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Research Article

Discovering Underground Interventions Within the Landscape of the El Pardo Woodlands: Artesian Wells and Trenches

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ABSTRACT

El Pardo Woodlands is known as the largest natural setting in the Community of Madrid and it is the oldest Royal Site in the Spanish capital. These hunting grounds were declared a Special Protection Area for Birds in 1987 (ZEPA). The present investigation aims to bring to light two main excavated areas that have affected the development of the landscape in this protected woodland area: the artesian wells and the civil war trenches. In order to discuss interventions such as artesian wells and trench construction, we could define that both affected the subsoil but have very different characteristics since the wells were implemented to provide water to the Royal Site of El Pardo, before the war, and the trenches were made a little later to protect the sides that defended the place. These interventions, both from the first half of the 20th century, have modified the natural terrain and, for different reasons. One intervention is the artesian wells constructed by engineer Janini between 1910 and 1920. The other is the construction of trenches. The method employed for this analysis of the impact on the land used is based on historical knowledge of the place. Previously documentation (maps, blueprints and pictures) has been extracted and systematized to locate the wells and trenches in time and place. As a novelty, this study shows unpublished information and photographs found in historical, military and National Heritage archives. The results allowed us to understand factors and elements of the urban layout.

Keywords: El Pardo Woodlands; National Heritage; Landscape; Artesian Well; Trenches.

INTRODUCTION

Historical Background and State of Art

El Pardo Woodlands (Figure 1), a protected natural area, was first a hunting ground used by the Spanish monarchy. The Royal Palace of El Pardo is one of the residences of the Spanish royal family. It was originally a hunting lodge for the Austrians, and later became the sovereign's main winter residence under the Bourbons. During the Franco dictatorship it was the official residence of Francisco Franco, and its main use today is to accommodate foreign heads of state when they are on official visits to Spain.

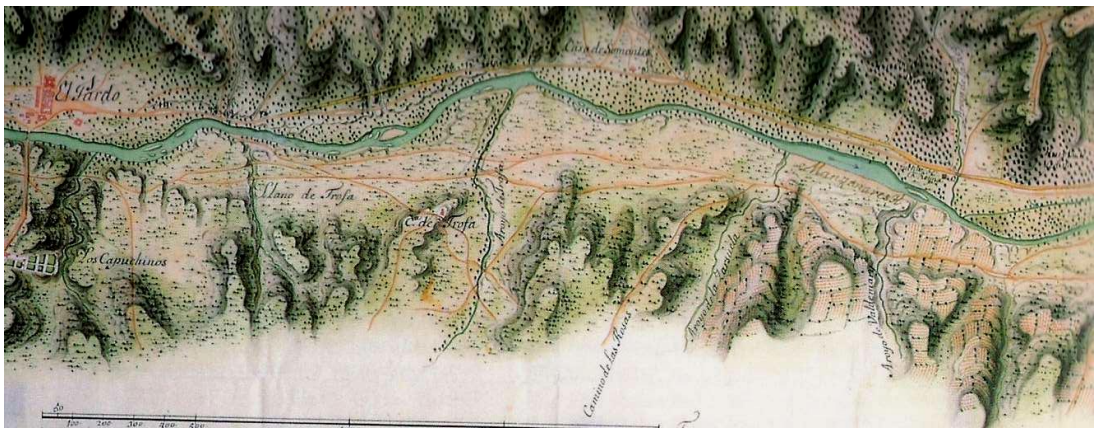

Figure 1. "Proyecto del Camino Real de El Pardo", "Royal Path Project" (1741)
Source: Sebastián de Rodolphe, in Archive [A.G.P.]

These woodlands, surrounding the palace, were declared 'Especial Protección para las Aves' or ZEPA that means 'Special Protection Area for Birds' in 1988. El Pardo woodlands was registered with reference ZEPA ES0000011 number (https://www.comunidad.madrid/sites/default/files/doc/medio-ambiente/zepa-monte-el-pardo.pdf.). Since the mid-twentieth century, there has been concern about the imbalance between urbanization and environmental conservation (Urbano-López de Meneses, 2013). The implementation of the «European Agreement of the Landscape» in Spain in March 2008 introduces a new element for the conservation and management of the landscape in Spain. The strong economic growth of the country and the process of urbanization from the 1960s that there gives place in which 84 % of the buildings have less than 50 years explain that there should have worried more about the creation of urban soil than the protection of the landscape (Zárate, 2011). Territorial planning (state, regional and subregional) gained some momentum in the 1960s, but suffered a significant collapse, like the rest of public planning, with the great economic crisis of the 1970s. However, in the last two decades, largely due to the impetus given to regionalisation by the Council of Europe and the European Communities, territorial planning has been reborn, above all, logically, at the regional level; at the same time its objectives, methods and procedures have been clarified to a certain extent, although the relationship, in those same years, with an emerging policy of great importance such as the environmental policy, has also contributed to delaying its implementation as a well-defined public practice (Zoido Naranjo, 2002).

Regarding land ownership, there is evidence, from documents extracted from the National Heritage Archive, that since the beginning of the 20th century, this National Heritage Institution has been granting access to the use of land for different sporting activities. These usages include the Country Club, the Spanish Hockey Federation, Zarzuela's Hippodrome, Madrid Beach, the Royal Club of the Iron Gate, the Tiro de Pichón, the Somontes Sports Park and the Club Tejar de Somontes. In addition to socio-recreational activities, the National Heritage has granted land for the establishment of various research centers considered to be of special social interest because of their unique architecture and remarkable location close to the M-30, which is the main access route to the Royal Site of El Pardo. An example is the Llorente Institute National (Figure 2) and the Agricultural Research or Pest Control Services Institute which are functionally linked to the El Pardo Woodlands.

Figure 2. "Instituto Llorente" (1930)
Source: National Heritage Photographs Archive

Surveyors and engineers were interested in the intrinsic natural qualities of this place and wrote articles, essays and books, which were sometimes accompanied by cartography based on planimetry, as well as sections or profiles of the terrain. Intrinsic values of the El Pardo Woodlands are recorded in a descriptive, practical and visual style, almost to lure in visitors and outdoor recreationists as Enrique Partagás began detailing routes for bicycle tourism at the end of the 19th century (Partagás, 1896). Twenty years earlier, Fernández de los Ríos had cleared the way and established a guide model in Madrid (Fernández de los Ríos, 1876). His descriptions were journalistic and incorporated his style as a historian familiar with the emerging urbanism of the time. To locate the time frame of the Fernández de los Ríos treaty, we remember that Mesonero Romanos had published his historical, topographical, administrative and artistic manual of Madrid (Mesonero Romanos, 1844, pp. 427-429) and Madoz the geographical, statistical and historical dictionary (Madoz Ibáñez, 1848).

At the end of the 19th century, Manuel Ayala y Raya wrote an interesting introduction about the Royal Site of El Pardo for the Provincial Government in the General Chronicle of the Towns of the Province of Madrid (Ayala y Raya, 1898, p. 10-103). The Marquis Manuel de Foronda would join his contemporaries by writing an article on El Pardo in the Spanish Excursions Bulletin (Foronda y Aguilera 1904, p. 66).

Elías Tormo also participated by writing booklets for hikers about historic El Pardo. In 1919, he wrote a specific one (Tormo Monzó, 1919), which was influenced by Facundo Cañada's writings on the Royal Site (Cañada López, 1902). At that time, Núñez Granés' urban plan was in the making, which would signify the expected expansion of Madrid (Núñez Granés, 1910).

Not only historians, surveyors and journalists were inspired to write about the Royal Site, but others linked to the site developed studies that provide complementary information as well. In terms of landscape, the terrain tends to be studied from the surface. For this reason, the motivation for this study is precisely to investigate what occurs in the subsoil of the protected area of the El Pardo Woodlands. Historical underground interventions in the area, including the artesian wells and trenches presented in this research, are now undetectable by common visitors. Nowadays, both the wells and the trenches have been left underground and have not been identified as an important part of the history of this Royal Site. They cannot be visited and their location is not even indicated. All these publications relate to the underground interventions because, although these elements have not yet been considered in previous scientific investigations, artesian wells and trenches are important factors in every landscaping project that has been conditioned by the soil and its treatment throughout El Pardo and Manzanares river plan in this Royal Site.

If we study the graphic documentation of the 17th century and the first half of the 18th century (Figures 3 & 4), it is observed that the path that led to the entrance to the Palace and the Casa de Oficios or "House of Trades" was inside the current Royal Gardens. These unplanned paths conditioned all subsequent underground interventions because they established the bases for the design of the gardens designed later and the fountains that were located in these gardens generated the framework or network that we will see later.

Figure 3. Painting of the Royal Palace Sight from the Ancient South Access Between the "Casa de Oficios" or "House of Trades" and the Royal Palace (17th Century)

Source: Anonymous. Real Monasterio de San Lorenzo de El Escorial

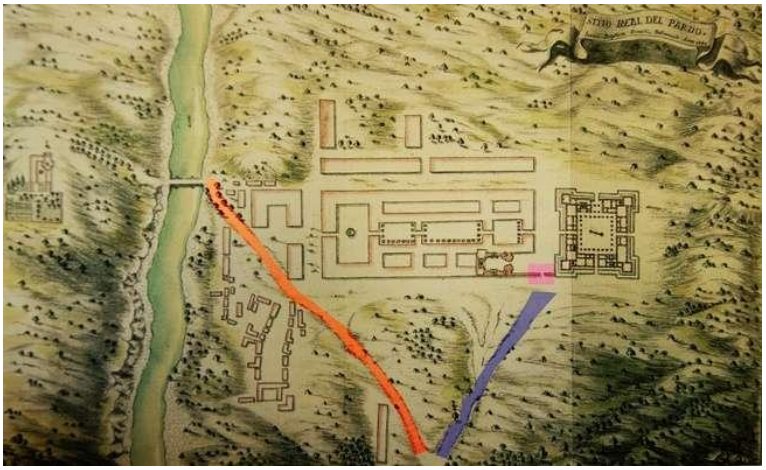

Figure 4. Royal Palace and Context Buildings at the El Pardo Royal Site

Source: Novello (1740) in Archive [Biblioteca Marciana]

The Novello painting (Figure 4) depicts the rectangular floor plan of the "Quartel de Guards Españolas y Walonas" to the left of the Del Rei path (in orange). The House of Trades was equipped with several access points within its perimeter and changes have been recorded from one century to the next. The plant variations in relation to perspective are considerable even if they are not appreciated by the naked eye. As a result of the study of these unpublished documents, we can confirm the disappearance of certain constructions that made up the original urban and building complex of the Royal Site prior to the intervention of Sabatini by Carlos III the King. The fact is that by reconditioning all the buildings, the layout of sanitary and drainage networks as well as water pipes for wells and fountains would be altered (Figure 5).

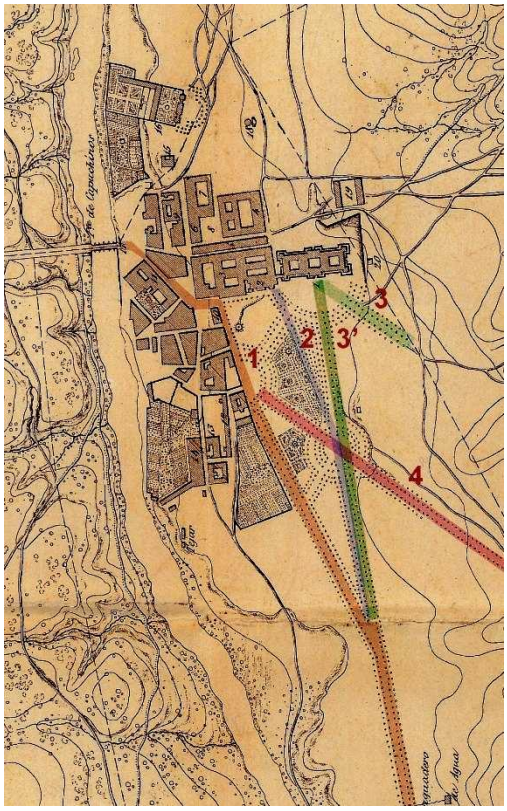

Figure 5. El Pardo Royal Site; Shooting School (right) (1862)

(1) Madrid's path to Capuchinos Bridge (2) Path to the Royal Chapel and Royal Palace (3) path from Fuencarral to the Royal Palace (3') main axis from the Royal Gardens to the new organizational roundabout (4) New path from Fuencarral to El Pardo.

Source: Jacinto Hernández de Ariza and Basilio Agustín, in Archive [C.C.G.E.]

Narciso Pascual y Colomer's map from 1851 (Figure 6) provides information about the new layouts of gardening design and water conductions or irrigation.

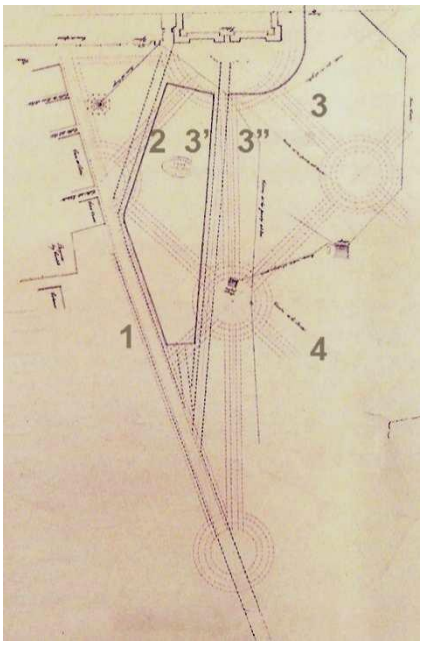

Figure 6. New Layout of the Tree-lined Promenades in front of the El Pardo Palace with the Old Layout and Water Conveyance (1851)

(1) Madrid's path to Capuchinos Bridge (2), Madrid's Path to the Royal Chapel and Royal Palace (3) path from Fuencarral to the Royal Palace (3') New main axis from the Royal Gardens to the new organizational roundabout (4) New path from Fuencarral to El Pardo.

Source: Narciso Pascual y Colomer, in Archive [A.G.P]

In the floor plan analysis, the following appreciations are noted: The water path that starts at the southeast corner of the Royal Chapel, flows down to Branch 1 on the left side towards the Fuente del Campo, (which today is placed at the Mar Océana Park), Branch 2 on the right side runs parallel to the main axis of the Palace gardens. Branch 2 is named by Colomer as "Cañería de las Fuentes del Sitio." The third and final branch, Branch 3, was named the "Nueva Cañería" by Colomer. It starts at the well in the north gardens of the Palace and goes parallel to the east wall of the gardens then breaks again in a southwesterly direction to the cistern. It ends by flowing through what he calls the "lost pipe," towards a smaller pipe located at the main access to the gardens.

Study Aim, Goals and Novelty

In the development of this study, the aim is to examine what occurs in the subsoil of the protected area of El Pardo Woodlands and how that has transformed the gardening, landscape and urban development into what it is today. As part of the response to the mentioned theory, we describe two interventions that occurred from the surface to the subsoil. The study goals present two interventions that occurred from the surface to the subsoil, and vice versa, and served to provide two of the most important resources: water and defense. The first intervention is the artesian wells, which were implemented between 1910 and 1920 by engineer Janini stood out for his work to improve agricultural and forestry wealth and eradicate the phylloxera plague. Ahead of his time in terms of environmentalism and environmental protection, he directed the American Ampelography Station and the Viticulture and Oenology Station. Janini was responsible for the first Spanish treatise dedicated to publicizing and promoting monumental trees, entitled Some Old Trees and Shrubs of the Province of Valencia (Spain) published in 1914. He established an inherited order in the soil itself and provided water. The second intervention is the trenches, which were built during the Civil War between 1936 and 1939, for defense. In order to achieve a balanced development of the territory, we are faced with the issue of planning, which involves numerous figures from different disciplines: geologists, botanists, architects, landscapers, designers and artists. An architect must know how to operate in this interconnected multidisciplinary context, describing new operational practices, in which the already established participation of citizens gives rise to new inclusive and fruitful practices of participatory planning (Del Puglia, 2021).

As novelty this study recovers photographs of the landscape found in unpublished historical and military

archives with the intention of showing certain excavations that affected the El Pardo Woodlands, such as Janini's artesian wells and the Civil War trenches. This is a crucial step forward in thinking through concepts informing understandings of surface–subsurface relations (Hine & Mayes, 2022; Jensen, Karkee, & Lindquist, 2022).

METHODOLOGY

The method proposes to start by first understanding the materials used and the unpublished information found in archives. Secondly, to give an overview of what exactly was done to obtain the data as well as requesting information outside the chronological framework of the goals of study in order to find starting or conclusive points within documents that were previously unpublished, non-digitized or unsolicited.

Materials and Documented Resources Used

Part of the published documentation reviewed that was used as bibliographic references has been relocated due to changes in the management of some archives. These documents include the Map Library of the General Military Archive of Madrid and the Central Military Library. Also, there have been updates to other documents in places such as the National Heritage Palace General Archive. Therefore, updating some data has been part of the objectives of the study, thus speeding up the search for future research. Diagrams are used to explain the research methodology of sources detailed below.

Aerial photographs, or orthophotos, provide reliable clarification of the urban development of the town of El Pardo. The areal documentation method implanted in the twentieth century, which was restricted to cartographic-military use, provides some poor definitions of aerial photographs. As a result, their deficient quality prevents the comparison and attribution of architectural and topographic elements to planimetric representations. Thus, a series of photographic documents was produced in order to help clarify the distribution of temporary buildings. These old aerial photographs have been interpreted and handled in order to glimpse and establish a comparison between the previous and current elements that concern us in this research (artesian wells and trenches). The documents contained photographs from the 1930s and 1940s and more recent ones from the 1970s and 1980s.

To establish the chronology, it was essential to contrast photographic documentation with historic plans and analyze the layouts. Also, superimposing the urban layouts helps to understand building and residential development.

Archives Researched

AHEA: The Historical Archive of the Air Force in Villaviciosa de Odón, Spain.Sixteen 34 x 46 cm. black and white aerial photographs, or orthophotos, from the Historical Archive of the Air Force were found, many of which are from the first half of the twentieth century (c.1930). The photographs are of El Pardo as well as the trenches that were dug in times of war and sentry boxes that were built by the Republican faction.

CEGET: Cartographic Archives of the Spanish Army Geographic Center. Military maps found in the Cartographic Archives of the Spanish Army Geographic Center provided valuable topographic and communication information on road and highway access in the 19th and 20th centuries. Some of them were decisive in understanding the Royal Road from Madrid to El Pardo. Examination of archives using zoom techniques and limiting the study to a specific framework of the center of population provided additional information about plans drawn at different scales.

BCM: Central Military Library of Spain. Madrid. An original by the engineer Rafael Janini Janini on the artesian wells in El Pardo (Janini Janini, 1913) was found in this library. Explanatory information about the location of artesian wells, farmlands and hunting grounds in El Pardo has been extracted from this book. Also, plans of a third longitudinal cut of the land were found, to which a fourth plan containing detailed information on the cuts of the wells and the constitution of land strata was added. These not only showed the location of the wells, but also the topographic sections in the urban core of El Pardo from the beginning of the 20th century, which provided information on building styles and the urban arena prior to the Civil War. The book also contains plans from the Royal Heritage of El Pardo that indicate the location of underground water, which are signed by D.F. Garcia Muñoz. Another set of plans signed by Muñoz was also found, which show the geological cuts of sections a–b, parallel to the Manzanares River, in El Pardo.

AGP: National Heritage Palace General Archive. This archive provides relevant information regarding urban planning prior to the current layout of the El Pardo Royal Site and also contains updated street map information. Without this finding it would not have been possible to understand the location of the wells within the current layout of the Royal Site. Various people from this institution have facilitated the present study including Eugenio Hernando Mora, former Head of Investor Control and Coordination; Juan Hernández, former Directing Architect

of the Department of Real Estate; José Luis Sancho, Heritage researcher and Javier Fernández, Technical Archivist of the AGP, citizen of El Pardo and creator of the blog (https://elpardohistorico.blogspot.com/), cited here for reference.

Techniques Used

The method applied to this study is a graphic analysis of the original planimetry of the second half of the 19th century found in the National Geographic Institute Archive (AIGN), which was compared with historical planimetric sources found in the General Military Archive (AGM). Information about previous streets found in the General Archive of the National Heritage (AGP) has been cross referenced with computerized CAD documents that show current nominations of streets, which were requested from the Old Municipal Planning Department. Redrawing and overlapping layers with color codes has facilitated the reading of the Royal Site developments. A reading that was not prompted by the study of the population.

RESULTS

About On-site Interventions: Artesian Wells

In 1904, Alfonso XIII the King encouraged agriculture and livestock usage within the Royal Site of El Pardo. As a result, the Royal Palace cultivated large plots in the woodlands with around five hundred hectares of non-irrigated land. This made it necessary to use an innovative method of excavation in the ground: artesian wells, not only for irrigation but also to supply water to the Royal Palace and livestock, as well as to irrigate the royal gardens and other plots. A wire fence was built around it to protect the crops from both large and small game. Numerous wells were dug on several plots (Figure 7) that reached about one hundred and ten meters in depth. These wells, near Queen Victoria's Bridge, yielded about eight hundred liters of water per minute and could shoot out of the ground more than twenty meters high. The historical and cultural heritage and biodiversity associated with the springs also fascinate people, and many of them can become unique tourist destinations with a high visual impact (Akhmedenov & Idrisova, 2021).

Figure 7. Artesian Well in El Pardo (1913)

Source: in Archive [BCM]

There were also four electrohydraulic pump installations. Two of the most powerful of these pumps could draw out 3,300 and 6,000 L. of water per minute, respectively. Thanks to these installations, it was expected that the total extension of irrigated land would reach 187 hectares. Grains, legumes and vegetables such as wheat, barley, oats, rye, grass peas, beans, chickpeas, carob, potatoes, alfalfa, corn, turnips, beets and other foods that are currently consumed were harvested in these farmlands. Crops from non-irrigated gardens were worked using modern, agricultural technology of the time such as moldboard plows, rollers, harrows, seeders, cultivators, mowers as well as powerful steam powered threshers. Manure and chemicals were used as fertilizer.

This agriculture data for El Pardo was found in the Espasa Encyclopedia, where Janini Janini was introduced

as the creator of the agricultural expansion of the Royal Site. Other agricultural research in this sector also arose in these years, such as that of Maluquer and Mesa on artesian wells in the United States at the same time. (Mesa y Ramos, 1909). Artesian wells are used for domestic needs and agricultural irrigation, but are not accompanied by environmentally sound use of groundwater (Hendrayana, Riyanto, Nuha, & Lisan, 2021).

It also makes reference to his book (Espasa Calpe, 1920, p. 371):

> Due to the kindness of D. Rafael Janini Janini, agricultural engineer of the Royal Household and Heritage, who had the pleasure to carry out the initiatives of Alfonso XIII. [...] Also, author Janini, who wrote the remarkable publication entitled Irrigation with Artesian Groundwater, compiled a mass of data about the great importance of cultivating the land. It is a work of true patriotism and is extremely useful, not only for the Royal Palace but for all farmers. [...]

Alfonso XIII also commissioned Janini to study and promote the agricultural exploitation of the fertile plains of Manzanares. The area of study stretched from the San Fernando Bridge to the town of El Pardo. This stretch of land was considered alluvial terrain with several water tables. In 1908, Janini planned to transform the site into what he called an "urban settlement" or a true town with sanitation, culture and areas of recreation such as pavilions, hotels and villas surrounded by gardens. Many of these building projects were never developed, however, agriculture was greatly favored thanks to the artesian wells and irrigation systems that were implemented, which undoubtedly promoted the self-sufficiency of the town.

García Muñoz's Groundwater Study

Geologist, García Muñoz, studied the Woodlands and the town of El Pardo in detail and on a large scale. Muñoz analyzed the groundwater network through a series of parallel geological cuts (Figure 8). From north to south, there are around thirty-two horizontal cuts (indicated as A–B) that extend from the gates of Velada northwards to the Iron Bridge and parallel to the Manzanares River. The composition is constant and is detailed in the section drawing (Figure 9). The cut, read from outside to inside, shows sand and clay (A), marl (M), sandstone (H) and limestone (C).

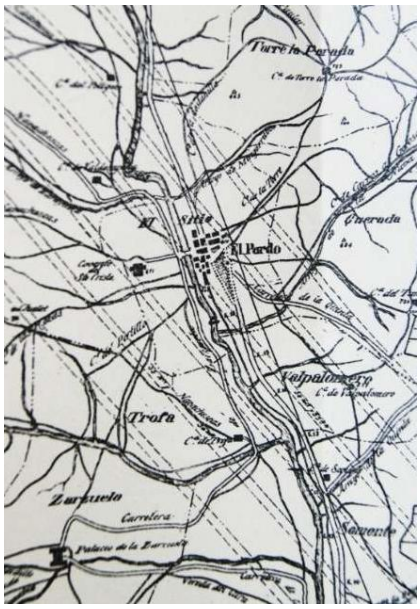

Figure 8. Indications of Groundwater in El Pardo (1913)

D. F. García Muñoz. Source: (Janini Janini, 1913) in Archive [BCM]

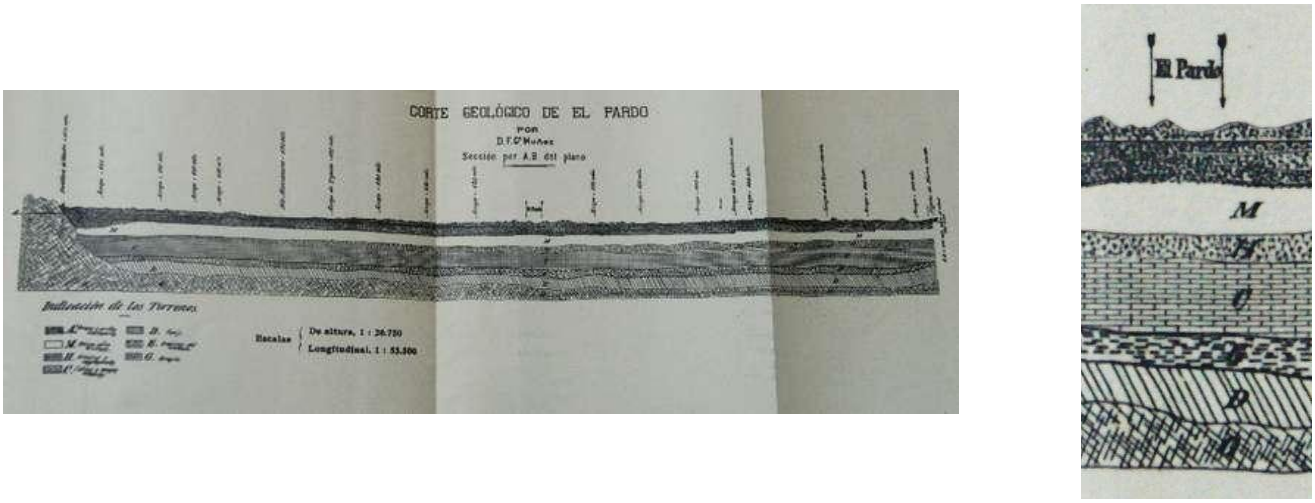

Figure 9. Geological Cuts (1913)

D. F. García Muñoz. Source: (Janini Janini, 1913) in Archive [BCM]

José Ramón Espartero collaborated with Janini and García Muñoz by providing graphic information on the location, shape and extension of farmlands. Esparto's documentation also indicated the location of the five hunting grounds, which were codified in shades of yellow (Figure 10).

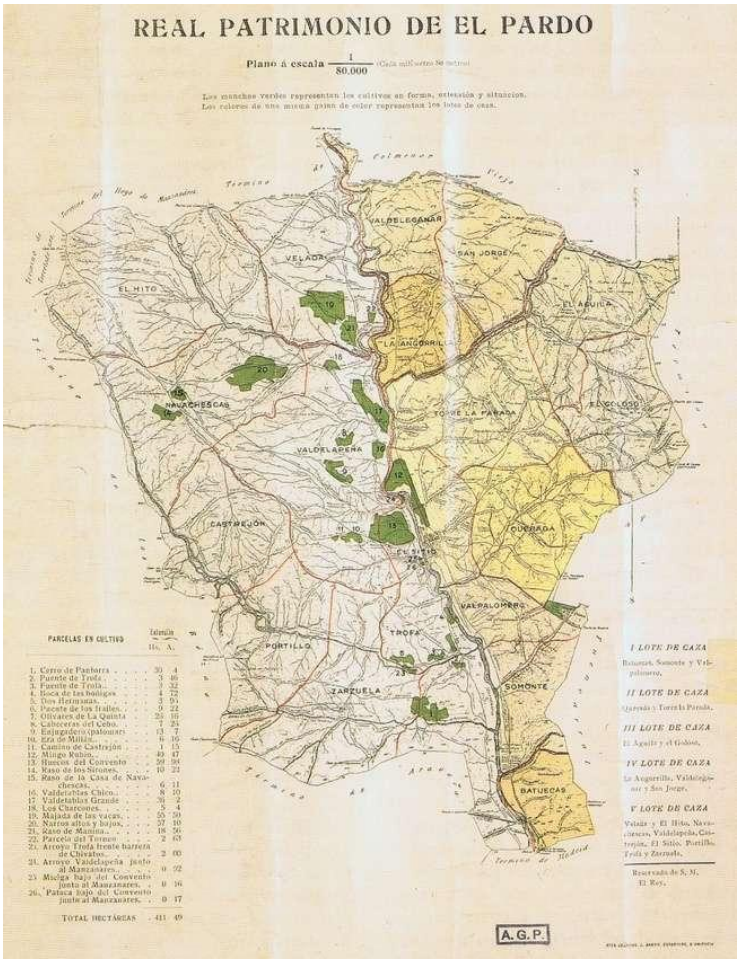

Figure 10. Map of Areas of Cultivation and Hunting Grounds (right and below) (1913)

Source: (Janini Janini, 1913) in Archive [B.C.M.]

These hunting grounds correspond to the so called "Cuarteles" or "Royal Barracks" and each lot included several barracks. For example, lot V, which includes "El Sitio" or "The Royal Site" different from "Trofa", a stream

in the west basin by the river.

The farming plots are indicated in green and have been named and numbered from 1 to 26. The estimated area is 49 hectares with a total of 411 plots. All the lots are outside of the Royal Site, with the exception of lots 25 and 26, which are the alfalfa patch below the Convent (0.16 ha) and the artichoke patch (0.17 ha.) next to the Manzanares River. The plan also shows no. 12, called Mingo Rubio, which was affected by the urbanization of the Mingorrubio Colony in the 1950s.

Janini's Artesian Wells

What at first seemed to be somewhat of a foolish and risky project, the implementation of the artesian wells at the Royal Site in El Pardo was later considered to be both logical and beneficial. Geologists warned that there was little probability of finding artesian groundwater in the sandy, Quaternary areas in the province of Madrid, nevertheless, Janini found them just as he had predicted.

As a result, Janini shared in his book the important actions taken during the 20th at the Royal Site of El Pardo to use groundwater for the crops. According to physical-chemical, qualitative and quantitative analysis, he describes in his book the extensive and deep deposits of quartz sand in El Pardo as: "[...] scarce in clay and very poor in limestone [...]" (Janini Janini, 1913, p. 2)

Groundwater investigations in the aforementioned Royal Site began in 1906 by making an open pit near the point where the first artesian drilling would later be made. The first cascades were found in mid-1908. The natural barrier at the Freijó Lookout shows the horizontal stratification of sands and clay as well as erosion caused by rainwater (Figure 11).

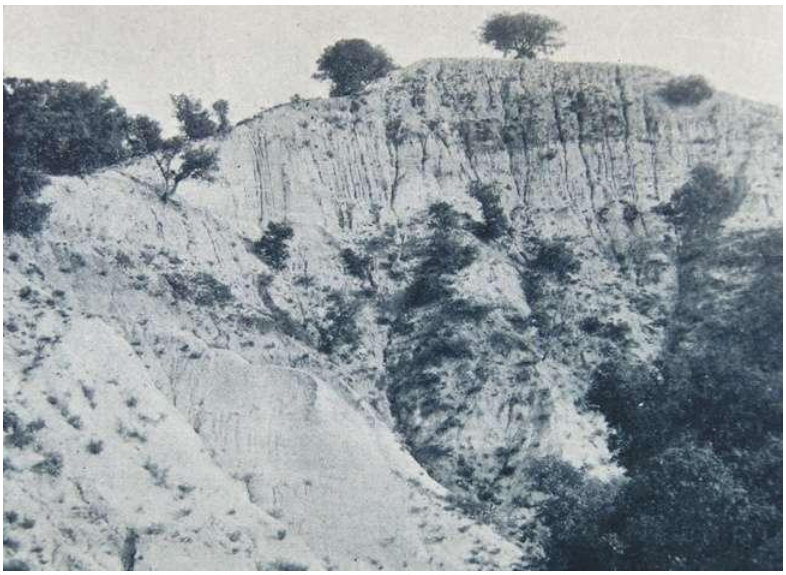

Figure 11. Natural Barrier at the Freijó Lookout in El Pardo

Source: in Archive [BCM]

"[...] At the end of this year, artesian groundwaters were found in another new well close to the previous ones. All the data can be seen in the plans, except for those of the Torneo and the one near the Queen Victoria's Bridge [...]" (Janini Janini, 1913, p. 15).

Janini Janini's studies show site plans of constructed artesian wells along with leveling routes and areas easily irrigated with artisan groundwater (Figure 12).

These are shown with a color code system. The leveling routes are drawn with a red line and the location of ten wells is indicated with red circles. This route starts at the San Fernando Bridge in town and extends to the House of Torneo by the North Pond. The irrigable areas are indicated in green, which includes the gardens and alfalfa patch on the east and west sides of the Manzanares River.

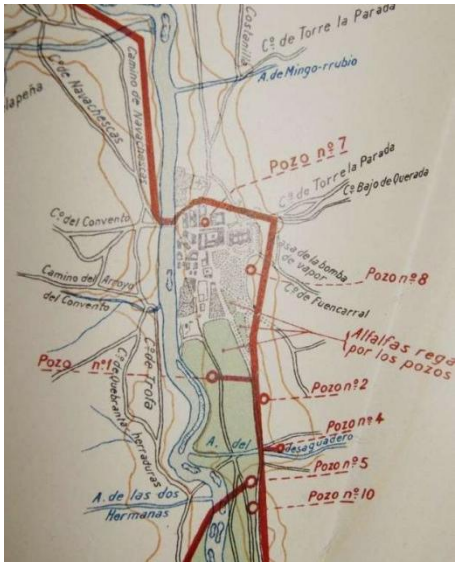

Figure 12. Site Plan of Sources of Constructed Artesian wells (1913)

Source: (Janini Janini, 1913) in Archive [BCM]

Artesian Wells in the Urban Core Layout

> [...] Water abounds in the Royal Site of El Pardo almost as much as holm oaks. I do not believe there is another town that has such a concentration of springs as we do. Of course, towns with 4,000 inhabitants and 40 springs will be few in the world [...] (Galindo, 2011).

"[...] In each corner there is a water source that springs forth and is masked by stones [...]." (Argote de Molina, as cited in Janini Janini, 1913).

Ever since the master plumber, Francisco Delgado, built the Queen's Fountain in 1676, which was later repaired by Madrilenian architect and master plumber Manuel del Olmo, several interventions of this nature have taken place in various fountains of El Pardo. Water in El Pardo is an essential element in its history.

Regarding residential architecture, the present study shows the wells that were located within the town of El Pardo. These wells have affected the distribution of water and the subsequent layout of urban infrastructure. Wells no. 10 and no. 5 are located near the town's access to the left of the Madrid highway. The latter, parallel to the road through the west basin of the river, was built in a ring and was used to close off the network to the south. Wells no. 4 and no. 2 are found near the Transmission Station or Zarco del Valle, (at this time called the Transmission Regiment) (Figures 13 & 14), which irrigated the alfalfa patches that were in front of the gardens of the Convent of Conceptionists. Currently, La Montaña restaurant is located within what is called the Pedrós Gardens (Figure 15).

Figure 13. Artesian Well no. 4

Source: in File [BCM]

Figure 14. Artesian Well 4 Located in Lands of the Transmission Regiment

Source: in File [BCM]

Figure 15. Alfalfa Patches Watered with Artesian Groundwater (1913) (In the background, we can see the old Transmission Station)

Source: in Archive [BCM]

Wells no. 7 and no. 8 are within the urban core.

Well no. 7 was in the enclosure of the Corps Guard Barracks in front of the Ballestería building in which a cistern was built with a circular upper tank and metal frame girders with a square floor plan measuring approximately 5×5 m. This was necessary due to its considerable height, as can be seen in the photographs inside and outside the Barracks (Figures 16 & 17). According to the analysis of aerial photographs from the 1930s, in which the cistern did not appear, we deduce that it was possibly built in the 1940s.

Figure 16. Artesian Well no. 7. at the Guard Corps Barracks (1913)

Source: in Archive [BCM]

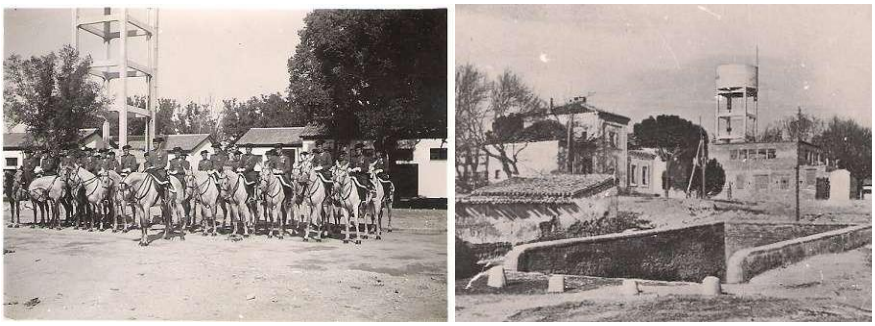

Figure 17. Water Tank above Artesian well no. 7. from the New Fountain (c.1930)

Source: Javier Fernández

and from the Guard Corps Barracks (c.1950); Previously unpublished photograph given by Maria Dolores Prieto (citizen of El Pardo)

Well no. 8 was in the pond and was used to water the south garden of the Palace. It is located where Pascual and Colomer had already implemented a well that was used for irrigation in the gardens within branch no. 3 of the so-called "New Pipe" (Figure 17). Currently, a fountain is located on this point, which almost coincides with the main axis of the gardens of the Royal Palace of El Pardo.

To this, detailed information is added pertaining to the cuts of constructed wells and the constitution of the soil strata. The post for well no. 7 is at the “Casita del Príncipe” or the “Prince’s House,” which is near the Corps Barracks.

The ascending line, seen in the diagram, starts at the “El Puente del Convento”, which refers to the “Capuchin Bridge”, and reaches the highest point at well no. 8, which is specified as “estanque que riega el jardín frente a Palacio” or the "pond that waters the garden in front of the Palace" (Figure 18).

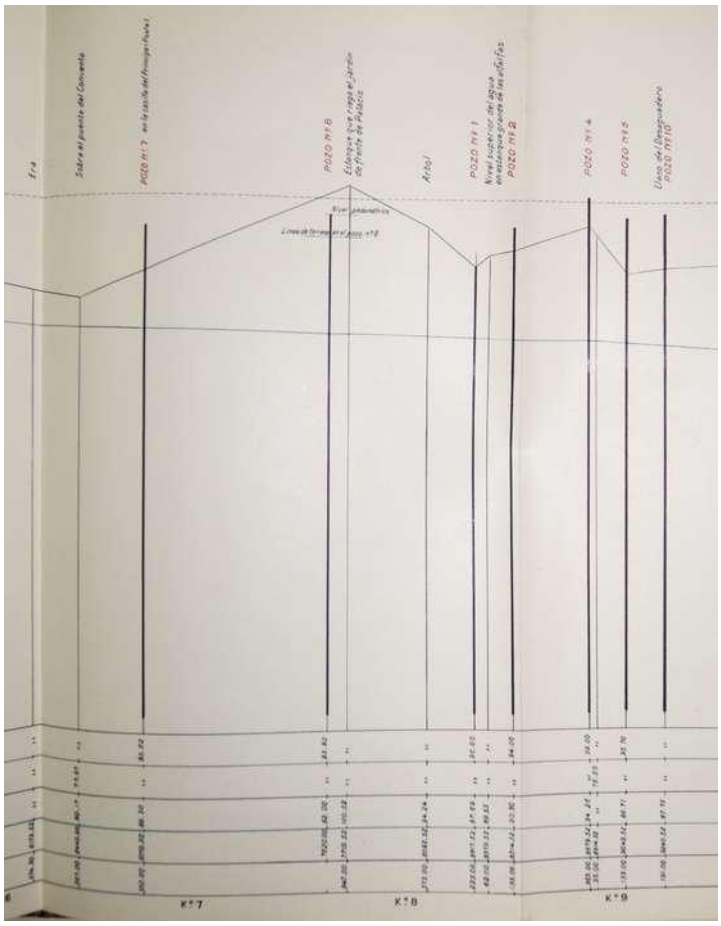

Figure 18. Diagram of the Cuts of Constructed Artesian Wells (1913)

Source: (Janini Janini, 1913) in Archive [BCM]

The diagram shows that well no. 7 had a piezometric level of 7 m. / 1 m. to 500 L. per minute. The following geological composition is as follows:

In the most superficial layer, sandstone topsoil is found at 0.50 m., followed by fine, coarse sands at a depth of 16.50 m. and, going another 2 m. deeper, medium gravel is found. At a depth of 11 m., there are non-ascending waters and, at 20 m., medium sands.

Then, water is found again at this depth, with ascendants at 50 m. Below this, thicker sands combined with finer sands are found.

At 50 m., increasingly abundant water appears with a strong, surging force. At 81 m., the water ascends to 7 m. on the surface of the land with 1 m. to 500 L. per minute. Finally, there are clays mixed with a lot of fine sand and gravel.

Well no. 8, (within the gardens of the Royal Palace), had a piezometric level of 3.50m. / at ground level 350 L. per minute. Up to 2 m. of topsoil is found in this order: stone and gravel up to 10 m. and small loose sand at 18 m.

If we continue analyzing the composition of the terrain for another 15 m., we find coarse washed sands and coarser sands. These sands are coarser than those found at a depth of 5 m.

At 6 m., small sands are found and 3 m. deeper, very thick sands and water are found. Under the water at 11 m., there are medium sands. Thick sands and water are found throughout the following 5 m. Continuing to dig for another 5 m., fine sands and stones are found as well as medium sands within the following 5 m. Alternating layers of fine and coarse sands are found in the following 7 m. Throughout the next 6 m., alternating layers of fine and coarse sand are found again but at 6.4 m. there is more coarse sand than fine. Finally, the terrain becomes very hard and compact and there appears to be sand in the final 6 m. excavated.

Results about On-site Interventions: Trenches

Although architect Ángel Hurtado stayed away from politics, he was always linked to the City Hall of El Pardo. At the end of the Civil War in 1939, he was named Deputy Mayor and, up until that point, he managed projects for the town of El Pardo. Among the projects he was commissioned to do was the construction of trenches and shelters during the war.

In the Archive of the Villa de Madrid, plans were found that indicate the distribution of air raid shelters used as defense for the civilian personnel at El Pardo. The map shown here is dated June 30, 1938 (Figure 19).

In the shelter plans, there is a section that helps determine the depth of the bunkers, which could be from 10 to 14 m. deep.

The shelters were parallel to the road of El Pardo in which several ventilation wells were established approximately every 25 m. Their width was 90 cm. with a height of 2 m. They allowed for the passage of refugee civilians and were elongated at distances of 36 to 65 m.

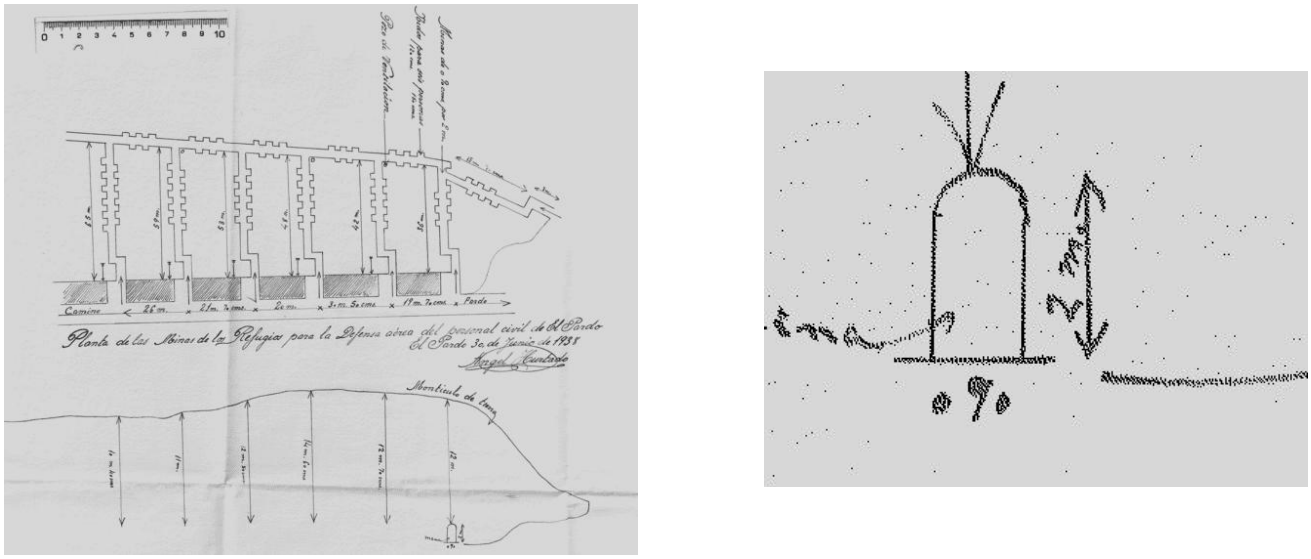

Figure 19. Plans of the Distribution of Air Raid Shelters for Civilian Personnel in El Pardo Shelter, Dome Shaped. Detail. (1938) Architect: Ángel Hurtado; Previously unpublished

Source: [AVM]

The shelters designed by Hurtado, by order of the mayor, are located about fifty meters up the slope to the Christ Church and below San Francisco Park, which was rehabilitated and opened its doors again during the post-war period. These bunkers had two access points. In case of a bombing at one end, there was an exit at the other end.

A maximum of six people could be inside one of the bunkers. They are shown in the drawing and look like teeth or niches that were cut out on each side and they measured between 120 to 150 cm (Figures 20, 21 & 22).

Figure 20. Trenches in El Pardo (above)

Second Line of Fire at El Pardo (1936–1939); Previously unpublished

Source: [AHEA]

The photos of El Pardo in Civil War time found in the AHEA (Figures 20 & 21) give an idea of how the shelters and cement bunkers were built.

Figure 21. Cement Bunker in El Pardo (zoomed image on the right)

Second Line Trench at El Pardo (1936-1939); Previously unpublished

Source: [AHEA]

Figure 22. Cement Bunker at El Pardo(1936-1939)
Second Line Trench at El Pardo; Previously unpublished
Source: [AHEA]

The main defense line was outside the wall of El Pardo (Figure 23) and ran parallel to the Dehesa de la Villa road, which is now called Sinesio Delgado Street.

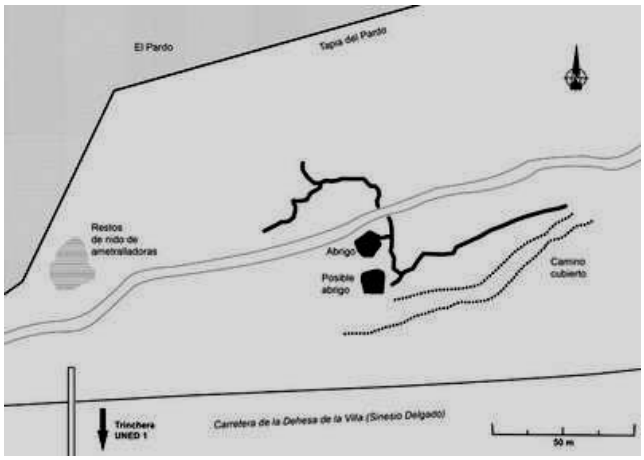

Figure 23. Trenches next to the Wall of El Pardo (They were located between the wall of El Pardo and the Dehesa de la Villa road. The covered road is shown with a dotted line)

To the south, between the wall of El Pardo and the road, were the machine gun bunkers (Figure 24). Between this road and the Dehesa de la Villa road, a covered road was formed that protected access to the shelters and possible shelters of defense.

Figure 24. Machine Gun Bunker in El Pardo (1936–1939)
Second Line Trench at El Pardo; Previously unpublished
Source: [AHEA]

DISCUSSION

Until now, the so-called "landscape wounds" had not been investigated from a historical point of view in a Royal Site of the importance of El Pardo in the Spanish Civil War. The protected landscape of this place has undoubtedly been conditioned by its original urban design and its changes dictated by history and the use of this unique environment. At present, the two interventions highlighted in this investigation go unnoticed, yet in their day they acquired vital importance, both in times of war (defence) and in supplying water from the Manzanares River as it passes through this Royal Site and on its access to Madrid.

This section explains the discussion of the study and how it should contribute to the management and education of the El Pardo Woodlands as well as outlining research lines that must be pursued.

A period of eighty years, from 1885 to 1965, is established for analysis in this study. New contributions can be supported because this time period covers the most momentous changes that have been made to the current physiognomy of the residential area of El Pardo. This is also the period when the layout began to take its current form. Comprehensive analysis of this period aims to clarify gaps as well as connect two relatively well-known stages. The analysis clearly shows the need to systematize photographic and planimetric data in order to provide a possible comprehensive understanding of the goals of the study. It is this process of studying excavations that gives us new conclusions to different hypotheses.

Oral sources have participated and interacted in the analysis of certain photographs because it was possible to directly analyze information with some of the authors, relatives or collaborators. Therefore, these people have contributed to the state of the research and to new observations with sound criteria pertaining to the goals of the study.

Relevant National Heritage figures (already named in the method section) have also provided unpublished information for this research.

CONCLUSION

The presented conclusions are linked and supported by the analysis done. They refer to the analysis of the natural and landscape context of the excavation of both the wells and trenches:

The study of agricultural infrastructure and natural features, especially the Manzanares River and the El Pardo Woodlands, has enabled us to mark the axes, limits and areas of urban expansion and configure historical changes on important roads and on the characterization of the main access to the Royal Site.

Through the analysis of certain constructions, such as the creation of artesian wells designed by engineer Janini and the hydrodynamic testing channel of the early 20th century, determining points were extracted within the urban layout.

These engineering works conditioned subsequent interventions in the design of water networks, sanitation and other infrastructures, which had an impact on the urban layout of El Pardo in the 20th century.

There were fountains and wells that provided a service to the people and were closed down due to the current network. Examples include the New Fountain, the Fountain del Campo and artesian well no. 7.

During the preparation of this study, unpublished information and information found in different archives have been brought to light and will be part of new publications.

1. This information refers to new data on the expansion of networks and communication systems such as the arrival of the railway in El Pardo and what this meant to the town for several years.

2. The railway network and the development of the tram in Madrid brought about improved communications between the Royal Site and the capital city. However, to date, a study on how the termination of the tram network affected the citizens of El Pardo has not been carried out.

3. The previous study on the establishment of barracks and gateways has allowed us to understand and include factors and elements of the urban layout such as roads, access points, traffic flow and circulation. This analysis opens a new line of study and is presented here for future investigations.

4. This study has also opened up new lines of work in determining boundaries, borders and how the implementation of fences has affected circulation. An example of this is the construction of the Iron Gate (Figure 25), which has greatly influenced our historical understanding of the fact that the El Pardo Woodlands was the main access to the Royal Site of El Pardo.

Figure 25. “Puerta de Hierro”, “Iron Gate” (c.1930)
Source: National Heritage Archive

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ETHICAL DECLARATION

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