

Drastic Lithologic Variations within Glacial Deposits: Case Study in Worth, Illinois

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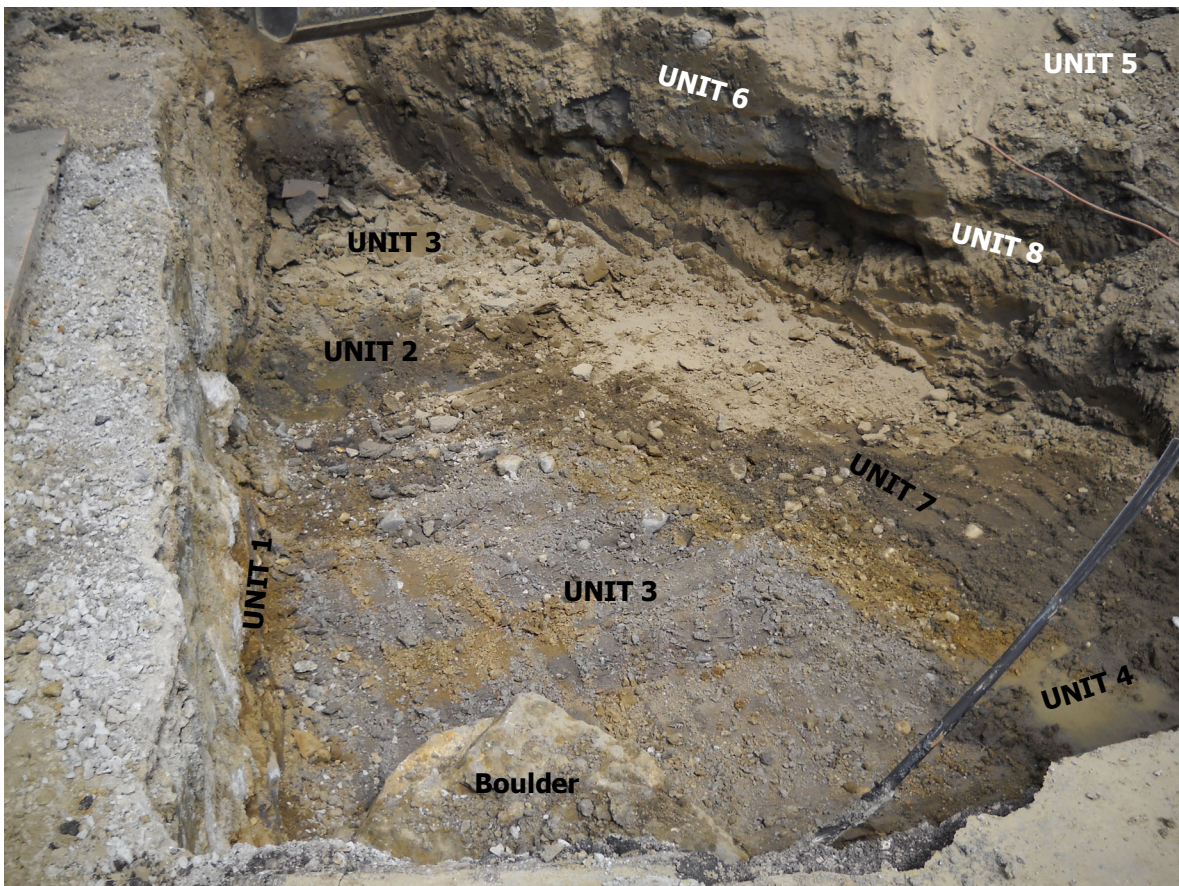
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Drastic Lithologic Variations within Glacial Deposits: Case Study in Worth, Illinois

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Excavation Pit looking North

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Introduction

This report addresses how geologic materials can vary greatly within a small area. It is important to understand these lithologic variations because anything that happens beneath the surface is controlled by the geology. These sharp variations can influence groundwater flow, groundwater minerals, foundation settlements, and contamination routes.

Method

The site is located in Worth, Illinois (see Figure 1) and was excavated in September of 2009 to install a slurry wall on the property in order to attempt to control the flow of benzene contamination to the north. All units recorded were studied within the excavation area and samples were taken to preserve the recorded lithology.

Geology of the excavation

According to the only published geologic map of the area (see Figures 2A and 2B) the excavation falls onto the contact of two main geologic units. The geologic map was done in a time when glacial units were not given formal status. What is labeled "Ql" on the map is the reworked Wadsworth Formation. What is labeled as "Qr" is now called the Henry Formation. "Qr" is mostly the remnants of outwash cobbles, gravels, and slack water silt deposits with sand. Most Units in Figure 3 are of the Henry Formation. Only several Units are not part of the Henry Formation. In Figure 3, Unit 6 is believed to be the only representative of the Wadsworth Formation in the excavation. Unit 5 is modern backfill material. Unit 9 is buried topsoil. Unit 4 is subglacial outwash, and Unit 3 is the Lemont Formation.

Other than what is visible in the excavation some background data was needed to assess the depth to bedrock (bedrock is not exposed at the surface) and the extent of subsurface units.

API Wells:

The bedrock is buried in the area and is from about 520 feet above MSL to about 560 feet above MSL based on wells in the area. One water well was utilized in this study and is mapped in Figure 1 (API Well # 120310231500 or 31500 for short). It is a private well at an elevation of 607 feet above MSL, and the elevation of the bedrock surface is 521 feet above MSL.

The well logs typical glacial till from the surface to a depth of 66 feet with a strong sand lens or tongue from a depth of 4 to 30 feet. This sand lens most likely extends west into the excavated area and is labeled as Unit 4 in Figure 3. This sand lens has no formal rank and depending on its extent it may separate the Wadsworth Formation from the underlying Lemont Formation in the area. From 66 to 81 feet below the surface is clay and gravel of what used to be called the Lemont Drift but is now the Yorkville Member of the Lemont Formation. From 81 to 86 feet down is gravel that is typical on top of bedrock. The gravel has no formal name. At a depth of 86 feet is the dolostone bedrock. The well log does not give detailed descriptions, so it is impossible to tell if it is the Sugar Run Formation or the overlying Racine Formation, both of which are Silurian in age.

Geologic Effect on People

As seen in Figure 3 the geology can get complicated within the area. The fact that coarser deposits intertongue with glacial tills can complicate contamination routes carried by groundwater flow. Perched groundwater in the area is moving from East-Southeast to the West-Northwest. The excavated pit had extremely elevated benzene contamination in unit 4. Benzene is a known carcinogen. Yet the site itself never had anything such as underground gas tanks that would cause the contamination. So where did it come from? If Unit 4 is indeed extensive and thickens from a mere 5 feet in the excavation to 26 feet in well number 31500, it is the most likely route that the benzene contamination followed from an east direction west to the site and ultimately to Stoney Creek (see Figure 1). There are plenty of sources of this contamination. Across the street to the east is a gas station. If the tanks are set in this sand layer than it is the most likely source of the benzene.

This contamination should not effect the local drinking water on a large scale due to the fact that the entire City of Worth gets its water from Lake Michigan. That being said, the contamination is known to be within 6 feet of the surface in the excavation it could potentially enter a cracked or corroded water line set at the typical 5 foot depth, thus polluting the drinking water. There are other health hazards as well. The benzene could pollute the air in people's basements creating a vapor health hazard. This would cause headaches, light-headedness, and fowl odors in the short term. In the long term, such vapors can cause cancer even if they cannot be smelled.

Conclusions

Understanding the geology and mapping subsurface units is very important. Not only to understand the history of the Earth, but also to protect people from the modern gasoline-dependent society that we as humans rely so much on.

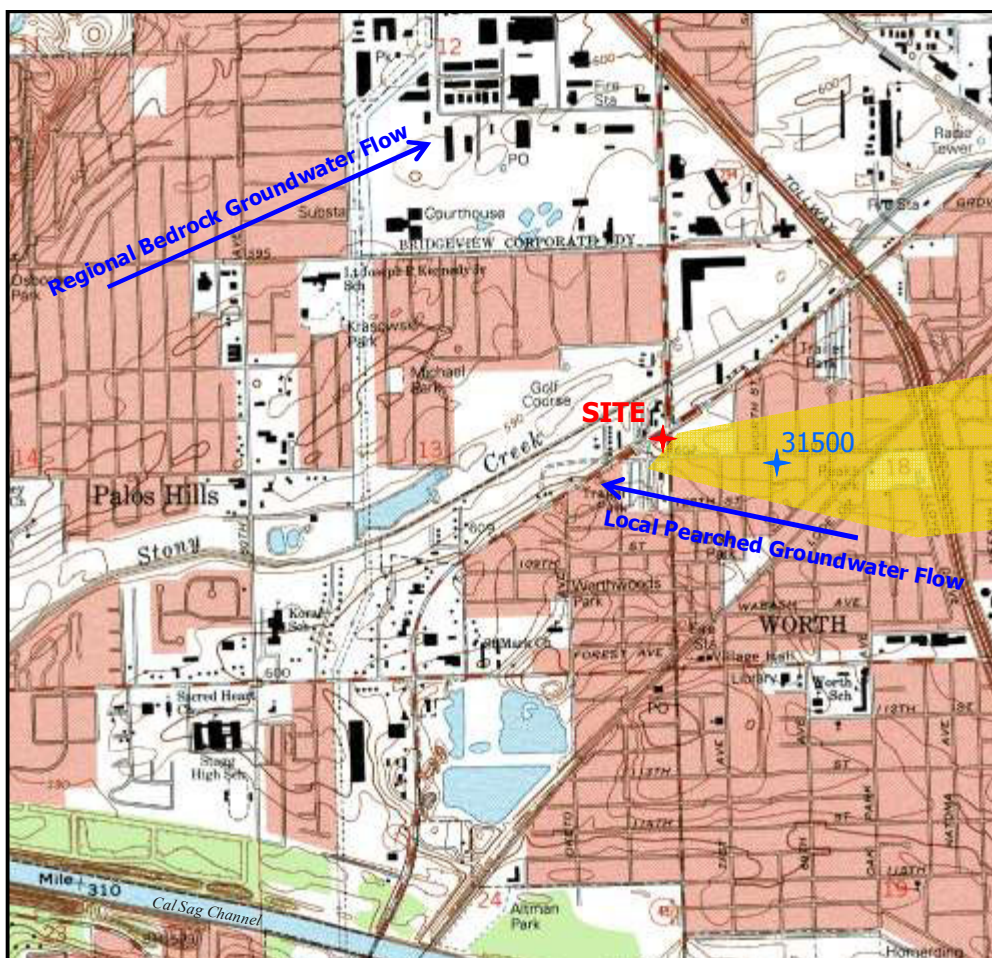
FIGURE 1: Site Location Map

GPS location of the northern tip of excavation:

N: 41.697866

W: 87.979965

Elevation: 600 feet above Mean Sea Level (MSL)



LEGEND:

Contour Interval = 10 feet

2400 feet



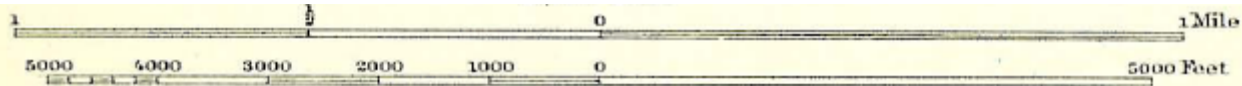
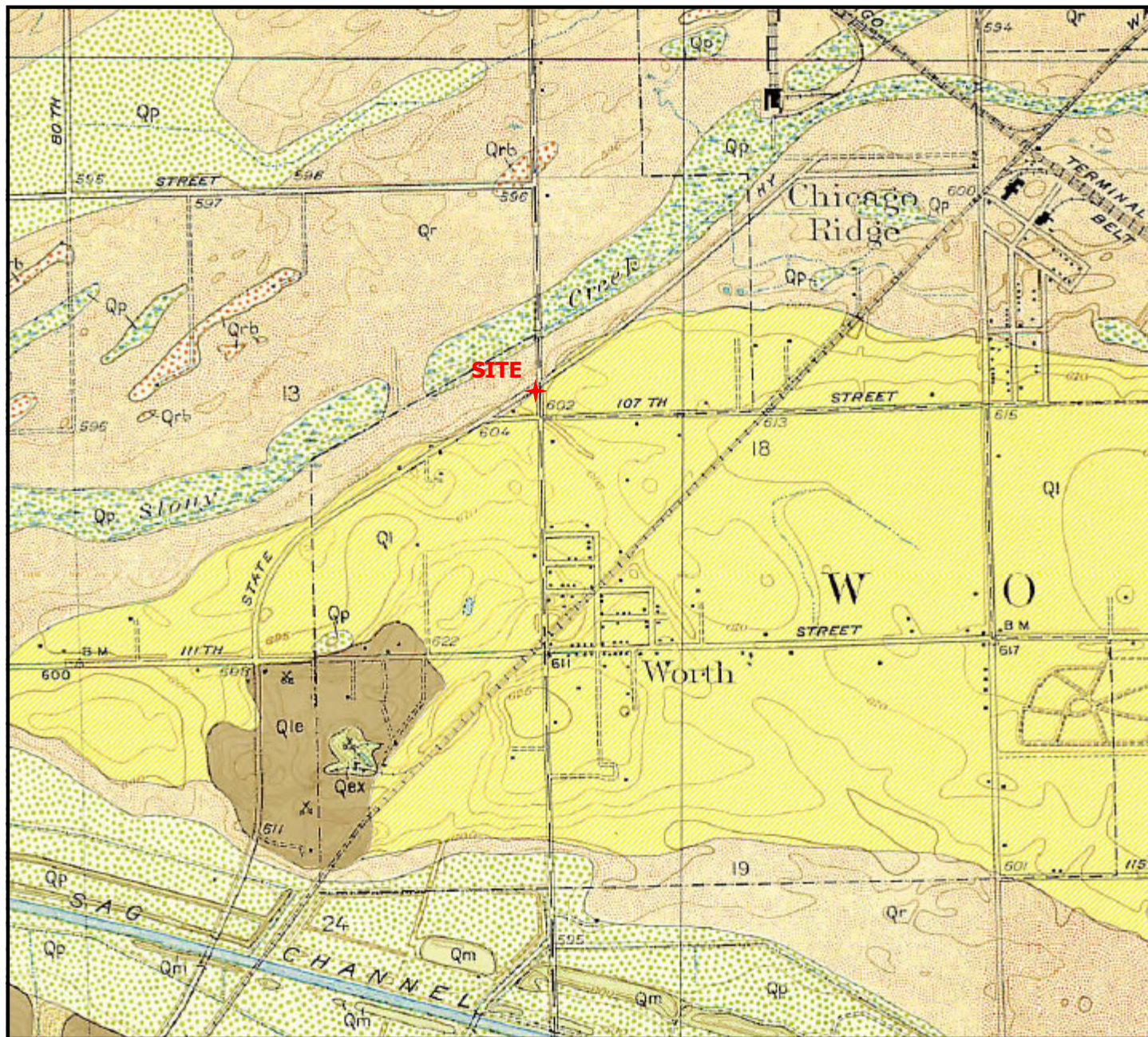
31500 Water Well used in study

Theoretical Extent of sand tongue/lens

SURFICIAL GEOLOGY OF THE PALOS PARK QUADRANGLE

BY

J HARLEN BRETZ



Contour interval 5 feet.
Datum is mean sea level.

Geologically surveyed in 1930-1932.
In connection with other
quadrangles of the Chicago area.



FIGURE 2A: Surficial Geologic Map

SURFICIAL GEOLOGY OF THE PALOS PARK QUADRANGLE

BY
J HARLEN BRETZ

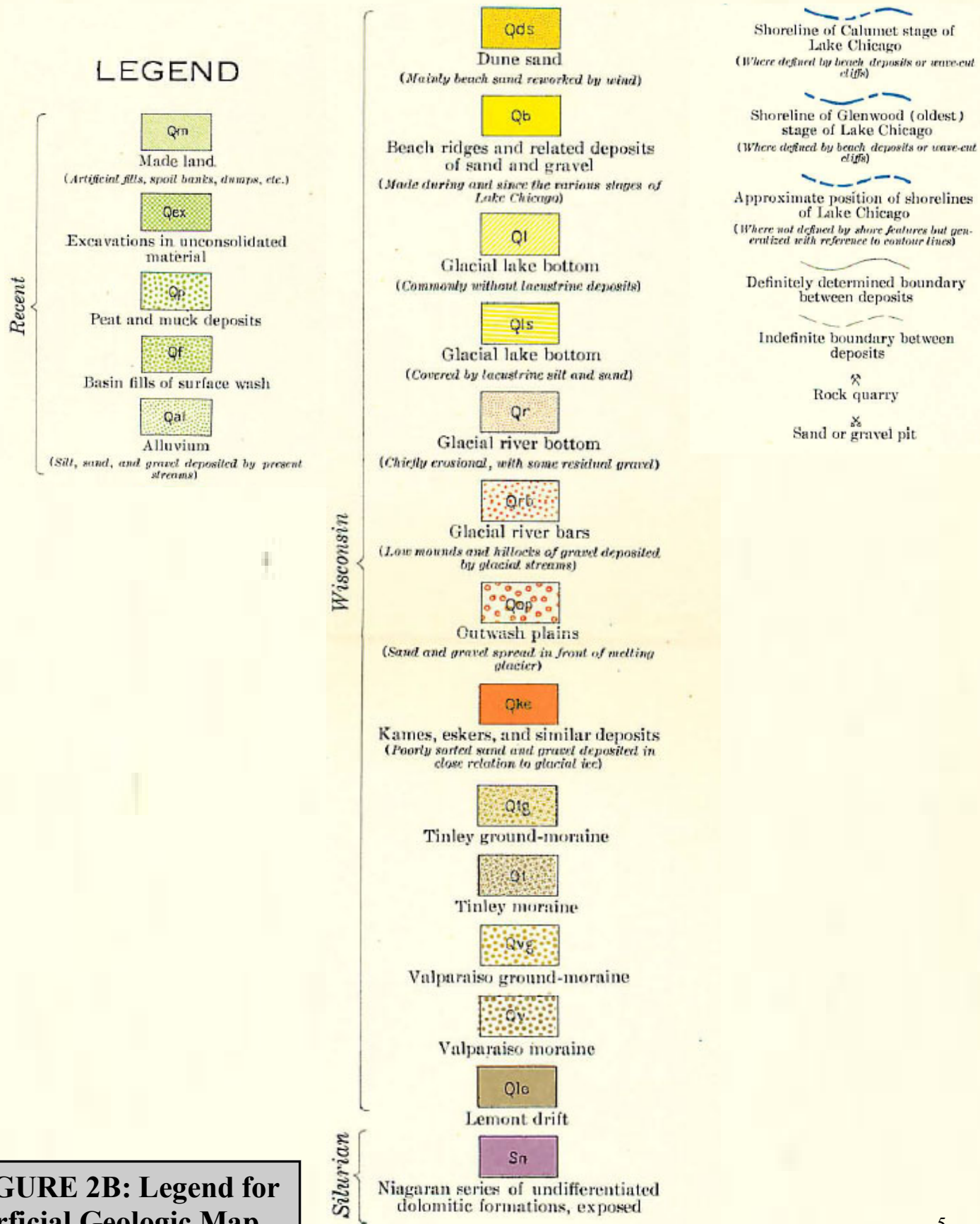
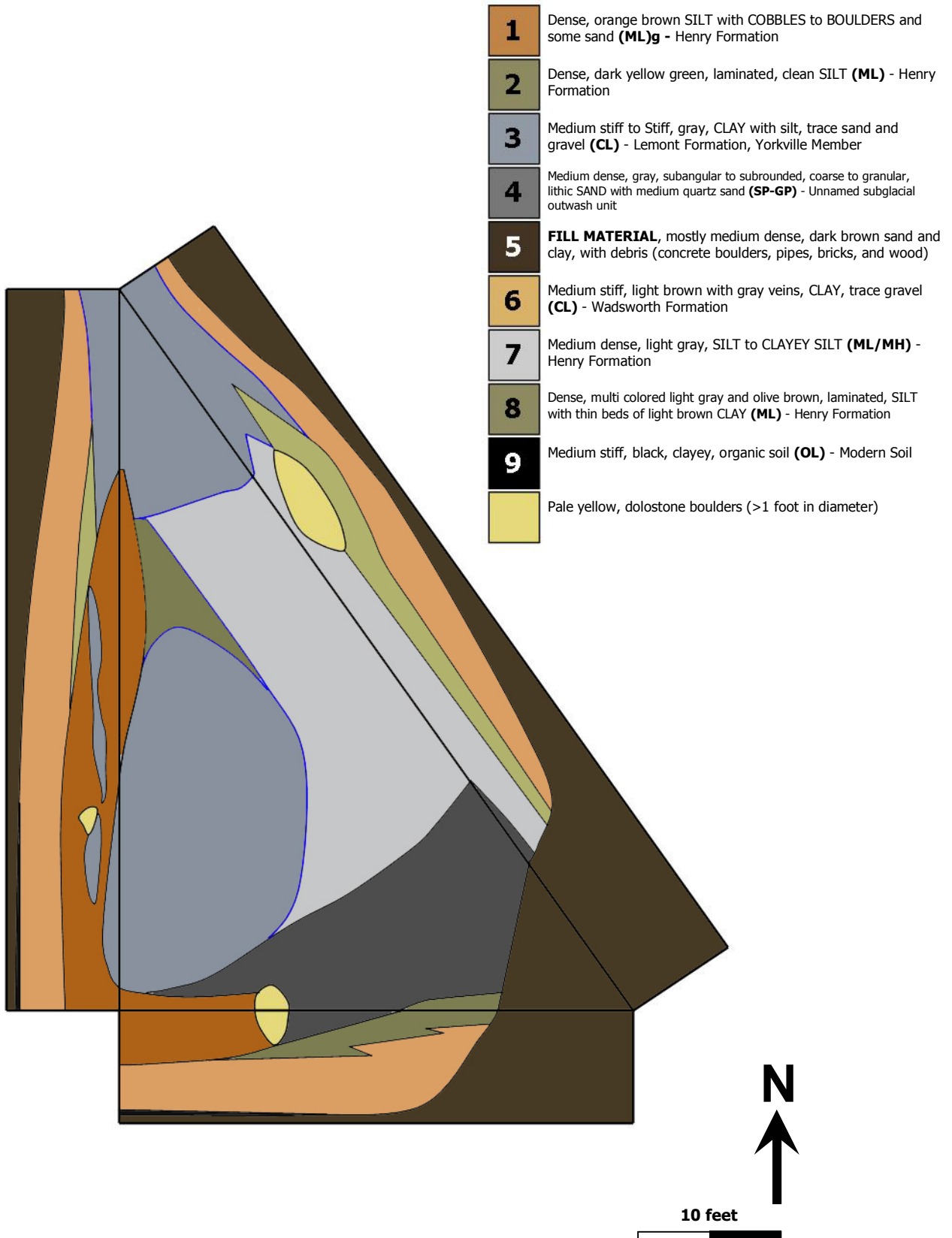


FIGURE 2B: Legend for Surficial Geologic Map

FIGURE 3: Lithologic Units in the Excavation Pit.



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API Well Logs: 120310231600, 120310231500, 120310213000

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