

BZA Appeal No. 17285; Appeal of Patrick J. Carome of Building Permit No. B460927, 4825 Dexter Terrace, NW, Frank and Dina Economides, Owners

April 5, 2005, Testimony of Robert Dean Pinciotti, Professional Engineer, on behalf of Intervener the National Park Service.

My name is Robert Dean Pinciotti. My work address is 200 Orchard Ridge Drive, Gaithersburg, Maryland, 301-258-5806. I am a licensed Professional Engineer and am currently licensed in PA, MD, VA, SC, and the District of Columbia. My area of practice is geotechnical engineering. I have experience with design and / or construction of building foundations, basement walls, earth retaining walls, bridges, highways, water tanks, hydrospheres, dams, dikes, embankments and other earth structures.

I currently work as a Principal Geotechnical Engineer for URS Corporation and am based in their Gaithersburg, MD office. URS is a large engineering firm providing a multitude of science and engineering services to both government and private clients. URS has held an IDIQ contract to provide design services to the National Parks Service (NPS) since about 2002. To date, we have performed 31 task orders on this contract.

As part of the scope of work on this current task order, I have reviewed some if not most of the drawings and specifications that are in the record respecting the Economides' structure. In particular, I have reviewed the design package prepared by Ryan and Associates. I have provided similar reviews, as well as provided design parameter for, and conducted the geotechnical analysis on, these types of structures for both internal and external clients. I have also been on sites while structures such as the one at issue were being constructed, but I was not responsible for the oversight of the construction.

I have visited the NPS parkland behind Dexter Terrace three times and observed the site work that has been performed on the Economides property. I understand that one of the areas of dispute has to do with where this structure fits into the DC zoning code. That is: Is this structure a retaining wall or something else?

A retaining wall functions to retain soil on a site and/or to provide a means of a sudden change in elevation. In 1977, when I understand the relevant zoning provision regarding required fences and retaining walls was enacted, a typical retaining wall was relatively thin and made of one or perhaps two component parts. Examples of such retaining walls are: 1) a masonry retaining wall made of stones or CMU set upon each other with mortared joints; 2) a cantilevered concrete retaining wall made of a concrete base and a relatively thin concrete vertical wall or stem; and 3) a sheet pile retaining wall made of wood or steel sheeting which is driven into the soil. Soil retaining walls can be small, such as the 18-inch high timber wall that supports three sides of the garden in my back yard, or they can be large, such as Vietnam Memorial wall.

I also note that the April 5, 2005, Power-Point presentation to the BZA entitled "Response of the District of Columbia Zoning Administrator" contains the following definition of a retaining wall: "a wall that is not laterally supported at the top, designed to

resist lateral soil load.” BOCA 1996. I went back and specifically looked at this section of BOCA 1996. Section 1812.2 defines foundation walls and retaining walls. The importance of this difference has to do with the way these two different types of walls react to the lateral soil loading, that is the reason for providing the definition. More important to the discussion of whether the Economides structure is a wall is covered in Section 1825 – Retaining Walls, Subsection 1 – General, where it states “Walls built to retain or support the lateral pressure of earth or water or other superimposed loads shall be designed and constructed of masonry, concrete, steel sheet piling or other approved materials (see Section 2311.7)” Section 2311.7 discusses the use of wood for retaining walls. Further, Chapter 21 – Masonry, Section 2102.0 – Definitions, defines masonry as “a built-up construction or combination of building units or materials of clay, shale, concrete, glass, gypsum, stone or other approved units bonded together with mortar.” The structure at issue is not masonry bonded together with mortar, nor is concrete, nor is it steel, nor is it wood. Thus, according to the definition of retaining wall provided by BOCA, as referenced by the Zoning Administrator, the structure is not a retaining wall.

A structure such as the one in the Economides backyard on Dexter Terrace is more accurately referred to as a Mechanically Stabilized Earth (MSE) retaining structure or system. It is a structure or system because it is made of several different component parts that are interdependent. It is composed of three components: compacted soil, layers of geogrid embedded throughout, and a vertical venire or modular block facing. In this case, the vertical venire is composed of the MESA blocks. The geogrid is a grid of high-density polyethylene (HDPE) plastic. According to the MSE design prepared by Ryan Associates, the structure has four different design sections and each design section has approximately 20 layers of geogrid. The design also calls for the use of 4 different strengths of geogrid. Two of the design sections call for differing spacing of the geogrid within the design section. The design calls for various lengths of geogrid, and some of these lengths (that is, the same length) are of different strength geogrid .

The components of the MSE structure work together to form a stable mass with a vertical face. Typically in an MSE structure, the geogrid panels have a length that about 7/10 as long as the structure is tall. In this case, the geogrid sections range from approximately 13 to 27 feet in length. All MSE structures create an inherently stable platform on top. In the case of the Economides yard, the MSE platform top width, together with the soil fill placed behind it, results in an elevated platform that covers the entire backyard. The MSE structure and the soil that is directly supported by the MSE structure covers approximately 77 percent of the rear yard, based on the approximate location of the rear line of the building, as established by the Zoning Administrator during the April 5, 2005 hearing. ~~rear yard being measured parallel to the rear property line or approximately 68 percent of the rear yard, based on the rear yard being measured parallel to the rear of the house.~~

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While the MESA blocks give the appearance of a wall, they could only be used without the geogrid for very limited heights, say less than four courses. Above approximately four courses, the blocks would, overtime, be pushed over by the lateral earth pressure of the retained soil. Compacted soil alone is typically considered to have long-term stability

when it is constructed with a slope of less than 2 horizontal to 1 vertical. The inclusion of reinforcement, such as geogrid, in the compacted soil mass increases the stability and allows the structure to be constructed to a steeper slope. It should be noted that the geogrid depends on 95 percent compaction to provide the frictional component and the passive pressure on the cross section of the web of the geogrid that is necessary to keep the geogrid from pulling out of the soil mass.

The City of Gaithersburg owns an MSE structure similar to the Economides and a comparison of these structures is informative. In Gaithersburg, two lakes are so close to each other that the downstream slope of the dam embankment forming the upper lake was constructed of MSE so as to minimize the encroachment of the dam on the lower lake. In this case the geogrids were stepped back with the slope and geoweb was anchored to the surface to reduce the potential for movement of the surface soils. This dam demonstrates that an MSE structure, like the Economides structure, need not incorporate a walled venire in order for it to be a functional retaining structure. Indeed, in temporary applications, MSE structures have been built with nearly vertical faces by wrapping the geogrid around the front face of the fill. In such applications, it is necessary to place a geotextile or other material between the soil and the geogrid to keep the soil from falling out from between the grid.

Next, I will address the MSE design and the soil borings conducted by the Economides' engineer as part of the infiltration trench study. (Attachement C of Mr. Aguglia's brief) According to these documents the leveling pad, at the design depth, would have to be 48 inches to 72 inches wide, 12 inches to 18 inches thick and reinforced with 2 or 3 layers of geogrid. Thus, the pad should extend 18 to 30 inches beyond the face of the wall. A plat drawing showing a 1 foot plus or minus buffer between the face of the MSE structures outer wall and the park boundary was also part of the permit package (Appendix 51 of Appellants Brief). When the plat is read together with the MSE design and the boring information, it should have been clear that the leveling pad would extend beyond the approximate 1 foot buffer and onto NPS property.

On April 26, 2005, I was present on site to assist in the sampling and classification of the soils in 7 exploration borings. The purpose of this test was to determine whether the leveling pad was indeed located on NPS property and, if so, whether it met the MSE design prepared by Ryan Associates. The initial boring, designated Boring T, was used as a control test and was located several feet away from the property line and the potential zone of construction activity. The other 6 borings, designated Borings A through F were located approximately 8 inches on the park side of the property line. The exact location of the borings were determined to be on park property and were recorded by Leon Chmura, Land Surveyor with the Bureau of Land Management, U.S. Department of the Interior.

In all 6 of the borings adjacent to the property line we encountered fill from the ground surface down to a depth of 2.5 to 3.5 feet. Generally, the fill consisted of silty sand and sandy silt, similar to the native soil of the area. Occasionally, it consisted of silty clay. In Boring D and Boring F we encountered crushed stone, approximately 6 and 7 inches

thick, respectively. The crushed stone is part of the leveling pad for the MSE structure. There was a sheet of heavy plastic on top of the crushed stone in Boring F. From these borings we were able to confirm that portions of the leveling pad are located on park property. This finding is not inconsistent with the MSE design and boring analysis conducted by the Economides engineers.

I also was able to determine that the leveling pad does not meet MSE design requirements. Once I excavated the crushed stone from borings D and F, I performed a dynamic cone penetrometer test to measure the consistency and density of the soil supporting the leveling pad. Results of the tests at both locations indicate that the soils immediately below the leveling pads were not sufficiently to support the leveling pad constructed there. Pursuant to the MSE design requirements, the subsoil at Boring D require the use of a 1 foot thick by 4 foot wide leveling pad with one layer of geogrid. The pad was only 6 inches thick and no geo-grid was used. Similarly, the subsoil at Boring F require the use of an 1.5 foot thick by 6 foot wide leveling pad with two layers of geogrid. Here the pad was only 7 inches thick and no geo-grid was used. The leveling pad should extend 1.5 and 2.5 feet in front of the wall, which is well onto the parkland. We could not confirm the full extent of the encroachment but could only confirm that an encroachment occurred.

Finally, NPS has asked me to evaluate the potential for future development on top of the MSE structure. According to the design, the MSE structure should be able to support a live load of 120 pounds per square foot (psf). This would allow for most typical outdoor activities. The owner could not excavate in the MSE structure to plant large tree balls because the excavation would compromise the geogrid.

Mr. Chairman, this concludes my testimony. If you have any questions I'd be happy to respond.