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August 7, 2023

National Land Developers, LLC
1010 Wilson Avenue
Glen Mills, PA 19342

TO: **JOSEPH MARLEY, PRESIDENT**

FROM: **ROBERT COOK, PH.D., P.G., COOK GEOLOGIC, LLC**

RE: **CONDITIONAL USE APPLICATION, MILFORD TOWNSHIP, PIKE COUNTY PROPERTY: 247 ROUTE 6 - TAX MAP PARCEL 096.00-01-16**

The purpose of this memorandum is to summarize observations of the sedimentologic characteristics of the above referenced property (the "Site"). These observations were made on August 2 and 3, 2023 as Midlantic Engineering, Inc. was excavating test pits for infiltration testing. Sixteen test pits arrayed around the perimeter of the proposed area of development were examined (Figure 1).

Observations

Photographs and field descriptions can be found in Exhibit 1. All excavations, except for I-1C and I-6E, exposed poorly sorted medium sand to cobbles. The largest cobbles were up to ~0.5 m in longest dimension. The pebbles and cobbles were sandstone and were well rounded. At location 1-4B, the cobbles appeared to be matrix supported (i.e., they appeared to float in a sand matrix). At locations I-2A, I-4A, and TP-15, graded, but still poorly sorted, bedding was present. No cross-stratification was observed. At location I-4A some cobbles exhibited weak imbrication suggesting eastward sediment transport. At locations I-6A and I-6B some cobbles exhibited weak imbrication and elongated cobbles exhibited preferred orientation suggesting south-southwestward sediment transport. Bedding, where observed, was approximately horizontal at all locations except for I-2A. At I-2A, bedding dipped 130^{o}, 23^{o} (i.e., southeastward).

Excavation I-1C exposed only fine sand. The sand appeared predominantly massive but thick laminae (~5 mm) were observed at some locations. Excavation 1-6E also exposed primarily massive fine sand. A thin lens of sand and cobbles was also present.

Groundwater was encountered in excavation I-6E. The excavation was initially without water. The water entered the excavation from a gravel layer near the base of the excavation (at ~1.2 m) and subsequently filled the excavation to a

level of ~0.7 m. It was unclear if this was a water table or simply discharge from a locally confined gravel layer of limited extent. The sediment at the bottom of I-6D was moist. The sediment at the bottom of TP-16 was wet.

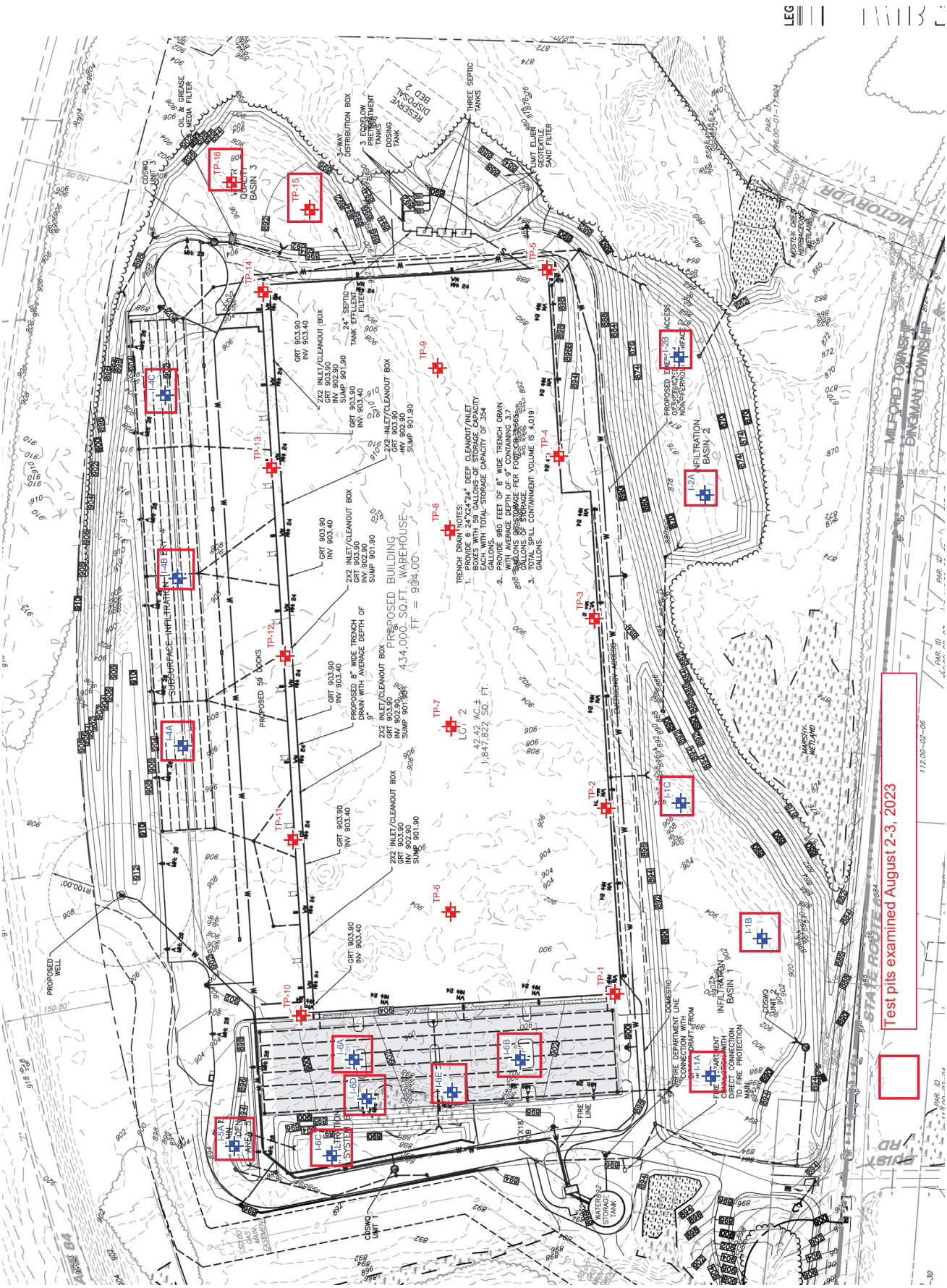
Interpretation

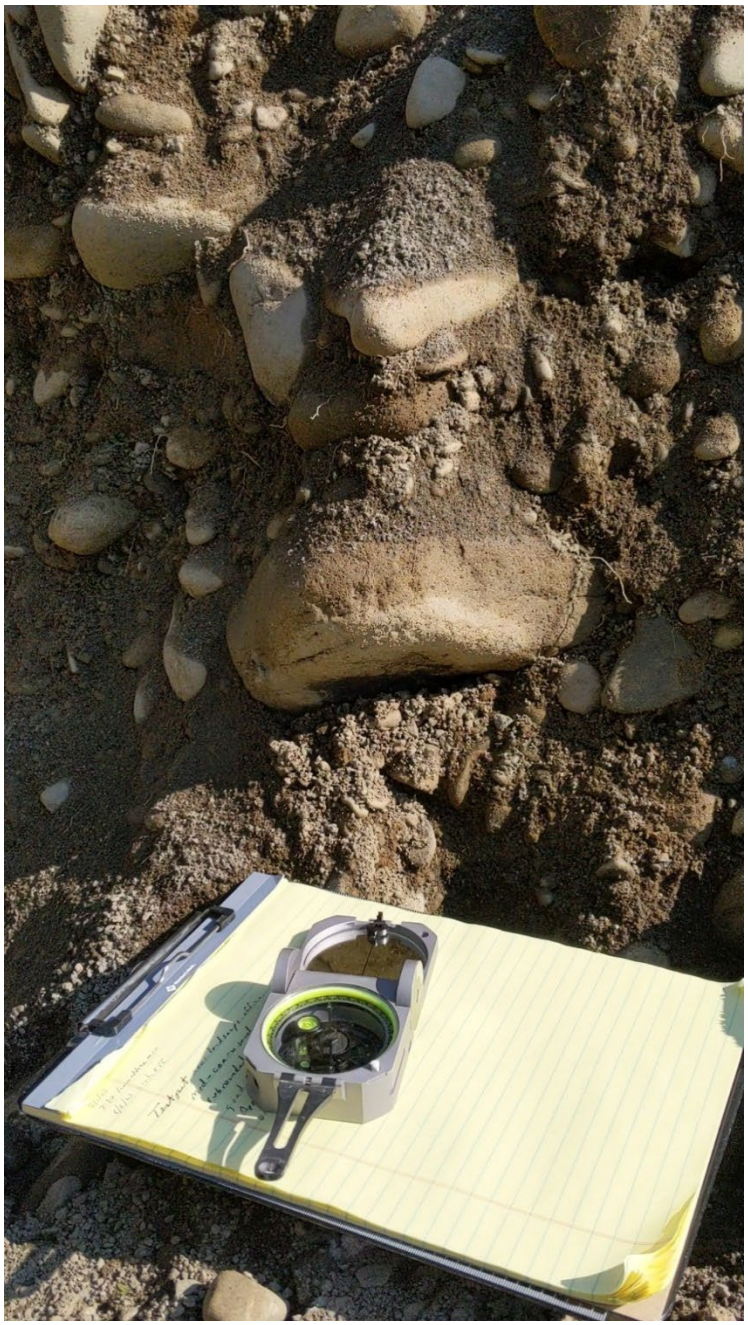
The sedimentology can be interpreted within the glacial-lake delta depositional framework for the region outlined by Witte (2012). The coarse texture and poor sorting of the sediments indicate rapid deposition in a water body from very high energy, sediment-choked, streams. [A modern analog may be the ongoing glacial outburst flooding near Junea, Alaska.] The approximately horizontal layering across most of the Site suggests that the deposits represent topset beds. A notable exception is location I-2A where the beds dipped southeastward toward the paleo-valley of Sawkill Creek. Those deposits are interpreted as foreset beds.

Fine sand deposits observed at locations I-1C and I-6E lacked evidence of transport (ripples, cross-stratification, etc.) and are interpreted as being deposited in small water bodies developed in Kettle holes. These fine sediments may have been transported by wind.

Attachments: Figure 1 – Test pit location map
Appendix 1 – Photographs with field descriptions

Figure 1





I-6B Rounded to well-rounded medium sand to cobbles. Poorly sorted, not graded. No bedding or sedimentary structures. Flat cobbles are approximately horizontal, weak imbrication in some cases. There is an apparent preferred long dimension orientation (200°, 198°, 186°, 196°). Total depth 1.5 m.

I-6B Well rounded prolate cobble. Cobbles up to ~0.5 m diameter are present. None appear to be faceted or striated.

I-6A Rounded to well-rounded medium sand to cobbles. Poorly sorted, not graded. No bedding or sedimentary structures. Flat cobbles are approximately horizontal, weak imbrication in some cases. Apparent preferred long dimension orientations (~185º). Total depth 1.4 m.

I-5A Medium sand to cobbles. Some fine sand and silt in B-horizon (to ~0.75 m). Total depth 1.5 m.

I6C On north (upslope) side of pond. Total depth ~1.5 m.

I-6C B-horizon 0-0.5 m silt to cobbles. 0.5 to 0.7 m coarse sand to pebbles. 0.7 to ~1 m coarse sand to cobbles. Layers are approximately horizontal (difficult to measure).

I-6D At north side of pond. The pond is approximately 1.2 m south with some standing water. Medium sand to cobbles. No sedimentary layering. Pebbles and cobbles are matrix supported. Total depth 1.3 m. Moist at bottom.

I-6E North wall of excavation adjacent to south side of pond. Fine sand 0 to 1.2 m. Water enters from pebble and cobble layer on west side at bottom. Large cobbles at surface. Small lens of sand and cobbles at 0.5 m in north wall. Water at ~0.7 m.

I-6E Water enters from pebble and cobble layer on west side at bottom. Sand, pebbles, and cobbles in west wall of excavation

I-4A Medium sand to pebbles with few cobbles layer 0-0.75 m, sand and cobbles 0.75 to bottom (1 m). Layer fines upward. Layer is nearly horizontal (difficult to measure). Some imbrication of cobbles suggests eastward transport.

I-4B Medium sand to cobbles. Cobbles are matrix supported.

I-4C Medium sand to cobbles.

TP-15 Medium sand to cobbles 0-1 m. 1 m to 1.2 m coarse sand layer. 1.2 m to 4.9 m coarse sand and cobbles. Appears to be graded with large cobbles at bottom (up to ~0.5 m) to smaller cobbles to a depth of 1.2 m. Layers are approximately horizontal.

TP-16 Coarse sand to cobbles. Approximately horizontal alignment of cobbles. Slightly finer material near bottom. Total depth 5.2 m. Wet at bottom (no water).

I-1A Medium sand to cobbles. Total depth 1.5 m.

I-1C Fine sand. Platy structure in some areas. Predominantly massive. Thin planer beds are evident in some areas. No ripples or other sedimentary structures. (Relocated to 41.337739, -74.830601)

I-1C Fine sand showing thick lamination (~5 mm).

I-1B Medium sand to cobbles. Large cobbles at base (difficult excavation). Total depth 1.5 m.

I-2A Medium sand to cobbles 0 to 1.2 m. Medium sand and medium sand to cobble layers at bottom. Layers dipping ~130º, 23º. Total depth 2.1 m.

I-2A Medium sand with few granules and pebbles at 1.2 m. Possible small slump structure at top of meter stick.

I2-B Old road. Buried A-horizon at 0.7 m. Medium sand to cobbles to 1.5 m.