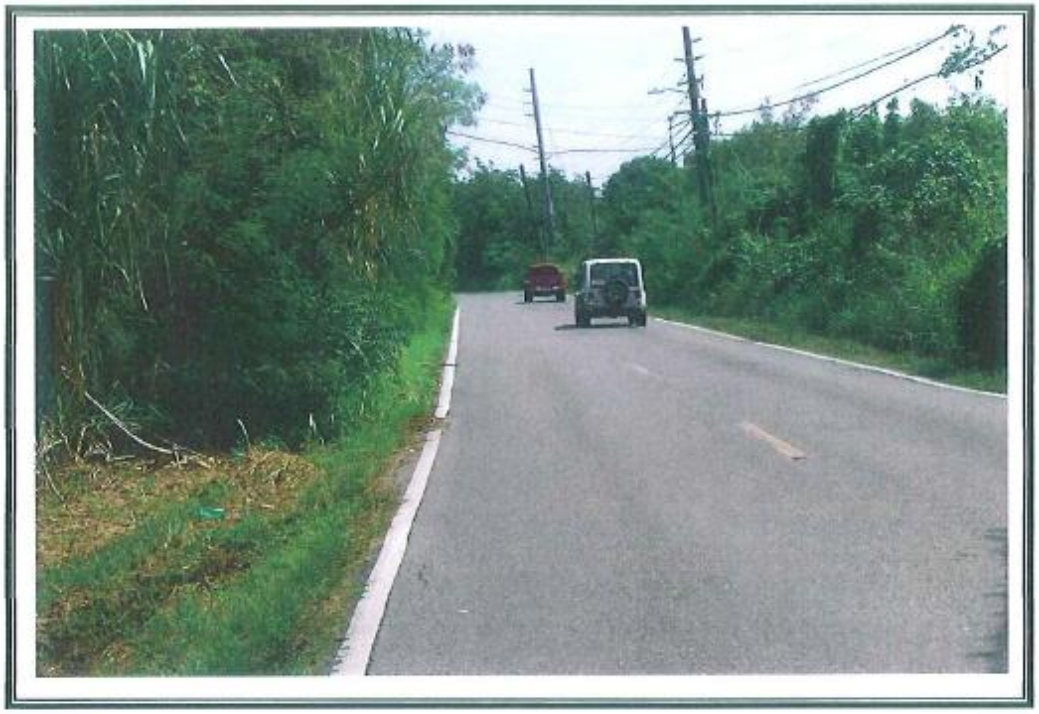

PHOTO NUM. 15

PHOTO NUM. 16

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PHOTO NUM. 18

PHOTO NUM. 19

PHOTO NUM. 20

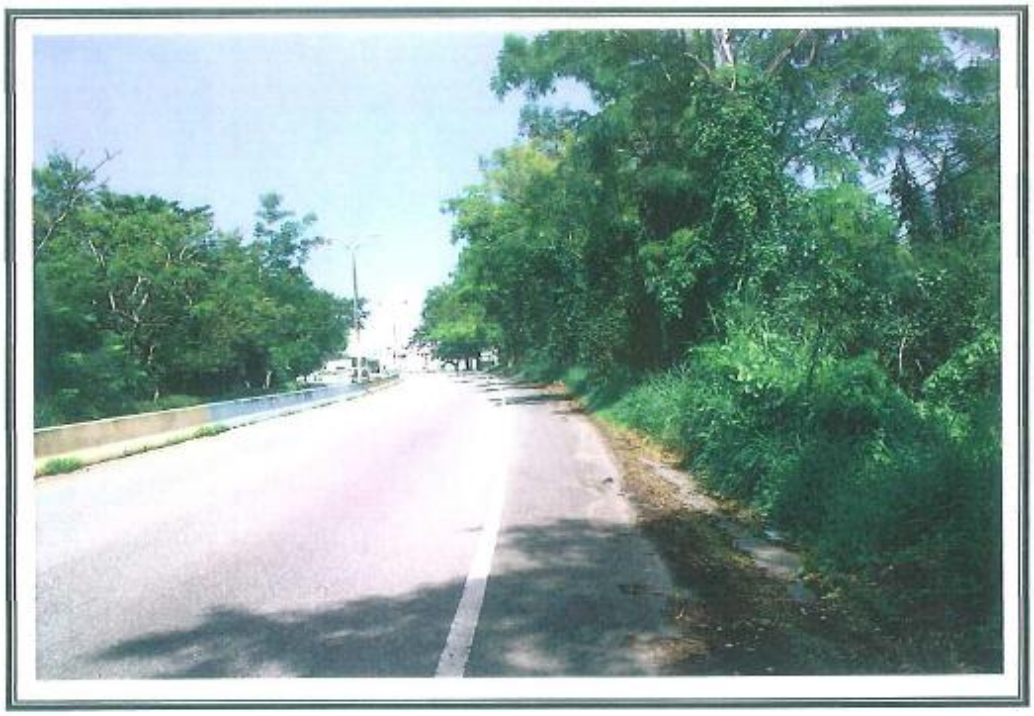

PHOTO NUM. 21

PHOTO NUM. 22

PHOTO NUM. 23

PHOTO NUM. 24

Appendix D

Appendix E