Subsurface Description and Bedrock Topography Map of The Ohio State University Central Campus Area

Senior Thesis Project

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Introduction

The purpose of this report is to describe the subsurface geology of the central campus area at the Ohio State University, Columbus, Ohio. In general, the strata here consist of relatively flat-lying sedimentary rock units (dipping slightly to the East) which are overlain by various glacial and fluvial deposits. The surface of the bedrock here is rather variable and the thickness and composition of overburden varies greatly from one location to another. The stratigraphic description in this report is of an idealized section described from the bottom to the surface.

Accompanying this report is a subsurface bedrock topography map of the central campus area with cross sections and several stratigraphic columns. The data used in the preparation of the bedrock topography map were obtained from bore hole data records kept at the University Architect's Office on Millikin Road in Columbus.

Description of Bedrock

The bedrock buried under unconsolidated material in the central campus area consists primarily of shale and limestone. Deeper units were not reached by building site borings, therefore they will not be described in this report. For a description of some deeper units described from a core taken behind Mendenhall Laboratory on O.S.U campus, see attached Figure 1.

Delaware Limestone:

This limestone and dolostone is highly variable in lithology. It grades from thin shaly layers with nodules of chert to massive limestone with few impurities. This unit has an average thickness of 32 feet in Franklin County (Kovach and Baker, 1966). It has a medium gray to light-olive-grey color, sparsely-fossiliferous, and shows some poorly-developed styolites. The Delaware Limestone sits on top of the older and much thicker Columbus Limestone; the boundary between the two is generally marked by an abrupt change from the massive, cherty Delaware to the highly fossiliferous, skeletal Columbus Limestone

Olentangy Shale:

The Olentangy Shale is composed principally of bluish-grey to greenish-grey clay shale with black fissile beds in upper portion (Kovach and Baker, 1966). Thin interbedded layers of argillaceous limestone are characteristic. The Olentangy shale is soft and easily weathered. This is evidenced by the relatively-thick sections of unconsolidated, weathered shale encountered in several borings.

Ohio Shale:

The Ohio Shale is brown to blue-black, carbonaceous, and contains some siliceous sands. Weathered surfaces of Ohio Shale have a distinctive blue color. This unit is present in the subsurface only in the very northeast corner of the

central campus area.

The depositional environment of all three of these units was shallow marine. These sediments were deposited during the Devonian Period while the central Ohio area was inundated by a shallow sea.

Bedrock Surface

The surface of the bedrock underlying the central campus area has been carved and shaped by the advance and retreat of five major ice sheets over the last million years. The highly abrasive nature of these ice advances and their associated processes modified the bedrock relief considerably and then preserved this landscape in a blanket of unconsolidated material. Directly on top the bedrock surface in many areas, there is a layer containing angular fragments of the underlying material. This indicates that the surface was extensively scoured by glacial action. Angular fragments of shale on top of unweathered limestone bedrock probably indicates glacial removal of shale bedrock to expose the underlying limestone

Unconsolidated materials

Thickness of the unconsolidated material covering the bedrock varies from over seventy feet to less than ten feet across the central campus area. The average thickness of cover is between thirty and fourty feet.

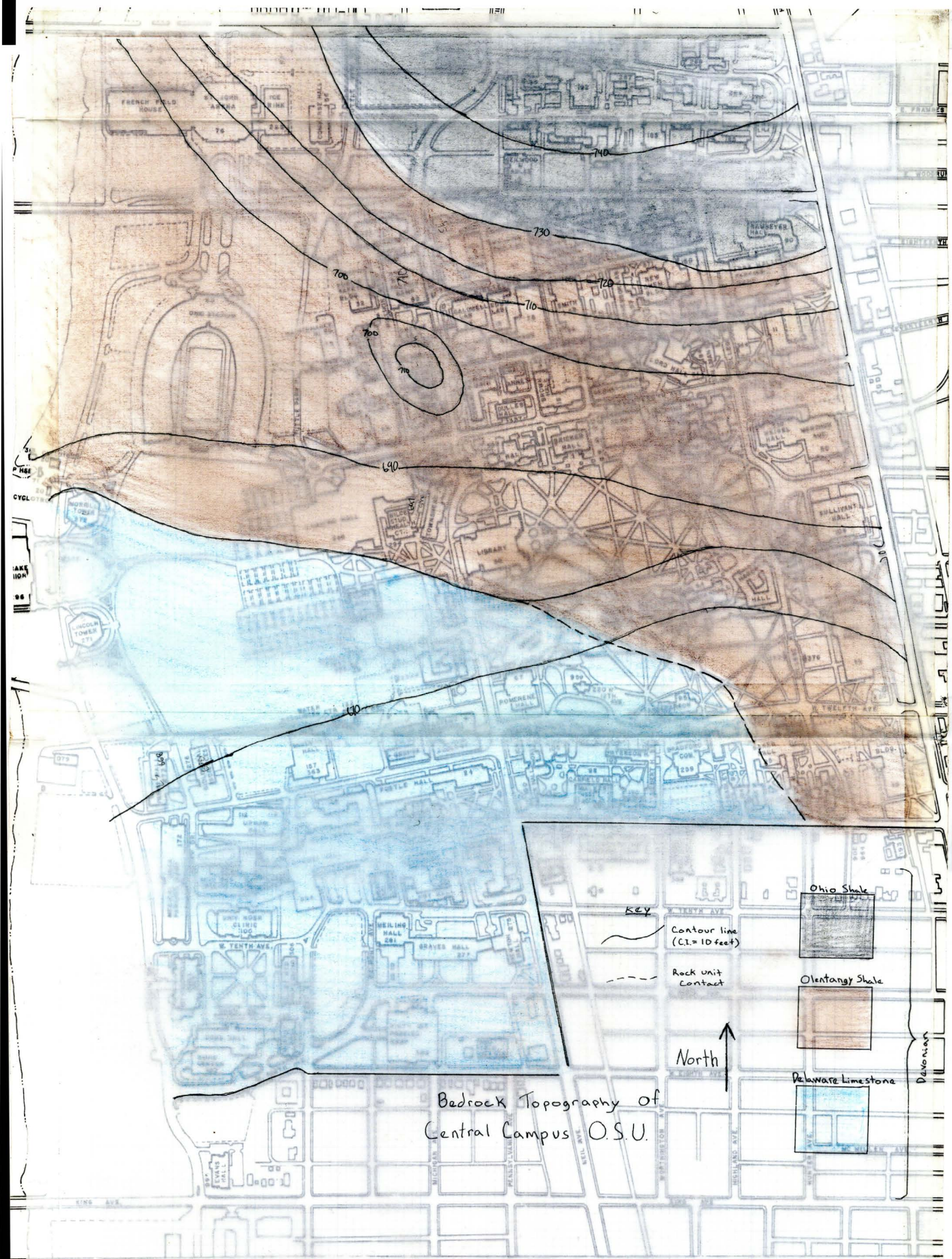
The lowest portion of unconsolidated material generally consists of clays and silts with embedded fragments of bedrock. Next there is characteristically a thick layer of glacial till containing cobbles of exotic materials (i.e. granite) with intermittant lenses of well-sorted outwash sand and gravel. In most areas there is more glacial till than outwash but in others, the overburden consists almost entirely of outwash sand and gravel. The upper few feet of strata are fill and topsoil. Borings taken near the old floodplain of the Olentangy show several feet of alluvium consisting of clays and fine silt.

Several borings taken at sites along the western edge of the central campus area indicate the presence of some organic material in the overburden. Test Boring #1 (Columbus Testing Laboratory, 1965) near the southeast corner of Parks Hall indicates the presence of a four foot thick layer of peat, humus, and wood fragments buried under eight feet of clay and silt (alluvium). Directly beneath this organic layer is a thick sequence (33 feet) of glacial till. Several other test borings taken in the present foundations of Lincoln and Morrill Towers also contained organic layers sitting on top of glacial till deposits. Near the North end of Ohio Stadium, a shallow test boring (Mason, Sandefur, and DeVerteuil, Inc., 1984) revealed a thin layer of wood fragments sitting on top of an outwash deposit. This organic layer seems to be relatively continuous along the edge of campus near the Olentangy River; it probably represents the burial of post-

glacial vegetation by the early floodplain deposits of the Olentangy.

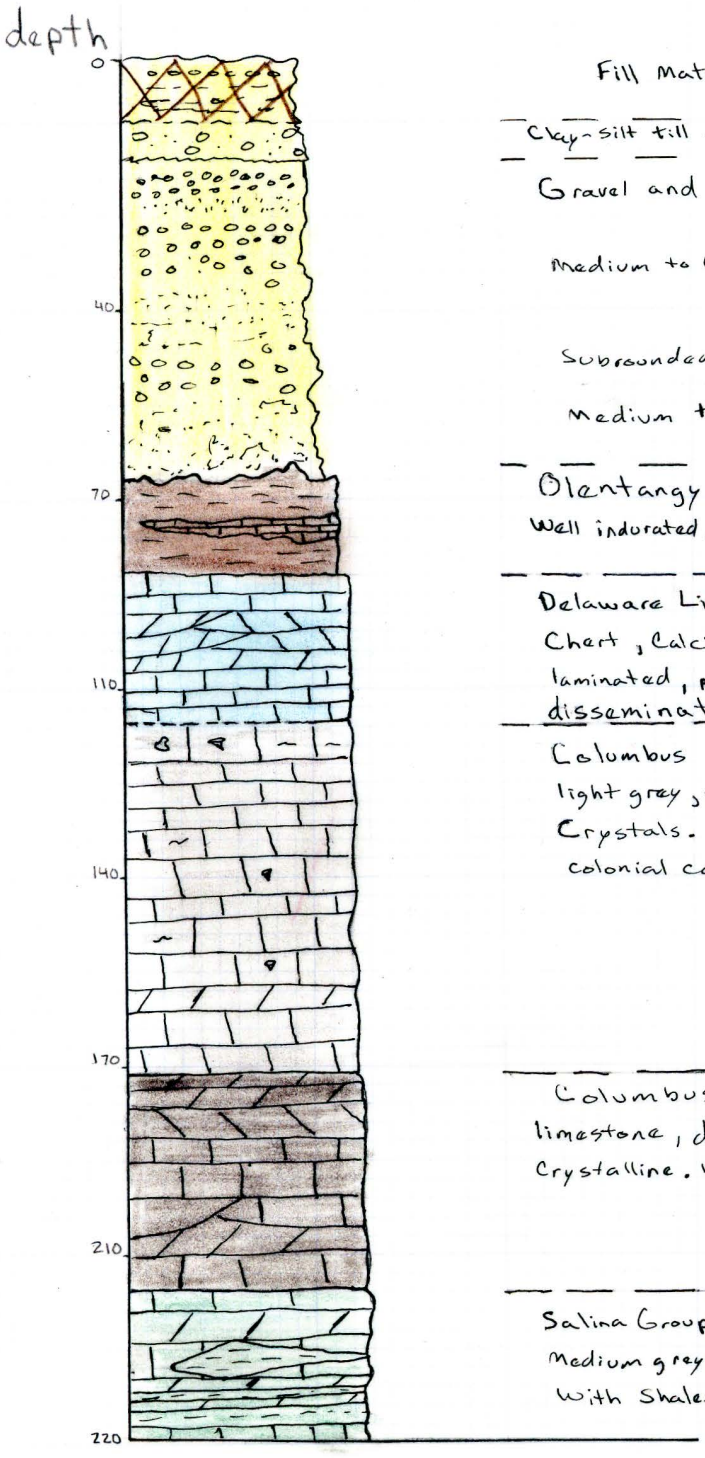
Further study:

Carbon-14 dating of the wood chips found in these organic layers may provide an opportunity to place an absolute date on the final retreat of glacial ice and the return of fluvial conditions to the area. Wood fragments suitable for carbon-14 dating could be obtained from existing samples taken at these locations or new soil borings could be drilled at minimal expense due to the shallow depth and incompetent nature of the material.


740
730
720
710
700
690
680
Key
Contour line (C.I.= 10 feet)
Rock unit contact
Ohio Shale
Olentangy Shale
Delaware Limestone
Devonian
North
Bedrock Topography of Central Campus O.S.U.
TENTH AVE.
KING AVE.
north
SCALE 200' 400'

Mendenhall Core Stratigraphic Section (Figure 1)

adapted from: Ohio Department of Natural Resources
Division of Geological Survey
Core Record



Fill Material

Clay-silt till, sand <20%, limestone pebbles

Gravel and Sand deposits with some trace clay

Medium to Coarse Sand

Subrounded to subangolar gravel

Medium to fine Sand

Olentangy Shale - med. to dark grey, Calcareous, laminated, well indurated, sparsely-fossiliferous, pyrite nodules, Limestone lenses

Delaware Limestone - limestone and dolostone, med-grey, Chert, Calcite, dolomite, argillaceous material, burrow mottling, laminated, poorly dvlped styolites, Vug-filling Spar Calcite and dolomite disseminated Pyrite Present.

Columbus Limestone, Delhi Member - Skeletal limestone. light grey, with minor pyrite, Vug-filling euhedral Calcite Crystals. Abundant fragments of pelmatozoans, Rugose and colonial corals, brachiopods, and trilobites.

Columbus Limestone, Bellepoint Member - dolomitic limestone, dolostone, and chert, Spar Cement, fine to Coarse Crystalline. Well developed styolites.

Salina Group undifferentiated - dolostone, Chert, minor Shale, Medium grey to yellow-grey. Thin bedding to laminated; interlaminated with Shales in some intervals.

REFERENCES CITED

Kovach,J.,and F.J Baker, 1966, Project X-301 Physical Studies- Geology of Franklin County, Ohio; Comprehensive Regional Plan of Columbus and Franklin County,25 p.3 figs.

Stauffer,C.R., G.D. Hubbard, and J.A. Bownocker,1911, Geology of the Columbus Quadrangle, Geological Survey of Ohio Fourth Series, Bulletin 14, 129 p. 3 maps

Bore Data: available at Office of The University Achitect

Alcon Core Drilling of Columbus

Columbus Diamond Core Drilling Company

Columbus Test Boring Company

Columbus Testing Laboratory

Grey, Hamilton, Professional Engineer; Site Plan Reports

Dunbar Geotechnical Engineers

H.C. Nutting Co., Engineers and Chemists

Mason, Sandefur, and DeVerteuil,inc.