DOI 10.4467/21995923GP.22.001.17079

GEOINFORMATICA POLONICA
21: 2022

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STANDARDIZATION OF DIGITAL SITE PLANS IN POLAND

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Abstract

At the turn of the analogue and digital era in archaeology, in Poland, the earlier forms are still dominant. The National Institute of Cultural Heritage (NID in Polish) sets out the general rules for the development of site plans, which are the part of the archaeological field work documentation. However, NID does not define standards for the development of plans with the use of geoinformation technology. The paper presents some aspects of a digital site plan elaboration. The goal is also to demonstrate how to implement the solution in a Geographical Information System (GIS) application, using the example of QGIS software. On one hand, the solution proposed in this study is in line with the Polish archaeological nomenclature and gives the possibility to take into account data dependencies between sites located in different parts of the country. On the other hand, the proposed system of raw material and found codes may also be used to analyze concepts and phenomena covering an area beyond current national borders (e.g. the Amber Route based on fossil resin from the Baltic region). The description of the proposed archaeological site data model in Unified Modelling Language notation creates great implementation capabilities in any GIS and Database Management System environments. Standardization in the area of digital archaeological documentation and the use of common data structures may extend the possibilities of analysis and interpretation of research results both in the micro (e.g., urban) and macro scale (e.g., international).

Keywords: geographical information system (GIS), archeological documentation, map, feature type catalogue, Unified Modeling Language (UML), UML application schema

STANDARDYZACJA CYFROWYCH PLANÓW STANOWISK ARCHEOLOGICZNYCH W POLSCE

Abstrakt

Na przełomie ery analogowej i cyfrowej w archeologii, w Polsce, dalej w przewadze jest ta pierwsza. Narodowy Instytut Dziedzictwa zdefiniował ogólne reguły wykonywania planów stanowisk archeologicznych, które mają być przedstawione w dokumentacji z prac archeologicznych. Wytyczne NID nie definiują jednak, jak ma wyglądać standaryzacja poszczególnych elementów, w przypadku wykonywania opracowań za pomocą technologii geoinformacyjnej. Niniejszy artykuł przedstawia wybrane aspekty opracowania cyfrowego planu stanowiska archeologicznego. Celem szczegółowym jest zaprezentowanie sposobu wdrożenia rozwiązania w systemach informacji geograficznej (GIS) na przykładzie QGIS. Opracowana koncepcja, zgodna z polską nomenklaturą archeologiczną, daje możliwość zintegrowania danych między stanowiskami w różnych częściach kraju. Proponowany system kodów surowców i zabytków mógłby mieć także zastosowanie przy analizie koncepcji i zjawisk obejmujących zasięgiem obszar wykraczający poza współczesne granice państw (np. Szlak Bursztynowy oparty na żywicy kopalnej z rejonu Bałtyku). Opis proponowanego modelu danych stanowiska archeologicznego, wykonany przy użyciu UML, stwarza duże możliwości implementacyjne w dowolnym środowisku narzędziowym GIS i systemie zarządzania bazą danych. Standaryzacja w obszarze cyfrowych opracowań archeologicznych oraz stosowanie uzgodnionych struktur danych mogą rozszerzać możliwości na poziomie analizy i interpretacji wyników badań w mikroskali, np. miejskiej lub makro, np. międzynarodowej.

Słowa kluczowe: system informacji geograficznej (GIS), dokumentacja archeologiczna, mapa, katalog typów obiektów, zunifikowany język modelowania (UML), schemat aplikacyjny UML

1. INTRODUCTION

An indispensable element of modern and effective management of archaeological heritage, and in particular its protection and preservation for future generations, are system solutions that involve standardizing not only administrative procedures, but also activities in archaeological finds, including conducting the field work, as well as developing the archaeological site documentation.

In recent years the interest in the use of digital technologies, geoinformation applications and infrastructures in archaeology has increased in the processes of monuments discovery, visualization, as well as documentation [1-7]. The literature overview shows that in the area of archeological documentation development the use of a geographical information system (GIS) could be considered. In contrast to traditional printed maps all information in a GIS-based map is linked to certain information contained in a database. Multiple types of information, the majority of which contain a geographical component, are recorded, acquired, used, and exchanged.

At the turn of the analogue and digital era in archaeology, in Poland, the earlier forms are still dominant. Digital methods are being introduced slowly due to different skill levels of their users. Archaeologists use different individual systems for identifying excavation elements, features or archaeological finds during field work, giving them correct names only at the time of preparing the site documentation. It often happens that basic distinctions such as boundary, feature, or profile are used without attempting further classification, already at the stage of field survey. One of the most important parts of the archaeological documentation are plans that present individual objects in different scales and with different cartographic representations, depending on what the author wants to highlight. The National Institute of Cultural Heritage (NID in Polish) sets out the general rules for the creation of plans [8], which are the part of the archaeological field work documentation. However, NID does not define standards for the development of plans with use of geoinformation technology.

The paper presents some aspects of a digital site plan elaboration, which can become the beginning of standardization in the field of archaeological documentation in Poland. The goal is also to demonstrate how to implement the solution in a GIS application, using the example of QGIS software.

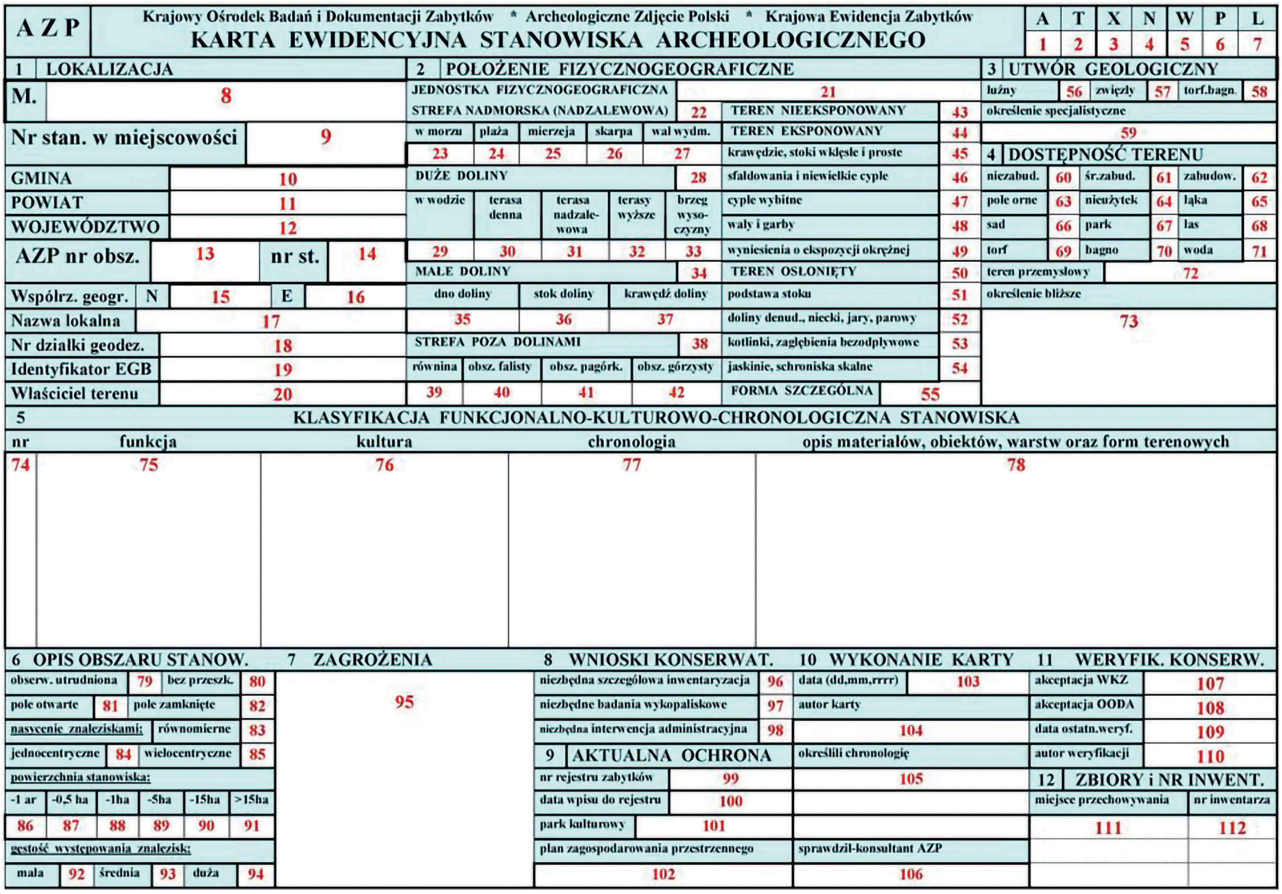
2. ARCHAEOLOGICAL SITES INFORMATION SYSTEM

In Poland, in the 1970s, the Archaeological Image System of Poland (AZP in Polish) was introduced. The system's goal was the recognition and registration of new archaeological sites and national heritage monuments and the monitoring of existing ones. In the initial phase, it was a database of conservation areas. For the implementation of the project Poland was divided into selected areas of AZP. The AZP has had the form of an analogue map for five decades.

An Archaeological Site Register Card (KESA in Polish) presented in Figure 1 was established for each site [9].

The KESA card meets many of the assumptions of presenting objects information that may be used to create a data structure in a GIS application. It describes the detailed position of the site based on geographical coordinates, presents details of the area in which the site is located, its function, dating, and many other details. Access to this information is confidential in order to protect national heritage. At this point it is necessary to be aware that the number of such a position can denote, for example, a rich Bronze Age cemetery, strongly exposed to intentional looting, which took place more than once.

Access to information in the KESA card is granted only to archaeologists who have obtained a permit



AZP Krajowy Ośrodek Badań i Dokumentacji Zabytków * Archeologiczne Zdjęcie Polski * Krajowa Ewidencja Zabytków
KARTA EWIDENCYJNA STANOWISKA ARCHEOLOGICZNEGO

A	T	X	N	W	P	L
1	2	3	4	5	6	7

1 LOKALIZACJA
M. 8
Nr stan. w miejscowości 9
GMINA 10
POWIAT 11
WOJEWÓDZTWO 12
AZP nr obsz. 13 nr st. 14
Współrz. geogr. N 15 E 16
Nazwa lokalna 17
Nr działki geodez. 18
Identyfikator EGB 19
Właściciel terenu 20

2 POŁOŻENIE FIZYCZNOGEOGRAFICZNE
JEDNOSTKA FIZYCZNOGEOGRAFICZNA 21
STREFA NADMORSKA (NADZALEWOWA) 22
w morzu 23, plaża 24, mierzeja 25, skarpa 26, wał wydm. 27
DUŻE DOLINY 28
w wodzie 29, terasa denna 30, terasa nadzalewowa 31, terasy wyższe 32, brzeg wysoczyzny 33
MAŁE DOLINY 34
dno doliny 35, stok doliny 36, krawędź doliny 37
STREFA POZA DOLINAMI 38
równina 39, obsz. falisty 40, obsz. pagórk. 41, obsz. górzysty 42
TEREN NIEEKSPONOWANY 43
TEREN EKSPONOWANY 44
krawędzie, stoki wklęsłe i proste 45
sfałdowania i niewielkie cyple 46
cyple wybitne 47
wały i garby 48
wyniesienia o ekspozycji okrężnej 49
TEREN OSŁONIĘTY 50
podstawa stoku 51
doliny denud., niecki, jary, parowy 52
kotlinki, zagłębienia bezodpływowe 53
jaskinie, schroniska skalne 54
FORMA SZCZEGÓLNA 55

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luźny 56, zwięzły 57, torf.bagn. 58
określenie specjalistyczne 59

4 DOSTĘPNOŚĆ TERENU
niezabud. 60, śr.zabud. 61, zabudow. 62
pole orne 63, nieużytek 64, łąka 65
sad 66, park 67, las 68
torf 69, bagno 70, woda 71
teren przemysłowy 72
określenie bliższe 73

5 KLASYFIKACJA FUNKCJONALNO-KULTUROWO-CHRONOLOGICZNA STANOWISKA

nr	funkcja	kultura	chronologia	opis materiałów, obiektów, warstw oraz form terenowych
74	75	76	77	78

6 OPIS OBSZARU STANOW.
obserw. utrudniona 79, bez przeszk. 80
pole otwarte 81, pole zamknięte 82
nasycenie znaleziskami: równomierne 83
jednocentryczne 84, wielocentryczne 85
powierzchnia stanowiska:
-1 ar 86, -0,5 ha 87, -1ha 88, -5ha 89, -15ha 90, >15ha 91
gęstość występowania znalezisk:
mała 92, średnia 93, duża 94

7 ZAGROŻENIA 95

8 WNIOSKI KONSERWAT.
niezbędna szczegółowa inwentaryzacja 96
niezbędne badania wykopaliskowe 97
niezbędna interwencja administracyjna 98

9 AKTUALNA OCHRONA
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plan zagospodarowania przestrzennego 102

10 WYKONANIE KARTY
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autor karty 104
określili chronologię 105
sprawdził-konsultant AZP 106

11 WERYFIK. KONSERW.
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akceptacja OODA 108
data ostatn.weryf. 109
autor weryfikacji 110

12 ZBIORY i NR INWENT.
miejsce przechowywania 111, nr inwentarza 112

Fig. 1. The KESA card [9]
Ryc. 1. Karta KESA

to conduct research in a given area and submitted an application (they receive only job data from that area) or to researchers who possess an appropriate statement from their superiors to use the archives for, e.g., writing a scientific thesis, but they receive permission only for the requested areas. This information is also available to local government officials with respect to the sites on their territory, while private persons on whose land the archaeological site is located only receive information in the building permit about its existence and the need to examine it, but they do not receive access to any information contained in the KESA card.

The Archaeological Site Register Card KESA system was transferred into the GIS. Currently, the information about Polish monuments (its scope and detail depends on the relevant permissions) is available on a special map portal [10].

Figure 2 shows a fragment of the current AZP map available in the map portal. Under each of the registration numbers of the area grid there are properly classified archaeological sites (in Fig. 1, e.g. area 56-67, state. 4, multicultural settlement).

Unfortunately, the information available in the map portal allows us to locate the monument or site in space, but it does not inform about the details of the cultures inhabiting the area. This detailed, most relevant information is obtained during field work. At that stage, the function of the site can generally be clearly defined and consideration can be given to whether it was a settlement or a workshop, a graveyard or, for example, a flint mine. This data is collected and described according to the general guidelines of National Institute of Cultural Heritage (NID) on field documentation principles. Usually, the description method of the field documentation is selected by the researcher and can be drawn from different scientific centres. Very few types of archaeological sites have uniform documentation systems. These include early medieval strongholds,

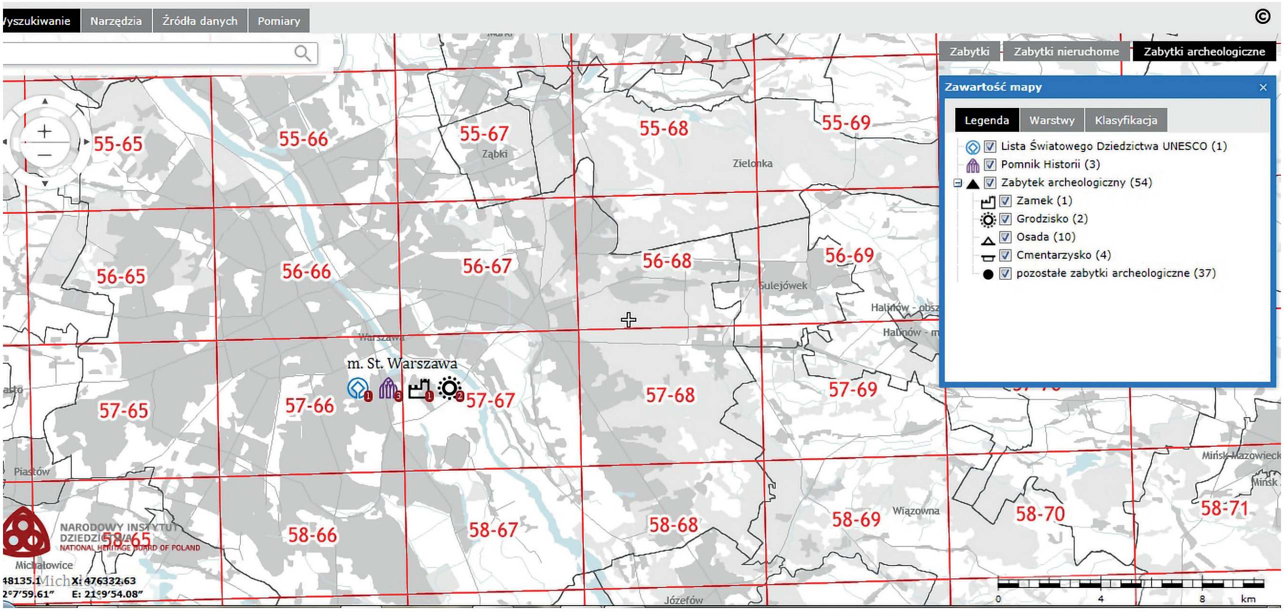


Fig. 2. A fragment of the area grid of AZP for the city of Warsaw and sample site information [10] (https://mapy.zabytek.gov.pl/nid/)
Ryc. 2. Fragment siatki obszarów AZP dla miasta Warszawy

flint mines and concentrations of ore smelting furnaces. And here comes the reflection on how powerful the archaeologist would be, if it was possible to easily access not only general information about the site itself, but also whether the site was in some part studied, or had similar archaeological features.

3. METHODOLOGY

The conceptual phase was divided into three steps. In first one the archaeological site data model was developed. The methodology of geographic information, as well as the ISO 19100 series of geographic information standards were used for that purpose. The feature types catalogue and the application schema were prepared. The General Feature Model was the base for definition of the feature types characteristics. The conceptual schema language for the application schema was the Unified Modeling Language [11,12]. In the second step the classification and codes of field surveying data were proposed based on experience of the authors in the area of field work and surveying. The last step was development of the marginal information layout for printable version of the site plan. The guidelines of the National Institute of Cultural Heritage (2019) were the base for proposals in this study. The conceptual studies were followed by the implementation phase. It included a case study from the Polish industrial archaeology and the QGIS application.

4. RESULTS

In the following subsections a proposal is presented for standardization of site maps and plans for the purposes of their development with use of geoinformation technology.

4.1. Archeological site data model

Figure 3 shows the application schema describing data model concerning archaeological studies on the site and is based on the feature types described below. In the conceptual schema feature types are presented as the classes with attributes describing their both spatial and descriptive characteristics. The feature types are in relations with each other.

Archeological feature

In the creation of any archaeological documentation, the most basic unit includes archaeological features. It consists of one or more human-made stratigraphic units. They can have a concave form such as storage pits, hearths or wells, such as walls, shafts, etc. They can be divided into simple as the aforementioned storage pit, that is, simply buried down, or complex, e.g., the ruins of the house, where there are both walls and pits or various types of resource cavities. Each feature in the documentation process is assigned its own attributes, thus it can be analyzed individually, as well as in correlation with other features (e.g., Harris matrix) and, consequently, can be presented on the plans and analyzed in terms of different attributes.

Proposed functions of the archaeological features are as follows: BD – structure, CL – undisturbed soil, DL – pit, DM – ore smelting furnace, DP – cremation grave, DS – posthole, DZ – drainage, FM – foundation, GEO – geological layer, GR – grave, GW – trench boundary, HK – cultural horizon, JZ – storage pit, KH – barrow, KN – channel, KL – earth floor, LP – crater on a ball, LT – latrine, MC – brick wall, MK – stone wall, MR – wall, OB – undefined features, PC – furnace, PD – floor, PL – fireplace, PW – ceiling, PWN – basement, RW – ditch, ST – well, WB – construction trench, WK – cultural layer, WO – arable layer; WS – combustion layer, WWB – building layer.

Proposed dating: Palaeolithic, Mesolithic, Neolithic, Bronze Age, Iron Age, early Middle Ages, late Middle Ages, modern era, contemporary and undefined period.

Proposed material codes: AG – silver, AU – gold, BR – bronze, BU – amber, CG – brick, CM – pottery, DR – wood, FE – iron, K – bones, KL – human bones, KM – stone, KZ – animal bones, MT – coin, NK – stone tool, PB – lead, PK – charred bones, PP – burnt clay, SI – flint, SK – glass, WD – charcoal, ZZ – slag. For certain materials, additional codes may be used for local types that can be found in Poland. Flint materials: SI_PAS – striped flint, SI_CZ – chocolate flint, SI_JPK – Jurassic, sub-Krakow flint. Amber materials: BU_BT – Baltic amber.

Archeological features profile

It is a line of theoretical or physical intersection of an archaeological feature, determining the section of its documentation in the profile. In the map, it is marked with measured, start, and end points and their connecting lines. The archaeological profile can be a front stone wall protruding on the surface, where point A is its beginning and point B is the end. It can also be a physical intersection of an object in the ground to understand its structure.

Nail of archeological profile

This is an integral part of the entire profile, expressed in a point vector layer. Nails open and close a given profile.

Archeological feature levelling

This is a measurement (or measurements) of elevation, expressed in metres above sea level, that indicates the level on which the feature has occurred. It may tell us both about the use level of humans in the ancient times and about the depth, and thus the period in which it was created. It may also inform us about the drop of the object, e.g. for barrows.

Excavation boundary

The boundary or boundaries of the excavation define a closed space for research or archaeological work.

Exploration level boundary

It often happens that several levels are explored within a single archaeological excavation and even a specific part of it. They may either be presented in the overall plan or a separate plan for each level is created.

Excavation levelling before exploration

Each area of research must be levelled before work can begin in order to create a height plan.

Exploration levelling

As in the case of an archaeological object, the entire explored level must have its height levelling in order to reconstruct the settlement level or relative dating in accordance with the principle of superposition of stratigraphic units.

Find

It often happens that during exploration a movable archaeological monument is found, which requires to be placed in a coordinate system and not only in the description of the context of its discovery.

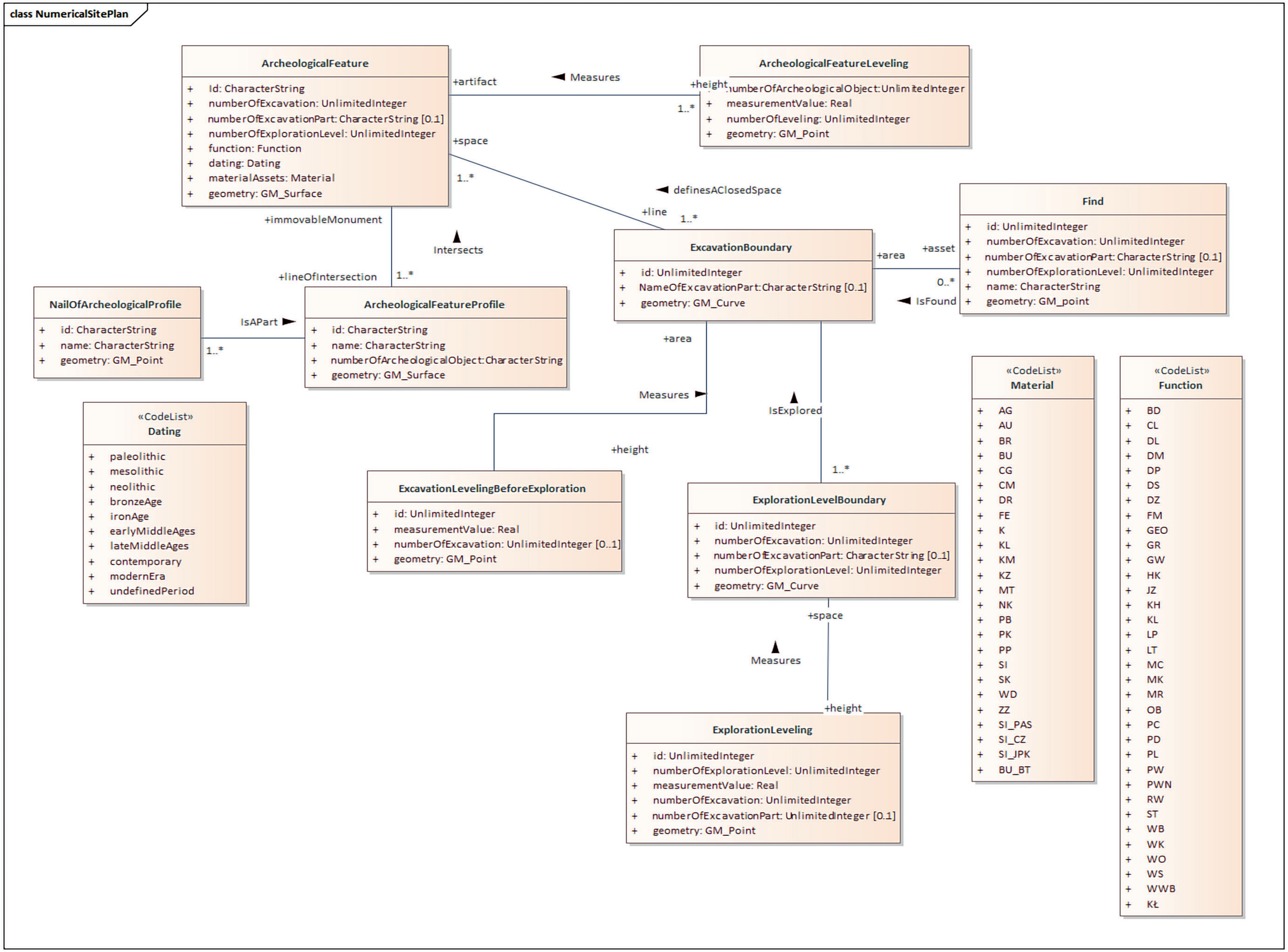


Fig. 3. The UML application schema of the archeological site plan
Ryc. 3. Schemat aplikacyjny UML planu stanowiska archeologicznego

Table 1. Codes for data from field surveying
Tabela 1. Kody dla danych pomiarowych

Object	Code	Description
Archaeological feature	1_JZ_001	Variable code depending on the function of the feature
Archaeological feature profile	1_PRA/PRB_001	1 _measuring level, measure of A and B during the code change, number of profile
Archaeological feature leveling	1_NI_001	1_exploration level, invariable code, number of feature
Excavation boundary	0_GR_001	Measured on the ordnance datum (0), invariable code, number of excavation
Exploration level boundary	2_GRP_002	First figure – depth, invariable code, number of excavation
Excavation levelling before exploration	0_NIW_001	0_always ordnance datum, invariable code, number of excavation
Exploration levelling	1_NIW_001	1_ exploration level, invariable code, number of excavation
Find	1_ZW_001	1_ exploration level, invariable code, number of features

4.2. Classification of field surveying data and reference data

To elaborate an archaeological site plan, raw data obtained by surveying equipment in the coordinate system imposed by the National Institute of Cultural Heritage or the local office for the protection of monuments is mainly used. In addition to measuring the contour of archaeological objects, other surveying data is also collected, which is then processed in GIS applications. Table 1 provides proposals for the codes for collected raw data that must be included in the plan.

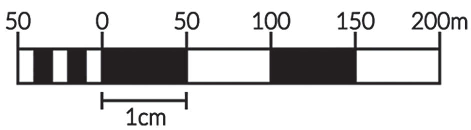
In addition to raw data, topographic maps or digitalized analogue maps are often used in the process of making the site plan. These are the sources of reference data. In some cases a raster layer is also considered, such as available as Web Map Service (WMS) or images from photogrammetric low-altitude flights Ground photogrammetry is also often considered in cases of e.g., clusters of ceramics, especially well-preserved finds or unusual features.

4.3. Plan scales and marginal information layout

The guidelines of the National Institute of Cultural Heritage (2019) assume specific types of scale for site plans depending on the presented content. One of the most important parts of archaeological documentation are the plans that present individual features in different scales and with different cartographic representations, depending on what the author wants to highlight. The National Institute of Cultural Heritage defines what plans are to be presented in the documentation of archaeological works [8]. As part of the report and the elaboration of archaeological results, a map of the location of the archaeological site and a plan with contour lines of the archaeological site (in a scale of 1:1 000 or more) should be provided, with applied grid referenced to the state geodetic control network. In justified cases (high density build-up areas) it is allowed to abandon the contouring plan in favour of the characteristics of the terrain before housing, presented in graphical form, and the abandonment of the grid referenced to the state geodesic control point network, in a scale of 1:10 000, and a graphic representation of the layout of separate stratigraphic units from the archaeological research area with a grid marked and their chronology marked in a scale of 1:200 or more.

Depending on the scale, the plan will have different optional content, but the core one is mandatory. Mandatory content includes the marginal information (information about the plan), and a grid referenced to either the local or geodetic control network. The marginal information layout for printable version of the site plan is presented in Table 2.

Table 2. Marginal information
Tabela 2. Opis pozaramkowy

Information about site plan	**North arrow**
Locality: Voivodeship: Borough: AZP area grid: No. Of Site: No. Of cadastral parcels: Coordinate system: Author: Scale: Data:	
Bar scale	**Information about the institution (company) responsible for archaeological research**
	

4.4. Site plan elaboration in the gis application

Work with data from archaeological excavations, as well as developing a site plan based on the assumptions presented in Section 4.1–4.3 are presented in the example of the QGIS application.

At the first stage of work, both a new project and the relevant thematic layers were created in accordance with structures presented in Subsections 4.1–4.2. In order to embed the layers in geodesic space, they must be linked to field measurements. These coordinates and codes have been added to QGIS as an existing CSV text layer. The next step was completing specific parameters for the entire project and individual layers, including the file name and its file format, row and column settings, geometry, coordinates reference, and layer properties. The result of these settings and the loaded data was a points cloud in the XY system (Fig. 4).

At this point, geometry and specific attributes have been added for individual features. After completing the data, the archaeological site plan was developed, with all objects having their attributes (Fig. 5–6).

In order to create a map that addresses certain needs, the field surveying data were edited afterwards. For this purpose several QGIS analytics tools were used. The final step in working on the map was to create a printable version of the map, containing all the necessary elements described in Section 4.3. Two maps were developed. One was a 1:10000 scale map (Fig. 7) with a site location, the other a 1:200 scale map (Fig. 8) taking into account archaeological work results.

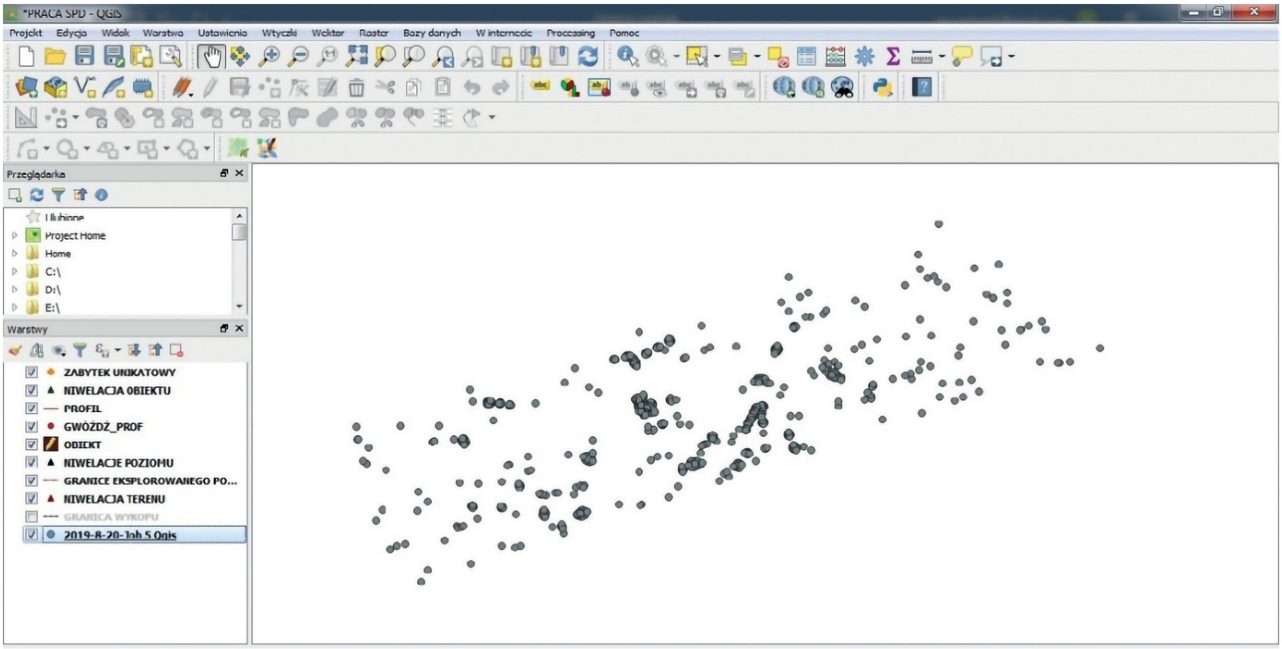


Fig. 4. Thematic layers and points cloud as the result of adding CSV file
Ryc. 4. Warstwy tematyczne i chmura punktów wygenerowana w wyniku dodania warstwy CSV

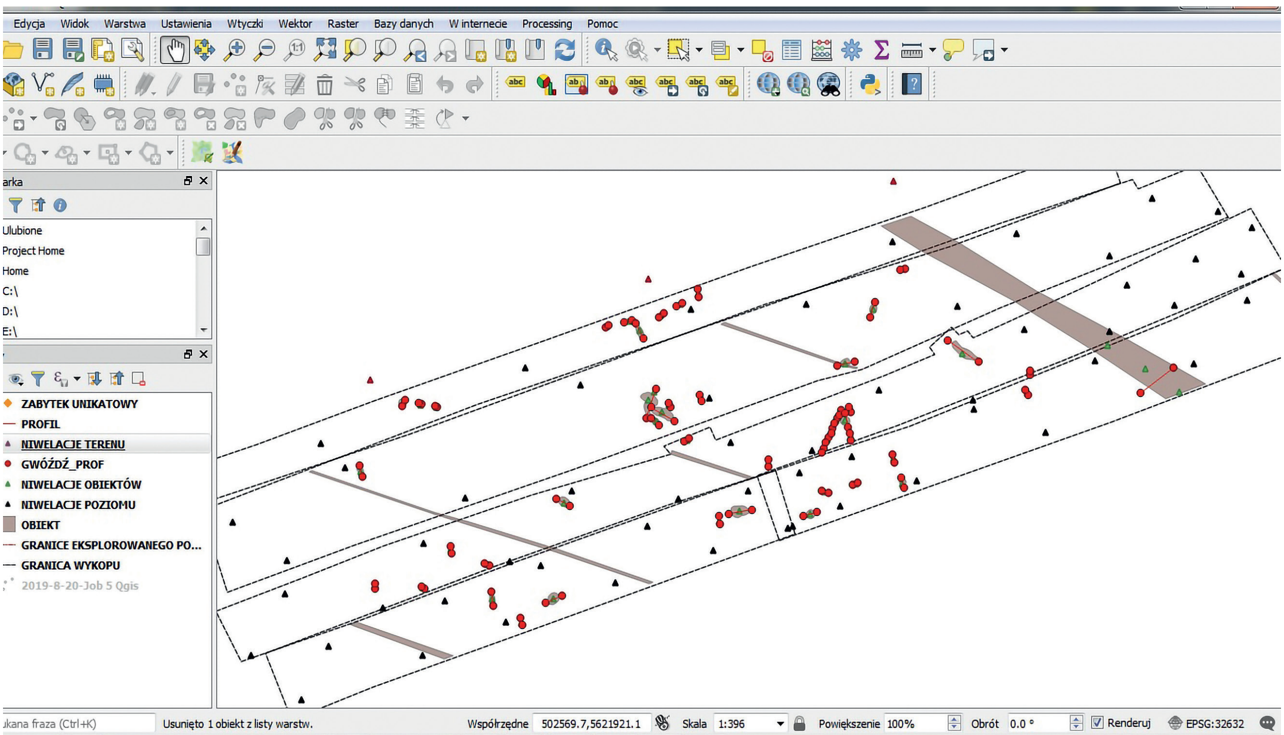
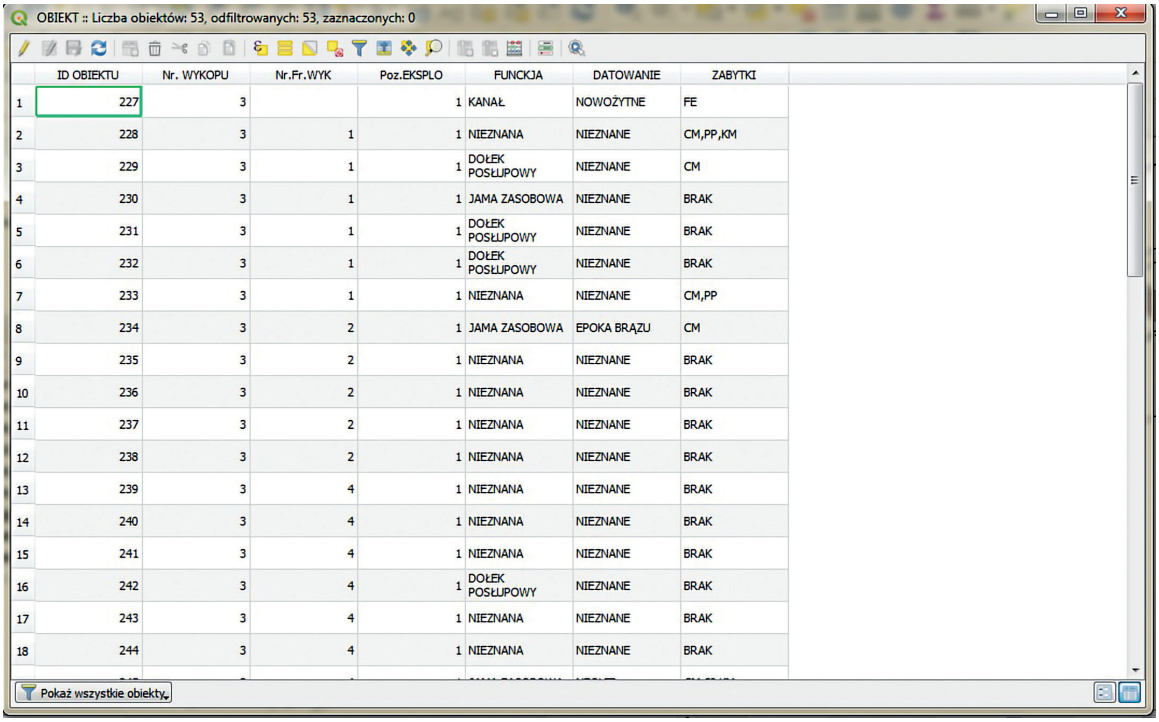


Fig. 5. First draft version of the plan after adding the attributes and geometry
Ryc. 5. Wstępna wersja planu po uzupełnieniu atrybutów obiektów oraz przyporządkowaniu geometrii



	ID OBIEKTU	Nr. WYKOPU	Nr.Fr.WYK	Poz.EKSPLO	FUNCKJA	DATOWANIE	ZABYTKI
1	227	3		1	KANAŁ	NOWOŻYTNE	FE
2	228	3	1	1	NIEZNANA	NIEZNANE	CM,PP,KM
3	229	3	1	1	DOŁEK POSŁUPOWY	NIEZNANE	CM
4	230	3	1	1	JAMA ZASOBOWA	NIEZNANE	BRAK
5	231	3	1	1	DOŁEK POSŁUPOWY	NIEZNANE	BRAK
6	232	3	1	1	DOŁEK POSŁUPOWY	NIEZNANE	BRAK
7	233	3	1	1	NIEZNANA	NIEZNANE	CM,PP
8	234	3	2	1	JAMA ZASOBOWA	EPOKA BRĄZU	CM
9	235	3	2	1	NIEZNANA	NIEZNANE	BRAK
10	236	3	2	1	NIEZNANA	NIEZNANE	BRAK
11	237	3	2	1	NIEZNANA	NIEZNANE	BRAK
12	238	3	2	1	NIEZNANA	NIEZNANE	BRAK
13	239	3	4	1	NIEZNANA	NIEZNANE	BRAK
14	240	3	4	1	NIEZNANA	NIEZNANE	BRAK
15	241	3	4	1	NIEZNANA	NIEZNANE	BRAK
16	242	3	4	1	DOŁEK POSŁUPOWY	NIEZNANE	BRAK
17	243	3	4	1	NIEZNANA	NIEZNANE	BRAK
18	244	3	4	1	NIEZNANA	NIEZNANE	BRAK

Fig. 6. An example of attribute window for the Archeological features layer
Ryc. 6. Przykład wypełnionej tabeli atrybutów dla warstwy Obiekt archeologiczny

Fig. 7. Overview map in 1:1000 scale
Ryc. 7. Mapa poglądowa w skali 1:10000

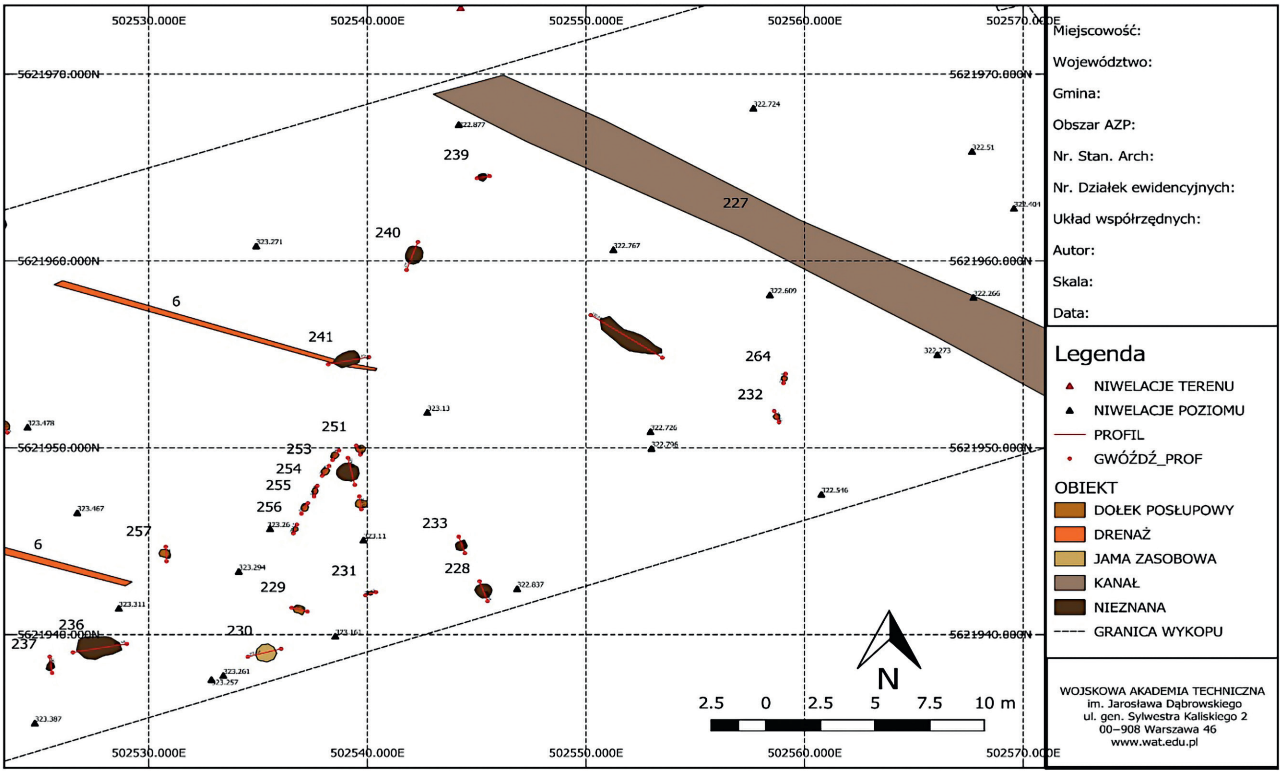


Fig. 8. Site map in 1:200 scale
Ryc. 8. Mapa stanowiska w skali 1:200

5. DISCUSSION

The result of the study is a proposition of standardization in the area of developing the national archaeological finds system and description of archaeological features identified for individual sites during field works, as well as establishing some principles for creating digital site plans.

The presented data model was developed in accordance with the Polish archaeological nomenclature and guidelines and can therefore be used in archaeological research in the territory of Poland. Moreover, it gives the possibility of data correlation between sites in different parts of the country. For example, the use of a common code specifying the raw material, e.g. SIP_AS for striped flint (archeological feature), a rock founded only in few regions of Poland, would lead to the possibility of creating an accurate map of its distribution in different chronological ranges. The same mechanism can be applied to all types of raw materials or monuments that occur only in the territory of Poland. At the same time the proposed classifications could also be useful in the analysis covering an area beyond modern national borders (e.g., the Amber Route based on fossil resin from the Baltic region).

The presented data model draws from the system developed by the Office for the Protection of Monuments of the German Land of Baden-Wittenberg and the ideas of survey2Gis application developers [13, 14, 15]. This is due to the fact that the proposed database structures meet the needs of modern archaeology in terms of geographical information science. The system concerns the systematization of archaeological information already at the stage when it is obtained during archaeological field works, where it is reproducible and occurs in a very similar form around the world. As such, the following concepts can be identified: boundaries of the test area, levelling horizon, stratigraphic systems or archaeological features themselves and their functions or the material.

The description of the concepts in UML language [11] and the reference to the principles of database schema construction according to the rules provided in the ISO 19100 standards [16–18] enables the use of the Model Driven Architecture (MDA) methodology [19] and preparation of many different implementation environments, software and infrastructure. The UML application schema could be also developed to include international conditions, codelists etc. or new feature types. The UML is one of notations which was used to describe an ontology understood as a formal representation of phenomena with an underlying vocabulary including definitions and axioms that make the intended meaning explicit and describe phenomena and their interrelationships. As the Semantic Web and Linked Data bring new opportunities for the geographic information realm to lay these in achieving semantic interoperability, the UML application schema presented in Fig. 3 may be translated to OWL-DL ontology and in this way contribute to the development of cultural heritage infrastructures based on linked data [2] and machine learning [20, 21].

General access for archaeologists to the site plans managed with the use of geoinformation technology developed according to the common structures and principles will open further possibilities at the level of data processing including attributes of features, finds, samples, dating, etc. It will enable searching for links between phenomena or facts in micro e.g. urban or macro e.g. international scale. At this point, it should also be noted that this system will never be available to the public for reasons of heritage protection; it will require a permit for access, as is the case in the Polish AZP system. These first proposals for standardizing selected elements of documentation in digital form in archaeology in Poland are the response to the development of the world in this direction. These are the right actions to take, considering the possibilities that can be achieved in the long term, so it seems inadvisable not to take up this topic.

It was assumed for the purposes of this study that during the field works the following devices and equipment are available: a total station, the geodetic control network, and a computer with installed GIS program. It should be also emphasized that Polish archaeology is still quite strongly rooted in the analogue era. One reason is the lack of obligation to prepare the field documentation in computer programs. Moreover, there are no standards or guidelines for the development of plans with the use of geoinformation technology. Another issue is a technical one. Quite often, an archaeologist who possesses digital competences might simply not have the funds for basic equipment, that is, a computer that efficiently supports GIS programs, the GIS application license itself, and modern surveying equipment. The advantage of the software used in this study to present the implementation of the conceptual proposals is its accessibility and the fact that it is free of charge.

6. CONCLUSIONS

The study concerned the subject of archaeological plans developed with use of geoinformation technology, resulting from the growing need to use geospatial information systems in everyday tasks in archaeology. The presented case study refers to the functionality of the QGIS application. Using QGIS, we were able to present the implementation of the conceptual proposals, as well as the principles of working with data collected during excavation work. The concepts developed in this study included the archaeological site data model, classification and codes of field surveying data, as well as the marginal information layout for printable version of the site plan. The presented results are a step in the area of Polish industrial archaeology. At the same time, it points out the need to develop standards for the digital archaeological documentation. Further studies should concern the cartographic aspects including the presentation of objects and signs.

Standardization in the area of digital archaeological documentation and the use of common data structures may broaden the possibilities of analysis and interpretation of research results both in micro (e.g., urban) and macro scale (e.g., international). This will greatly improve the data availability, complementing the knowledge of sites that have not had a chance to be broadly presented. This can affect many interpretations, e.g. the extent and development of archaeological cultures, the development of specific technologies, the application of trade routes or the historical migration of populations. Moreover, it can greatly contribute to the popularization of archaeology by discovering new information about their places of residence

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