Soil Reconnaissance Report
For
Parks Bergamo LLC
On
Tax Map Parcel Number:
234-20.00-22.00

Report Conducted
By
Delmarva Soil Services
Phillip S. King
Soil Scientist
D Lic# 4159
CPSC 24789
and
Matt King

DSS
10912 Old Furnace Road
Seaford, DE 19973
301-606-8000

General Site Information

The parcel of land is situated 0.4 miles west of Morris Mill Rd and its intersection with Gravel Hill Rd, north of Millsboro in Sussex County, DE. The property is zoned as Agricultural/Residential.

It is presently owned by Parks Bergamo LLC of Oradell New Jersey

The parcel consists of about 50 acers plus or minus of wooded land adjacent to Morris Mill Rd. Adjacent land use to the west and south is residential development (Country Meadows), to the east is row crops and residential housing. The north is row crops and is wooded.

History of Land Use

This parcel of land is wooded since 1937. In 2015 selective timbering was conducted on the parcel. The parcel is currently a mix of old growth and new growth forest.

Relief

Relief on this parcel is relatively flat and general slopes from south to north and drains into a channelized tributary of Cow Bridge Branch. The highest elevation on the property is 30 feet. The lowest elevation is 24 feet and is adjacent to the channelized tributary.

Geology

The geology on this site, as determined by Delaware Geologic Survey, shows it to be on the Lynch Heights Formation. This formation is composed of light-gray to brown to light-yellowish brown, medium to fine sand with discontinuous beds of coarse sand, gravel, silt, fine to very fine sand, and organic-rich clayey silt to silty sand. Upper part of the unit commonly consists of fine, well-sorted sand. Small-scale cross-bedding within the sands is common. Some of the interbedded clayey silts and silty sands are burrowed. Beds of shell are rarely encountered. Sands are quartzose and slightly feldspathic, and typically micaceous where very fine to fine grained. Unit underlies a terrace parallel to the present Delaware Bay that has elevations between 50 and 30 feet. Interpreted to be a fluvial to estuarine unit of fluvial channel, tidal flat, tidal channel, beach, and bay deposits. (Ramsey, 1987) Overall thickness ranges up to 50 feet.” My soil reconnaissance agrees with this determination.

Surface Hydrology

This parcel drains into the Cow Bridge Branch tributary to the west where it empties into Cow Bridge Branch, upon which is dumps into Millsboro Pond on its way the Indian River Bay. The 12 unit HUC for this site is (20403030201) Cowbridge Millsboro Pond. The 10 unit HUC for this site is (204030302) Indian River Bay.

Wetland

According to DNREC environmental navigated 2007 wetland map, no wetlands are located on the property. My field investigation determined that hydric soil and wetland vegetation do occur on the property but are directly adjacent to the Cow Bridge Branch tributary. To conform this, I suggest that a ground water monitoring study be conducted to confirm the absence of wetland hydrology.

Soils and Septic Suitability

The soils mapped by NRCS and depicted on Web Soil Survey show three soil map units on this parcel. The first map unit PsA Pepperbox-Rosedale complex 0 to 2 percent slopes is moderately well drained with a slowly permeable clayey substratum. It occurs on the northern two third of the property. The southwest portion of the property is mapped FhB Fort Mott-Henlopen complex 2 to 5 percent slopes and FhA Fort Mott-Henlopen complex 0 to 2 percent slopes and is well drained with rapid permeability.

My investigation document similar soil conditions with the exception of the soils directly adjacent to the tributary of Cow Bridge Branch. Please see Fig 1 for location.
In general, the soils on site have a seasonal high water table which ranges from 10 inches to 65 inches across the entire parcel. The permeability of the soils is typically rapid (10 to 20 mpi) in the upper 3.5 feet and slow over very slow (90 to 120 mpi) below 3.5 feet.

Soil suitability for onsite wastewater disposal systems according the DNREC regulations has been map and is shown on Fig. 1. The soils have been rated for system types which use $\leq$ 1500 gpd as requested. In the mapping of the soil on this parcel, I have constructed 6 map units. They are: **Denial, Denial-ALT, ESM, CF/FD LPP_MP, CF/FD LPP_SP, and CF/FD Gravity**.

The **Denial** map unit is unsuited for any and all onsite waste water system due to a seasonally high water table.

The **Denial/ALT** map unit is somewhat poorly drained with a seasonally high water table from 11 to 20 inches. The use of this map unit for onsite wastewater is severely limited. Alternative technology map possibly be used but this is solely at the discretion of DNREC.

The **ESM** map unit is suited for and Elevated Sand Mound, Peat Filter, or Micro-drip system(s). This map unit has a seasonally high water table from 20 to 27 inches and has permeability of 30-90 minutes per inch. The occurrence of a clayey substratum and subsequent slow permeability will make the footprint of the system quite large.

The **CF/FD LPP Moderate Permeability (MP)** map unit is suited for Capping Fill Low Pressure Pipe system(s). This map unit has a seasonally high water table from 27 to 47 inches. Permeability is less than sixty minutes per inch (MPI).

The **CF/FD LPP Slow Permeability (SP)** map unit is suited for full Depth Low Pressure Pipe

system(s). This map unit has a seasonally high water table from 27-47 inches. The occurrence of a clayey substratum and subsequent slow permeability (60-120 MPI) will make the footprint of the system quite large.

The **CF/FD Gravity** map unit is well suited for capping fill gravity system(s). This map unit has a seasonally high water table from 48- >72 inches.

Regardless of what type of onsite wastewater system that is used on this parcel, pre-treatment will be required and must meet PSN3 standards on account of this parcel residing within the Indian River drainage system.

*Soils between borings have yet to be determined. Further investigation is needed to properly classify.

SOIL UNIT	ACRES
CF/FD_GRAVITY	7.443779377
CF/FD_LPP_MP	15.67028523
CF/FD_LPP_SP	5.180630258
DENIAL	3.260254833
DENIAL/ALT	7.577298871
ESM	10.81911151

Encumbrances

Encumbrances on this parcel consist of two types. First there is a channelized stream shown on Fig 1. This area is precluded from installation of all onsite wastewater treatment and construction of any building. Secondly, the wells on the adjacent properties will impact onsite wastewater approval because of a one-hundred-foot setback requirement by DNREC.

Summary of Investigation

The subject parcel has considerable variability in soil physical properties. The seasonally high water tables ranging from 10-65 inches. The permeability of the soils on site are general rapid in the upper solum (0 to 3.5 ft) and slow in the substratum 3.5 to 6 feet.

Respectfully Submitted

Phillip S. King
Soil Scientist CPSC
Lic# D 4159
CPSC 24789

Appendix

FIG 2

Soil Classification	**Abbreviation**
Typic Hapludult	Ty Hap
Arenic Hapludult	Ar Hap
Aquic Hapludult	Aq Hap
Aquic Arenic Hapludult	Aq Ar Hap
Typic Paleudult	Ty Pal
Typic Endoaquult	Ty End
Typic Umbraquult	Ty Umb
Typic Alaquods	Ty Alaq
Oxyaquic Hapludult	Ox Hap

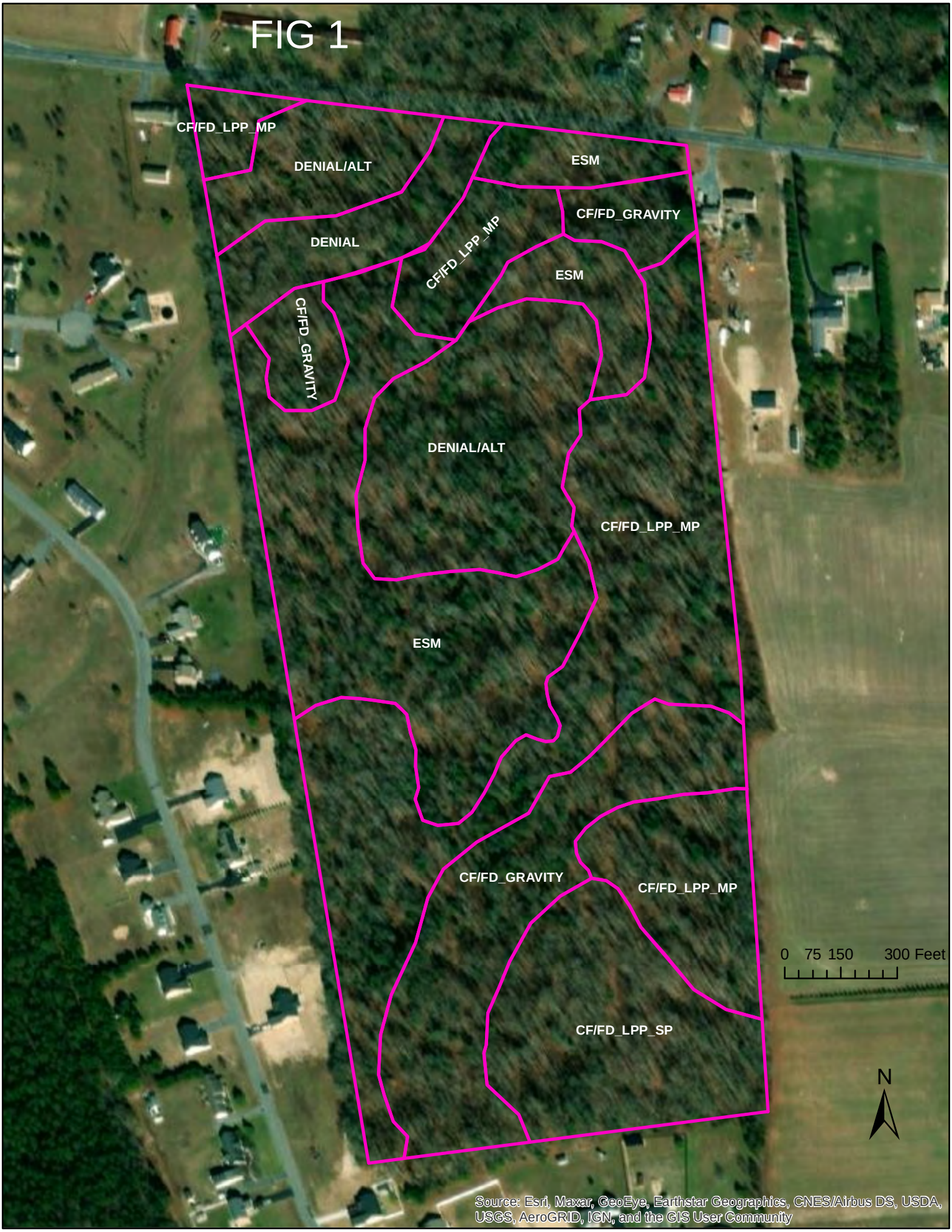
FIG 1
CF/FD_LPP_MP
DENIAL/ALT
ESM
CF/FD_GRAVITY
DENIAL
CF/FD_LPP_MP
ESM
CF/FD_GRAVITY
DENIAL/ALT
CF/FD_LPP_MP
ESM
CF/FD_GRAVITY
CF/FD_LPP_MP
CF/FD_LPP_SP
0 75 150 300 Feet
N
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


FIG 2
OX HAP
AQ HAP
OX HAP
OX HAP
AQ HAP
OX HAP
TY HAP
AQ HAP
OX HAP
AQ HAP
TY HAP
TY HAP
AQ HAP
OX HAP
AQ HAP
AQ HAP
OX HAP
OX HAP
AQ HAP
OX HAP
AQ HAP
OX HAP
OX HAP
OX HAP
AQ HAP
OX HAP
OX HAP
AR HAP
OX HAP
OX HAP
OX HAP
AR HAP
OX HAP
AR HAP
OX HAP
0 65 130 260 Feet
AR HAP
OX HAP
OX HAP
AR HAP
OX HAP
OX HAP
N
AR HAP
OX HAP
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


FIG 3 (DEPTH TO LZ IN INCHES)
35
19
26
24
13
34
55
10
24
23
40
62
16
30
12
12
27
24
21
34
22
24
37
24
22
34
35
34
55
24
36
36
54
36
65
28
36
46
32
35
61
28
0 65 130 260 Feet
N
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community