An Evolving Wastewater Island in Henrico Co., VA

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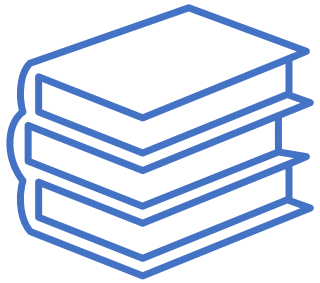
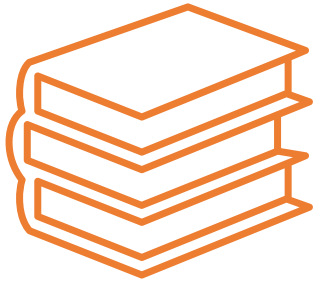
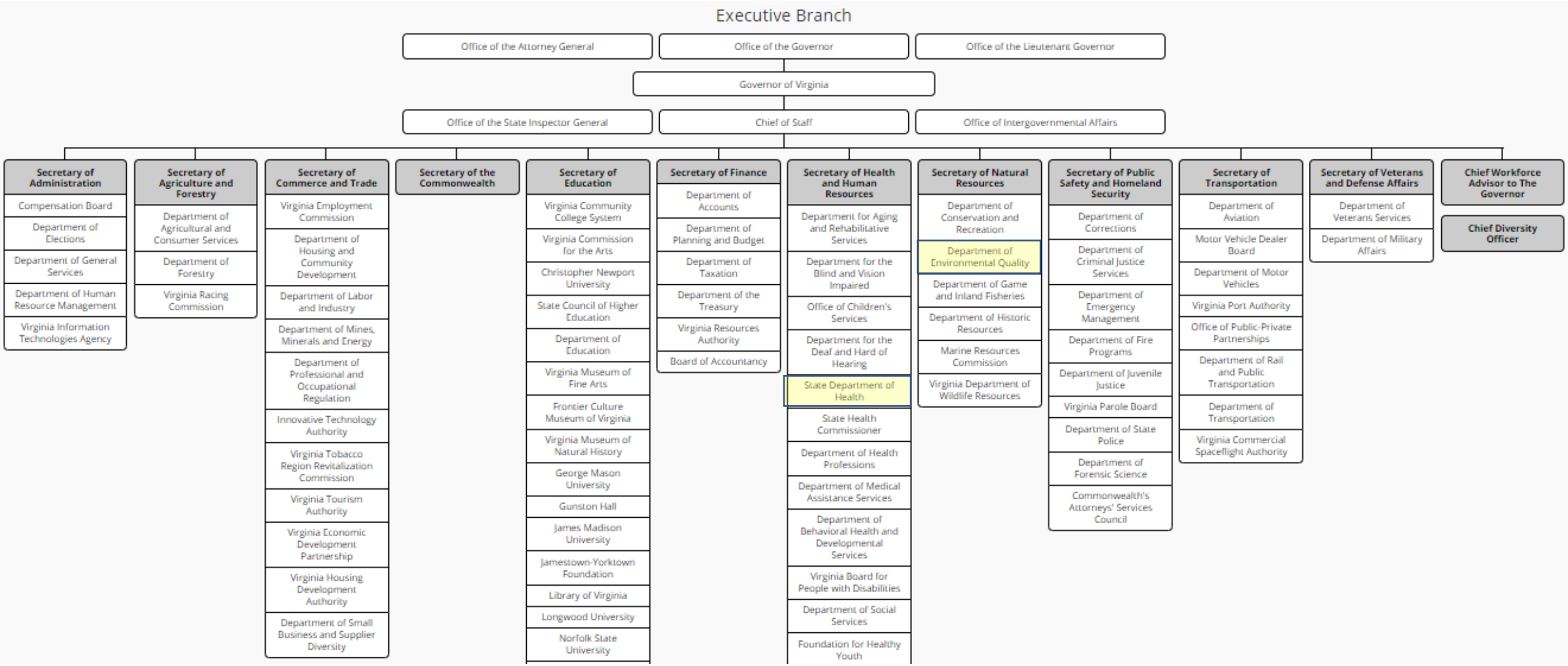


Federal Laws



State Laws

Local Laws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Office of the Governor
Office of the Lieutenant Governor
Governor of Virginia
Office of the State Inspector General
Chief of Staff
Office of Intergovernmental Affairs
Secretary of Administration
Compensation Board
Department of Elections
Department of General Services
Department of Human Resource Management
Virginia Information Technologies Agency
Secretary of Agriculture and Forestry
Department of Agricultural and Consumer Services
Department of Forestry
Virginia Racing Commission
Secretary of Commerce and Trade
Virginia Employment Commission
Department of Housing and Community Development
Department of Labor and Industry
Department of Mines, Minerals and Energy
Department of Professional and Occupational Regulation
Innovative Technology Authority
Virginia Tobacco Region Revitalization Commission
Virginia Tourism Authority
Virginia Economic Development Partnership
Virginia Housing Development Authority
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Secretary of the Commonwealth
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+ CHESAPEAKE BAY
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+ STORMWATER
+ WASTEWATER
+ WETLANDS & STREAMS
+ LAND APPLICATION & BENEFICIAL REUSE
+ CLEAN WATER FINANCING

VDH VIRGINIA DEPARTMENT OF HEALTH

To protect the health and promote the well-being of all people in Virginia

Office of Drinking Water

Office of Environmental Health Services

- Bedding and Upholstered Furniture Program
- Childhood Lead Poisoning Prevention
- Food Safety in Virginia
- Marina Program
- Migrant Labor Camps
- Public Health Toxicology
- Shellfish Safety
- Tourist Establishment Regulation
- Waterborne Hazards Control
- Water and Wastewater Services

Onsite Sewage Systems and Environmental Justice in Virginia

Danna Revis
Virginia Department of Health
Lance Gregory
Virginia Department of Health

SB 1396 Onsite Sewage Indemnification Fund; use of Fund for grants to certain property owners.

Introduced by: **Ghazala F. Hashmi | all patrons** ... **notes | add to my profiles**

SUMMARY AS INTRODUCED:

Sewage; Onsite Sewage Indemnification Fund; Wastewater Infrastructure Policy Working Group; report. Authorizes the State Board of Health to use the Onsite Sewage Indemnification Fund to provide grants and loans to property owners with income at or below 200 percent of the federal poverty guidelines to repair failing onsite sewage systems or install onsite sewage systems on properties that lack adequate sewage disposal. The bill provides that no expenses shall be paid from the Fund to support the program for training and recognition of onsite soil evaluators, or to provide grants or loans to repair failing onsite sewage systems or install onsite sewage systems on properties that lack adequate sewage disposal in lieu of payment to any owner or owners qualified to receive payment from the Fund. The bill also directs the Board to adopt regulations that include consideration of the impacts of climate change on proposed treatment works.

The bill sets out the policy of the Commonwealth regarding wastewater infrastructure and establishes the four-member Wastewater Infrastructure Policy Working Group as an advisory board in the executive branch of state government to continually assess wastewater infrastructure needs and develop policy recommendations. The bill provides that the Working Group shall expire in 2030. The bill also directs the Department of Environmental Quality, in partnership with the Virginia Department of Health and in consultation with stakeholders, to estimate and report every four years the amount of wastewater infrastructure funding that is necessary to meet policy goals but is not eligible to be covered by grant funding pursuant to the Virginia Water Quality Improvement Act of 1997.

Poverty Guidelines, 48 Contiguous States (all states except AK and HI)

2021 Annual

Household/ Family Size	25%	50%	75%	100%	125%	133%	135%	138%	150%	175%	180%	185%	200%	225%	250%
1	$3,220	$6,440	$9,660	$12,880	$16,100	$17,130	$17,388	$17,774	$19,320	$22,540	$23,184	$23,828	$25,760	$28,980	$32,200
2	$4,355	$8,710	$13,065	$17,420	$21,775	$23,169	$23,517	$24,040	$26,130	$30,485	$31,356	$32,227	$34,840	$39,195	$43,550
3	$5,490	$10,980	$16,470	$21,960	$27,450	$29,207	$29,646	$30,305	$32,940	$38,430	$39,528	$40,626	$43,920	$49,410	$54,900
4	$6,625	$13,250	$19,875	$26,500	$33,125	$35,245	$35,775	$36,570	$39,750	$46,375	$47,700	$49,025	$53,000	$59,625	$66,250
5	$7,760	$15,520	$23,280	$31,040	$38,800	$41,283	$41,904	$42,835	$46,560	$54,320	$55,872	$57,424	$62,080	$69,840	$77,600
6	$8,895	$17,790	$26,685	$35,580	$44,475	$47,321	$48,033	$49,100	$53,370	$62,265	$64,044	$65,823	$71,160	$80,055	$88,950
7	$10,030	$20,060	$30,090	$40,120	$50,150	$53,360	$54,162	$55,366	$60,180	$70,210	$72,216	$74,222	$80,240	$90,270	$100,300
8	$11,165	$22,330	$33,495	$44,660	$55,825	$59,398	$60,291	$61,631	$66,990	$78,155	$80,388	$82,621	$89,320	$100,485	$111,650
9	$12,300	$24,600	$36,900	$49,200	$61,500	$65,436	$66,420	$67,896	$73,800	$86,100	$88,560	$91,020	$98,400	$110,700	$123,000
10	$13,435	$26,870	$40,305	$53,740	$67,175	$71,474	$72,549	$74,161	$80,610	$94,045	$96,732	$99,419	$107,480	$120,915	$134,350
11	$14,570	$29,140	$43,710	$58,280	$72,850	$77,512	$78,678	$80,426	$87,420	$101,990	$104,904	$107,818	$116,560	$131,130	$145,700
12	$15,705	$31,410	$47,115	$62,820	$78,525	$83,551	$84,807	$86,692	$94,230	$109,935	$113,076	$116,217	$125,640	$141,345	$157,050
13	$16,840	$33,680	$50,520	$67,360	$84,200	$89,589	$90,936	$92,957	$101,040	$117,880	$121,248	$124,616	$134,720	$151,560	$168,400
14	$17,975	$35,950	$53,925	$71,900	$89,875	$95,627	$97,065	$99,222	$107,850	$125,825	$129,420	$133,015	$143,800	$161,775	$179,750

Wastewater Island

- **Environmental Factors:**
  - No access to centralized sewerage.
  - Soils not suitable for COSS.
  - Sensitive receiving environment (local TMDL, ground water concerns, existing water quality issues).
  - Small lot size.
  - Older homes and communities.
  - Actively failing onsite sewage system with raw or partially treated wastewater backing up into the house, discharging to the ground surface, or discharging directly to groundwater.
- **Financial Factors:**
  - Low income.
  - Difficulty obtaining a loan.
  - Difficulty raising funds for initial installation.
  - Difficulty paying for ongoing maintenance cost.
- **Social Factors:**
  - Historical inequities.
  - Lower education regarding environmental/public health issues.


HOUSE
FOR RENT

Windsor Subdivision

- Subdivision plat dated 1975
- 169 homes
- Average value: $198,055.03
- Average age of home: 39 years

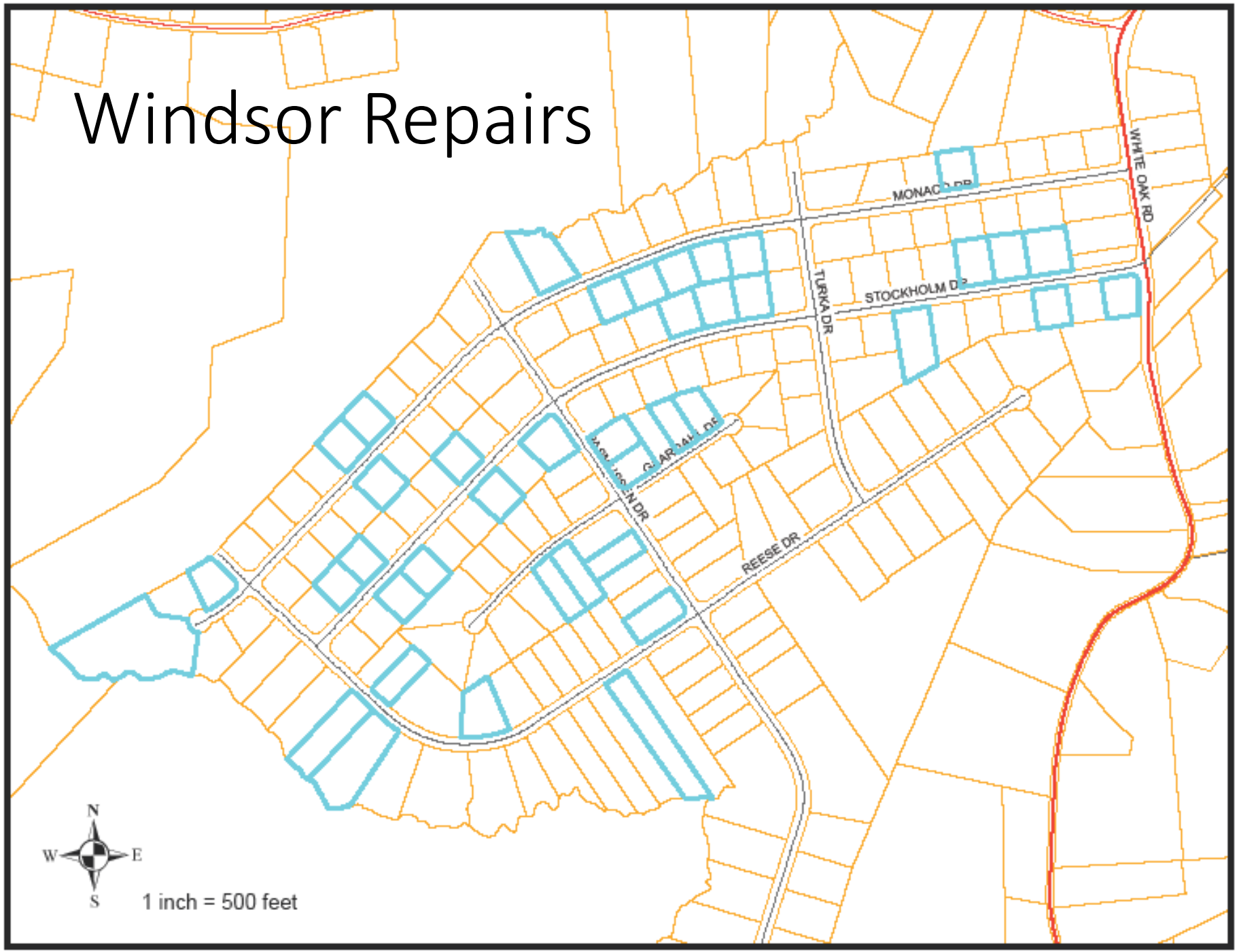
Windsor – Year Built

	A	B	C	D	E	F
1	**Row Labels**	**Count of Parcel ID**	Percentage			
2	1976	9	5%			
3	1977	24	14%			
4	1978	32	19%			
5	1979	10	6%		Built	
6	1980	8	5%	49.1%	1976-1980	
7	1981	4	2%			
8	1982	2	1%			
9	1983	20	12%			
10	1984	25	15%			
11	1985	13	8%	87.0%		
12	1986	5	3%			
13	1987	4	2%			
14	1988	1	1%		Built	
15	1990	7	4%	47.9%	1981-1990	
16	1991	1	1%			
17	2000	1	1%			
18	2007	1	1%			
19	2009	1	1%			
20	2011	1	1%	3.0%	Built since 1991	
21	**Grand Total**	**169**				

Number of bedrooms

	A	B	C
1	**Row Labels**	**Count of Parcel ID**	**Percent**
2	2	6	3.6%
3	3	139	82.2%
4	4	23	13.6%
5	6	1	0.6%
6	**Grand Total**	**169**	

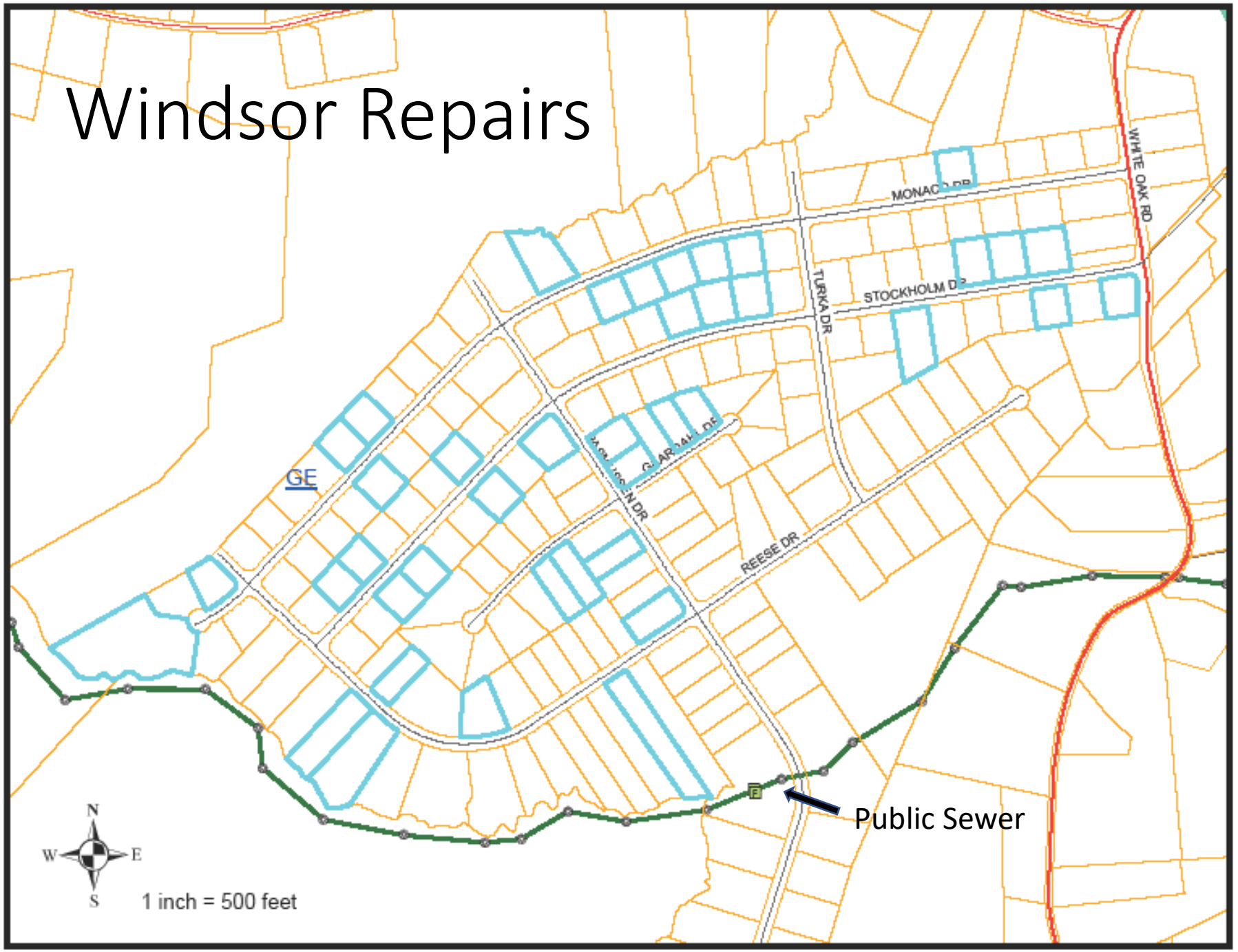
Windsor Repairs



Windsor Repairs

- 41 repairs out of 169 houses: 24.2%
- Average age at time of repair: 23.8 years
  - 46% of the repairs occurred by the time the houses were 20 years old.

Windsor Repairs

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DELAWARE
MARYLAND
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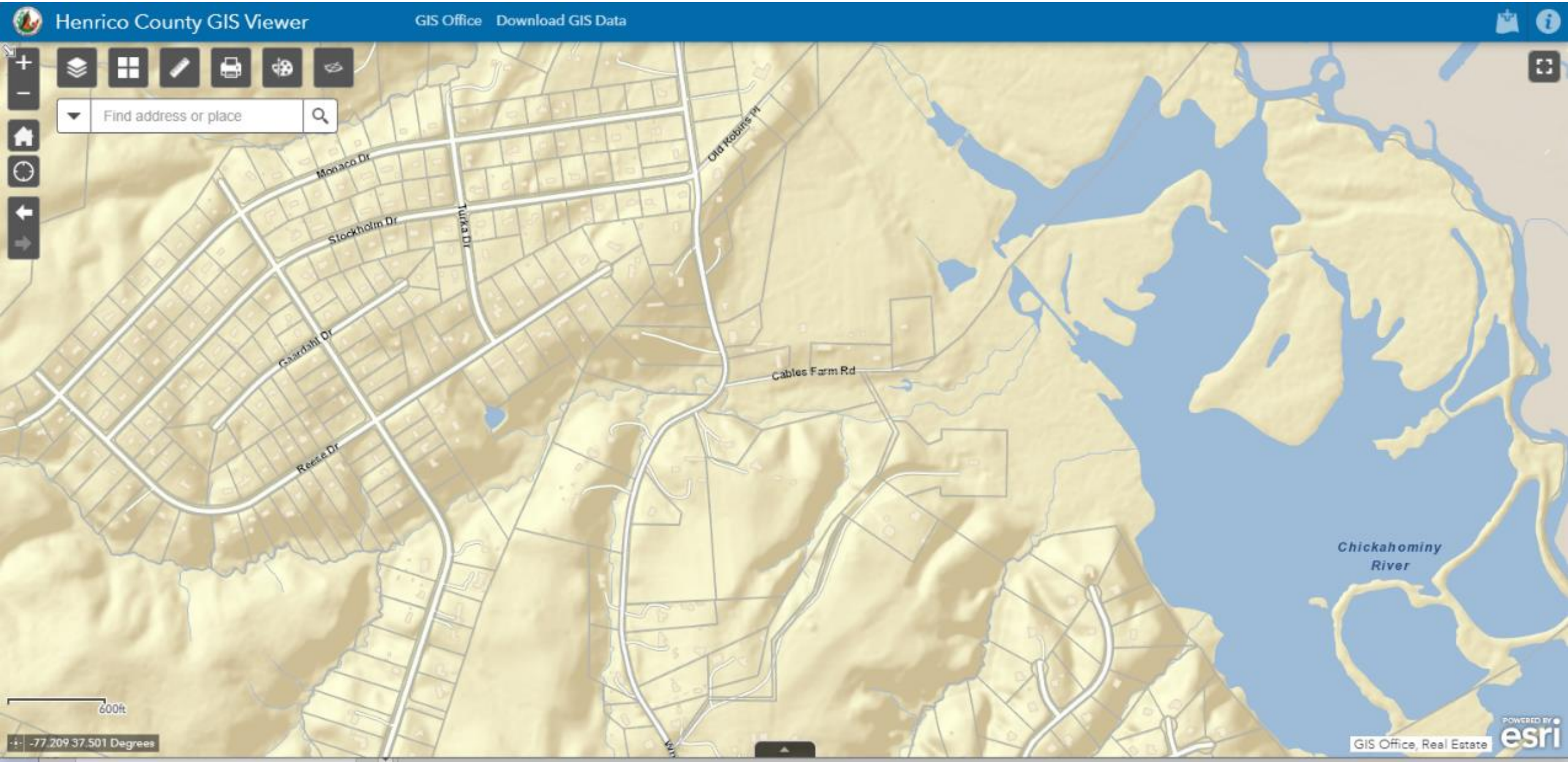
Norfolk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Turka Dr
Old Robins Pl
Cables Farm Rd
Chickahominy River
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Rasmussen Dr
White Oak Rd
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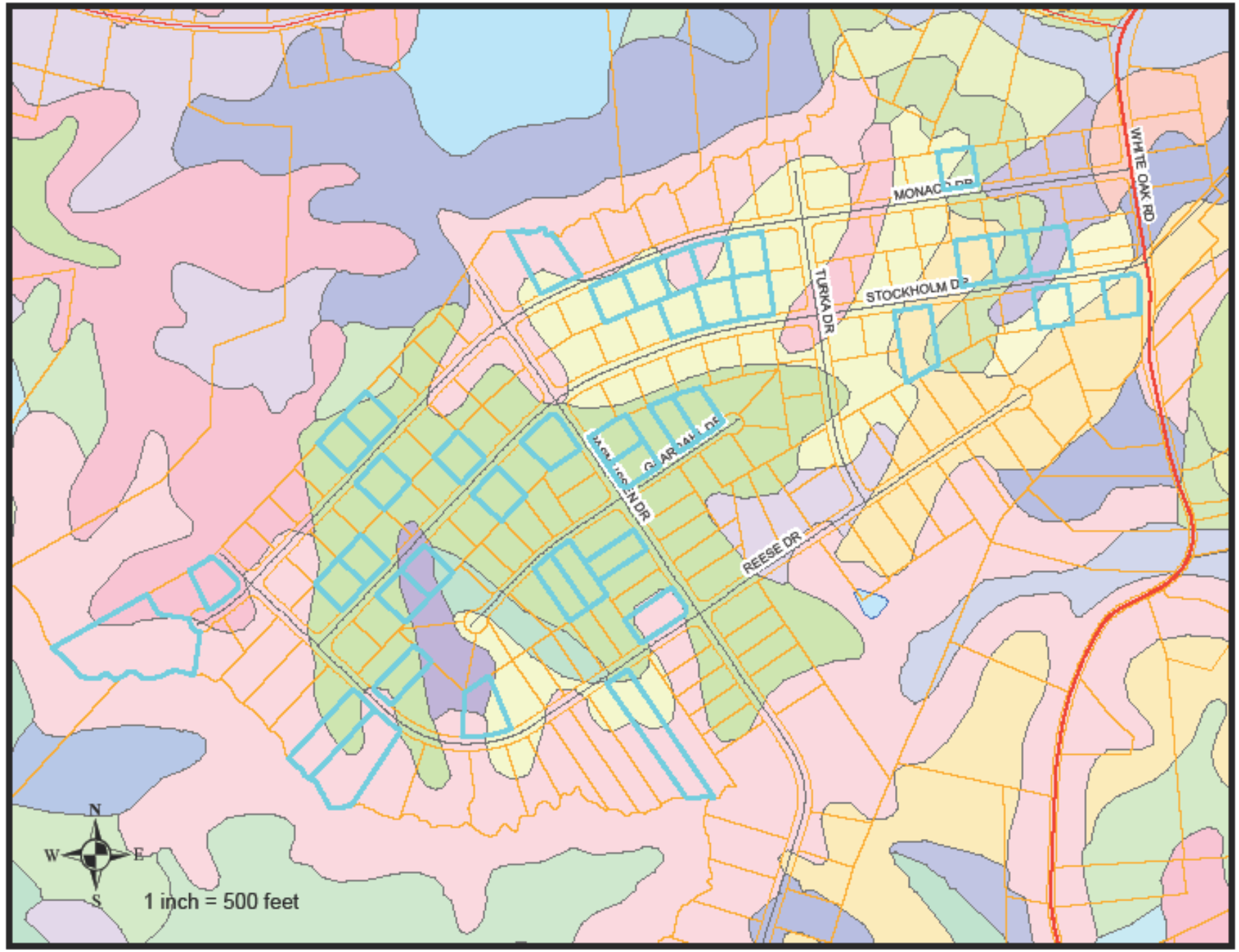

WHITE OAK RD
TURKA DR
REESE DR
N
W
E
S
1 inch = 500 feet

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AfA	Altavista fine sandy loam, 0 to 2 percent slopes	0.0	0.0%
AfB	Altavista fine sandy loam, 2 to 6 percent slopes	1.2	0.8%
CaB2	Caroline very fine sandy loam, 2 to 6 percent slopes, eroded	3.0	2.0%
KaC	Kalmia fine sandy loam, 2 to 10 percent slopes	4.6	3.1%
KeA	Kempsville fine sandy loam, 0 to 2 percent slopes	28.4	19.2%
KeC2	Kempsville fine sandy loam, 2 to 10 percent slopes, eroded	3.6	2.4%
KgA	Kempsville very fine sandy loam, clayey substratum, 0 to 2 percent slopes	47.1	31.8%
KgB	Kempsville very fine sandy loam, clayey substratum, 2 to 6 percent slopes	5.1	3.4%
KgC2	Kempsville very fine sandy loam, clayey substratum, 6 to 10 percent slopes, eroded	3.8	2.6%
Kn	Kinston and Mantachie soils	4.5	3.0%
NoC	Norfolk fine sandy loam, 6 to 10 percent slopes	0.3	0.2%
OUD	Nevarc-Remlik complex, 6 to 15 percent slopes	0.5	0.3%
OUF	Nevarc-Remlik complex, 15 to 50 percent slopes	37.4	25.2%
RrC	Rumford loamy sand, 0 to 10 percent slopes	5.2	3.5%
UE	Udorthents, loamy	3.3	2.3%
Totals for Area of Interest		**148.0**	**100.0%**

1982 Sewage Handling and Disposal Regulations

Separation Distance from Trench Bottom to Free Standing Water

Percolation Rate Minutes/Inch	Distance From Trench Bottom Inches
5	2
17	3
46	12
90	18
120	20

2000 Sewage Handling and Disposal Regulations

Table 4.3.
Summary of Separation Distances between Systems Using Naturally Occurring Undisturbed Soils and Limiting Site Factors.

Site Factor	In-Ground System[1]		Shallow-Placed System[1]	
	Septic Tank Effluent	Secondary Effluent	Septic Tank Effluent	Secondary Effluent
Bed Rock	18"	12"	n/a	18"
Restriction	18"	12"	n/a	18"
Shrink-Swell Soil	18"	12"	n/a	18"
Slope	50%	50%	n/a	50%
Perc Rate	5-120 mpi	5-120 mpi	n/a	5-45 mpi
Water Table	18"	12"	n/a	12"

[1]The separation distances for in-ground and shallow-placed systems are measured from the trench bottom or other infiltrative interface vertically down to listed site factor.

KEMPSVILLE SERIES

Soils of the Kempsville series are very deep, well drained, and moderately permeable. They formed in loamy sediments on the upper Coastal Plain. Slopes are dominantly 0 to 6 percent but range to 25 percent. Mean annual temperature is 59 degrees F, and mean annual precipitation is 47 inches.

TAXONOMIC CLASS: Fine-loamy, siliceous, subactive, thermic Typic Hapludults

TYPICAL PEDON: Kempsville fine sandy loam on a 3 percent slope in a mixed pine and hardwood forest. (Colors are for moist soil.)

A--0 to 4 inches; dark grayish brown (2.5Y 4/2) fine sandy loam; weak fine granular structure; very friable; many medium and common coarse roots; common fine and medium tubular pores; very strongly acid; clear smooth boundary. (0 to 8 inches thick)

E--4 to 14 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak fine and medium granular structure; very friable; common coarse medium and fine roots; common fine and medium tubular pores; very strongly acid; gradual smooth boundary. (0 to 15 inches thick)

Bt1--14 to 20 inches; yellowish brown (10YR 5/6) fine sandy loam; weak fine and medium subangular blocky and weak fine angular blocky structure; friable; few coarse medium and fine roots; common fine and medium pores; few faint clay films on faces of peds and common clay bridging between grains of sand; few medium faint light yellowish brown (10YR 6/4) iron depletions; very strongly acid; clear smooth boundary.

Bt2--20 to 32 inches; strong brown (7.5YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable; few coarse fine and medium roots with the coarse roots mainly in the upper part of the horizon; few fine and medium pores; common distinct clay films on faces of peds; few medium distinct light yellowish brown (10YR 6/4) iron depletions; very strongly acid; clear smooth boundary.

Bt3--32 to 40 inches; strong brown (7.5YR 5/6), light yellowish brown (10YR 6/4), and pale brown (10YR 6/3) fine sandy loam; weak coarse and medium subangular blocky structure; strong brown portion is friable, light yellowish brown and pale brown portion is firm and slightly compact in place; few fine roots; few fine and medium vesicular pores; few distinct clay films on faces of peds; light yellowish brown and pale brown portions are iron depletions; strongly acid; clear wavy boundary.

Bt4--40 to 55 inches; yellowish brown (10YR 5/6) sandy clay loam; weak coarse and medium subangular blocky structure; friable, slightly compact in place; few fine and very fine roots; few fine vesicular pores; few distinct clay films on faces of peds and common bridging between sand grains; common medium distinct pale brown (10YR 6/3) iron depletions and common medium faint strong brown (7.5YR 5/6) irregularly shaped masses of iron accumulation; strongly acid; clear wavy boundary. (Combined thickness of the Bt horizon is 28 to 60 inches.)

C--55 to 68 inches; yellowish brown (10YR 5/6) fine sandy loam; massive; friable; few fine roots; few fine vesicular pores; common medium distinct strong brown (7.5YR 5/6) irregularly shaped masses of iron accumulation, and many coarse prominent gray (5Y 6/1) and common medium distinct light yellowish brown (10YR 6/4) iron depletions; strongly acid.

4610 Stockholm Drive

- System installed in 1978.
- Original Homeowner
- 1,256 square feet
- 3 bedrooms, 1.5 baths
- Assessed value: $176,600

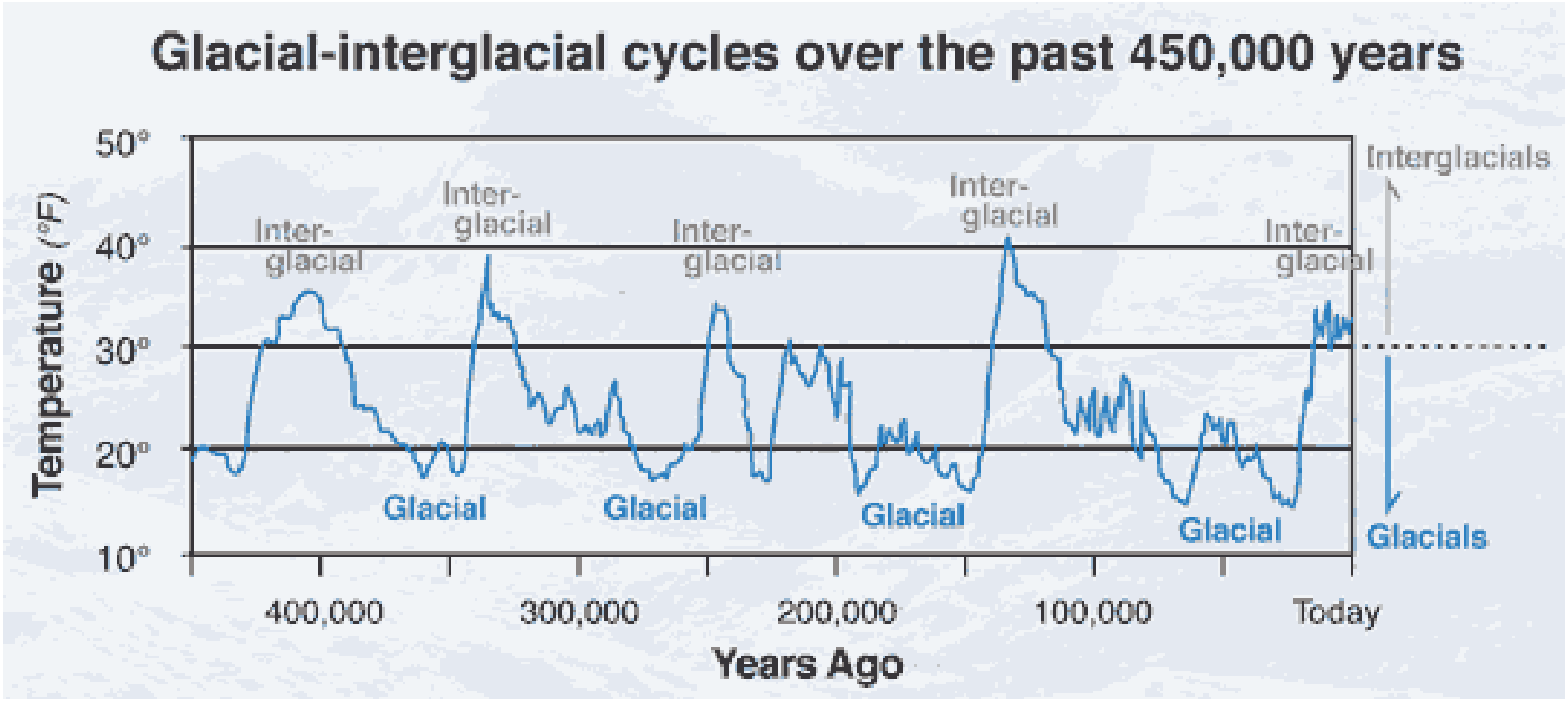
What made these soils problematic in the first place?

Not recognizing relict and permeability limiting features in the soil and how that relates to soil structure and permeability.

Misinterpreting massive and cemented soils due to the brittle nature of compacted soils.

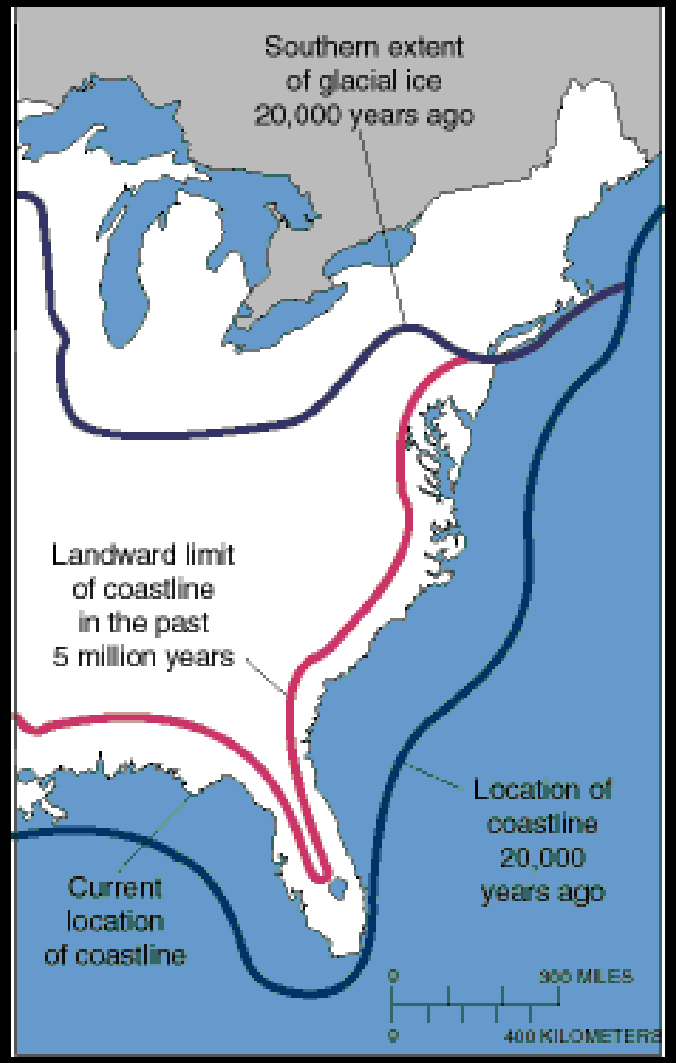
To illustrate this, it might help to understand the condition and environment in which these soils originally formed.

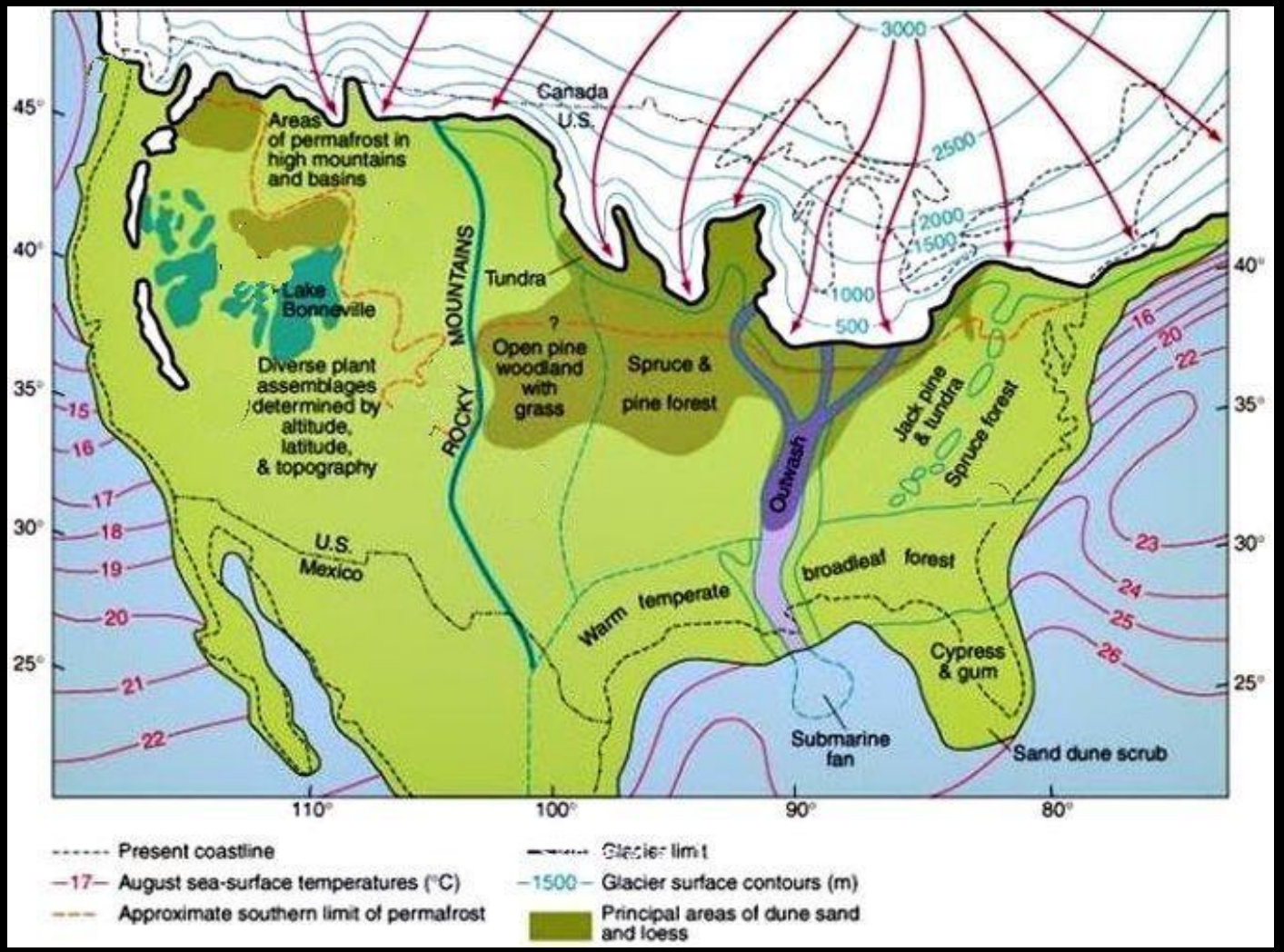
Pleistocene Era – dominated by Ice Ages



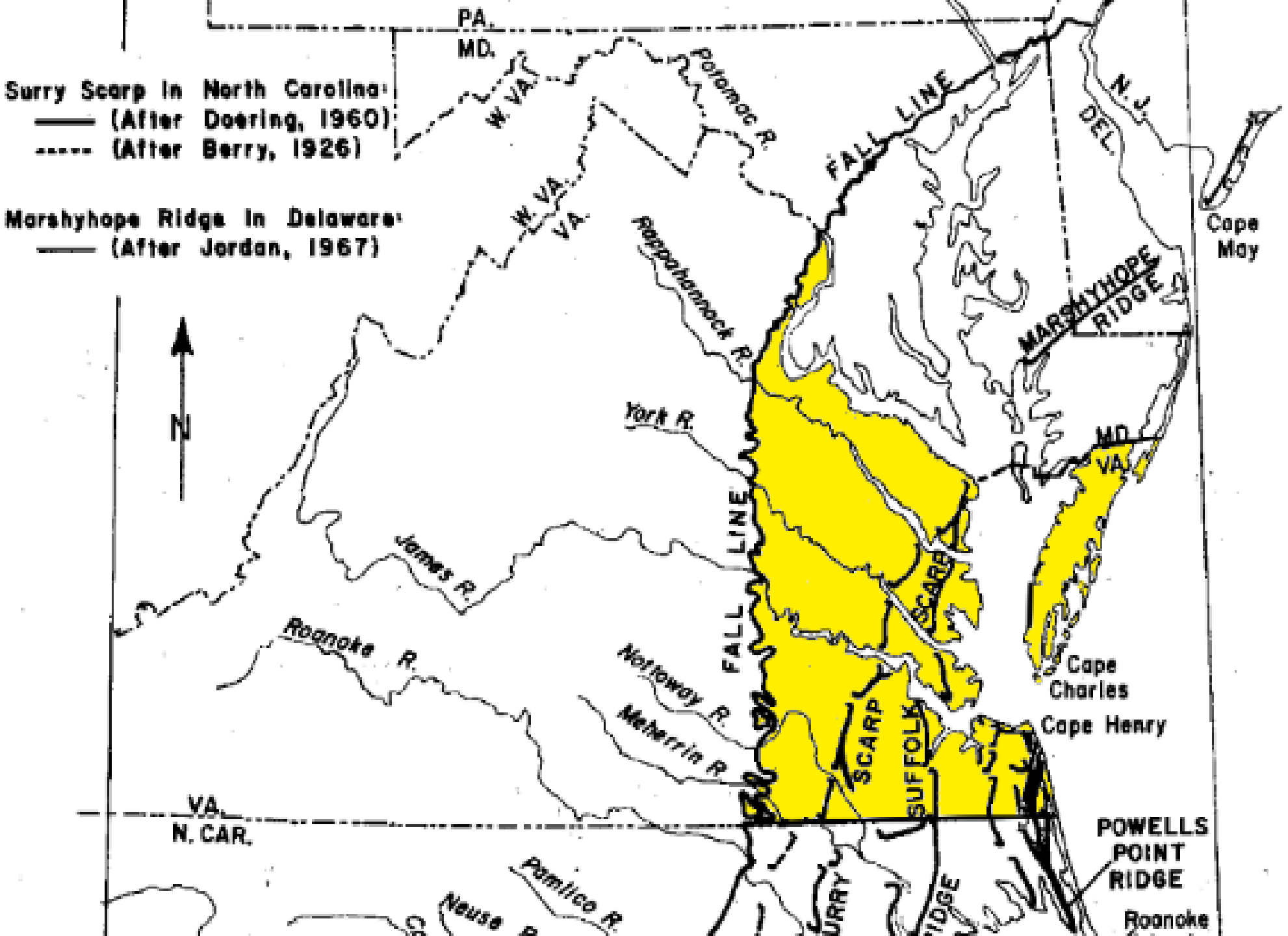
Utah Geological Survey, September 2019 publication.

Fluctuating coastlines and climates



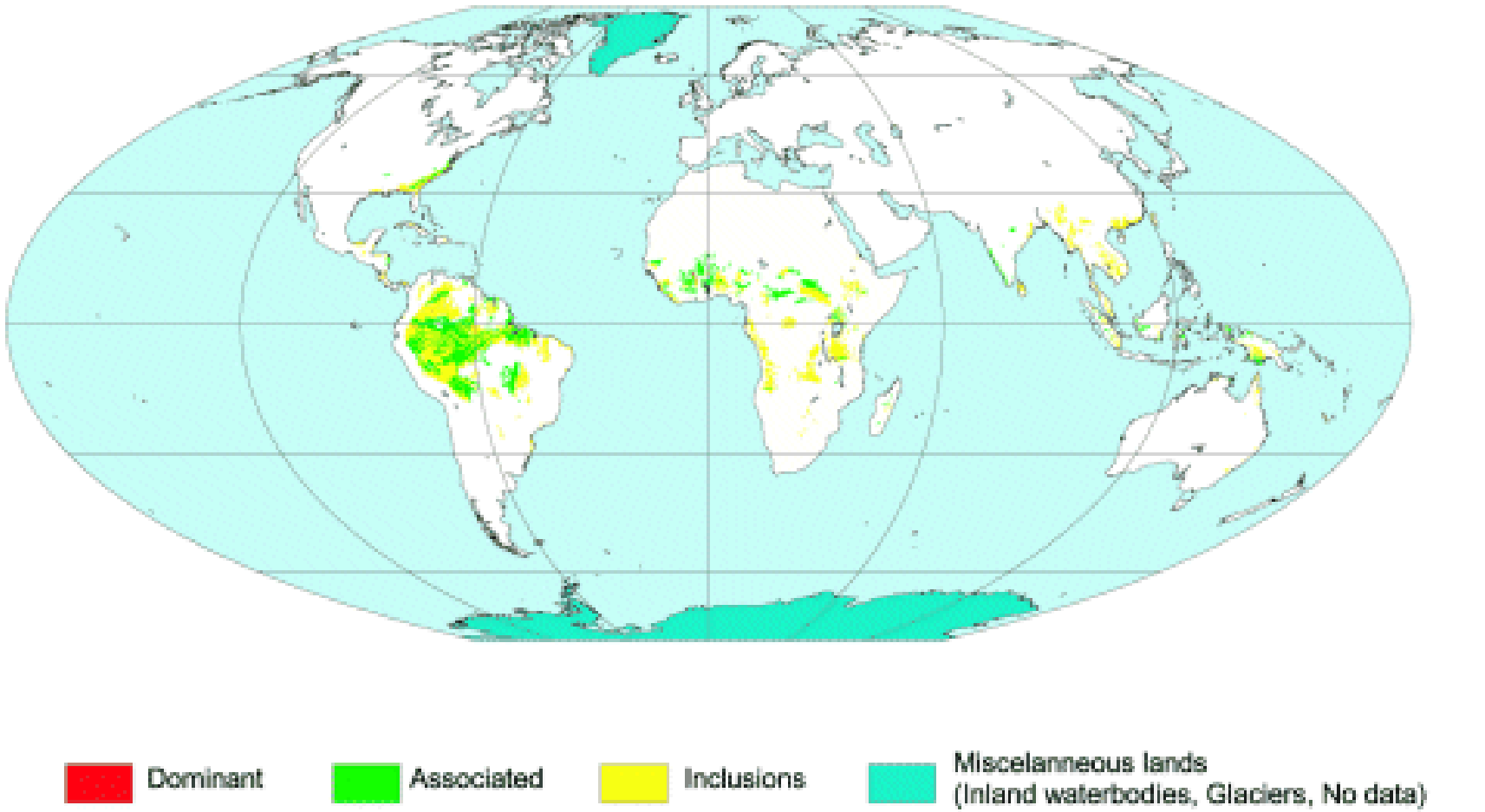


(Public domain – source USGS)



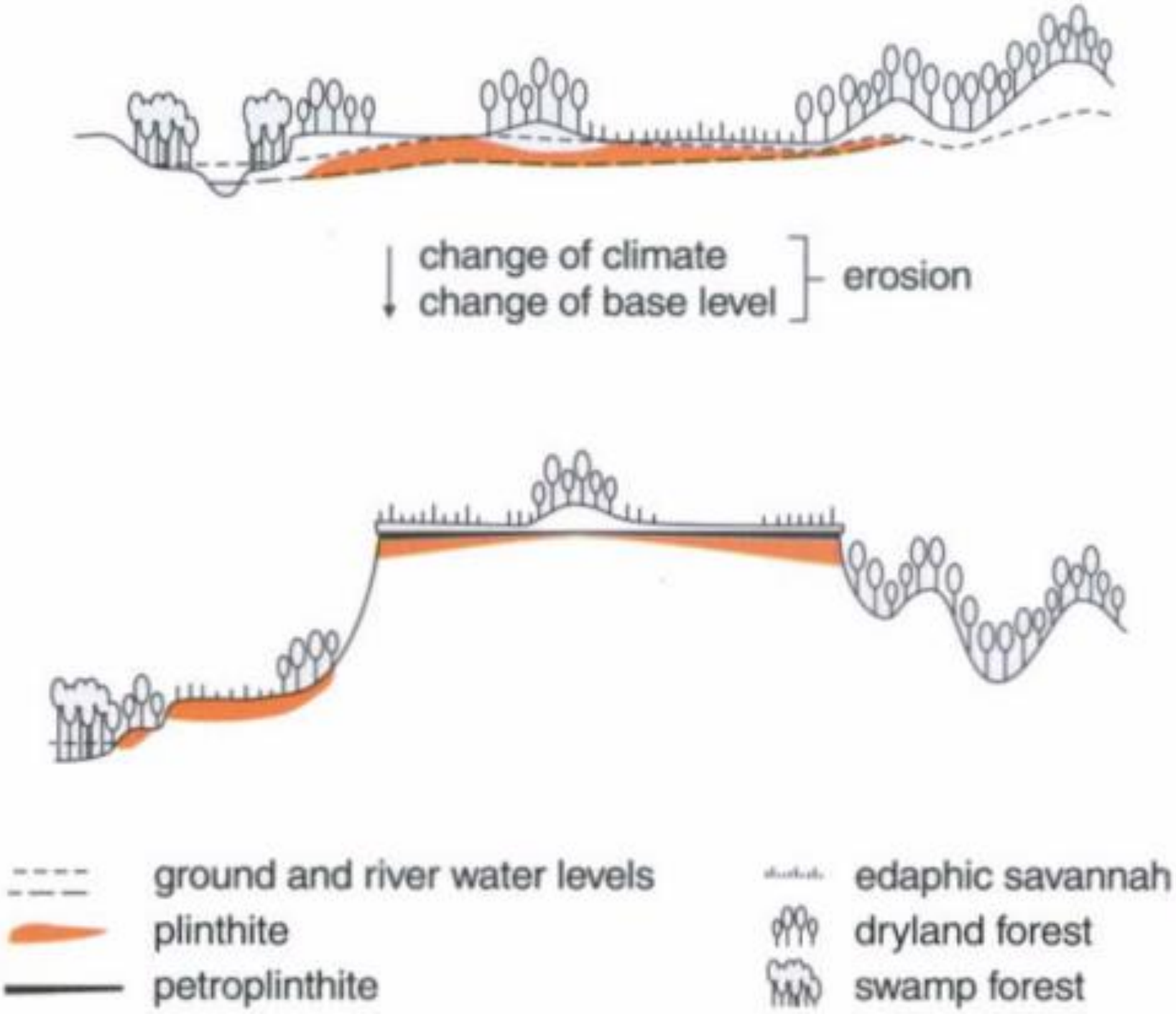
http://www.virginiaplaces.org/regions/coastalplain.html

Where is plinthite actively forming now?



Current soil proflie showing a Plinthosol with the begining formation of plinthite lower in the soil profile.

https://en.wikipedia.org/wiki/Plinthosol



https://www.isric.org/sites/default/files/major_soils_of_the_world/set6/pt/plinthos.pdf

What does plinthite look like in the field?

The ultimate test is to pinch it and see if it is slightly cemented (crunchy). Also it gets more and more firm after it dries.

Cut bank showing reticulated relict features further down in the soil profile

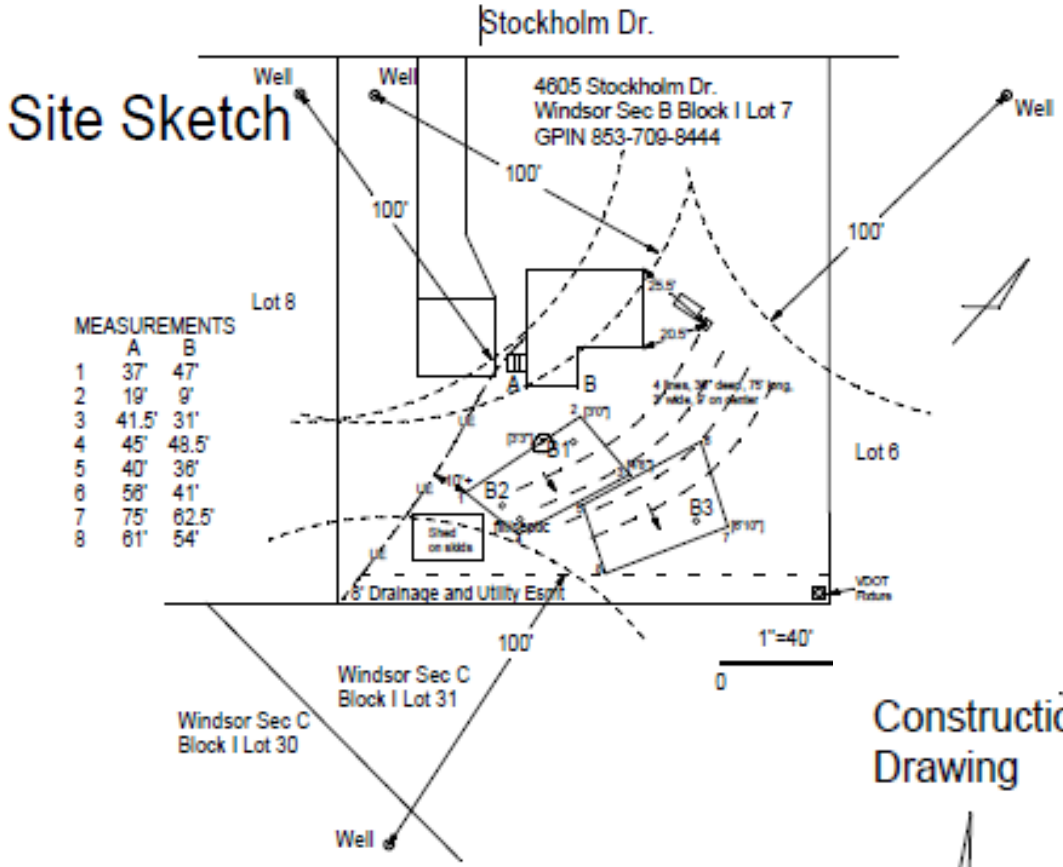
Uniform soil matrix with the first signs of relict features appearing in the lower right.

What should be taken into consideration when designing in these soils that show evidence of restriction, but no evidence of seasonal water table?

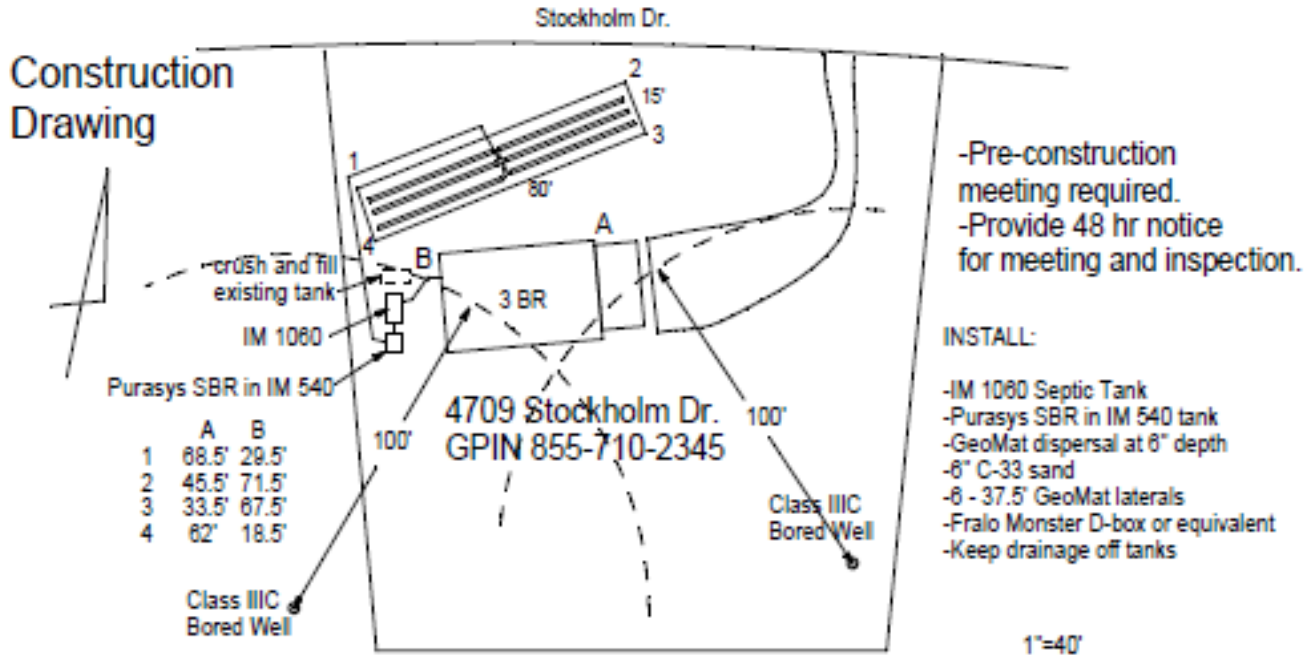
- Water mounding calculations
- Run Ksat tests or design at a higher rate than the soils indicate
- Install shallow and ensure positive drainage away from drainfield
- Install a French Drain if reasonable, even on shallow placed systems
- Consider ditching out roof drains and gutters
- Specify grading around house, away from septic tank and drainfield
- Anticipate rates of greater than 120 mpi in horizons that contain relict red features.

Things to remember when in the coastal plain

- Red (2.5YR and greater) and yellows are relict
- Grays are relict and sometimes active redox
- Pale brown (light brownish grays) and strong brown (orange) are probably active redox
- Plinthite (typically on the 10R page and irreversibly hardened) indicate rates of 120 mpi or greater.



Small Lots, Well Conflicts



Wastewater Island

- **Environmental Factors:**
  - No access to centralized sewerage.
  - Soils not suitable for COSS.
  - Sensitive receiving environment (local TMDL, ground water concerns, existing water quality issues).
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Windsor Repairs