



## Department of Energy

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**OCT 19 2011**

Dr. David Snyder, Ph.D.  
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Ohio Historic Preservation Office  
1982 Velma Avenue  
Columbus, Ohio 43211

PPPO-03-1273889-11

Dear Dr. Snyder:

### **SUBMITTAL OF THE RESULTS OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 110 SURVEY CONDUCTED TO IDENTIFY PREHISTORIC NATIVE AMERICAN MOUNDS AT THE PORTSMOUTH GASEOUS DIFFUSION**

In accordance with Section 110 of the National Historic Preservation Act (NHPA), the U.S. Department of Energy (DOE) Portsmouth/Paducah Project Office (PPPO) has prepared the enclosed *National Historic Preservation Act Section 110 Survey Conducted to Identify Prehistoric Native American Mounds at the Portsmouth Gaseous Diffusion Plant, in Scioto and Seal Townships, Piketon, Ohio* (RSI/PORTS-199).

This document describes the materials and methodologies recently employed in an attempt to identify any previously undocumented prehistoric Native American mounds on the DOE Portsmouth Gaseous Diffusion Plant (PORTS) property located in Scioto and Seal Townships, Piketon, Ohio. The information in this survey will be added to the baseline of information on the Portsmouth site.

The report documents DOE's efforts to identify historic properties on the Piketon site, in particular, Native American mounds. In May 2009, DOE requested information of the public about previously unrecorded sites within the PORTS boundary. The 2009 request did not receive any replies. In this most recent effort to identify historic properties, DOE conducted a facility-wide survey and made use of both original site data and the newest available technologies in an attempt to identify any prehistoric mounds and earthworks on the site.

Mound-like topographic features were identified in pre-construction (1952) topographic data and Light Detection and Ranging (LiDAR) data collected in 2006. Once identified, mound-like topographic features were then visited in the field and subjected to a visual inspection. Through visual inspection and comparison of the topographic data to facility maps and historic aerial photographs, all mound-like topographic features were determined to be relatively recent in age (i.e., related to PORTS or the historic-era farmstead occupations that preceded PORTS). Further details on methodology and results are explained within the report. Thus, in failing to find any distinctive, prehistoric topographic features in a thorough topographic examination of the entire facility, it is the conclusion of this study that PORTS contains no intact Native American mounds 30 centimeters tall or taller—the size range of nearly all documented mounds in Ohio. The

*Earthwork and Mound Sites in the Area of the Department of Energy Portsmouth Gaseous Diffusion Plant, Pike County, Ohio: An account of the published information and other sources also support this conclusion,*

DOE is issuing this inventory for your information and for the information of our consulting parties and interested members of the public. DOE recognizes that although these survey efforts did not identify any Native American mounds on site, that appropriate caution and diligence is necessary when conducting activities involving excavation outside of the PORTS Perimeter Road in previously undisturbed areas of the site.

If you have any questions in reference to this submittal or our NHPA program activities please contact Amy Lawson of my staff at (740) 897-2112.

Sincerely,



Dr. Vincent Adams  
Portsmouth Site Director  
Portsmouth/Paducah Project Office

Enclosure:

Report of a Survey for Mound-Like Topographic Features at PORTS

cc w/enclosure:

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# Report of a Survey for Mound-Like Topographic Features at the Portsmouth Gaseous Diffusion Plant in Pike County, Ohio

By Jarrod Burks, PhD  
September 2011

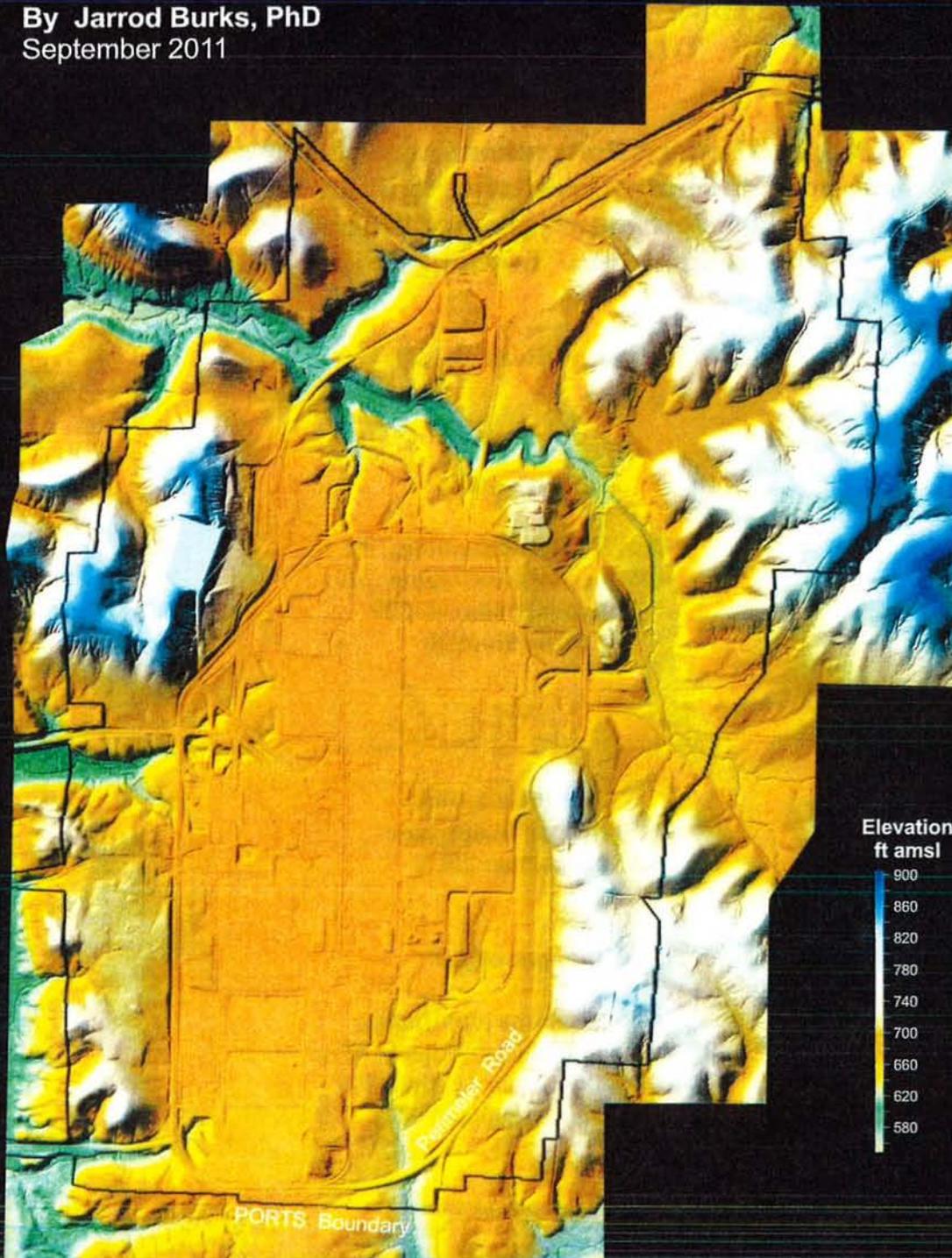


Image based on PORTS LiDAR Data  
with some vertical exaggeration

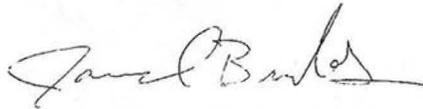
OVAI Contract Report #2011-34

**National Historic Preservation Act Section 110 Survey  
Conducted to Identify Prehistoric Native American Mounds  
at the Portsmouth Gaseous Diffusion Plant,  
in Scioto and Seal Townships, Piketon, Ohio**

Jarrold Burks, Ph.D.

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Principal Investigator  
September 2011

***Prepared for:***

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## Executive Summary

Approximately 2000 Native American mounds are documented with the State of Ohio in the Ohio Archaeological Inventory, housed at the Ohio Historic Preservation Office (personal communication, Brent Eberhard, May 2011). However, many archaeologists believe that Ohio was once home to as many as 10,000 mounds. Erosion and weathering, as well as 200 years of logging, plowing, and development have erased many from the landscape.

While a number of relatively large mounds are known to have once existed on the Scioto River floodplain west of the Portsmouth Gaseous Diffusion Plant (PORTS), no mounds have been documented within the 1,528.5 hectares (3,777 acres) at PORTS in spite of numerous published and unpublished mound studies of the PORTS area (e.g., Atwater 1820, Burks 2006, Fowke 1894, 1895, 1898, 1902, 1926/27, Lindner 1980, Reeves 1936, Sassaman 1952, Squier and Davis 1848, Thomas 1889, 1891, 1894). The Department of Energy Portsmouth/Paducah Project Office has recently published a report entitled *Prehistoric Native American Earthwork and Mound Sites in the Area of the Department of Energy Portsmouth Gaseous Diffusion Plant, Pike County, Ohio: An Account of the Published Information and Other Sources*, that consolidates the results of these reference materials.

To ensure that this lack of mounds is not due to an oversight on behalf of the archaeological community, this study, which took place during the months of May and June 2011, has attempted to identify and evaluate all mound-like topographic features more than approximately 30 cm tall and five meters wide at PORTS. A survey of a 1952 pre-construction topographic contour map of PORTS (with ca. 60 cm contour intervals) developed prior to PORTS construction, and high-density Light Detection and Ranging (LiDAR) data, a powerful tool for imaging topographic features 30 cm tall and taller, yielded a list of 28 topographic features to be examined in the field. A sub-meter global positioning system (GPS) was used to navigate to the locations of these 28 topographic features and field observations were made of each.

The 28 identified topographic features ranged in size from 30 cm tall to over three meters tall and up to nearly 25 meters in diameter. At many of the GPS locations no topographic feature was observed on the ground, indicating that the LiDAR data had likely been over-vertically exaggerated and what appeared to be subtle mound-like features on the computer screen were identified on the ground as vegetation or the base of a tree. In the cases where larger topographic features were identified on the ground, each could be explained as resulting from a historic-era activity—and often a PORTS-era activity. In summary, through on-the-ground visual inspection and comparison of the topographic data to facility maps and historical aerial photographs, all mound-like topographic features were determined to be relatively recent in age (i.e., related to PORTS or the historic-era occupations that preceded PORTS).

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## **ACKNOWLEDGEMENTS**

The LiDAR data used in this study were provided by Matt Donovan, then with Restoration Services, Inc. Donovan kindly divided the LiDAR data into 1 km square blocks prior to sending the data to Ohio Valley Archaeology, Inc. William Kennedy, of the Dayton Society of Natural History also lent his GIS expertise to the project. He took the LiDAR data files and converted them into a format accessible with Surfer®, a software package commonly used by archaeologists. This project could not have been completed without their hard work.

## 1. INTRODUCTION

Ohio contains thousands of mounds built by Native American groups (approximately 2000 have been recorded by the Ohio Historic Preservation Office, Brent Eberhard, 2011 personal communication), and the Scioto River Valley is home to perhaps the greatest density. The practice of mound construction, mostly for purposes of burial, began around 1000 B.C., with its greatest peak between about 300 B.C. and A.D. 500. Mounds can be found on bluff tops overlooking river and creek floodplains, on ridges and saddles in the uplands, and on terraces in bottomlands. The largest mounds in the southern Scioto Valley region were first documented in the early to mid-1800s as over 9 m (30 feet) tall and 45-60 m (150-200 ft) across, while the smallest were only 50 cm to a meter tall and just ten meters wide. While most were made of clay, topsoil, and other sediments gathered from nearby, sometimes with gravel capping layers, some mounds are composed entirely of stone blocks. Nearly two hundred years of plowing, land modification, and targeted excavation (archaeological and otherwise) have flattened nearly all but the largest mounds. However, since many mounds covered the remains of pits and burials placed beneath them, even those that are no longer visible at the surface can have intact subsurface features.

The area along the east side of the Scioto River, from Piketon to Wakefield, and extending east from the river approximately four miles has long been an area of interest to mound scholars. Caleb Atwater (1820) published the first account of area mounds, specifically those associated with the Piketon Graded Way site (33Pk1). Several decades later the surveys of Squier and Davis (1848) recorded both the Piketon Graded Way and Pike County's only large earthwork complex, what they called the Seal Township Works (33Pk22, located along U.S. Route 23 to the west of PORTS).

The late 1800s were a period of intense mound excavation during which nearly every large mound in the area was excavated and/or described, primarily by Gerard Fowke (e.g., 1894, 1895, 1898, 1902, 1926/27). Cyrus Thomas and his Bureau of American Ethnology mound study crew remapped parts of the Seal Township Works in the 1880s (Thomas 1889, 1894) and completed a catalogue of mounds and earthworks that included the Pike County sites (Thomas 1891). After the late 1800s, very few mounds in the PORTS area were excavated or described in the published literature relating to Ohio mounds and earthworks. In 1914 Mills published a map of the mounds and earthworks of the area in his *Archaeological Atlas of Ohio*. In 1934 Dache Reeves (1936) flew over the area and captured an aerial image of an earthwork shown as an inset (Supplementary Plan N) in Squier and Davis's map of the Seal Township Works (1848:Plate XXIV)—part of their work entitled *Ancient Monuments of the Mississippi Valley*. About 20 years later William Sassaman (1952), an archaeologist from the Ohio Historical Society, visited the area just prior to the construction of PORTS in an effort to relocate previously documented mound and earthwork sites. His efforts primarily focused on the Graded Way site near Piketon, though nothing was ever published of his observations. In 1980 Lindner reported on archaeological sites in the PORTS area and visited several possible mound sites south of PORTS along U.S. Route 23, including one small possible mound excavated by a local archaeology enthusiast.

More recently, the area within PORTS was subjected to an archaeological survey in the mid 1990s (Schweikart et al. 1997). While a small prehistoric lithic scatter site and several isolated objects were found (in addition to numerous historic-era sites), no possible mounds were observed. Finally, in 2006 Jarrod Burks, of Ohio Valley Archaeology Inc., managed to pinpoint

on today's landscape the earthwork from the Squier and Davis Supplemental Plan N inset using Reeves's 1934 aerial photograph and global positioning system data collected in the field (within the same timeframe, GIS specialist Mark Kalitowski also spotted this earthwork on a 1938 United States Department of Agriculture aerial photograph. This earthwork is not on the PORTS reservation). Though detailed accounts, published and unpublished, of the mounds of the southern Scioto Valley area do exist, as recounted here, no single attempt has been made to specifically and systematically identify mounds within the grounds encompassed by the PORTS boundary fence.

This report presents the results of a survey that attempts to identify possible intact mounds from topographic data collected at PORTS. Two sources of topographic data were consulted for the survey. The first data source includes the 1952 topographic contour maps prepared by Tennessee Valley Authority, Maps and Surveys Branch for the Atomic Energy Commission (AEC) prior to the construction of PORTS. The drawings show the central area of PORTS (primarily the area within Perimeter Road). The second source of PORTS topographic information is available in the Light Detection and Ranging (LiDAR) data collected specifically for DOE-PORTS by aircraft in 2006 at approximately 30 cm (1 ft) intervals.

Topographic features identified in the 1952 topographic maps and the LiDAR data were then visited in the field and observations were made about the overall shape and condition of the features. The following sections describe the methods used in this study and present the details about each of the 28 topographic features identified and field checked.

## 2. METHODS

The survey for topographic features at PORTS was conducted in two stages. First, two sources of topographic data were scanned by a trained individual to identify small topographic features consistent in size and shape with other known mounds in the region. In the 1952 topographic data (which may have been generated with transit and stadia rod in the field or using aerial photographs and photogrammetry) the only mounds likely recorded would have been larger features. Figure 1 is a portion of one of the 1952 topographic maps, included here as an example of what these maps look like. The 1952 contour maps exhibit the locations of buildings, fence lines, and even trees (identified to species).

To begin the topographic feature identification process, the six 1952 topographic maps, covering most of the area within Perimeter Road and some ground just to the north, were layered into a master map of PORTS. Then, topographic features were identified by closely scanning the contour lines for mound-shaped irregularities. The locations of these features were indicated on a separate layer so that they could be compared to other maps and images of PORTS, like the 1939 and 1951 United States Department of Agriculture (USDA) aerial photographs. These 1952 topographic maps are the most detailed maps of the central PORTS area made prior to construction.

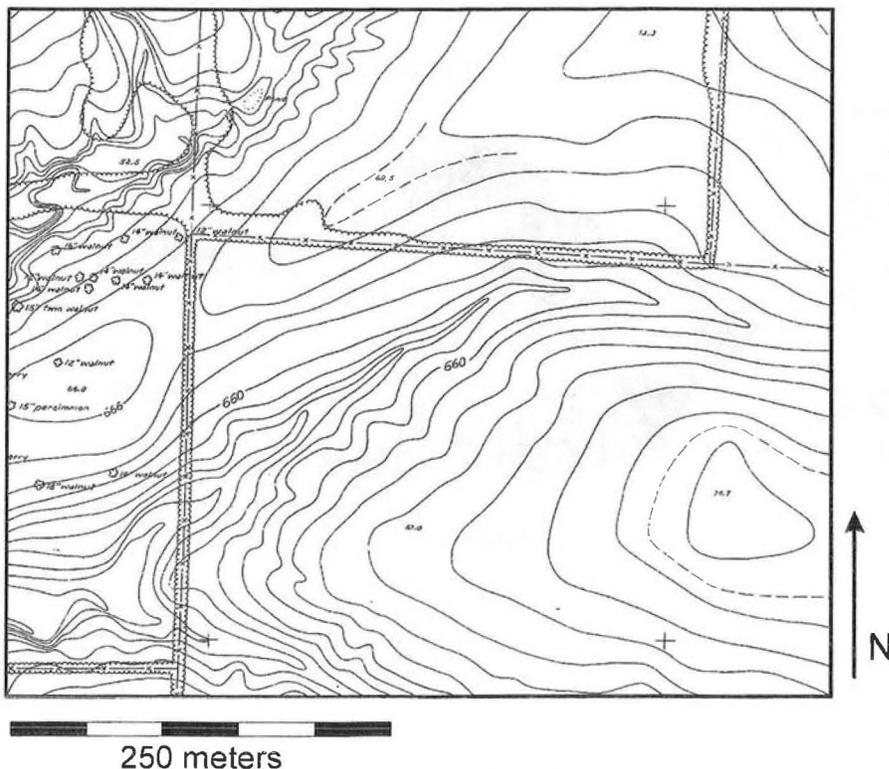


Figure 1. A portion of one of the 1952 AEC topographic maps made of a portion of before construction.

The best approach for identifying small and large topographic features at PORTS is a survey of high-density topographic data, with points taken every 30 cm to 60 cm. This approach makes it possible to examine areas of the site that are now too densely vegetated to examine on

foot. The LiDAR data collected at PORTS in 2006 provide the necessary data density for this task. Larger mound-like features are quite evident in the LiDAR data, and even small mound-like features just 30-60 cm high can be identified. The ability of the LiDAR data to detect small topographic features was proven on several occasions when slight rises (about 30 cm tall) associated with known features at historic-era farmsteads (e.g., at 33Pk217) were field verified, as shown below (see Section 3.2, Topographic Feature #18). LiDAR data have also been used at other Ohio sites to identify equally as subtle topographic features, including documented mounds and embankments that have been flattened by agricultural plowing (e.g., Romain and Burks 2008a, 2008b). Thus, scanning LiDAR-based imagery is a proven technique for locating mound sites.

A survey of the PORTS LiDAR data for topographic features was conducted using the Surfer® (version 8) software package, which was used to project the data on a computer screen as three-dimensional surface maps with vertically exaggerated relief. A virtual, low angle light source was added to enhance subtle topography. Figure 2 shows an example of Surfer®-projected LiDAR images from PORTS. To the left is a view looking directly down at the ground surface (orthogonal view) with a light source to the upper left. A relatively large topographic feature (PORTS Topographic Feature #7) is indicated by the red arrow. To the right is the same data projected obliquely and rotated. For the office component of the LiDAR survey, the data covering PORTS were divided into 27 approximately 1 kilometer square areas. Each block of data was closely scanned for topographic features by rotating and angling the blocks of data (in various orthogonal and oblique views) so as to highlight different topographic features.

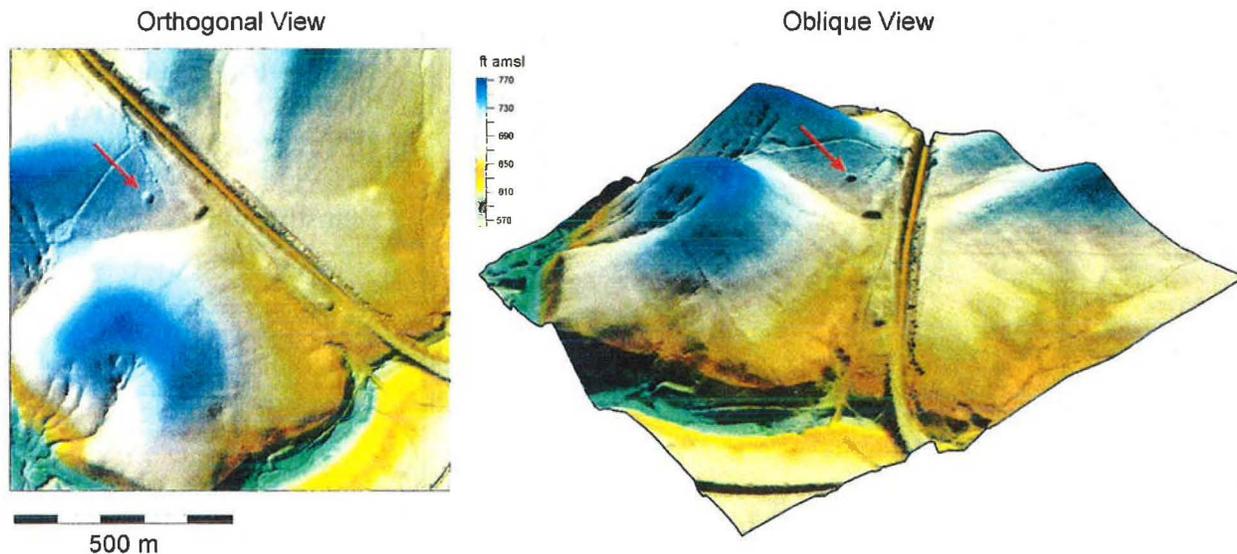


Figure 2. Surface relief maps created using LiDAR-based elevation data (red arrows point to PORTS Topographic Feature #7).

This project also included an on-the-ground visit to the topographic features of interest. The biggest challenge for the field visit portion of the project was finding these features in the brushy, overgrown settings that are typical outside of the core area of PORTS. In order to overcome the brushy and dense vegetation typically found in the areas outside of Perimeter Road, a global positioning system (GPS) was used to navigate to the coordinates of each of the

topographic features. The GPS (a Trimble® GeoXT) was outfitted with an external hurricane antenna that allowed for productive work even under tree canopy. One or more photograph(s) was taken of the location of each topographic feature, with the GPS serving as a scale—the GPS and external antenna were attached to a range pole with the antenna extended to 2 meters in height (the GPS is present in all topographic feature photographs presented below).

### 3. RESULTS

#### 3.1 Topographic Data Examination Results

As described above, searching for possible mounds was a systematic effort. All mound-like features of any note, and not obviously part of an extant building, were selected from the data. The LiDAR data proved the most useful, and state-of-the-art, dataset for identifying topographic features. Most mounds can be easily identified on a computer screen using three dimensional virtual landscapes created with the high-density LiDAR data. For instance, Figure 3 shows two examples of mound sites in very different settings. The Metzger Mound is located in northern Ross County on a bluff overlooking Deer Creek. The mound is covered by very dense undergrowth and some larger trees. Nevertheless, the LiDAR imaging technology was able to penetrate this dense vegetation and provide data sufficient to clearly image the mound and a nearby low embankment. The second example, a portion of the Graded Way mound and earthwork site, is located in Mound Cemetery to the south of Piketon and shows one large mound and several smaller mounds, with some possible small mounds to the southwest. All are evident in the LiDAR data.

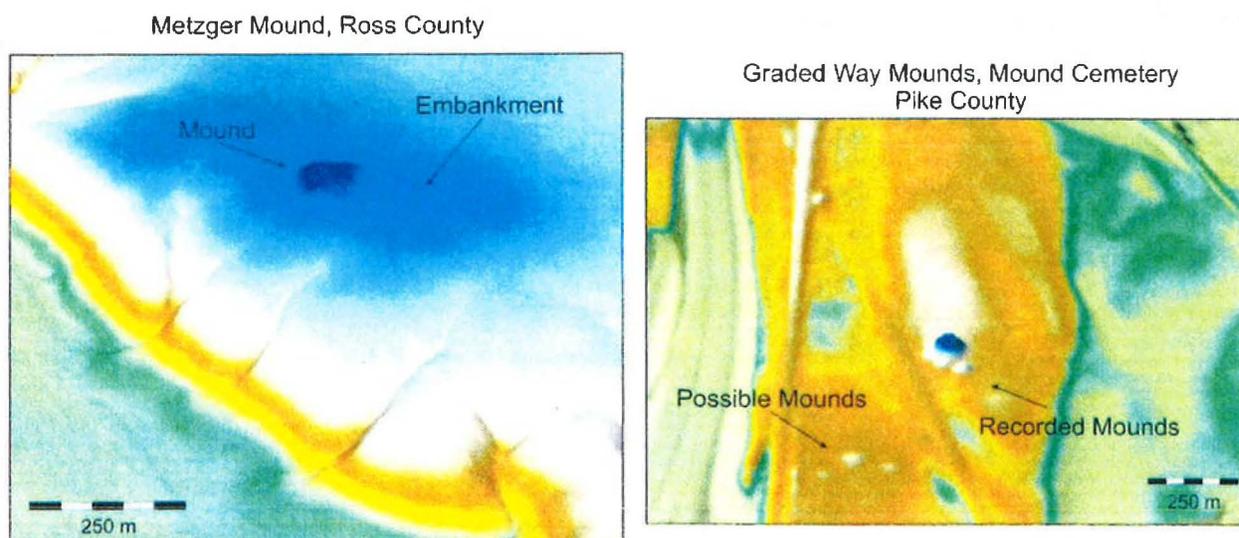


Figure 3. Two examples of mound sites that are evident in 3D surface maps generated with LiDAR data (both vertically exaggerated).

At PORTS, twenty-eight topographic features of interest were identified in the LiDAR data and the 1952 contour maps. Figure 4 shows their locations on a composite map of the LiDAR data for PORTS (i.e., all 27 one-kilometer topographic blocks merged together). The PORTS boundary fence and Perimeter Road are indicated in the figure as well. Table 1 provides details about each of the 28 features as gleaned from the 1952 maps and the LiDAR data, including location coordinates (in Universal Transverse Mercator [UTM], Zone 17 north, North American Datum [NAD] 27), general information about the dimensions of the features, and comments of note that were helpful in locating these features in the field.

The topographic features that were identified for evaluation as possible mounds are scattered all across the northern two-thirds of PORTS. Any topographic mound-like feature that appeared to be approximately 30 cm high or taller was chosen for closer inspection in the field. Topographic Features 1-6 were identified on the 1952 pre-construction maps and three of the features occur within the area now inside of Perimeter Road. These features (Topographic Features #3-5) are no longer available for closer examination and did not appear in the LiDAR imagery, thus they were not visited during the field reconnaissance portion of this project. The rest of the topographic features occur outside Perimeter Road, most being located in the northern one-third of the PORTS reservation. While all of PORTS was examined for topographic features, special attention was paid to the areas on stream terraces and along ridge tops, especially those overlooking streams, as these landforms are the most likely locations in which to encounter mounds in southern Ohio.

Section 3.2 details each of the 28 topographic features in numerical order. Several pieces of information are provided for each, including (1) a close-up map with 30 cm contour lines derived from the LiDAR data (with an inset map showing general location of the close-up view) and labels for distinctive topographic features at each location (for topographic features that do not appear in the LiDAR data [e.g., within Perimeter Road], an aerial photograph is used), (2) a photograph of each visited location, and (3) a description of the location based on observations made during the on-the-ground visit.

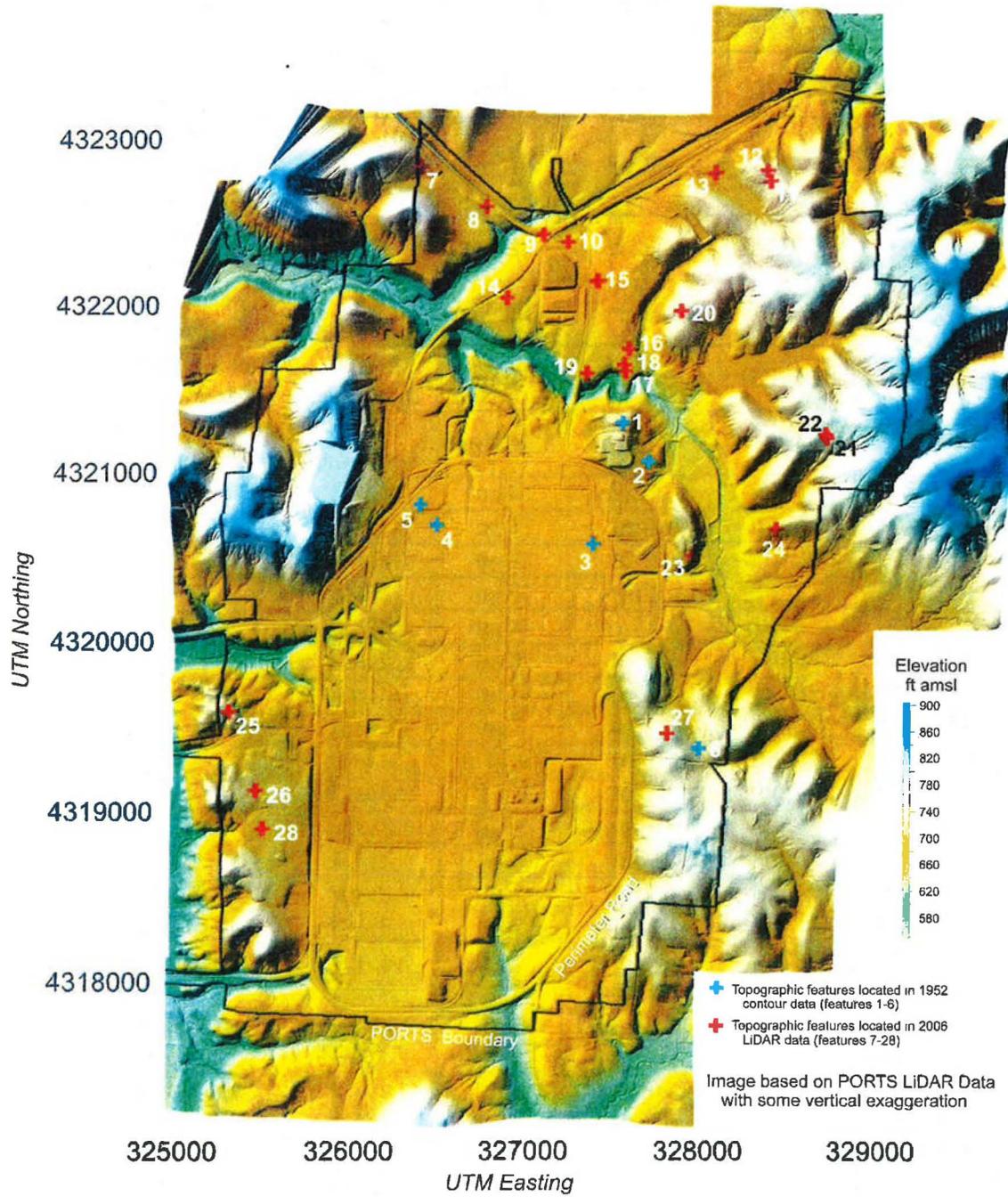


Figure 4. Topographic map of PORTS based on LiDAR data, numbered symbols indicate locations of mound-like topographic features (locations derived from 1952 maps and LiDAR data) investigated in this study (ft amsl=feet above mean sea level).

Table 1. Desktop data related to mound-like topographic features of interest.

Topo Feature #	Northing*	Easting*	Height	Diameter	Data Source	Comments
1	4321269	327556	0.6 m	18 m	1952 topo map	Nothing visible in LiDAR
2	4321053	327707	0.6 m	10 m	1952 topo map	Linear ridge visible in LiDAR
3	4320572	327394	1.2 m	12 m	1952 topo map	No longer observable
4	4320680	326497	0.6 m	10x21 m	1952 topo map	No longer observable
5	4320801	326400	0.6 m	10 m	1952 topo map	No longer observable
6	4319386	327991	0.6 m	12x24 m	1952 topo map	Nothing visible in LiDAR
7	4322792	326388	1.2-2.7 m	24 m	LiDAR	
8	4322563	326770	2.4 m	21 m	LiDAR	
9	4322393	327105	0.9 m	13 m	LiDAR	
10	4322353	327245	1.2 m	13 m	LiDAR	
11	4322694	328401	3-3.7 m	16 m	LiDAR	
12	4322760	328377	0.3 m	12 m	LiDAR	
13	4322759	328091	1.5 m	15 m	LiDAR	
14	4322018	326889	0.3 m	2 m	LiDAR	
15	4322113	327419	1.2 m	16x26 m	LiDAR	
16	4321720	327599	1.2 m	11 m	LiDAR	
17	4321586	327580	0.3-0.6 m	11 m	LiDAR	
18	4321628	327564	0.3 m	4 m	LiDAR	
19	4321576	327353	0.3 m	7 m	LiDAR	Top of slope
20	4321929	327892	0.3 m	6 m	LiDAR	Top of slope
21	4321181	328721	0.6 m	9 m	LiDAR	On slope
22	4321206	328711	0.3-0.6 m	6 m	LiDAR	
23	4320498	327950	0.3 m	7 m	LiDAR	Top of slope
24	4320656	328442	0.3 m	6 m	LiDAR	On slope
25	4319601	325344	0.3-0.6 m	4 m	LiDAR	Top of slope
26	4319141	325494	0.9 m	15 m	LiDAR	
27	4319475	327809	0.3 m	5 m	LiDAR	Top of slope
28	4318921	325530	0.3 m	6 m	LiDAR	Top of slope

\* Coordinates presented in UTM (zone 17 north) NAD27 (CONUS) in meters.

### 3.2 Field Reconnaissance Results

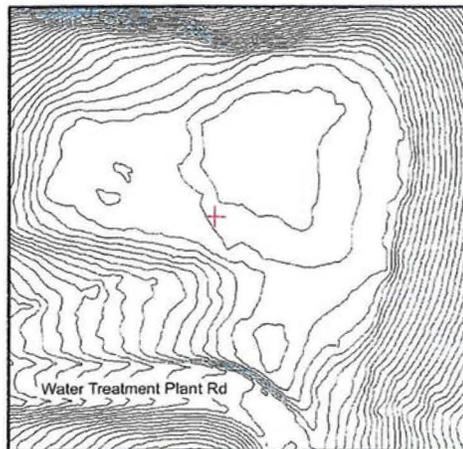
#### Topographic Feature #1

*Location:* N4321269, E327556

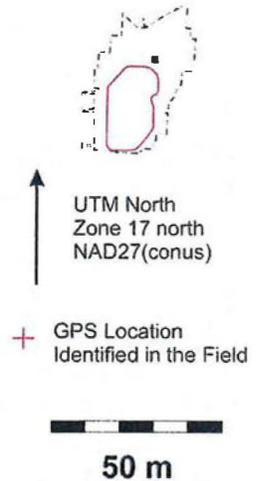
*Approx. Dimensions:* about 0.6 m tall, 18 m in diameter

*Field Visit Notes:* Located just north of the water treatment plant. The area has been heavily impacted by soil removal—bedrock is located at the surface or nearly so. Scrubby growth and a few pine trees are present in the general area. There is no visible topographic feature at this

location. It may be that the hill top was removed and used to build up the earthen platform underneath the nearby water treatment facility. On the 1952 topographic map this hill is not flat-topped (i.e., it is pointier), supporting the idea that the top of the hill was removed. The possible mound-like feature on the 1952 contour map was likely the top contour of the hill.



1ft contour interval



Topographic Feature# 1, looking north

Topographic Feature #2

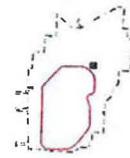
*Location:* N4321053, E327707

*Approx. Dimensions:* about 0.6 m tall, 10 m in diameter

*Field Visit Notes:* Grassy area just east/southeast of water treatment plant, about 10 meters southeast of a gravel road. The ground here is flat to gently sloping. The location is situated between several pine trees. The ground here does not look disturbed and the slope seems natural, though there could be some modification from landscaping. No topographic feature is evident here.



1ft contour interval



↑ UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field



100 m



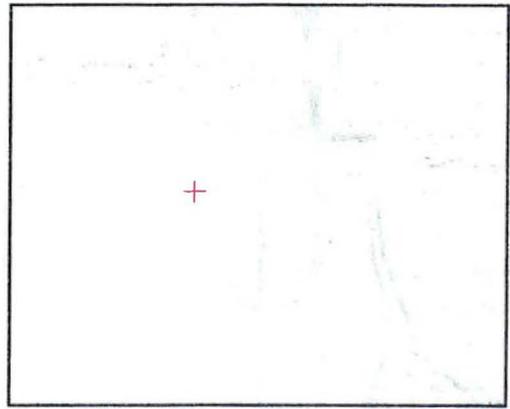
Topographic Feature #2, looking northeast

Topographic Feature #3

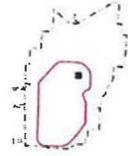
*Location:* N4320572, E327394

*Approx. Dimensions:* about 1.2 m tall, 12 m across

*Field Visit Notes:* On the 1952 contour map, this feature is located next to an arcing berm likely built as part of a pond. Nothing pond-like is evident on the 1939 or 1951 USDA aerial photographs, though this location is close to the junction of several property boundaries—the kind of place where fill was often dumped. Today, this area is at the edge of the X-333 Process Building (see the image below).



1ft contour interval



↑ UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field



100 m



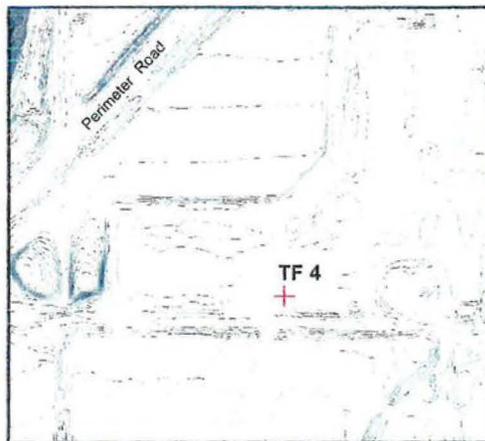
Location of Topographic Feature #3 on a recent aerial photo of PORTS

Topographic Feature #4

*Location:* N4320680, E326497

*Approx. Dimensions:* about 0.6 m tall, 10 m x 21 m across

*Field Visit Notes:* On the 1952 contour map this feature is the top contour of a small hill at the head of a ravine. It likely is just the top of the hill. This location was not visited during the field reconnaissance since it is located within the developed area of the plant.



1ft contour interval



↑  
UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field



250 m



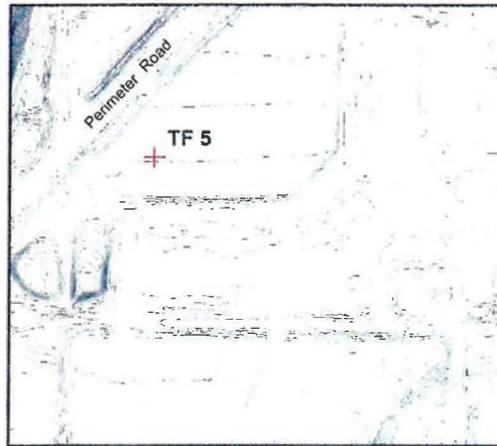
Location of Topographic Feature #4 just south of X-630-2B shown on a recent aerial photo of PORTS

Topographic Feature #5

*Location:* N4320801,  
E326400

*Approx. Dimensions:* about  
0.6 m tall, 10 m long  
north-south

*Field Visit Notes:* On the  
1952 contour map this  
feature is a small mound-  
like feature located on a  
ridge. Based on the contour  
map to the right, generated  
with the LiDAR data, it  
appears that this area has  
been leveled off or filled in  
since 1952. This location  
was not visited during the  
field reconnaissance since it  
is located within the  
developed area of the plant.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(conus)



GPS Location  
Identified in the Field



250 m



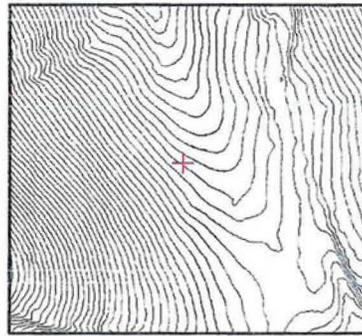
Location of Topographic Feature #5 at southwest corner of X-745E shown on a recent aerial photograph of PORTS

Topographic Feature #6

*Location:* N4319386, E327991

*Approx. Dimensions:* 0.6 m tall, 12 m x 24 m across

*Field Visit Notes:* Located on moderate slope, near base of hill. The vegetation was very dense. No topographic feature was evident at this location. The top of the hill to the west was also checked for any topographic features but none were observed. This feature, identified on the 1952 contour map, is likely just part of the natural contour of the land.



1ft contour interval



↑  
UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field



100 m



Topographic Feature #6 location, looking north

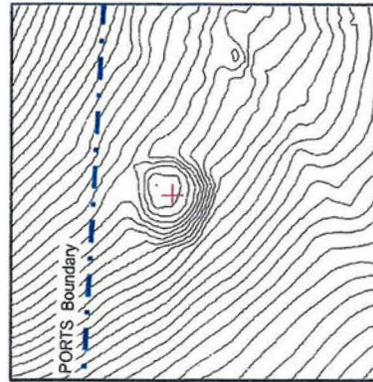
## Topographic Feature #7

*Location:* N4322792, E326388

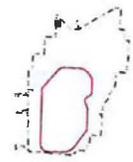
*Approx. Dimensions:* 1.2-2.7 m high, 24 m in diameter

*Field Visit Notes:* This large mound-like feature is located just east of the western PORTS boundary fence. It is approximately 2-3 meters tall and has a flat top with some undulations. Several of these undulations are tire ruts while others are small pits—the latter are about a meter in diameter and perhaps 30-40 cm deep and are slumped in, as if they were

excavated many years ago. The edges of this topographic feature are quite steep and the top seems as if it has been artificially leveled off. On the north side of the topographic feature, at ground level, there is a low linear embankment, about 30 cm tall and 30-60 cm wide that runs parallel to the PORTS boundary fence. Importantly, the linear feature runs under the mound-like feature. This linear feature was likely created when the PORTS fence was installed, or later. The fact that Topographic Feature #7 covers over this low linear embankment indicates that Topographic Feature #7 is more recent in age (i.e., created as part of PORTS) than the linear embankment. Other PORTS-era land modification is present 30-40 meters to the north and east of this feature.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field



50 m



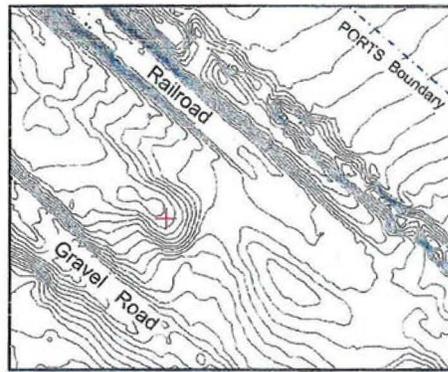
Topographic Feature #7, looking east

Topographic Feature #8

*Location:* N4322563, E326770

*Approx. Dimensions:* about 2.4 m tall, 21 m in diameter

*Field Visit Notes:* This large, oblong topographic feature parallels the nearby railroad and is in between two roads, a gravel road to the southwest and a frontage gravel road along the railroad. It is covered by grass and some raspberry/bramble bushes. The top of the feature consists of very compact sediment. While climbing the slope of the feature on its southwest side, a standing silt fence was noted at the base of the feature's slope. The silt fence was somewhat embedded in the sediment of the topographic feature. Given the location of this topographic feature and the high degree of land modification for the railroad and the gravel roads, plus the compactness of the soil, the lack of older vegetation, and the embedded silt fence, this feature was determined to be a relatively recent construction.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field



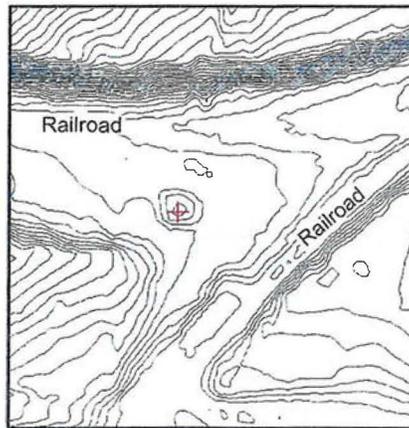
Topographic Feature #8, looking southwest

Topographic Feature #9

*Location:* N4322393, E327105

*Approx. Dimensions:* 0.9 m tall,  
13 m in diameter

*Field Visit Notes:* This is a type of loading ramp located just south of the railroad tracks. Its western side, which appears very straight in the contour map to the right, is a low wall of railroad ties holding back the sediment of the ramp. The ramp descends in elevation to the east. Large piles of rail road ties are present to the west of this feature. Overall, this entire area appears to be modified land related to the construction of the railroad.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field



100 m



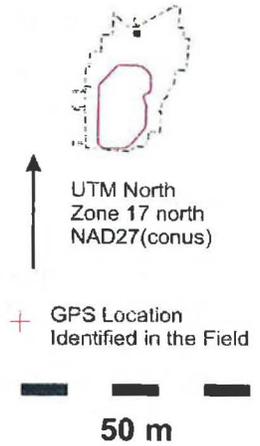
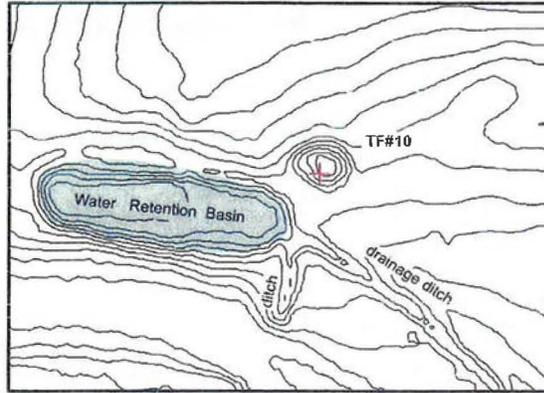
Railroad ties comprising the west edge of Topographic Feature #9, looking northeast

Topographic Feature #10

*Location:* N4322353, E327245

*Approx. Dimensions:* 1.2 m tall, 13 m in diameter

*Field Visit Notes:* This distinctive topographic feature is located immediately adjacent to a water retention basin lined with large stones. Two ditches lead into/away from the basin to the south and southeast. A little farther to the south is the X-735 Sanitary Landfill. Topographic Feature #10 appears to be part of the modified ground surrounding the retention basin and may in fact be made from some of the fill removed to create the basin.



Topographic Feature #10 looking north, with one of the rock lined ditches in the foreground

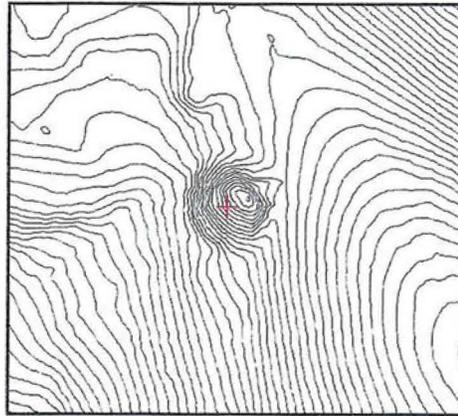
Topographic Feature #11

*Location:* N4322694, E328401

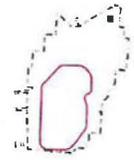
*Approx. Dimensions:* 3-3.7 m tall,  
16 m in diameter

*Field Visit Notes:* This tall and very steep topographic feature is located at the top edge of the soil borrow area at the northeast side of PORTS. This feature has an irregular top surface with some scalloping of the sides. The northwest and west sides are covered in small trees, none of which are more than about 5-15

years old. This topographic feature is likely a pile of sediment placed at this location as part of the borrow pit activities. The ground to the west and northwest has had the soil scraped away to some degree, with large amounts of flaggy stone present at the surface.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(conus)



GPS Location  
Identified in the Field



50 m



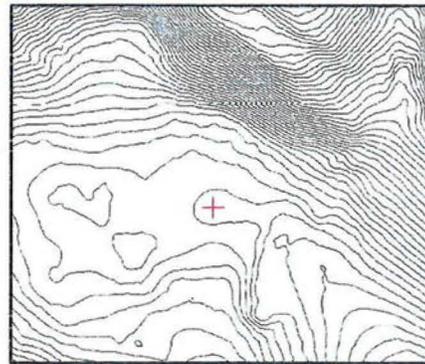
Topographic Feature #11, looking north, the trees to the right are outside of the borrow area

Topographic Feature #12

*Location:* N4322760, E328377

*Approx. Dimensions:* 0.3 m tall, 12 m in diameter

*Field Visit Notes:* This feature is located on a hill within the borrow pit area at the northeast side of PORTS. Rocky subsoil is present on the surface. There is a low mound-like feature at this location, and it has a small tree growing on it. This feature is likely just a higher spot left behind during the borrow pit excavations. The entire area around Topographic Feature #12 has been highly modified and flaggy stone is present at the surface.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(Conus)

+ GPS Location  
Identified in the Field



50 m



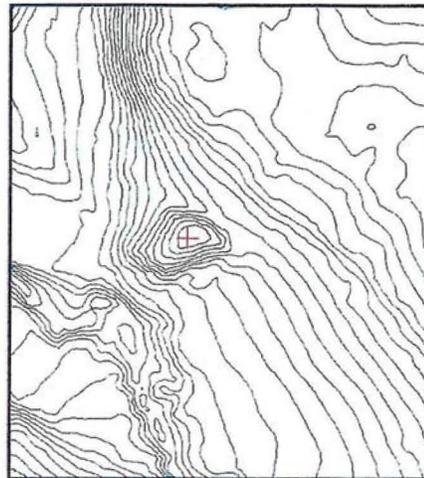
Topographic Feature #12, looking north

Topographic Feature #13

*Location:* N4322759, E328091

*Approx. Dimensions:* 1.5 m tall, 15 m in diameter

*Field Visit Notes:* This topographic feature is located immediately adjacent to the edge of the area modified by borrow pit activities (to east). To the west is a small stream channel; the feature seems to be sitting on the floodplain and bank at the stream edge. It has an irregular plan view shape, though this was difficult to see in the field because of the dense vegetation. Given the proximity of the borrow area fill, not more than 10-20 meters to the east, and its irregular shape, Topographic Feature #13 is likely related to the soil borrowing activities that have thoroughly modified the landscape in this entire area.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(conus)



GPS Location  
Identified in the Field



50 m



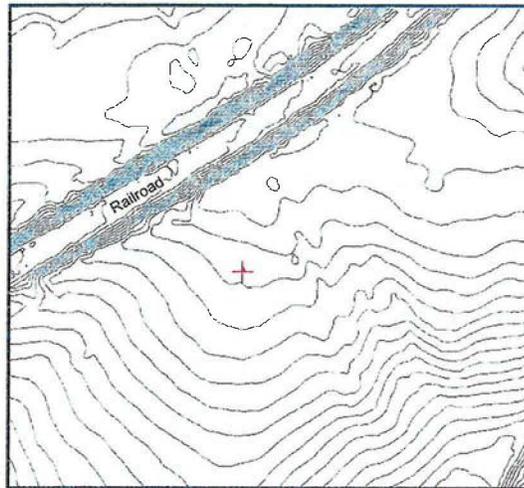
Topographic Feature #13, looking northwest

Topographic Feature #14

*Location:* N4322018,  
E326889

*Approx. Dimensions:* 0.3 m  
tall, 2 m in diameter

*Field Visit Notes:* This feature is located along a power line corridor to the southeast of a railroad track. The GPS location corresponds to a dense tree line along the edge of the power line corridor. No topographic feature was evident.



1ft contour interval



↑  
UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field



100 m



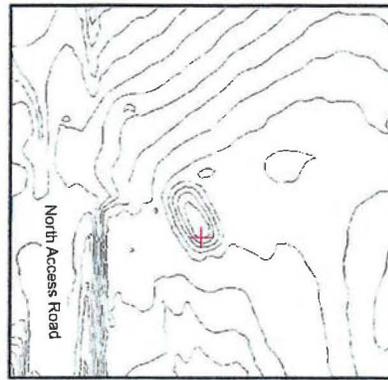
Topographic Feature #14, looking southwest

Topographic Feature #15

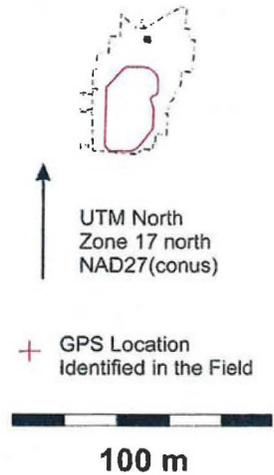
*Location:* N4322113, E327419

*Approx. Dimensions:* 1.2 m tall, 16 m x 26 m wide

*Field Visit Notes:* This oblong topographic feature, covered in grass, runs parallel to Fog Road near its intersection with the PORTS North Access Road. The north access gate is located about 60 meters to the west. A DOE fence runs over the north end of the feature. Several cinder blocks are present on the northeast face of the feature, and they look to have been placed there relatively recently. This feature likely dates to the same era as the construction of the north access gate complex as no soil discolorations or other features are evident at this location in the 1939 and 1951 USDA aerial photographs—at that time this location was agricultural field.



1ft contour interval



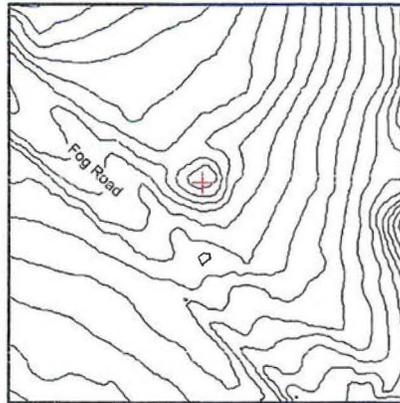
Topographic Feature #15, looking southwest

Topographic Feature #16

*Location:* N4321720, E327599

*Approx. Dimensions:* 1.2 m tall, 11 m in diameter

*Field Visit Notes:* This topographic feature has an irregular shape that is not evident in the LiDAR-generated contour map to the right. While it does have a roughly circular main mound-like feature about two meters tall (evident in the LiDAR image), this core area is attached to a lower (about 0.3-0.6 m), arcing linear embankment that tails off to the north. The arcing outline of this topographic feature along its southeast side looks to have been created by cut and fill activities made by a dump truck and a front-end loader. This topographic feature is located across the road from the Stockdale Dairy Farmstead (33Pk217), and it appears to be a PORTS-era construction.



1ft contour interval



↑  
UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field



50 m



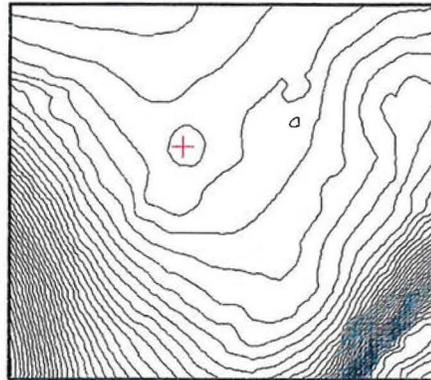
Topographic Feature #16 looking northwest, with the main core to the left and the tailing embankment to the right

Topographic Feature #17

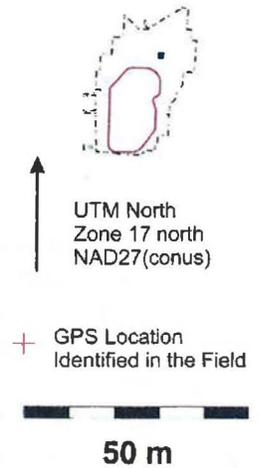
*Location:* N4321586, E327580

*Approx. Dimensions:* 0.3-0.6 m tall,  
11 m in diameter

*Field Visit Notes:* This is the location of the Stockdale Dairy Farmstead (33PK217) dairy barn. The barn foundation creates a slight rise that appears circular in the contour map of the LiDAR data (shown at right).



1ft contour interval



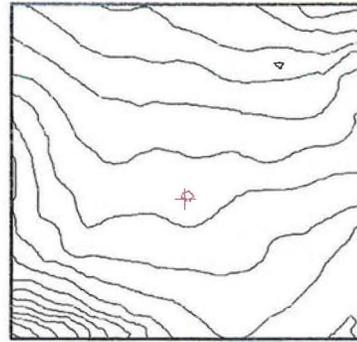
Topographic Feature #17, Stockdale Dairy Farmstead (33PK217) dairy barn foundation, looking northeast

Topographic Feature #18

*Location:* N4321628, E327564

*Approx. Dimensions:* 0.3 m tall, 4 m in diameter

*Field Visit Notes:* This small topographic feature is the chimney base of an older house at the Stockdale Dairy Farmstead (33PK217). Ohio Valley Archaeology, Inc. excavated 1x1 meter test units on either side of the chimney during the Phase II investigation of this site. This rise is only about 30 cm tall and is beneath a large tree, with weedy brush growing on top of it (this brush had been cleared for the Phase II work). This is a recent (historic-era) topographic feature.



**50 m**



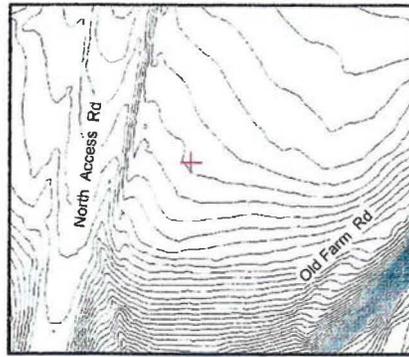
Topographic Feature #18, looking north at Stockdale Dairy Farmstead (33PK217)

Topographic Feature #19

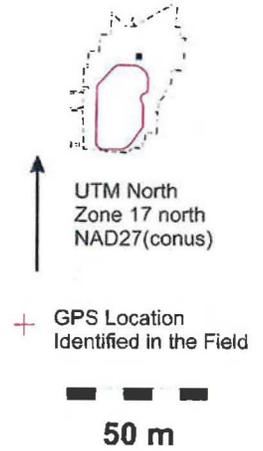
*Location:* N4321576, E327353

*Approx. Dimensions:* 0.3 m tall, 7 m in diameter

*Field Visit Notes:* This potential topographic feature is located at the edge of a pine grove east of the North Access Road and south of Fog Road. This location is on the north bluff overlooking Little Beaver Creek. However, no discernable topographic feature was found here during the field visit. The old farm road to the southeast (see contour map above) runs northeast toward the Stockdale Dairy Farmstead (33PK217).



1ft contour interval



Topographic Feature #19, looking north

## Topographic Feature #20

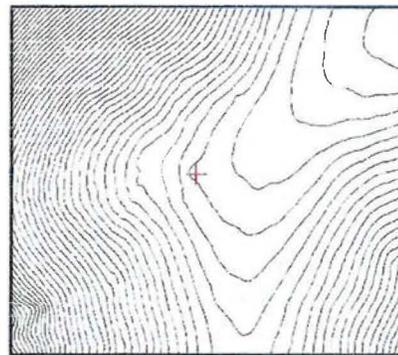
*Location:* N4321929, E327892

*Approx. Dimensions:* 0.3 m tall, 6 m in diameter

*Field Visit Notes:* This topographic feature is located on a ridge top north of Little Beaver Creek. There are numerous linear features on the ridge top here, most of which look like they could be the result of logging or bulldozer activity.

The 1939 and 1951 USDA aerial photos show this area as being brushy and perhaps recently logged. Topographic

Feature #20 was located and appeared to be an amorphous, linear feature about six meters long and 0.5 m tall—though it is very irregular on its surface and in plain view. This linear feature is related to whatever relatively recent ground disturbance has created the other linear features on this ridge. Based on its irregular size, shape, and location and the presence of other recent disturbances, Topographic Feature #20 is not part of a prehistoric hilltop enclosure or a mound.



UTM North  
Zone 17 north  
NAD27(Conus)



GPS Location  
Identified in the Field



50 m



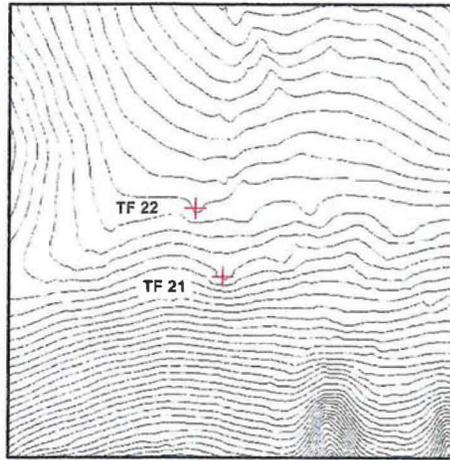
Topographic Feature #20, looking north

Topographic Feature #21

*Location:* N4321181, E328721

*Approx. Dimensions:* 0.6 m tall, 9 m in diameter

*Field Visit Notes:* This feature is likely an earthen platform built for a farm house that was once located here. There is an open concrete cellar about three meters north of the GPS location. The house sat on the top edge of a slope that runs downhill to the south. The farmstead is visible on the 1939 and 1951 USDA aerial photos. The site is covered in very dense brush and was difficult to access.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(conus)



GPS Location  
Identified in the Field



100 m



Topographic Feature #21 and GPS range pole, looking north. Heavy brush in the background is the open cellar.



Open cellar to the north of Topographic Feature #21, looking southwest.

Topographic Feature #22

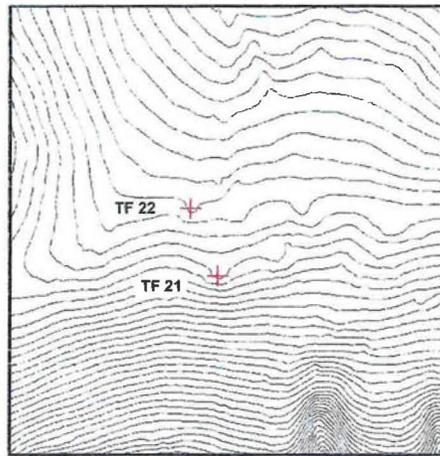
*Location:* N4321206, E328711

*Approx. Dimensions:* 0.3-0.6 m tall, 6 m in diameter

*Field Visit Notes:* This is a small topographic feature covered in very heavy brush. The 1939 and 1951 USDA aerial photos show this feature as being within the farm lot of the house located in Topographic Feature #21.

Therefore, Topographic Feature #22 is likely an historic-era feature related to this farmstead or

it may be a debris pile left behind when the farmstead was demolished.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(cons)



GPS Location  
Identified in the Field



100 m



Topographic Feature #22 just behind the GPS and under the heavy brush, looking north

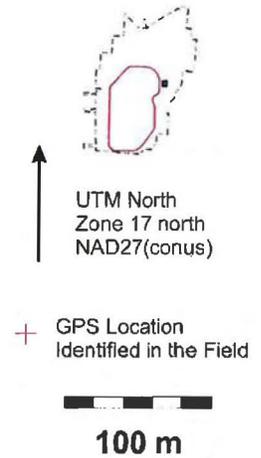
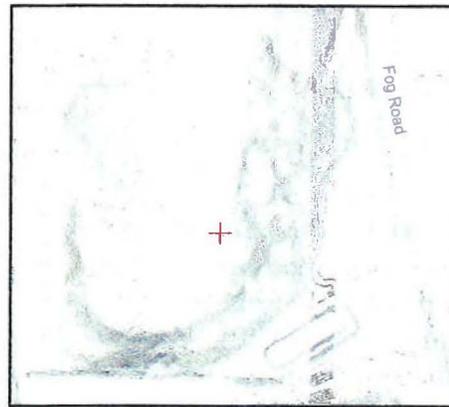
Topographic Feature #23

*Location:* N4320498, E327950

*Approx. Dimensions:* 0.3 m tall, 7 m in diameter

*Field Visit Notes:* This topographic feature is located on a hill just east of Perimeter Road. An old road used to run along the bottom of this hill, about 30 meters to the south. Part of this road is visible in the topographic map to the right, just left of the label for Fog Road, but much of it has been disturbed.

Topographic Feature #23 is a low mound-like feature when viewed on the ground. In the 1939 and 1951 USDA aerial photos this area was plowed agricultural land. But today it looks like the area has been heavily modified by bulldozers. There also are erosional gullies cutting into the hillside here. Given the large degree of disturbance in this area, Topographic Feature #23 is most likely a pile of excess soil.



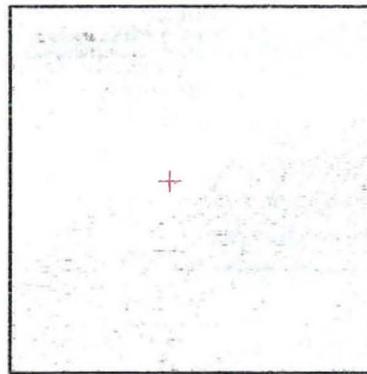
Topographic Feature #23, looking northeast

Topographic Feature #24

*Location:* N4320656, E328442

*Approx. Dimensions:* 0.3 m tall, 6 m in diameter

*Field Visit Notes:* Located on a slope, this area was once a plowed field or pasture land based on evidence in the 1939 and 1951 USDA aerial photographs. In 2011 there are few trees and grasses down slope and a secondary growth forest upslope. In the immediate area of the GPS location there are two pine trees and a cedar tree. No topographic feature was evident at this location, which is on the slope approximately two hundred meters northeast of the Terrace Farmstead (33PK206).



1ft contour interval



UTM North  
Zone 17 north  
NAD27(Conus)



GPS Location  
Identified in the Field



100 m



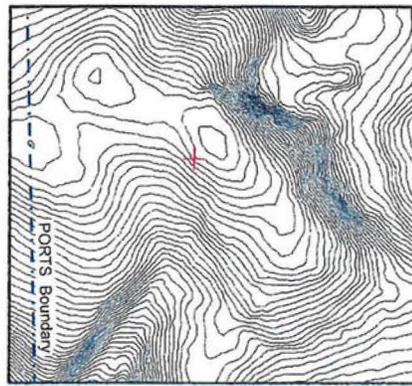
Topographic Feature #24, looking south

Topographic Feature #25

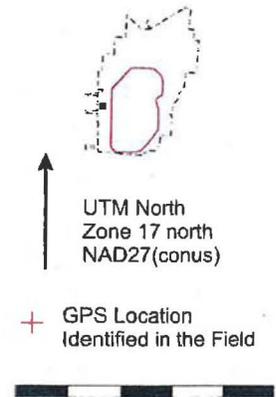
*Location:* N4319601, E325344

*Approx. Dimensions:* 0.3-0.6 m tall, 4 m in diameter

*Field Visit Notes:* This site is located at the top edge of a slope in heavy brush, about 50 meters east of the western PORTS boundary. The oldest trees in this area appear to be about 60 years old, suggesting this area was cleared prior to that. Based on the 1951 USDA aerial photo, this location is just north of a large farmstead. The soil at the surface here is sandy and dark, but no mound-like feature was visible on the ground.



1ft contour interval



UTM North  
Zone 17 north  
NAD27(conus)

+ GPS Location  
Identified in the Field

100 m



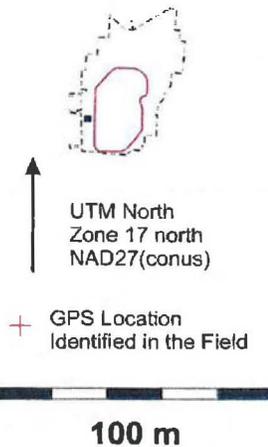
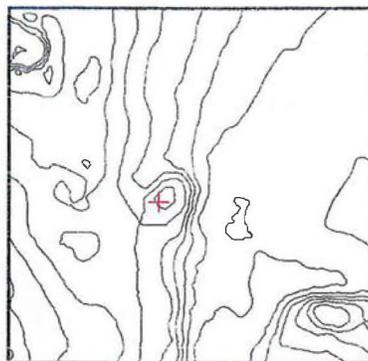
Topographic Feature #25, looking west

Topographic Feature #26

*Location:* N4319141, E325494

*Approx. Dimensions:* 0.9 m tall, 15 m in diameter

*Field Visit Notes:* This mound-like feature is located in a wooded area just west of a high-tension power line corridor. The edge of the power line corridor, adjacent to the topographic feature, is a low and wet area with horsetail (*Equisetum* sp.) plants. The topographic feature itself is about 0.75-1.2 m tall and at least 15 m long north-south. Its eastern side appears to have been truncated by heavy equipment, perhaps when the high tension power line was built. The top of the topographic feature has little vegetation other than a large sycamore tree (see pictures below). The area is surrounded to the west by low, wet areas. This area of PORTS is known to be an area of spoil piles and fill. Given its location and the presence of previous buildings and roads on the 1966 USDA aerial photo (below), Topographic Feature #26 is likely a PORTS-originated pile of earth.



Topographic Feature #26 showing the large sycamore tree, looking east



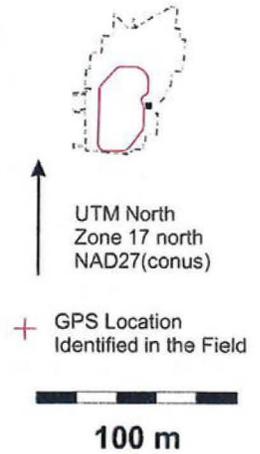
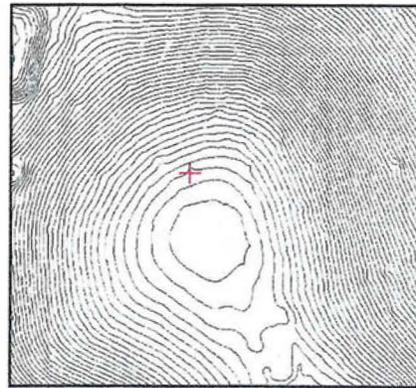
1966 USDA aerial photo showing the location of Topographic Feature #26 within a PORTS building complex that has since been removed (one of the two nearby trees is likely the sycamore tree shown in the photo to the left)

Topographic Feature #27

*Location:* N4319475, E327809

*Approx. Dimensions:* 0.3 m tall, 5 m in diameter

*Field Visit Notes:* This GPS location is situated at the top edge of a hill to the east of Perimeter Road. The area has relatively little undergrowth and larger trees, though in the 1951 USDA aerial photo it was covered by an active agricultural field. No discrete topographic features were observed on the ground here, though there is a subtle, broad undulation in the surface less than 30 cm tall.



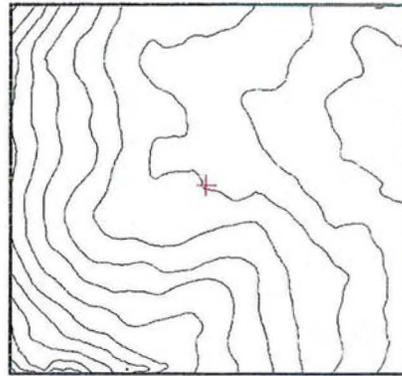
Topographic Feature #27, looking north

Topographic Feature #28

*Location:* N4318921, E325530

*Approx. Dimensions:* 0.3 m tall, 6 m in diameter

*Field Visit Notes:* This GPS location occurs along a subtle break in slope just west of a historic-era farmstead (possibly 33PK188). There are three wooden fence posts in a line located about 20 meters east of Topographic Feature #28. A high tension power line is present about 10 meters east of the GPS location. Other than a few small trees about 10 meters to the west, the area around Topographic Feature #28 is open. No mound-like features are evident at this location.



↑  
UTM North  
Zone 17 north  
NAD27(conus)

+  
GPS Location  
Identified in the Field



100 m



Topographic Feature #28, looking south

#### 4. SUMMARY AND RECOMMENDATION

The results of the review of the 1952 topographic contour maps, 2006 LiDAR data, field evaluation, and analysis showed that of the 28 topographic features detected in the topographic data and observed in the field, all were identified as historic-era constructions or false-positive features created by too much vertical exaggeration in the LiDAR data images. In many cases (i.e., essentially all of the features recorded as 0.3 m [1 ft] tall [e.g., Topographic Features #14, 25, and 27]), no topographic features were found on the ground. Since the LiDAR data were vertically exaggerated to highlight even the slightest mound-like features, it is likely that these smaller possible features represent noise or clutter in the LiDAR data, such as extremely dense vegetation—in other words, they do not represent mound-like features. At least three of the topographic features were created by known historic-era farmstead structure locations (e.g., Topographic Features #17, 18, and 21). Others are recently created PORTS-era features (e.g., Topographic Features #9, 10, and 15). The majority of the other mound-like features were highly irregular in shape or clearly represented some kind of soil dumping, bulldozing, or other ground disturbance (e.g., Topographic Features #20 and 23). In the few remaining cases where topographic features were not obviously of a recent origin (e.g., Topographic Feature #26), old USDA aerial photos were consulted and showed that these locations were associated with historic-era farmsteads or earlier PORTS-era construction activities. Table 2 summarizes the results of the observations made above.

While it is not possible to precisely and definitely prove that prehistoric Native American mounds ever did once exist on the PORTS site prior to the 1950s, the amount of attention paid to the larger mounds in the nearby Scioto floodplains in the late 1800s suggests that any larger mounds in the PORTS area would have been at least noted in the published literature of Atwater, Squier and Davis, Mills, and Fowke, if not also excavated by individuals such as Fowke (who excavated many mounds in the Piketon area, small and large) or amateur archaeologists over time. Thus, in failing to find any distinctive, prehistoric topographic features in a thorough topographic examination of the entire facility, it is the conclusion of this study that PORTS contains no intact Native American mounds 30 cm tall or taller—the size range of nearly all documented mounds in Ohio.

Table 2. Summary of results of field checked mound-like topographic features of interest.

Topo. Feature #	Height	Diameter	Data Source	Comments prior to field checking	Comments following field checking
1	0.6 m	18 m	1952 topo map	Nothing visible in LiDAR	Area disturbed, nothing observed
2	0.6 m	10 m	1952 topo map	Linear ridge visible in LiDAR	Nothing observed
3	1.2 m	12 m	1952 topo map	No longer observable	No longer observable
4	0.6 m	10x21 m	1952 topo map	No longer observable	No longer observable
5	0.6 m	10 m	1952 topo map	No longer observable	No longer observable
6	0.6 m	12x24 m	1952 topo map	Nothing visible in LiDAR	Nothing observed
7	1.2-2.7 m	24 m	LiDAR		Recent, PORTS-related feature
8	2.4 m	21 m	LiDAR		Recent, PORTS-related feature
9	0.9 m	13 m	LiDAR		PORTS-related feature
10	1.2 m	13 m	LiDAR		PORTS-related feature
11	3-3.7 m	16 m	LiDAR		PORTS-related, borrow area feature
12	0.3 m	12 m	LiDAR		PORTS-related, borrow area feature
13	1.5 m	15 m	LiDAR		PORTS-related, borrow area feature
14	0.3 m	2 m	LiDAR		No feature found
15	1.2 m	16x26 m	LiDAR		PORTS-related feature
16	1.2 m	11 m	LiDAR		PORTS-related feature
17	0.3-0.6 m	11 m	LiDAR		Associated with a historic-era farmstead
18	0.3 m	4 m	LiDAR		Associated with a historic-era farmstead
19	0.3 m	7 m	LiDAR	Top of slope	Nothing observed
20	0.3 m	6 m	LiDAR	Top of slope	PORTS-related feature
21	0.6 m	9 m	LiDAR	On slope	Associated with a historic-era farmstead
22	0.3-0.6 m	6 m	LiDAR		Associated with a historic-era farmstead
23	0.3 m	7 m	LiDAR	Top of slope	PORTS-related feature
24	0.3 m	6 m	LiDAR	On slope	Nothing observed
25	0.3-0.6 m	4 m	LiDAR	Top of slope	No feature found
26	0.9 m	15 m	LiDAR		Associated with a historic-era farmstead or of PORTS-creation
27	0.3 m	5 m	LiDAR	Top of slope	No feature found
28	0.3 m	6 m	LiDAR	Top of slope	Nothing observed

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