



# Stratigraphic and Structural Interpretations of the Prairie du Chien Group, Western Wisconsin and Eastern Minnesota

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**BIESANZ STONE**

*From the Earth to You*

## Abstract

The Prairie du Chien group in western Wisconsin and eastern Minnesota is a large supplier of dimension stone. The durability of these blocks allows them to be used in a wide variety of applications from small garden steps to large building stones. There are several different stratigraphic intervals in the Oneota Formation that are ideal for dimension stone, and identifying these intervals would increase the production of stone in the Prairie du Chien region. Detailed stratigraphic analyses of the Oneota Formation in Winona, Minnesota are used to determine zones of stratigraphic intervals of economic importance. The Oneota Formation is a cliff forming sandy dolomite that forms the bluffs along the Mississippi River. Petrologic and geochemical analysis have been conducted to determine the vug density and sand content. These data are essential in dividing the group into separate members and determining the lateral and vertical variations within members.

## Introduction

Dolomite from the Oneota Formation is ideal for a variety of applications in construction and landscaping, and has been mined at the Biesanz Stone Quarry in Winona, MN for over 100 years. Expansion of the quarry requires identification of high quality materials in the subsurface in adjacent leases. Detailed analysis of lithologic, petrologic, diagenetic and geochemical characteristics of quarry strata will be used to assess the quality of materials in drill core from adjacent properties. Eventual correlation between the on-site stratigraphic sections and off-site drill cores will serve as an essential reference for future mine expansion.

## Local Uses

Dimension stone from the Biesanz Stone Quarry is distributed nationwide for use in construction as natural stone panels and finishing material. It can be seen locally across Western Wisconsin and Eastern Minnesota in a wide variety of public and private buildings. Dimension stone from the Biesanz Stone Quarry was used extensively in the construction of the new W.R. Davies Student Center on the UW - Eau Claire campus, and may be found as facing stone on the external walls of the building, on all eight large fireplaces, and forms the benches that create the outdoor amphitheater.



At the Acuity Insurance Headquarters in Sheboygan, WI, Biesanz Natural Stone Panels were used to line the exterior of the building and Biesanz Minnesota Dolomite Limestone (MDL) was used on the interior tile flooring, wall columns and stairs.



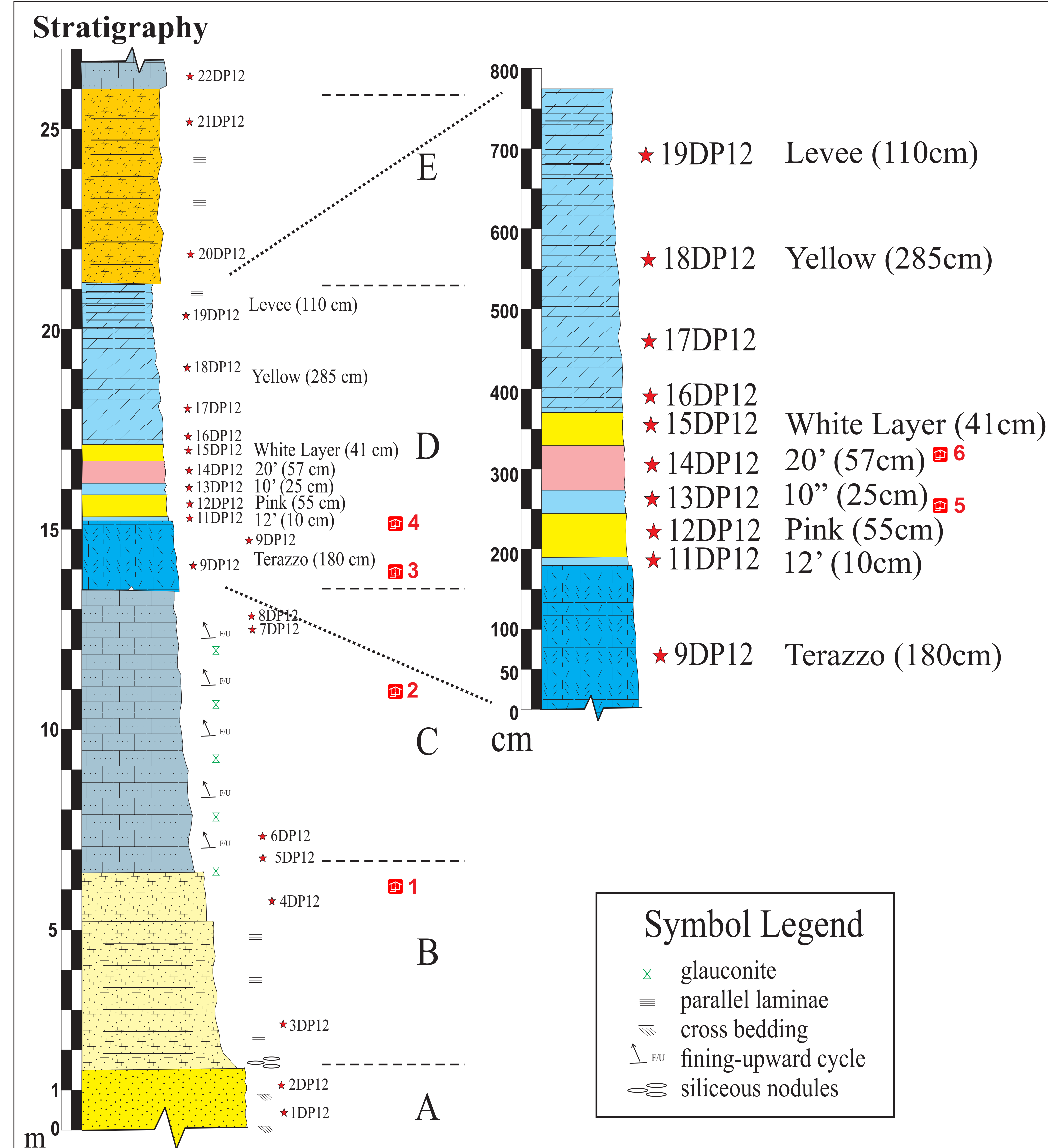
Goldfarb School of Nursing at Barnes-Jewish College in St. Louis, MO utilized natural stone panels to create a prominent image for their new nursing program.



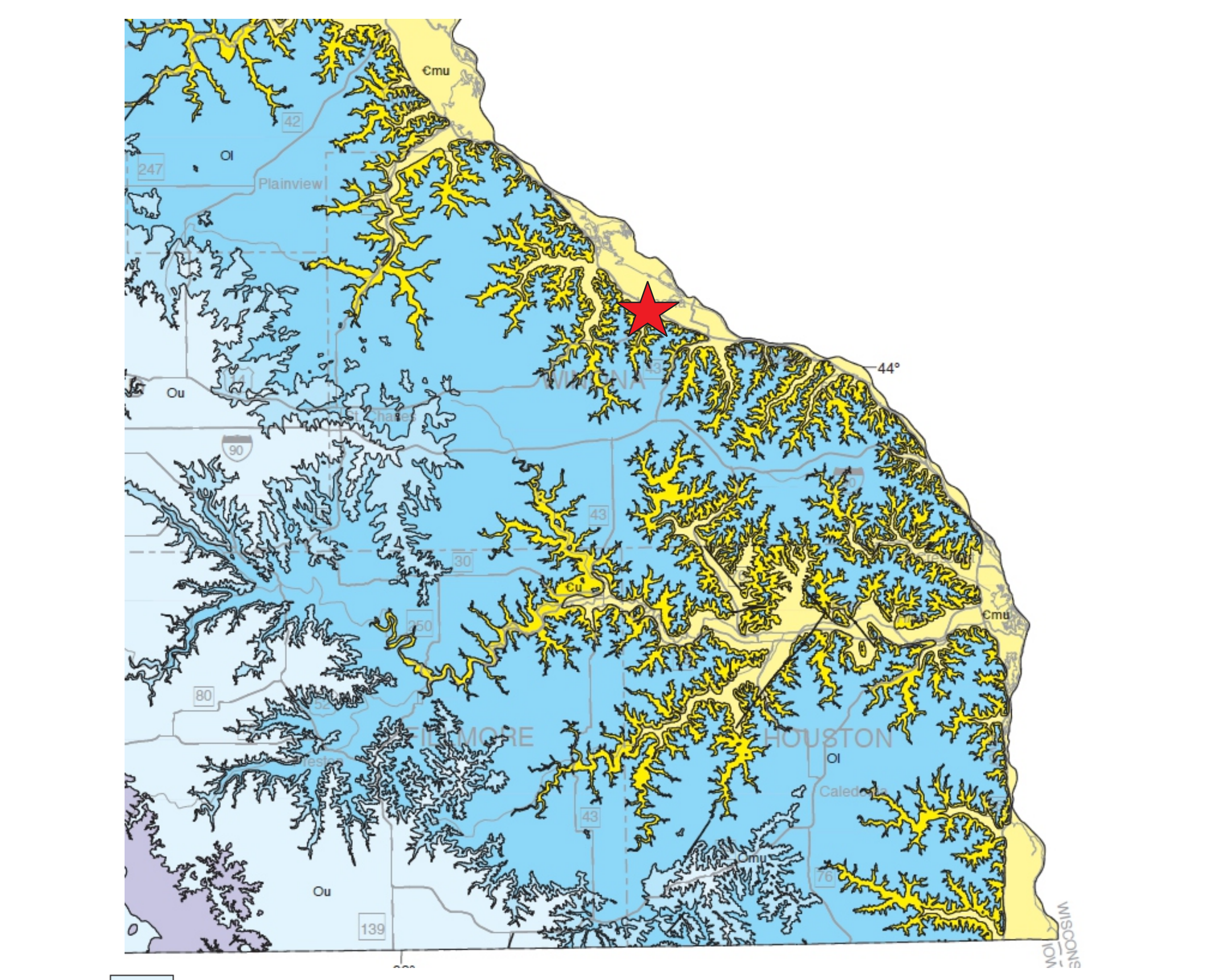
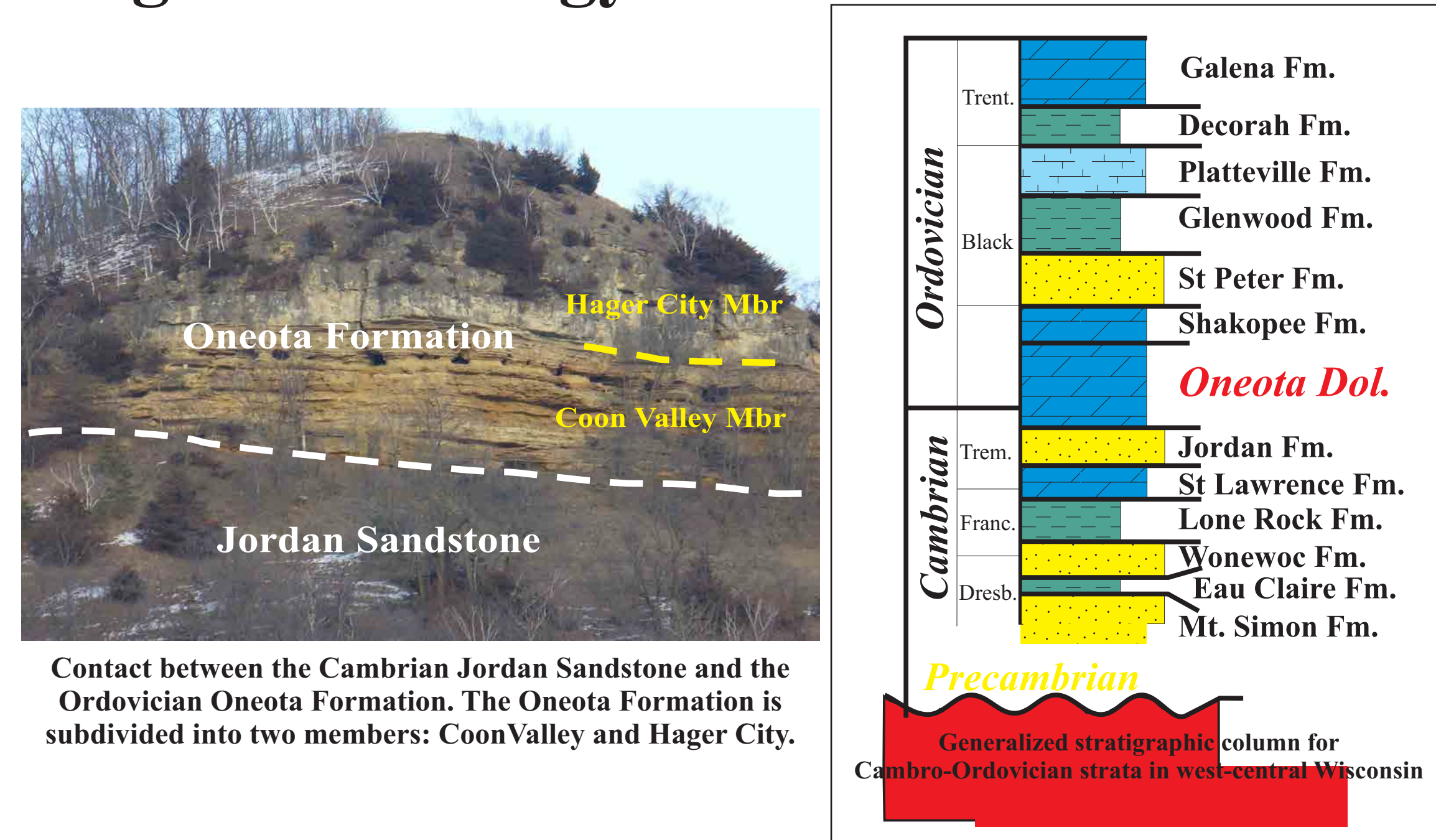
Dolomite dimension stone being applied to the exterior of W.R. Davies Student Center during construction in the Spring of 2012.

## Analysis

Detailed stratigraphic analysis of the Oneota Formation of the Prairie du Chien Group in the Biesanz Stone Quarry in Winona, Minnesota was used to characterize the economically important components of the stratigraphy. Lithologic and diagenetic characteristics were documented by detailed (1:100) analysis of quarry strata. Petrologic characteristics will be documented by thin section petrography. Major and trace element geochemistry was conducted via Sequential X-ray Fluorescence (XRF) Spectrometry at the University of Wisconsin - Eau Claire.

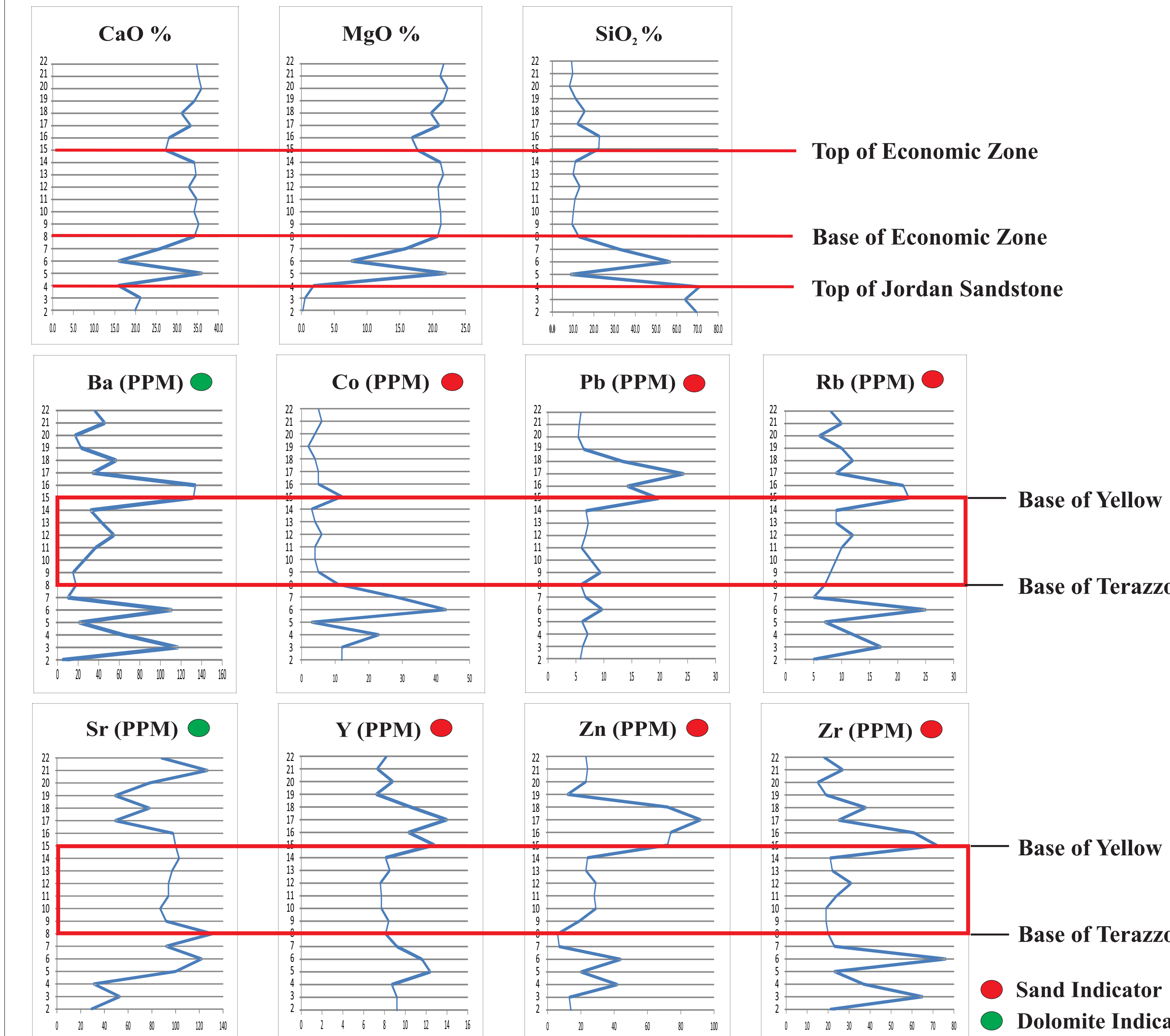


## Regional Geology



## Geochemistry

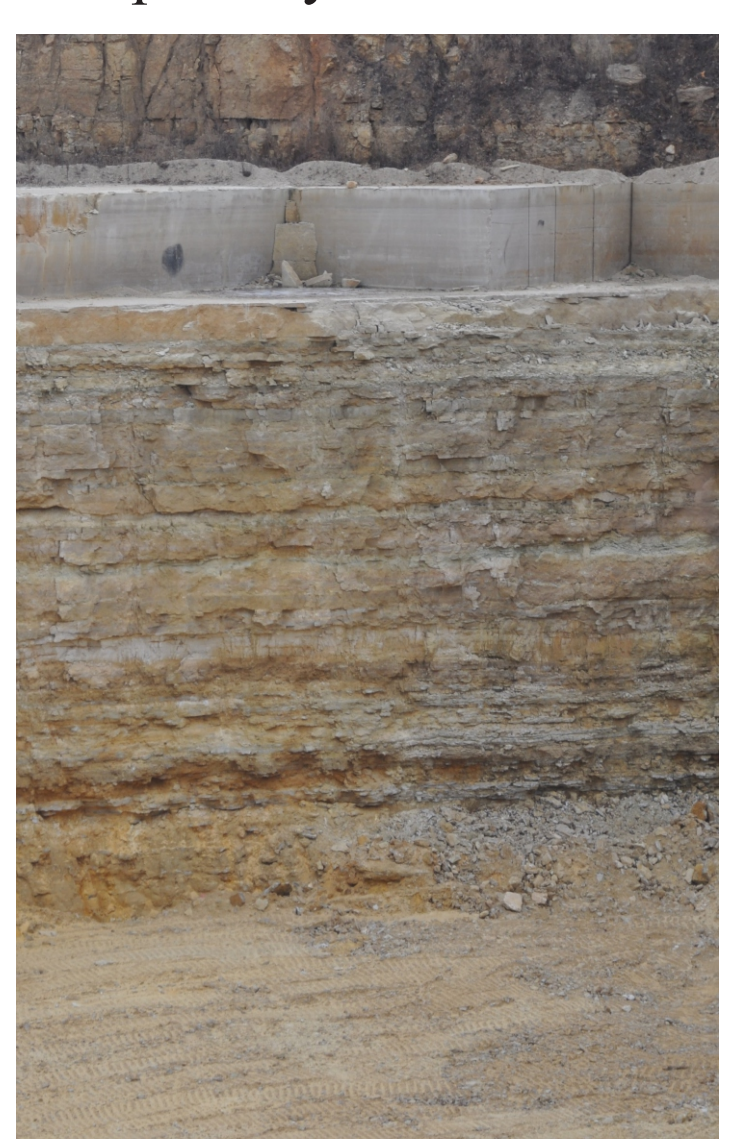
**Hypothesis:** Our initial hypothesis was that the quality of the dimension stone was fundamentally controlled by the quartz sand content and the percentage of vugs present in the units. Geochemically, an influx of quartz sand would be indicated by an increase in SiO<sub>2</sub>, Zr, Sc, Ce and other trace elements. Conversely, a decreased sand content would lead to elevated MgO, CaO, Ba, Sr and other elements with an affinity for carbonate.



**Conclusions:** The geochemical data gathered from stratigraphic samples confirmed the assumption that the quality of the dimension stone is at least in part controlled by the amount of quartz sand in the strata. Note that both major and trace element geochemical plots display a critical elemental shift at the base of the productive zone (Terazzo Ledge). Note the distinct increase in MgO, CaO, Ba, and Sr and decrease in SiO<sub>2</sub>, Zr, Sc, Ce, reflecting a decrease in the clastic component. A transition zone of integrated sandstone and dolomite can also be observed stratigraphically below the indicated switch in systems.

**Acknowledgments:** This project is a collaborative effort between the Department of Geology at the University of Wisconsin-Eau Claire and the Biesanz Stone Company. Pete Schwab of Biesanz Stone Company is thanked for project oversight and quarry access. Darrell Reed of SEH, Inc. is thanked for project management and access to drill core.

Generalized stratigraphic subdivisions utilized in the Biesanz quarry to classify different qualities of building stone. Note the 'productive zone' consists of several different discrete intervals based on hardness and durability that determine the primary use.



Thickness	Color	Quality	Primary Use
Varies	Fractured Rock	Best (hardest) Crushed Aggregate	
24" - 36"	Levee Ledge	Softer Stone	
10" ±	Fractured Rock	Waste Material / Landscape material or veneer	
12"	White Ledge	Thicker Uses - Dimensional Stone	
20" - 30"	20" Ledge	Wall Rock	
10" - 14"	10" Ledge	Biesanz Panel - sawed thin	
18" - 36"	Pink Ledge	BEST STONE	
12" - 18"	12" Ledge	Sometimes landscaping	
24" - 48"	Terazzo Ledge	Generally not quarried	
45" - 50" ±	Fractured Rock / Sand Rock	Too soft to make good aggregate	